



INTERNATIONAL CONFERENCE ON CONSERVATION FOR BETTER LIFE

11 - 13 September 2015

Reviewers:

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Editors:

Aji Purwinarko, S.Si, M.Cs

Mohamad Ikhwan Rosyidi S.S., M.A.

**SEMARANG STATE UNIVERSITY
2015**

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**PROCEEDING
“INTERNATIONAL CONFERENCE
ON CONSERVATION FOR BETTER LIFE”
2015**

THEME:

Conservation for Greener Life

PURPOSES:

The conference aims at:

- 1) communicating and to facilitating the information sharing among participants and qualified speakers in the field of conservation for better life;
- 2) disseminating the results of research studies conducted by researchers, teachers, and lecturers in the field of conservation for better life; and
- 3) inspiring the effort of conservation for the sustainability of the environment.

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FOREWORD

First, we would like to express our gratitude to Allah Almighty for His blessings so that this proceeding of the “International conference on conservation for better life” 2015 can be published. These proceedings consist of all papers presented at the conference on 11th-13th September 2015 at Patra Hotel Semarang Central Java Indonesia. The papers were internally reviewed by the qualified reviewers.

The theme of the conference was “Conservation for Greener Life”. It was expected that through this proceeding, we are able to disseminate the results of studies in the field of conservation. This event invited five speakers who presented materials closely related to the theme, namely: Greenhouse Effect, Ozone and Acid Rain Problems (by Dr. Nina Harsch), Prof. Aminuddin Hj Yusof, Biorefinery Project in Kanazawa University (by Prof. Kenji Takahashi), Design and Synthesis of New Solid Catalysts as an Integral Part To The Solutions of Today’s and The Future’s Conservation Efforts (by Prof. Hadi Nur), and Prof. Ian Rowland.

We hope that this proceeding will be beneficial for the society in terms of education, research, and community services.

Semarang, 21st September 2015

Editorial Board

WELCOMING SPEECH FROM THE COMMITTEE CHAIR PERSON

Assalamu'alaikum Wr. Wb.

First of all, allow me to invite all guests, invitees, presenters, and participants of this conference to God Almighty who has bestowed on us His blessings so that we are able to be together on this cordial occasion to conduct a conference on behalf of the Conservation University, Unnes, on 12th March 2010. Several efforts have been taken by all members of the committee so as to make this conference a success. The idea of conducting this conference on conservation for better life is part and parcel of the international agenda as the global response towards global warming, climate changes, and environmental damage. By integrating the concept of conservation in higher education, we hope that there will be more scientists who become aware of the importance of maintaining the environment.

Higher education plays an important role in “producing” scientists and professional candidates. They will be the future decision makers. Thus, in order to formulate recommendation on the issues of conservation, Unnes holds the International Conference on Conservation for Better Life 2015. This event is supposed to be an open forum for all disciplines to share their knowledge, experience and best practices in responding to global issues of conservation through education.

The committee appreciates all the speakers for their willingness to share their ideas, concepts, and experiences through this conference. We also thank the speakers in parallel session as well the participants for joining this conference. We hope this collection of proceedings is useful for the readers.

Wassalamu'alaikum. Wr. Wb.

Semarang, 21st September 2015
Committee Chair Person

Dr. Januarius Mujiyanto M.Hum.

WELCOMING SPEECH FROM THE RECTOR OF SEMARANG STATE UNIVERSITY

Assalamualaikum Wr. Wb.
Salam Konservasi,

At the outset, allow me to ask all of you, who are present in this conference, to praise Allah Almighty who has bestowed on us all his blessings and grace so that we are able to be together here in healthy, safe, and sound condition. We are grateful because Semarang State University (Unnes) could organize this International Conference on Conservation for Better Life (ICCBL) in 2015 very well and has finished compiling the proceedings so that it can be delivered to all the readers.

ICCBL is an international conference organized as a forum to share ideas on environmental conservation and cultural values. Conservation and preservation of nature at this time is one of the urgent international agendas to be implemented as a response to the issue of global warming, climate changes, and environmental problems. Unnes has been actively developing conservation policies started by declaring itself as the Conservation University on 12th March 2010. By integrating conservation in the world of higher education, it is expected that the higher education is capable of producing scientists and professionals who are sensitive and care about environmental issues. Universities are considered to be strategic in producing the prospective scientists and professionals, who would be the future decision makers.

This proceedings consist of papers presented by parallel speakers in ICCBL, either in the form of conceptual ideas or research results. The theme of conservation, Conservation for a greener life is inline with the vision of Unnes as the Conservation University which is healthy, outstanding, and prosperous. The notion of environmental conservation, values, and culture certainly lead to the improvement of people's welfare. The themes raised are relevant to the vision. They are among others: (1) the conservation of biological diversity (biodiversity), (2) green building, (3) waste management (waste management), (4) the development and utilization of clean energy sources (clean energy), (5) and cultural conservation values, (6) environmental education, and (7) the reduction of paper usage policy (paperless policy).

This event is supposed to be an open forum for all disciplines to share their knowledge, experience and best practice in responding the global issues of conservation through education.

Wassalamu'alaikum. Wr. Wb.

Semarang, 21st September 2015
Rector of Semarang State University

Prof. Dr. Fathur Rokhman, M.Hum

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BIOREFINERY PROJECT IN KANAZAWA UNIVERSITY

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ABSTRACT

Biomass conversion processes and equipment to produce bio-fuels, power, and chemicals from biomass are now becoming very important. These processes are called as “biorefinery”. The biorefinery concept is analogous to today's petroleum refineries, which produce multiple fuels and chemical products from petroleum. Industrial biorefineries have been identified as the most promising route to the creation of a new biobased industry.

By producing not only fuels but also chemicals, a biorefinery can take advantage of the differences in biomass components and intermediates and maximize the value derived from the biomass feedstock. A biorefinery may produce one or several low-volume, but valuable, chemical products and a low-value, but high-volume liquid transportation fuel. The high-value products enhance profitability, the high-volume fuel helps meet national energy needs, and the power production reduces costs and avoids greenhouse-gas emissions.

Figure 1 shows an overview of our present projects. In our project, one of final products are carbon fiber reinforced plastic (CFRP). In the figure two routs are showing. One route is converting cellulose or starch into sugars. Then the sugars are converted into building blocks, such as 2.5-furandicarboxylic acids. From these chemical building blocks, thermosetting and thermoplastic resins are produced.

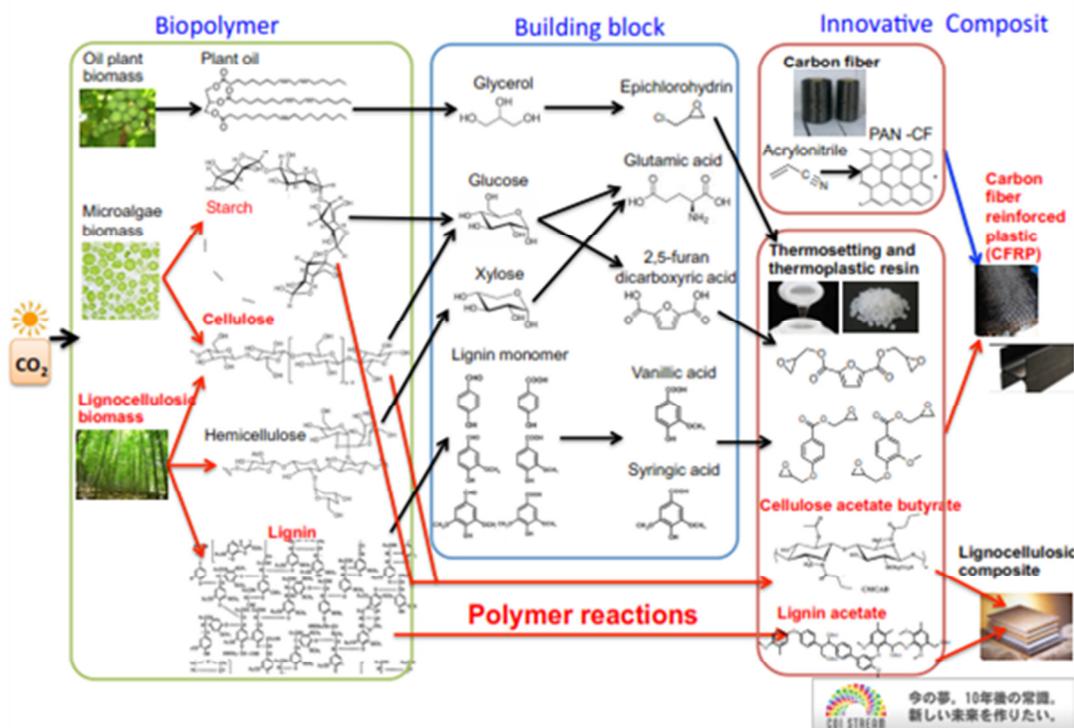
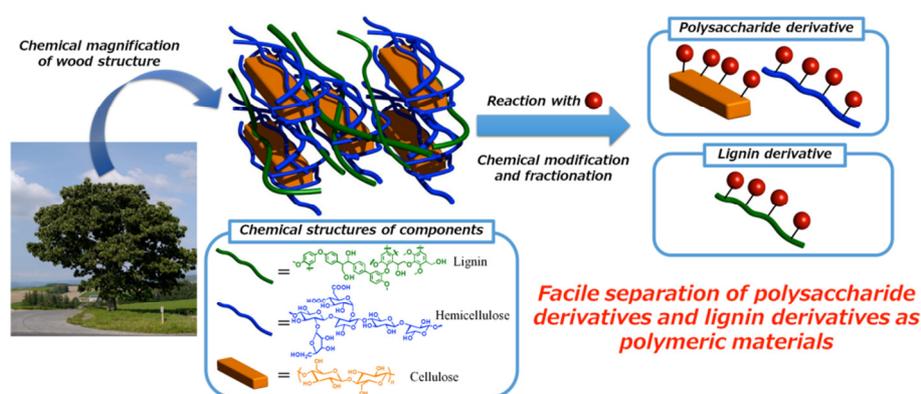


Figure 1. An overview of biorefinery project in Kanazawa University, Japan.

Another route is a producing the bio-based resin directly from biopolymers. Because of there was no good solvent that can be dissolve biomass or cellulose and lignin, there are only limited studies were carried out. In 2002, Rogers and co-workers reported that ionic liquids (ILs), a kind of solvents comprising of cations and anions as components, had a unique potential to dissolve cellulose under mild conditions. Triggered by this report, other biomaterials including lignin and even a raw biomass itself have been discovered to be dissolved in ILs under mild conditions. Because the above-noted biomasses were scarcely soluble in any solvents including both organic and aqueous solutions, these basic studies re-triggered a chemical treatment of biomass, which had been suppressed for long years.

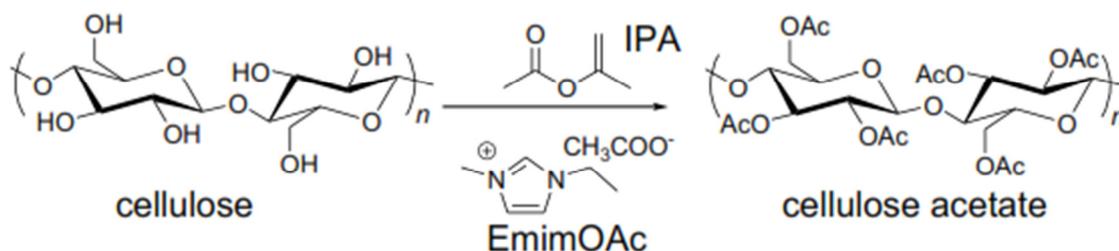
The lignocellulosic biomass is made from mainly three components, namely the cellulose, the hemicellulose, and the lignin with highly sophisticated architectures (Scheme 1). Usually, utilization of biomass has been depending on the depolymerization processes of either lignin or polysaccharides. Hence, reported study of biomass application were economically and thermodynamically disadvantageous. Hence, an ideal case in application of biomass is expected to be a direct separation of the lignin and the polysaccharide segments keeping their polymeric characters because such polymeric materials can be employed for a lot of industrial applications. However, it is extremely difficult to separate directly each components in biomass structure because the lignocellulose structure showed in Scheme 1 is very complex.

Herein, now a new biomass application, essentially realizing a direct chemical derivatization and subsequent fractionation of the polysaccharide and lignin of the lignocelluloses are proposed. Our attention was turned to the common feature of lignocelluloses. To be precise, the hydroxyl group is well-known to exist in any components of biomass and thus targeted as the ubiquitous reaction point. In specific cases, organic transformation reactions in ILs were revealed to undergo with ILs as both a solvent and organo-catalyst[1]. In this presentation, 1) a direct chemical reaction of raw biomass in ILs with ILs as a organo-catalyst to afford polysaccharides and lignin derivatives without the aid of metals and strong acids and 2) subsequent separation of polysaccharides and lignin derivatives with taking advantage of differences in their solubility are described (Scheme 1).



Scheme 1. Schematic representation of this work.

During the course of our study, we have found that the transesterification reaction (TER) of cellulose with isopropenyl acetate (IPA) in 1-ethyl-3-methyl-imidazolium acetate (EmimOAc) smoothly occurred to produce cellulose triacetate without any additional catalyst or corrosive chemicals, with which we can take full advantage of the dual functionalities of ILs, namely a solvent for cellulose and an activating agent for TER. In this study, we describe 1) the characterization and optimization of the direct transesterification of cellulose with IPA in EmimOAc without any additional chemicals, and 2) the kinetic insight into the direct TER of the cellulose with EmimOAc being a solvent and an activating reagent.



Scheme 2. Schematic representation of the transesterification reaction of cellulose in EmimOAc with EmimOAc as a solvent and an activating reagent.

As envisioned by significant properties of EmimOAc as an activating agent for organic transformation reactions such as the spontaneous generation of carbene species,²⁶ TER was selected because cellulose features hydroxyl moieties as chemically reactive groups. In order to confirm whether or not the EmimOAc served as both a solvent for the cellulose and an activating agent for the TER, the reaction of cellulose with stable esters was conducted. To be precise, a 3 wt% cellulose solution in EmimOAc was treated for 24 hours with an excess amount of IPA as an ester donating component at 80 °C under an Ar atmosphere. Surprisingly, the TER of the cellulose without additional chemicals was obviously confirmed by the clear transition from the biphasic reaction mixture to a homogeneous reaction solution, suggesting that the cellulose was chemically modified and thus the strong hydrogen bonding between the hydroxyl groups was switched off. The obtained polymer was purified by reprecipitation into methanol to afford a pale-colored solid as the product. IR measurements of the obtained polymers before and after the TER revealed that the band at 1738 cm⁻¹ due to the ester stretching clearly developed after the reaction, supporting the facile TER of the cellulose.

[1] Efficient and rapid direct transesterification reactions of cellulose with isopropenyl acetate in ionic liquids, *RSC Adv.*, 2015, **5**, 72071-72074

DESIGN AND SYNTHESIS OF NEW SOLID CATALYSTS AS AN INTEGRAL PART TO THE SOLUTIONS OF TODAY'S AND THE FUTURE'S CONSERVATION EFFORTS

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ABSTRACT

In this fast changing time, the development of high performance and conceptually innovative catalytic processes is crucial for chemical industries. It is generally accepted that heterogeneous catalysis is an important process in the transformation of energy, which is considered as an integral part of the solution of today's and the future's energy problems. The purpose of this presentation is to introduce several designs of heterogeneous catalytic systems, which were compiled, based on classification from the catalytic processes. These systems comprised of examples from researches that were carried out by the author together with his colleagues and students at Universiti Teknologi Malaysia (UTM). The aim is to develop and understand the catalytic phenomena through the design and physicochemical properties of the solid catalysts. A basic feature common to all catalytic systems is that the catalytic reaction can be considered as a reaction cycle, in which catalytically active sites are initially consumed and at the end of the cycle are regenerated. There are many different catalytic systems and most of the basic mechanistic features are well understood. Here, an attempt will be made to introduce several catalytic reactions in order to design a better catalyst through chemical design. The catalytic reactions that will be discussed are the oxidation and acid catalysis by heterogeneous catalysts. These works are classified into six classes, namely phase-boundary catalysis, acid catalysis, oxidation catalyst, bifunctional catalyst, photocatalyst and shape controllable synthesis of solid catalyst-assisted by the magnetic field. Hopefully, the structure-catalytic properties of these several designs of the heterogeneous catalytic system may assist in the further search for novel approaches to heterogeneous catalysis for an environmentally-benign transformation of biomass and new efficient energy systems.

Keywords - Sustainability; Particulate materials; Heterogeneous catalytic system; Synthesis of titanium dioxide under magnetic field; Liquid-gas boundary catalyst; Bifunctional catalyst; Photocatalyst; Chiral catalyst.

CATALYSIS, KEY OF THE SUSTAINABILITY

Catalysis is the key for the transformation of organic substrates into the useful chemical products. Usually, the simple organic substrate molecules are converted to form more complex molecules. These chemical transformations produced a large range of products for different industries, as well as products that can be used directly in the fields of health, the environment, and nutrition. The catalytic reaction is very effective to produce products with a high yield and also very effective to prevent the production of unwanted by-product. Today, many chemical industries processes used

catalysts, and consequently, they are a key factor to sustainability and profitability of chemical production processes.

PROBLEMS AND CHALLENGES IN CATALYSIS RESEARCH

There are three problems and challenges in the use of catalysts for the future's conservation efforts:

- Threat of a widening R&D gap. A widening gap was perceived between fundamental, university based, long-term research and short-term industrial applied research and development.

- Diminishing interaction. Communication in the field of catalysis depends partly on the availability of platforms between industries, government and universities. The widening R&D gap may cause the interaction between industry and the knowledge infrastructure to diminish. Specifically the selection and definition of research topics as well as joint funding and execution of research programs are issues in need of attention.
- Lack of qualified researchers. Malaysia has, and still experiences, a significant low in the number of students and post-docs at universities in science and technology of catalysis disciplines relatively to the advanced countries.

PARTICUOLOGY IN HETEROGENEOUS CATALYSIS

The word "particuology" was coined to parallel the technical terminology for the science and technology of particles by combining the Latin prefix *particula* for particles and the Greek suffix *logia* denoting subject of study [1]. Particuology in heterogeneous catalysis is an important topic in both of academic and industry point of view since the heterogeneous catalysis on of the important field in chemical industries. Heterogeneous catalysis one of the keys factor for sustainable development of industrial society.

The following are examples of my researches, which were carried out by me together with my colleagues and students. Some of the review on our researches had been published in books and journals [2–4]. This paper also summarizes some of the research that is being conducted in our laboratory at Universiti Teknologi Malaysia. I hope that these researches can give an inspiration for readers how the design of the catalyst can be related to the

physicochemical properties and the catalytic action for the chemical reactions, and may assist in the further search for novel approaches to catalysis.

“Catalysis by chemical design” has been a dream for decades. To specify the composition and structure of matter to affect a desired catalytic transformation with desired and predicted rate and selectivity remains a monumental challenge, especially in heterogeneous catalysis. With the advent of surface science techniques in decades past, the promise was perceived of turning increased molecular level understanding of reaction mechanisms and surface sites into principles of catalyst design. Surface science alone has not proven to be sufficient for this purpose. Over the past decade the rise of powerful, computationally efficient theoretical methods have shown promise, not just for identifying catalytic intermediates and reaction pathways accessible to experiments, but of providing quantitative predictions of energetic for elementary reaction processes not easily accessed experimentally. Much of our work is aimed at the rational design of catalysts for oxidation and acid organic reactions. This chemistry remains one of the most challenging problems in heterogeneous catalysis.

BETTER CATALYST THROUGH CHEMICAL DESIGN

Catalysts operate at a molecular level, so study of their mechanisms falls into the realm of nanotechnology: the science of the extremely small. Most catalytic chemical reactions are heterogeneous – they involve more than one phase. Usually a gas and/or liquid phase passes over a solid catalyst that starts up the reaction – the catalytic converter that cleans up a car’s exhaust gases is a typical example. By contrast, homogeneous catalysis occurs in a single phase, for example the enzyme-modulated reactions that determine the physiology of living organisms.

Our principle research interests lie in the fields of synthesis, characterization and catalytic reaction of heterogeneous catalytic system. The development of heterogeneous catalyst may be regarded as an iterative optimization process, basically consisting of three steps, namely synthesis, characterization and testing as depicted in Figure 1.

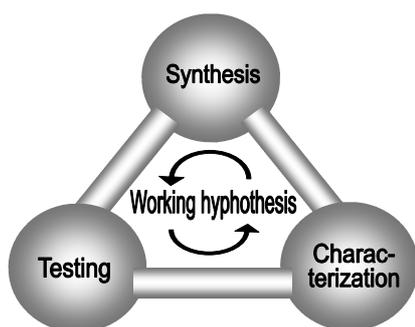


Figure 1 Schematic representation of the catalyst development cycle.

OUR RECENT RESEARCHES

A basic feature common to all catalytic systems is that the catalytic reaction can be considered as a reaction cycle, in which catalytically active sites are initially consumed and at the end of the cycle are regenerated. The elementary rate constant for product desorption often competes with the elementary rate constant for reactant activation, leading to the Sabatier volcano curve for overall rate of reaction versus interaction strength of the intermediate reaction complexes with catalytic bonding site. There are many different catalytic systems. Of most basic mechanistic features are well understood. Here an attempt will be made to introduce several approach to synthesize particulate catalysts.

Magnetic field in the synthesis of solid catalyst

For many years, scientists developed several methods for structural control of organized molecular assemblies, such as use of a flow and an electric field. Magnetic field is also one of a potential method to align and orient molecules and domains, because it has an advantage that any materials, even diamagnetic materials can be aligned by magnetic fields as long as they have the magnetic anisotropy. It is well established that diamagnetic assemblies having magnetic anisotropy will become oriented and rotate in a magnetic field to achieve the minimum-energy state. The protocols for producing orientated ordered inorganic-surfactant was reported but only based on simulation theory. The use of TiO_2 as inorganic precursor and organic surfactant, however, has not been reported. In our recent report [5], well-aligned titanium dioxide was successfully synthesized by sol-gel method by using tetra-n-butyl orthotitanate (TBOT) as titanium dioxide precursor. Well-aligned titanium dioxide with very high length to diameter ratio synthesized under magnetic field was demonstrated for the first time by sol-gel method under magnetic field (up to 9.4 T) with cetyltrimethylammonium bromide as structure aligning agent.

Figure 2 shows the scanning electron microscope (SEM) images of TiO_2 samples prepared with various parameters under magnetic field. Without the presence of CTAB surfactant and magnetic field, TiO_2 in block shape (Figure 2a) was obtained. On the other hand, the small granular particles of TiO_2 with sizes of 5 – 15 μm were observed in the presence of CTAB (Figure 2b). Apparently, results proved that the surfactant played crucial role to form granular shape of TiO_2 particles. Under low magnetic field of 2.5×10^{-4} Tesla and with the presence of CTAB, a small fraction of well-aligned TiO_2 was obtained (Figure 2c) in relatively fast hydrolysis rate for four days, indicating the alignment of TiO_2 was influenced by magnetic field. Interestingly, abundance of well-aligned TiO_2 with the

length of 500 – 2000 μm were successfully produced (Figure 2d) with relatively slow hydrolysis rate for seven days under same magnetic-field strength. This evidence implied that the slow hydrolysis rate was very important in providing enough time for the formation of abundance of well-aligned TiO_2 . Interestingly, the well-aligned TiO_2 was vividly straighter and more compact closer (Figure 2e) under strong magnetic field of 9.4 Tesla. Without CTAB with slow hydrolysis (7 days) under strong magnetic field (9.4 Tesla), TiO_2 in block shape (Figure 2f) was obtained. Therefore, we conclude that the use of CTAB surfactant as structure aligning agent, with slow hydrolysis rate and strong magnetic field are the key factors of well-aligned TiO_2 .

A new way to control the coordination of titanium (IV) in silica-titania catalyst

In our recent research, a new way to control the coordination of titanium (IV) in the sol-gel synthesis of broom fibers-like mesoporous alkyl silica-titania catalyst through addition of water [6]. The tetrahedral and octahedral coordination of Ti(IV) in alkyl silica-titania has been successfully controlled by the addition of water in sol-gel process. Octadecyltrichlorosilane (OTS) and

tetraethyl orthotitanate (TEOT) were used as precursors. The effect of the addition of water on the local coordination of Ti(IV) was analyzed by using Fourier transform infrared (FTIR) spectrometer, diffuse reflectance ultra-violet visible (DR UV-Vis) spectrometer, field emission scanning electron microscope (FESEM), X-ray diffraction (XRD) spectrometer and transmission electron microscope (TEM). It was demonstrated that water facilitate the formation of Si–O–Ti bond which is related to the tetrahedral Ti(IV). These materials exhibit the pattern of peak at the small angle of X-ray diffractogram and type IV shape adsorption - desorption isotherms characteristic of mesoporous silica-titania. The mesoporous structure shaped like ‘broom fibers’, arranged by lamellar structure like fibers with diameter size about 3 – 5 nm has been clearly observed by TEM. The catalytic activity of alkyl silica-titania catalysts obtained was tested in polymerization of styrene in the presence of aqueous hydrogen peroxide. It showed that the presence of the tetrahedral Ti(IV) gave a beneficial effect in increasing the activity in this catalytic reaction. Figure 3 shows the TEM image of mesoporous structure shaped like ‘broom fibers’ silica-titania particle.

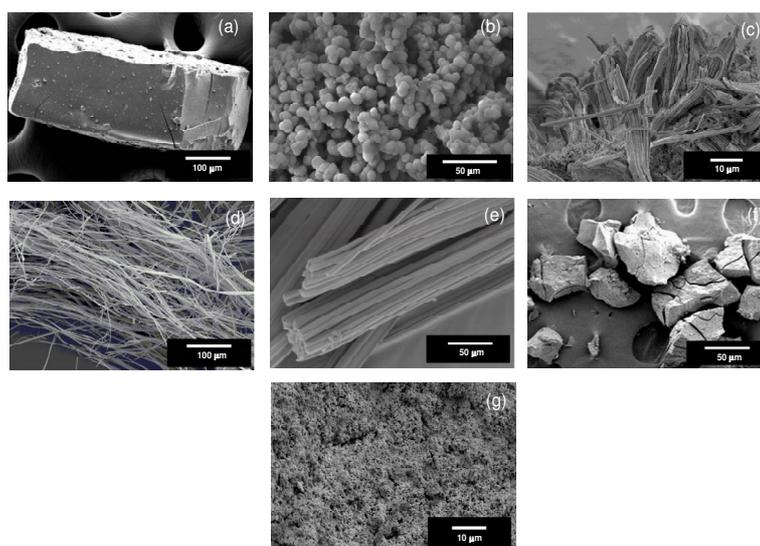


Figure 2 SEM images for TiO_2 samples synthesized with various parameters: (a) without CTAB, with fast hydrolysis (4 days) and without magnetic field, (b) with CTAB, with fast

hydrolysis (4 days) and without magnetic field, (c) with CTAB, with fast hydrolysis (4 days) and under low magnetic field (2.5×10^{-4} Tesla), (d) with CTAB, with slow hydrolysis (7 days) and under low magnetic field (2.5×10^{-4} Tesla), (e) with CTAB, with slow hydrolysis (7 days) and under strong magnetic field (9.4 Tesla), (f) without surfactant, with slow hydrolysis (7 days) and under strong magnetic field (9.4 Tesla) and (g) sample in Figure 2e after calcination at 500 °C for 2 h [5].

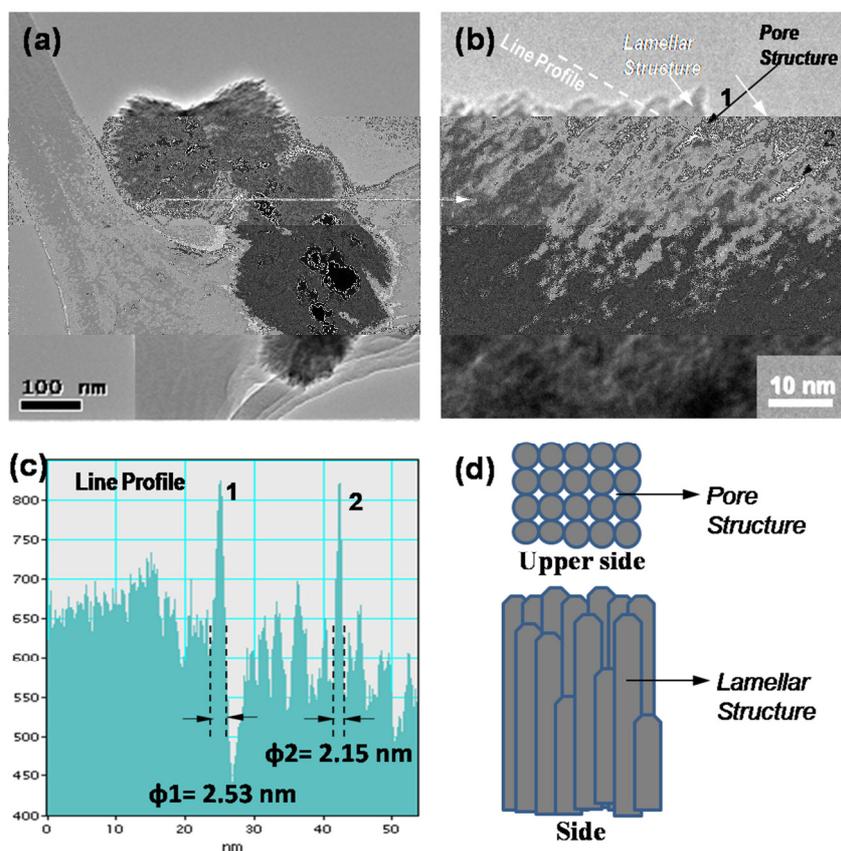


Figure 3 The image, line profile, pore sizes and structure analysis of alkyl silica-titania. (a) TEM image of the alkyl silica-titania material synthesized by sol-gel method at room temperature. (b) TEM image enlarged from the discontinue-lined white square marked area in (a). (c) Line profile of the discontinue-white line in (b). (d) Schematic illustration of the pore formed between the lamellar structured materials [6].

Liquid-gas phase-boundary catalytic system

Synthesis a solid catalyst which can be located in the boundary of immiscible liquid-liquid and liquid-gas systems remain a big challenge today. Previously, we reported the preparation of heterogeneous catalysts in the liquid-liquid phase boundary [7-18]. In this catalytic reaction system, the catalyst was

placed at the liquid-liquid phase boundary between aqueous hydrogen peroxide and water-immiscible organic phases and act as an efficient catalyst for epoxidation reaction. In this paper, the study is extended to liquid-gas catalytic system. Solid-gas catalyzed-liquid reactions are often encountered in the chemical process industry, most frequently in hydroprocessing operations and in the oxidation of liquid phase organic.

The fast-growing insight into the functional materials has led research more focused on the synthesis of materials for the specific properties. The preparation of hollow materials with low density is one of the targets. Along this line, we have attempted to make an effective heterogeneous catalytic system for this application by using gold/polystyrene-coated hollow titania as a catalyst [19]. Figure 4 shows a schematic illustration of the procedure used for the synthesis of floating gold/polystyrene-coated hollow titania. The catalyst was prepared in several stages; (1) preparation of the template hydrothermally by using sucrose as a precursor, (2) synthesis of hollow titania by using sol-gel method and the removal the carbon template by calcination, (3) polystyrene coating of hollow titania particles and (4) gold

sputtering of polystyrene-coated hollow titania.

Reaction between two immiscible liquids will require stirring to maximize the contact area of reactants. Nevertheless, the reaction between gas and liquid phases also need stirring to increase the solubility of gas into the liquid. Hence, this research will be great if it can contribute knowledge in floating gold/polystyrene-coated hollow titania catalysts with controllable void and floating properties. Besides, efficient control of the structural properties of hollow titania themselves and fabrication of gold/polystyrene composites are the other important subject for their application, especially in the field of catalysis. For floating purpose, it is necessary to fabricate polystyrene-coated hollow titania with low density.

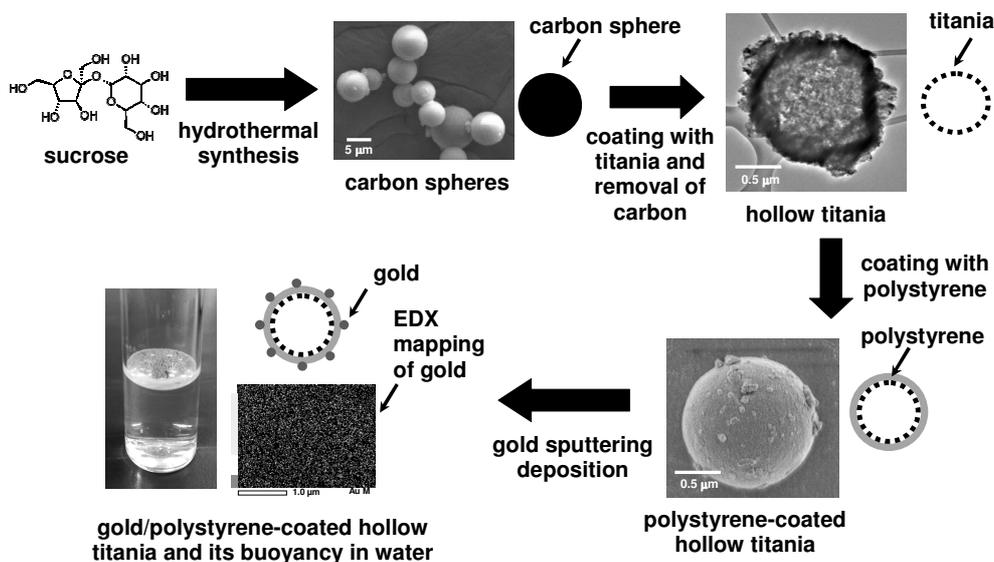


Figure 4 Schematic illustration of floating gold/PS-HT synthesis procedure with TEM micrograph of hollow titania, FESEM micrographs of CS and PS-HT [19].

Improvement of catalytic activity in styrene oxidation of carbon-coated titania by formation of porous carbon layer

Here, we demonstrated that an approach to improve the catalytic function of titania particle by covering it with porous carbon [20]. Porous carbon layer has been formed by treating the carbon-coated titania ($C@TiO_2$) with KOH solution. Carbon-coated titania ($C@TiO_2$) was obtained by pyrolysis of polystyrene-coated titania ($PS@TiO_2$), which was produced by in-situ polymerization of styrene by using aqueous hydrogen peroxide. The presence of polystyrene and carbon on the surface of titania were confirmed by FTIR and XPS. Carbon content was about 2.2 wt% with thickness of carbon layer ca. 5 nm.

After treating with KOH solution, $PC@TiO_2$ with the pore size of ca. 5 nm, total pore volume of $0.05 \text{ cm}^3 \text{ g}^{-1}$ and BET specific surface area of $46 \text{ m}^2 \text{ g}^{-1}$ has been obtained. Catalytic activity results showed that $PC@TiO_2$ gave a higher activity in styrene oxidation compared to bare TiO_2 , and $C@TiO_2$. The highest catalytic activity was obtained by using $PC@TiO_2$ that obtained after treating $C@TiO_2$ with 1.0 M KOH solution with benzaldehyde and phenylacetaldehyde as the main reaction products. At the higher concentration of KOH solution, the catalytic activity decreased when crystallinity of TiO_2 decreased. Figure 5 shows schematic diagram of the preparation of $PS@TiO_2$, $C@TiO_2$ and $PC@TiO_2$ particles and their FESEM and TEM photographs.

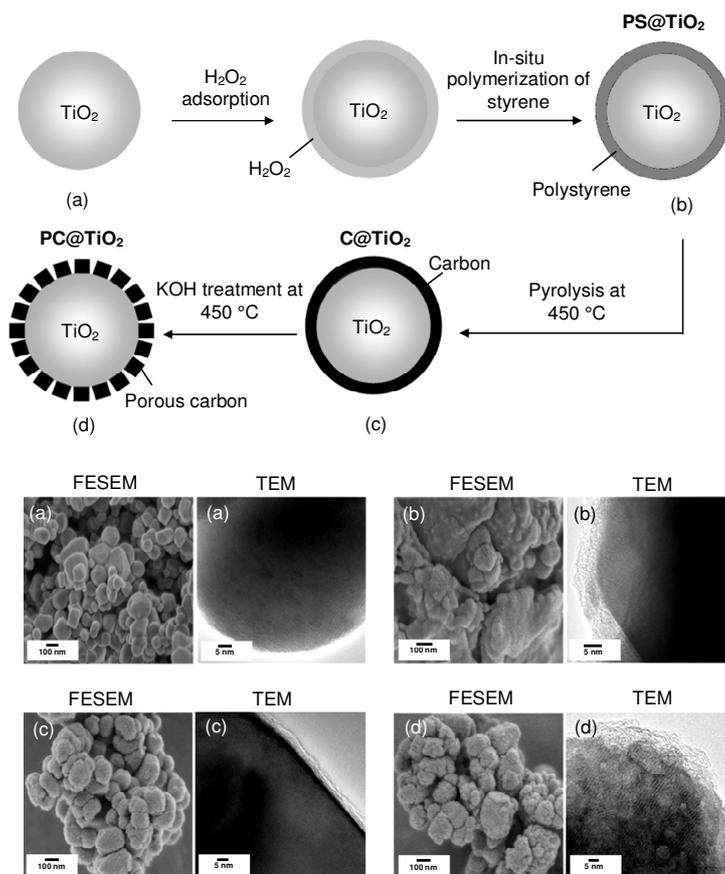


Figure 5 Schematic diagram of the preparation of $PS@TiO_2$, $C@TiO_2$ and $PC@TiO_2$ particles and their FESEM and TEM photographs [20].

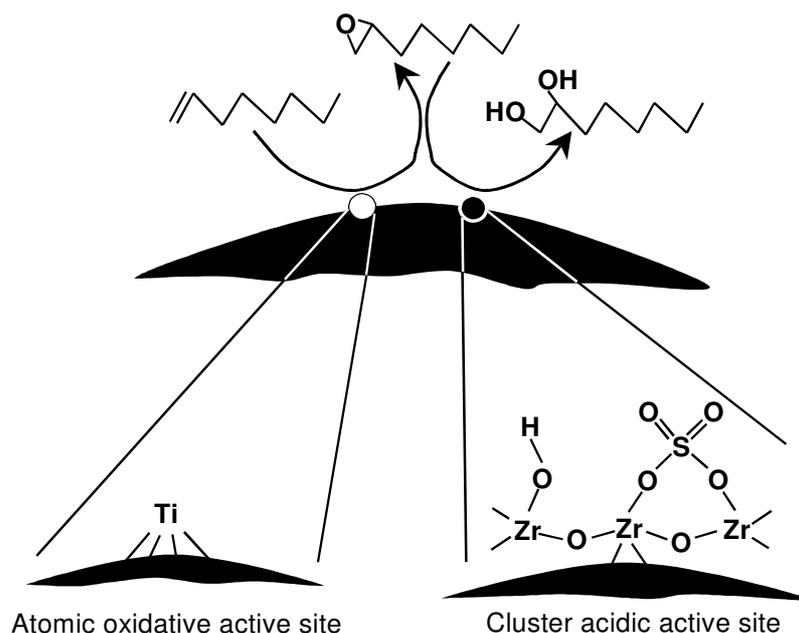


Figure 6 Proposed model of TS-1 loaded with sulfated zirconia as bifunctional catalyst for consecutive transformation of 1-octene to 1,2-octanediol through the formation of 1,2-epoxyoctane [24].

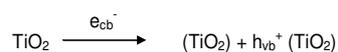
Bifunctional catalyst

Another type catalytic system can be defined as bifunctional. The prototype catalytic system is TS-1 loaded with sulfated zirconia as bifunctional oxidative and acidic catalyst for transformation of 1-octene to 1,2-octanediol [21-28]. The catalyst concerned contains two types of reactive centers, oxidative and acidic. The titanium act as active site for the transformation 1-octene to 1,2-epoxyoctane and the protonic sites hydrolyze the epoxide. The overall reaction consists of two steps, in which an intermediate formed in one reaction olefin is consumed on the other. In heterogeneous catalysis there is usually no control over the sequence of these steps. The control

that exists is basically due to differences in the reactivity of the different sites. Proposed model of bifunctional catalytic system is shown in Figure 6.

Photocatalyst

By definition, a photocatalyst is a substance that is able to produce, by absorption of light quanta, chemical transformations of the reaction participants, repeatedly coming with them into the intermediate chemical interactions and regenerating its chemical composition after each cycle of such interactions [29]. Titanium dioxide (TiO_2) is one of the most popular photocatalysts. Photocatalysis over TiO_2 is initiated by the absorption of a photon with energy equal to or greater than the band gap of TiO_2 (3.2 eV), producing electron-hole (e^-/h^+) pairs,



Consequently, following irradiation, the TiO_2 particle can act as either an electron donor or acceptor for molecules in the surrounding media. However, the photoinduced charge separation in bare

TiO₂ particles has a very short lifetime because of charge recombination. Therefore, it is important to prevent electron-hole recombination before a designated chemical reaction occurs on the TiO₂ surface. TiO₂ and high recombination rate of the photogenerated electron-hole pairs hinder its further application in industry. Having recognized that charge separation is a major problem, here, SnO₂-TiO₂ coupled semiconductor photocatalyst loaded with PANI, a conducting polymer, has been studied as photocatalyst in the oxidation of 1-octene with aqueous hydrogen peroxide. We reported that the attachment of polyaniline (PANI) on the surface of SnO₂-TiO₂ composite will reduce the electron-hole recombination during the photocatalytic oxidation of 1-octene due to PANI's electrical conductive properties (see Figure 7) [29].

Synergetic multi reaction center catalyst

In reactions of synergetic multi reaction center catalyst, at least two different reaction centers that communicate are required. An example is synergistic role of Lewis and Brönsted acidities in Friedel-Crafts alkylation of resorcinol over gallium-zeolite beta. The role of Lewis and Brönsted acidities in alkylation of resorcinol is demonstrated through the gallium-zeolite beta by varying the amount of Lewis and Brönsted acid sites (see Figure 8). The synergism of Lewis and Brönsted acid sites take place heterogeneously in Friedel-Crafts alkylation of resorcinol with methyl tert-butyl ether to produce 4-tert-butyl resorcinol and 4,6-di-tert-butyl resorcinol as the major and minor products respectively [30].

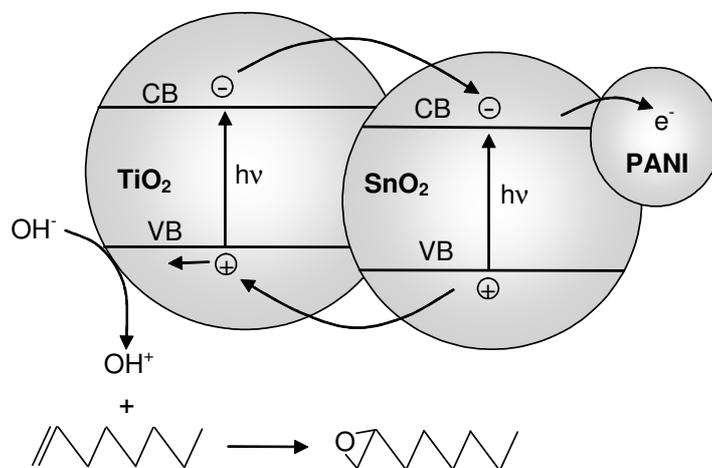


Figure 7 The proposed mechanism of photocatalytic epoxidation of 1-octene over PANI-SnO₂-TiO₂ [29].

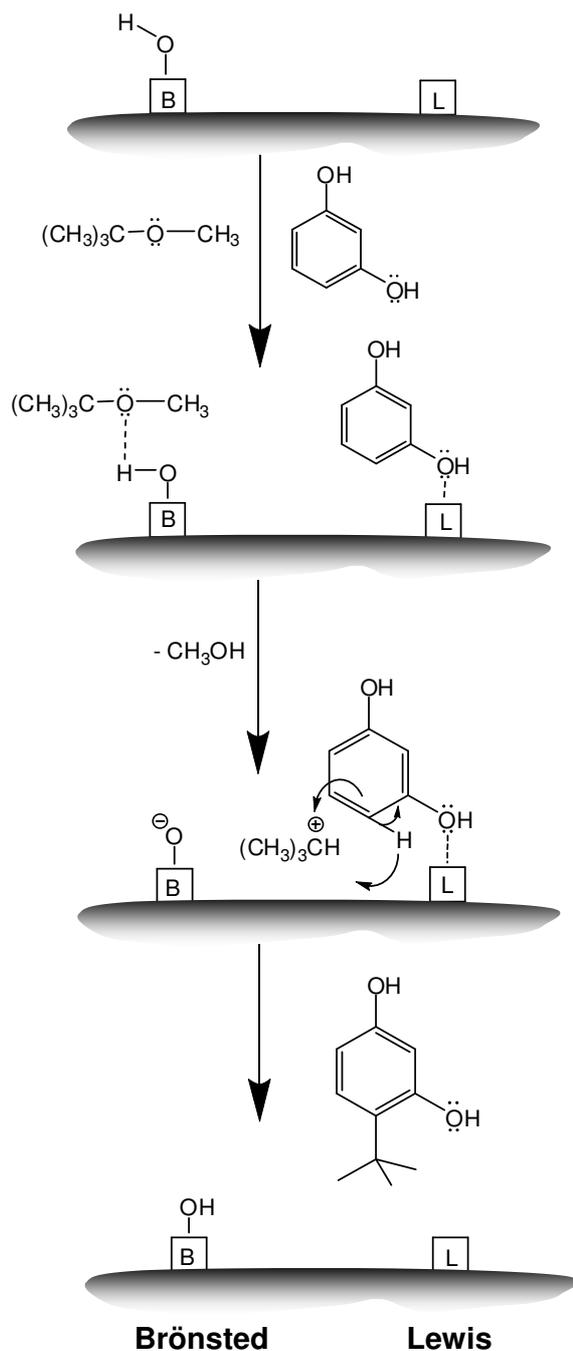


Figure 8 Proposed mechanism of the alkylation of resorcinol with MTBE [30].

Chiral catalyst

The control of enantioselectivity by heterogeneous asymmetric catalysis remains a big challenge today. The main drive has been to find new, exciting routes to chiral molecules while achieving high enantiomer selectivity. Here, a new strategy to obtain active catalyst in the

enantioselective hydration of epoxyclohexane is proposed [31, 32]. The research strategy is based on the ideas that the enantioselective reactions could be induced by chiral amino acids and the use of heterogeneous catalysis for synthetic purposes will overcome practical separation problems. In order to realize these ideas, chiral amino acid needs to be

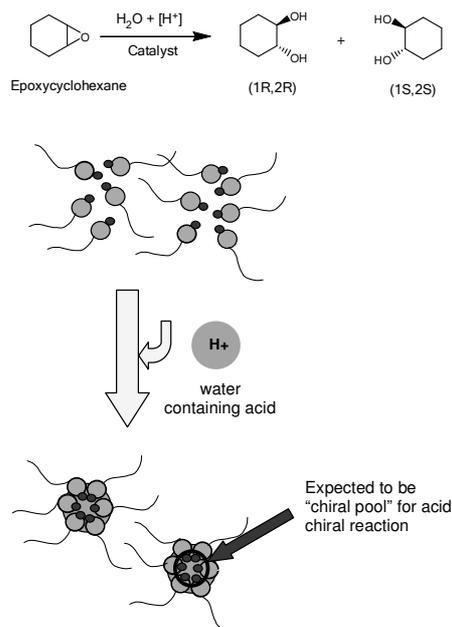


Figure 9 Amphiphilic chiral solid catalyst as heterogeneous micellar catalyst in enantioselective hydration of epoxy cyclohexane [31].

attached to the hydrophilic part of hydrolyzed octadecyltrichlorosilane (OTS). Amino acids such as L-glutamic acid and L-phenylalanine have been chosen because of their water-soluble properties; hence they can be easily removed by treatment with water. It is expected that the attachment of amino acid would result in a chiral solid catalyst with bimodal hydrophobic-hydrophilic character. The schematic action of amphiphilic chiral solid catalyst is shown in Figure 9.

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GREENHOUSE EFFECT, OZONE AND ACID RAIN PROBLEMS

Diagnosis of misconceptions and their challenge by a new curriculum in chemistry education

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ABSTRACT

“What do adolescents know about atmospheric pollution and how do they think they can help to protect our climate and improve the purity of our atmosphere?” – The answer to these questions is the starting point towards a sustainable future development of the global environment. The purity of the gases that naturally surround our earth is of vital importance for any species living on it. Anthropogenic phenomena such as acid rain, the ozone hole and ozone smog, as well as the increased emission of greenhouse gases and the related climate change have transboundary impacts and are being globally discussed [1]. However, the present global political discussion is rather complex and slow-going. That is why environmental education about these topics should be a requisite in any country: By imparting our expertise about anthropogenic atmospheric phenomena to the young generation, we can lay the foundation for revolutionary rethinking and joint action [2].

In order to put this into practice, two key steps have to be taken: (a) the analysis of the state of knowledge and prevalent misconceptions of adolescents regarding air and atmospheric pollution. Asking adolescents about their understanding of natural science topics, misconceptions are a common problem [3]. And (b) the development of accordant, versatily applicable curricula for correcting misconceptions and filling knowledge gaps with didactically refined educational material. As the understanding of these topics requires a significant amount of chemical knowledge, chemistry class is the perfect environment for their acquisition [4].

This contribution to the International Conference on Conservation for Better Life (ICCBL 2015) wants to present the results of a correspondent survey carried out in 2012 amongst 1.500 college students from Germany, Spain, apart from two small extra populations in Taiwan and Russia, which will not be discussed in this paper. “All air pollutants are greenhouse gases.” - “The greenhouse effect is caused by the ozone hole.” - “Acid rain provokes chemical burn and cancer.”... Those and other misconceptions, amongst a significant general lack of knowledge, were discovered by this survey [5]. Based on this and the application of the Delphi method to an expert panel of natural science teachers concerning their opinions and experiences, an accordant curriculum for chemistry class was developed and tested on German secondary class students. The learning progress was documented via statistically validated pre-, intermediate- and post-tests [5]. The structure, contents and delectably positive outcomes of the intervention will be presented below. Thus, both the survey and the curriculum make a contribution to the active inclusion of the young generation into the current topic of atmospheric pollution and its effects.

Keywords – Greenhouse effect, ozone, acid rain, misconceptions, empirical study, lecture series

Introduction

Environmental education is an important contribution to greener communities and conservation for a better life. One important area of environmental education is air and atmospheric pollution. The latter comprises

some phenomena such as the greenhouse effect, ozone and acid rain. All of these are globally relevant and currently topical: greenhouse gas emissions are rising, the same applies to the trace gases causing acid rain – and the ozone hole is still as large as it was in the 90ies.

Bearing this in mind, the education of the young generation, which will design our global future and has to deal with our environmental heritage, becomes clear. Especially the young people should have a certain knowledge about these global problems and thus have the basics to deal with them and try to solve them.

Based on these thoughts, this paper presents the results of an international empirical survey among 1.500 college students of grade 10 and 12 about air, acid rain, ozone and the greenhouse effect.¹ Based on the findings of the survey, as well as on literature research and expert consultations, a lecture series was developed and applied at school. After a short introduction to the subject fundamentals concerning the four subtopics, the structure and the main results of both the survey and the lecture series will be succinctly presented in this paper.

1. Subject fundamentals

1.1. Air

Our breathing air consists mainly of nitrogen (78 Vol %) and oxygen (21 Vol %). The rest, which is about 1 Vol %, consists of a large share of trace gases such as the greenhouse gases carbon dioxide, methane, nitrous oxide and ozone and many other gases, which, if they exceed their natural atmospheric concentrations, are denominated „air pollutants“ [6].

1.2. Greenhouse effect

In order to understand the functioning of the greenhouse effect, we have to start from the sun: The sun emits visible short-wave radiation to the earth's surface. The earth absorbs this radiation, transforms it and then re-emits it in form of long-wave heat radiation. The greenhouse gas molecules absorb the heat radiation and then re-emit it into all directions – also back to the earth's surface [7]. Due to this, our atmosphere

retains part of the heat energy and thus maintains a natural global mean temperature of about 15 °C. Without the greenhouse effect, the global mean temperature would be at -18°C.

It is furthermore important to distinguish between the natural greenhouse effect, causing a global mean of 15 °C, and the anthropogenic, that is humanly enforced, greenhouse effect: Due to the humanly caused emissions of greenhouse gases, the current global mean temperature is not at 15,0 but at 16,6 °C [8]. So the greenhouse effect has both a natural and an anthropogenic component.

1.3. Ozone

At about 12 to 19 miles above the earth, the ozone layer is located. The ozone layer is very important to us, as it absorbs all of the skin cancer causing solar UV-C and part of the UV-B radiation.

Apart from that, ozone can also be found in the earth's troposphere. However, close to the ground, ozone is a negative air component as it irritates our mucous membranes and contributes to the greenhouse effect. Where does the tropospheric ozone come from? – Due to traffic exhaust emissions, nitric oxides (NO_x) and a group of gases called VOC (volatile organic compounds) are constantly present in our troposphere. High concentrations of VOC and NO_x in combination with intense sunlight and heat provoke a chemical reaction which leads to the (over-)production of ozone [9].

Meanwhile, in the stratospheric ozone layer, ozone is constantly formed and depleted in a natural chemical reaction cycle (Chapman cycle) involving oxygen and solar radiation. The ozone formation is most effective at the equator, so the main share of the stratospheric ozone is produced above the earth's equator. Due to global wind systems (Brewer-Dobson circulation), this ozone is then constantly diverted to the Polar

¹ As from now, the following abbreviations apply:

GE: Greenhouse Effect

OZ: Ozone (stratospheric and tropospheric)

AR: Acid Rain

Regions. However, during the polar winter term, an annual strong polar vortex arises and blocks the ozone supply, especially in the Antarctic region [10]. During this season, the humanly emitted CFC (chlorofluorocarbon) molecules come into action and deplete the ozone within the vortex. So, each year during the polar spring term, a large ozone hole is emerges above the Antarctic continent. As CFC molecules have extremely large lifespans, the ozone hole is still a current problem today in Australia.

1.4. Acid Rain

Some of the gases emitted by traffic and industrial processes, produce acidic solutions whenever they get in contact with (rain) water. These gases are sulphur dioxide (SO₂), sulphur trioxide (SO₃) and nitrogen dioxide (NO₂) as well as carbon dioxide (CO₂). They produce solutions of sulphurous acid, sulphuric acid, nitrous acid, nitric acid and carbonic acid. Most of these acids are rather strong and cause the rain water to show pH values below 5,0. However, it is also important to take in mind that even unadulterated rainwater is always slightly acidic: This is because of the carbon dioxide, which is a frequent natural trace gas in our atmosphere and produces a slightly acidic solution with a pH of 5,6.

Acid rain can cause damages to the vegetation, to waters and to monuments [11]. Looking at the vegetation, many forest are harmed by influence of acid rain. Nowadays, this is combined with biological stress caused by tropospheric ozone and the climate change. Concerning waters, the example of the long-lasting acidification of many Norwegian lakes due to emissions from England during the 80ies shows that acid rain is a longsome and transboundary problem. Another negative effect of acid rain is the damage it causes to monuments made of calcium carbonate. If they are exposed to acid rain, the calcium carbonate is converted into calcium sulfate, which is a much softer and can thus be easily eroded.

Nowadays, the emission volumes of nitrogen, sulfur and carbon dioxide are globally rising, especially in the emerging nations such as Asia, India and the Middle East [12]. On the other hand, the European rates are actually decreasing or at least not strongly rising. This is due to the implementation of catalyzers and environmental politics, which clearly show their effect

2. Empirical Study

The following part of this paper presents the results of an empirical study about the state of knowledge of college students regarding the four subtopics.

2.1 Questionnaire and Target Group

The target group of the survey consisted of 1.500 pupils of grade 10 and 12 in secondary schools in Germany and Spain. The pupils received a questionnaire with open and closed questions concerning their attitude and motivation towards environmental protection as well as questions about their personal learning background. The main part of the questionnaire however tested their technical knowledge about the four topics of interest.

2.2 Principal Findings of the Empirical Study

Almost regardless of age and country, the evaluation of the survey revealed a significant lack of knowledge, as well as several misconceptions throughout all four subject areas. The most important findings will be presented in the following. In order to give a total overview, the percentages always refer to the entire student population (that is, grade 10 and 12 together). More detailed results, incorporating age and country differences, can be found in [13].

Asking the students about the main air components, 78 % nitrogen and 21 % oxygen, only a mere 20 % of the students were able to give the correct reply, while most of the others over-estimated the carbon dioxide rate and/or sub-estimated the

nitrogen rate. Looking at the minor air components and letting the students describe their notions of trace gases, air pollutants and greenhouse gases, it becomes clear that most of them don't differentiate between these three terms. Hence, to many of the students „all trace gases are air pollutants“ and „all air pollutants are greenhouse gases“.

Concerning the greenhouse effect, a 30 % of the surveyed pupils were able to give a correct description of how the GE works. When asked about the most significant greenhouse gases, only a mere 28 % of the pupils mentioned water vapour. Thus, it can be deduced that most of the students regard the GE to be completely anthropogenic (caused by humanity). Another very important misconception which can be found in the majority of the students consists in stating an interdependency between the GE and the ozone hole. To many of the students „the greenhouse effect causes the ozone hole“ or „the ozone hole causes the greenhouse effect“.

The topic „ozone“ (which incorporates both stratospheric and tropospheric ozone) showed low values for the recognition of tropospheric (ground level) OZ, which was known by only 21 % of the students. Stratospheric OZ, however, received better results, with a 44 % of the pupils naming the correct geographic location of the ozone hole (Antarctica) and again 44 % mentioning CFCs as a major factor for the depletion of stratospheric OZ. On the whole, it may be stated that for many students „ozone exists only in the ozone layer“. Furthermore, for those who did not know about the ozone hole above Antarctica, „the ozone hole is located above the industrial countries“, that is, above the countries with the highest emission rates.

The last part of the survey treated with acid rain. Here, the findings were that a 55 % of the pupils knew sulphur dioxide and nitrogen dioxide to cause AR, a 44 % furthermore correctly mentioned carbon

dioxide and a 35 % were able to name some consequences of AR (e.g. deterioration of monuments, damage to forests and acidification of lakes). Regarding misconceptions, it can be deduced that those pupils who did not mention carbon dioxide, might be of the opinion that “acid rain is completely anthropogenic”. Apart from that, some of the students believe that “acid rain is concentrated acid”.

3. Lecture Series

The last part of this research project comprises the conception and application of a lecture series about air and atmospheric pollution. Regarding the conception, the results of the above described empirical study, as well as extensive literature research and expert interviews were accounted for.

3.1 Conceptual Design

The conception of the lecture series comprised three working stages.

The first stage consisted in analysing the knowledge level and the possible misconceptions of the target group concerning air, GE, OZ and AR. This was done via the empirical study described in chapter 2 of this paper. These results were furthermore compared to already published findings in literature. As a second step, extensive literature research was done concerning already existent teaching concepts about these topics. Out of this, possible didactical approaches were developed and then discussed with experts (such as teachers and scientists).

Based on these findings, a lecture series was developed. The lecture series is composed of 7 school lessons which are surrounded by a pre- and a post-test and can be divided into three parts: First, the students take three lessons to acquire basic knowledge about the 4 subtopics air, GE, OZ and AR by means of expert learning.² Then, the teacher uses one

² Expert learning: Pupils are distributed into different thematic groups and then pass through the following stages: (a) individual studying, (b) exchange between experts, (c) each expert transmits

lesson to introduce a concept map in order to both recapitulate the basics and point out thematic interrelations. And finally, there are three lessons of teacher-class dialogue and experiments incorporating further knowledge about GE, OZ and AR.

3.2 Main Results of the Lecture Series

The main learning results of the lecture series can be seen in Figure 1 and Figure 2. Figure 1 shows the knowledge level of the pre-test in comparison with the post-test results. The improvement rates were 12 % for air, 20 % for GE, 29 % for OZ and 34 % for AR. On the whole, the pre-knowledge level was 43 % and the post-knowledge level was 67 %, which makes a general performance improvement of 24 %.

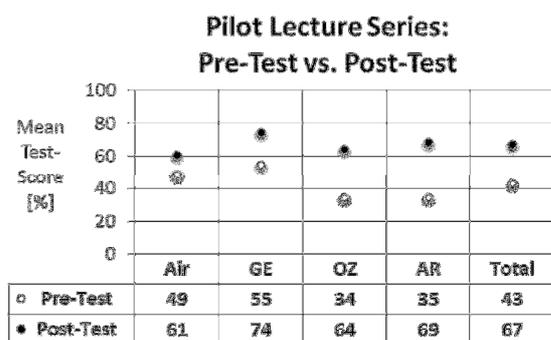


Figure 1: Lecture series – results of the pre-test vs. post-test

Figure 2 shows the knowledge level of an independent test (= pupils not taking part in the lecture series) of grade 12 in comparison with the post-test results (grade 10). Despite their younger age, the grade 10 students performed better than the ones of grade 12. The rate differences were 1 % for air, 25 % for GE, 25 % for OZ and 29 % for AR. On the whole, the knowledge level of the grade 12 students was 47 % and the (post-)knowledge level of the grade 10 students was 67 %, which makes a 20 % higher general performance of the latter.

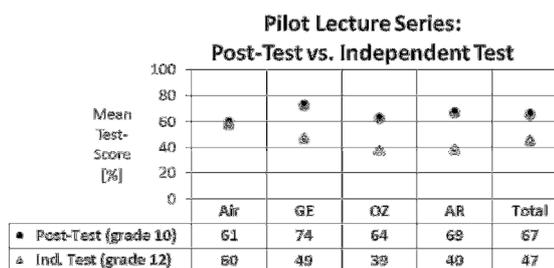


Figure 2: Lecture series – results of the post-test vs. independent test

4. Conclusions

The topic „air and atmospheric pollution“ is demanding and due to the complexity of the subject area, there is still room for further improvement of the lecture series. A survey amongst German college teachers showed their interest in the incorporation of the lecture series in their class, which is an important premise for its implementation. In order to assure the quality of the tuition, teachers’ trainings are very important.

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their knowledge to their peer group. In this way, each pupil learns about each topic.

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METACOGNITION AND SOCIAL ATTITUDES PATTERNS OF LEARNERS THROUGH THINK ALOUD PAIR PROBLEM SOLVING

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ABSTRACT

Metacognition and social attitudes need to be developed in learning at school. This study aims to analyze the pattern of metacognition, social attitudes, the relationship between metacognition patterns and social attitudes towards mastering concept. The benefits of this study were to obtain the pattern of metacognition, social attitudes, analyze the relationship between metacognition patterns and social attitudes towards mastering concept, and contribute in developing learning strategies and curriculum of physics. The data were obtained through the Think Aloud Pair Problem Solving, interviews, self-assessment of metacognition and social attitudes, and written tests. This study used mixed method with concurrent embedded strategy. The subjects were the students of class X MAN Dolopo in the academic year 2014/2015 by using snow ball technique. The results showed that there were three patterns of metacognition and social attitudes in the process of problem solving. They were metacognition pattern of Expert Problem Solving, Hypothetic Problem Solving, and Primitive Problem Solving. All metacognition patterns have honest attitude. The cooperative attitude showed the different results among these patterns. The Expert Problem Solving metacognition pattern can be a problem solver and a good listener, while Hypothetic Problem Solving and Primitive Problem Solving metacognition patterns have not been able to act as a good listener. The Expert Problem Solving and Hypothetic Problem Solving metacognition patterns showed the environmental awareness. In mastering concept, it's defined by metacognition and social attitudes together, so that learners with Expert Problem Solving metacognition pattern have the best ability in mastering concept.

Keywords - Metacognition, social attitudes, think aloud pair problem solving

Introduction

Metacognition is interpreted by most researchers as thinking about cognition. Lee, et al. (2009), Tok, et al. (2010), Sendurur, et al. (2011), and Young & Fry (2008) explains that students with high academic achievement using metacognitive strategies better than students with less academic achievement and metacognition is important in solving the problems of daily life or jobs. A social attitude (Yuliani, et al. (2013)) is an awareness of the person of someone who can influence to the social environment. Social interaction experienced by individuals can influence to the behavior of each individual as a member of society (Azwar, 2013: 30). Learners also showed creativity in responding to questions at the time of the think-aloud (Nugroho, 2010: 97-110).

Based on the information of the physics teacher in MAN Dolopo explain that the learning method used is does not make all learners are active and difficulty to solving problems. The situation of temperature and heat material in the curriculum of SMA/MA with standards competency is applying heat concepts and principles of energy conservation in various energy changes. Learning of temperature and heat are presented with practical and discussion as well as presenting problems associated with daily life.

Based on the description above can be concluded that relevance for development of metacognition and social attitudes. The problem that arises is what kind of learning that is capable of guarding metacognition development and social attitudes. The pattern of metacognition and social attitudes description can help to explain the state of

metacognition and social attitudes of learners. This study aimed to analyze the pattern of metacognition, analyzing social attitudes (honest, cooperation and caring attitude of the environment), and analyze the relationship between metacognition and social attitudes with mastery concepts of Think-Aloud Pair Problem Solving (TAPPS). The benefits of this study were to obtain the pattern of metacognition, social attitudes, analyze the relationship between metacognition patterns and social attitudes towards mastering concept, and contribute in developing learning strategies and curriculum of physics.

Theoretical Review Think Aloud Pair Problem Solving

Tapps is a method used to reveal the thinking of learners with words. The learners can work in pairs where one as a *problem solver* express with words in process of thinking and the other as the listener to explore of thought problem solver with a question (Pate, 2009). The patterns of problem solving based on the conclusions are *Intuitive Problem Solving, Problem Solving Primitive, Hypothetic Problem Solving, and Expert Problem Solving* (Yulianto, et al., 2013).

Metacognition

Metacognition is awareness and regulation of thinking processes or knowledge of learners and arrangements that belongs learners on learning activities and their thinking. There are two basic components of metacognition in problem solving that is metacognition knowledge and awareness of self-regulation (Lee, et. Al, 2009). Flavell explains that metacognition is cognition about cognition. Metacognition plays an important role in many types of cognitive activities such as communicating information, problem solving, social cognition, and so on (Schunk, 2012: 400).

Declarative knowledge is the learners know the information that is required to express a given problem. Procedural knowledge is the knowledge of a person to do something that is needed in the troubleshooting process. Conditional knowledge is knowledge related to when and why to use a strategy, technique, and specific methods to solve the problem. Monitoring comprehension (Monitoring) is the skill of identifying the problem and check the information that is learners to know and unknown. Planning is a skill to illustrate the problem, planning processes, and equipment needed to resolve the problem. Evaluation is decided the solution to a problem and analyze the performance and effectiveness of the strategies used (Rompayon, *et al.* (2010), Kelly & Irene (2010), Pate & Miller (2011)).

Social Attitudes

The character cannot be formed automatically but developed in during time and continuous in learning process. The integration of character education in science learning fostering scientific attitude of students is responsibility, honesty, cooperation, self-confidence, curiosity, and creative (Musyarofah, et al., 2013). A social attitude (Yuliani, et al. (2013)) is an awareness of the person of someone who can influence the social environment.

Honest is the behavior that is based on an attempt to make himself as a person who always trustworthy in expression, action, and jobs. Cooperation is working together with others to achieve common goals by sharing tasks and helping outright. Concerned the environment is the attitude and action to prevent the damage and to develop measures to repair the damage to the surrounding environment.

Research Methods

This study used mixed method concurrent embedded strategy. The qualitative method was done by recording students doing their

TAPPS and interviewed them. Meanwhile, the quantitative method was done by doing the metacognition self-assessment, social attitudes self-assessment, and the written test of the concept's mastery. The subject on the qualitative method of this study weren't randomly chosen. They were chosen by using the *snowball* methods.

Results and Discussion Results

The first result of this study showed that there are three kinds of metacognition patterns; they are expert, hypothetic and primitive problem solving.

Expert Problem Solving Metacognition Pattern

Subject of the study did *monitoring* in understanding the problems given. The important information that the subject got from the understanding step was used to find the involved facts and concepts. *Planning* was done by making plan in making hypothesis based on the facts and concepts. Moreover, planning in tested the hypothesis which was formed and deciding the solution by correlated it to fact and concept of temperature and heat. *Planning* needs metacognition knowledge. *Monitoring* in the finishing process was more like monitoring the finishing steps which has been thought of before. Evaluating was used to decide whether the finishing step was enough or should be repeated again.

The evaluating activity was shown from the students' activity in checking their answers, like recounting their answers everywhere else, checking the involved concepts, and the formula being used. Checking their answers started with understanding the problems, until deciding the final solution, but without *planning*. The subjects realized that *evaluating* need to do so that won't be any concepts left. The subjects knew that by recounting they will know if there's an error in the formula, units, and in the process of counting itself. The realization that the

subjects have is a declarative and conditional knowledge. The next *evaluating* activity that the subject did was deciding the solution after they did checking.

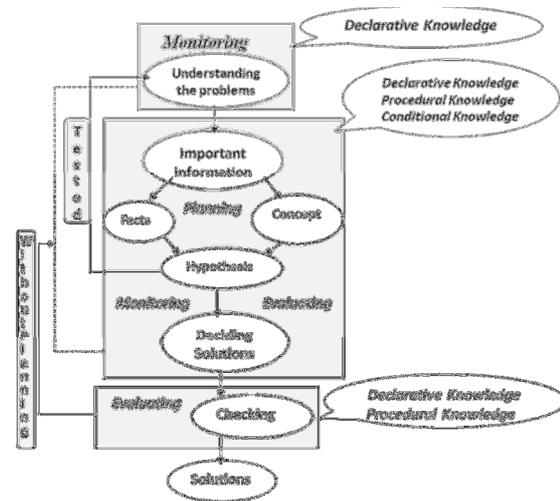


Figure 1 Expert Problem Solving Metacognition Pattern

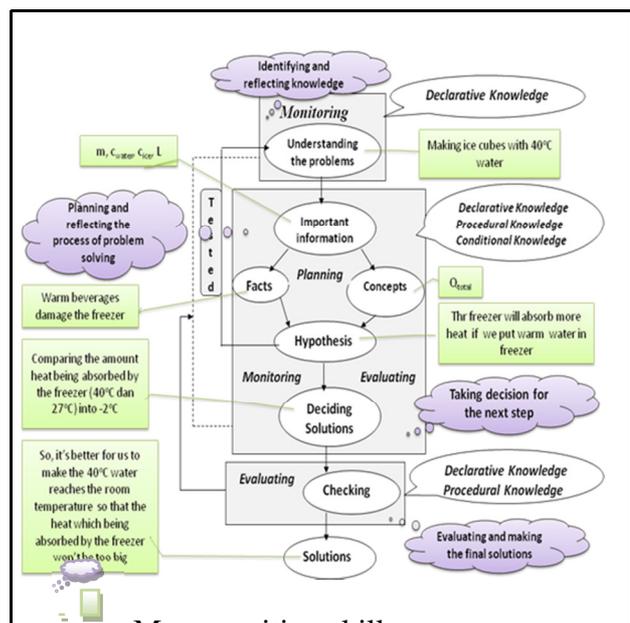


Figure 2 Thinking Process of Expert Problem Solving Metacognition Pattern

Hypothetic Problem Solving Metacognition Pattern

Hypothetic problem solving metacognition pattern is a bit similar to the expert problem solving metacognition pattern. The difference lays on the *monitoring* step. In hypothetic problem solving, the subjects

didn't do *monitoring* process. The subjects did the *evaluating* process, but they couldn't find any error and didn't correct their answers. The subjects felt unsure about the solution that they've taken. Subjects who have hypothetic problem solving metacognition pattern used problem solving metacognition pattern in solving the second problem which required counting. Based on the interview results, most of the subjects actually knew that solution has to be proved by mathematical counting, but they said "how do we count it?" it showed that the subjects didn't do the planning process before they solve the problems.

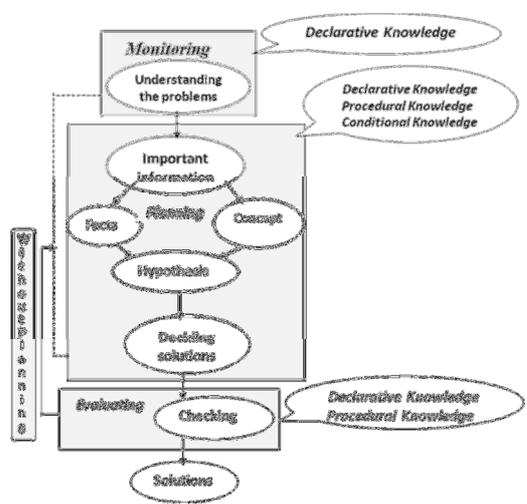


Figure 3 Hypothetic Problem Solving Metacognition Pattern

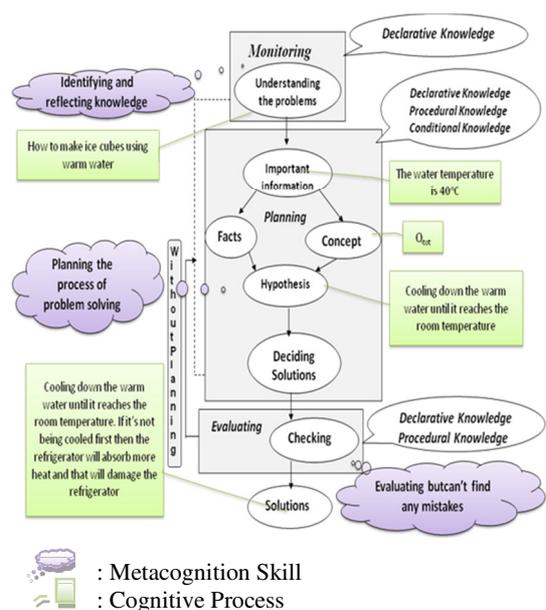


Figure 4 Thinking Process of Hypothetic Problem Solving Metacognition Pattern

Primitive Problem Solving Metacognition Pattern

In primitive problem solving metacognition pattern, at first the subjects tried to understand the problems by continuously reading until they got the important information from the problems. Just like the other two metacognition patterns, monitoring was used to identify knowledge which was needed to comprehend and solve the problems. The subjects knew about the facts and concepts which were related to the problems but didn't know which concepts that could help them solve the problems. This pattern didn't get through the planning process because the decision of the solution was directly derived from the facts. The subjects thought about the appropriate concept of temperature and heat but couldn't explain it specifically. So, actually the subjects have had the declarative knowledge, but they couldn't do the reflection process. Besides, monitoring towards the finishing steps hasn't be done by them. The subjects also didn't do the evaluating process. Furthermore, the subjects with this metacognition pattern have had the procedural knowledge but the subjects couldn't explain it specifically. Subjects with the primitive problem solving metacognition pattern didn't feel sure about their own solution.

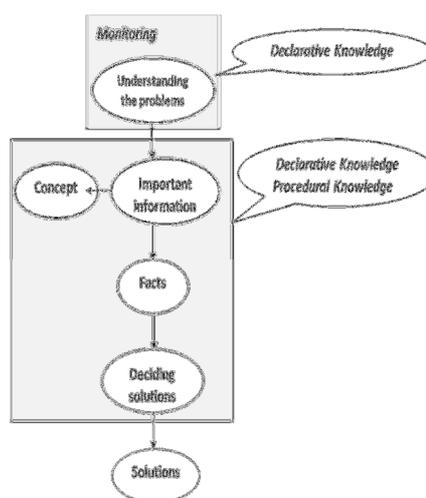
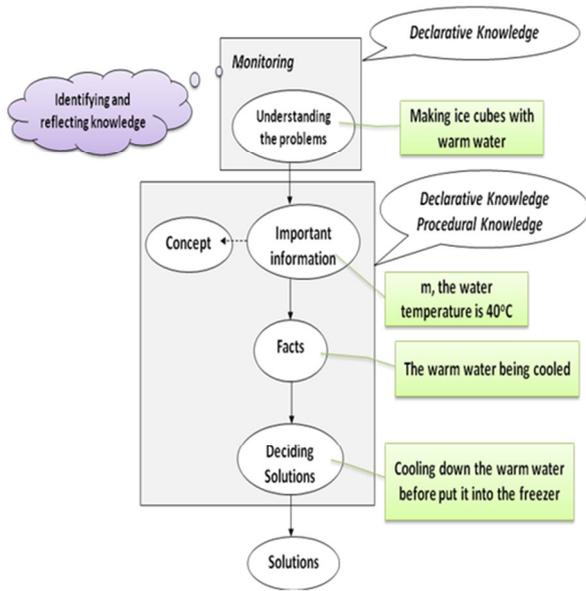


Figure 5 Primitive Problem Solving Metacognition Pattern



: Metacognition Skill

: Cognitive Process

Figure 6 Thinking Process of Primitive Problem Solving Metacognition Pattern

Social Attitudes

The second result of this study is social attitudes. The subjects tried to convey what is thought to provide a solution of the given problem according to capabilities. The subjects tried to answer own problems without asking to partner. All subjects of Metacognition Pattern with *Expert Problem Solving*, the Pattern of Metacognition *Hypothetic Problem solving* and *Primitive Problem Solving* trying to express understanding, revealing the knowledge, and provide clarity in answering.

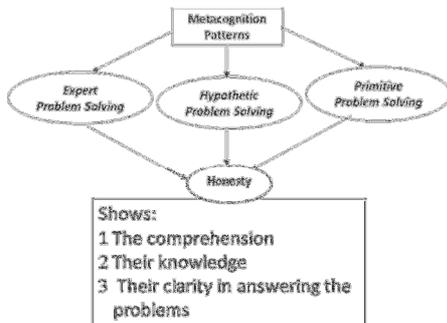


Figure 7 Relationships between Metacognition Pattern and Honesty through TAPPS

The Cooperation each of subject shown in the Figure, shows the same results when it acts as a *problem solver* but showed different results when it acts as a *listener*. All active subjects reveal is thought to resolve the issue when acting as a *problem solver*.

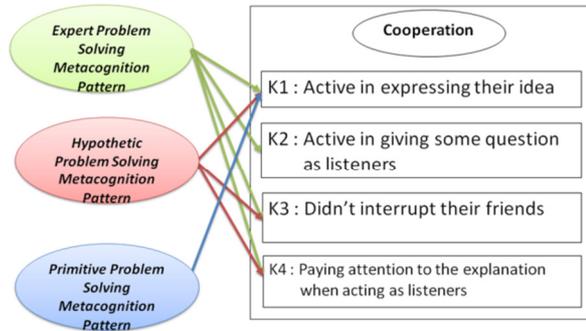


Figure 8 Relationships between Metacognition Pattern and Cooperation through TAPPS

The attitude of the students care about the environment can be seen from the explanation learners to expressing the solution of a problem in acts as a *problem solver*. Based on the data analysis that is subjects of *Expert Problem Solving* and *Hypothetic Problem Solving* Metacognition Pattern discussion of energy-efficient thinking when expressing the solution of these problems. The subjects of *Primitive Problem Solving* Metacognition pattern not consider energy efficient when solving problems. These findings indicate that the pattern of metacognition has a role in the growth to energy-saving ideas. The analysis of self-assessment showed similar results with the analysis of Tapps.

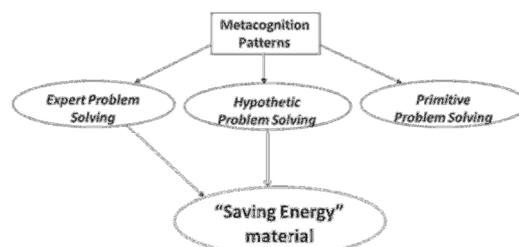


Figure 9 Relationships between Metacognition Pattern and Environmental Concern through TAPPS

The Relationship between Metacognition and Social Attitudes towards the Mastery of Concepts

The third result of this study is relationship between metacognition and social attitudes towards the mastery of concepts.

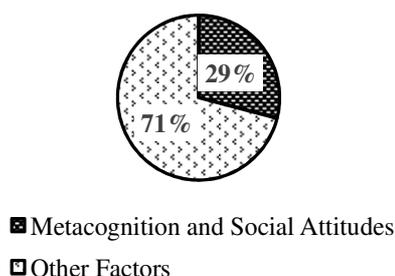


Figure 10 The concept mastery of learners are determined by metacognition and social attitudes of learners together and other factors

There is a positive relationship between metacognition with social attitudes of learners. Mastery of concepts students 29% determined by metacognition and social attitudes together, and 71% is determined by other factors as shown in Figure 10.

Discussion

Metacognition Pattern

The Metacognition pattern of *Expert Problem Solving* is a pattern that is able to reflect on metacognition. Lawson (1995: 112) explains that someone in early of adulthood and old able to think reflectively, describing the provisional estimates, and conclude. *Expert Problem Solving* is a problem-solving pattern that is determines the solution of the conclusions obtained from hypothesis testing (Yulianto, *et al.*, 2013). Jonassen and Grabowski explained that someone is reflective more likely to concentrate on the relevant information, are able to understand and interpret texts, and be able to solve problems and make decisions (Santrock, 2013: 156).

The activity of Metacognition can improve the achievement of learners (Schunk, 2012: 404). Subjects with Metacognition Pattern of *Expert Problem Solving* have confidence when expressing solution. There is a strong correlation between problem solving and metacognition that learners with the highest level of metacognition making it a success in problem solving (Gok, 2010). Pate and Miller (2011) explains that the learners should have the knowledge to do the planning, monitoring, and evaluation.

The Metacognition pattern of *Hypothetic Problem Solving* is a metacognition pattern that uses metacognitive strategies when solving the problem but does not perform monitoring during the process of resolving the problem and not able to determine and correct errors in evaluating the activity. To understand the problem, the subjects have the same pattern with Metacognition pattern of *Expert Problem Solving*, but there are differences when determining solutions.

The third pattern is *Primitive Problem Solving*. *Primitive Problem Solving* is a pattern that does not use metacognitive strategies when solving problems due to incomplete knowledge. The other findings that can be seen from subjects with metacognition pattern of *Primitive Problem Solving* still found mistaken concept. *Primitive Problem Solving* a problem-solving process that draws the conclusion of the preliminary data (Yulianto, *et al.*, 2013).

Honesty

Based on Figure 7, honest attitude in expressing what he has in mind are owned by third pattern of metacognition. It means that honest attitude does not have correlation with metacognition. The results of the data analysis showed that the average self-assessment of honest attitude in the three patterns of metacognition showed different results. Honest attitude formation may be through various means such as foster scientific attitude in learning at school. The

learners try to do assignment without cheating to friends (Musyarofah, et al., 2013).

Cooperation

The learners work together to solve a problem can improve the interaction between learners and communicate. The formation of a positive attitude can be developed through learning that emphasizes working together in a group. According to Hechman and Kautz (2013), the character is a skill not an innate characteristic that is formed through in family and social environments like school so that the characters can be changeable and can be changed.

The subjects of *Expert Problem Solving Metacognition Pattern* can cooperate well. The subjects of *Expert Problem Solving Metacognition Pattern* always actively to ask for provoke *problem solver* in order to reveal thought to resolve the problem. The subjects of Metacognition pattern of *Expert Problem Solving* never cut explanations *problem solver* and always to pay attention to every explanation expressed by the *problem solver*.

The subjects of *Hypothetic Problem Solving Metacognition* have an attitude of cooperation with Metacognition Pattern of *Expert Problem Solving* but the subject of *Hypothetic Problem Solving Metacognition* tends to be quiet as a *listener*. The subjects do not actively provide questions for provoke *problem solver* to give expression thinking. While the subject of *Primitive Problem Solving Pattern* is active as a *problem solver* but it tend to inactive as a *listener*.

Based on the data analysis above it can be seen that a good subject is acting as a *problem solver* may not necessarily be a good *listener*. When the subject as a *listener*, the subjects are required to provide questions that can provoke *problem solver*

reveal is thought to build knowledge. Contrary, the subjects acts as a good listener and problem solver.

The subjects of *Expert Problem Solving Metacognition* can cooperate better as compared with subjects of another metacognition pattern. A person's ability to solve problems illustrates the thinking ability (Yulianto, et al., 2013). The Results of this study contradict previous studies that the thinking ability is negatively correlated to the cooperate ability (Hartono, et al., 2013). It is also found in research results (Syaniyyah 2014) there is a negative correlation between the cooperate ability with the results of studying physics.

The cooperation attitude can observed from the results of previous studies is the attitude of collaboration when students doing practicum. The practical aspect of cooperation in the ability of those observed in previous studies is coordinating skills in working groups. According to Nurnawati, et al., 2012, coordination skills in co-operation is an action that set the task group could be resolved and directed. The attitude of cooperation observed in this study is likely the communication and exchange information skills. The Communication skills include the ability to ask, answer the question, and express opinions. The skills of share information include giving an explanation or clarification of information material. If these skills do not appear in working pairs then the task has been given will not be resolved properly (Nurnawati, et al., 2012).

Environmental concern

The Pattern of *Expert Problem Solving* have an attitude of concern of the environment is higher than the others of metacognition patterns and the subjects of *Primitive Problem Solving* has the lowest environmental concern attitude. Because of the subject of *Expert Problem Solving* pattern have a lot of experience.

According to Mulyani there is a correlation between educations, environmental knowledge with attitudes towards environmental management. The person knowledge will makes that person has an attitude. The attitude of person will develop an interest. The interest has affected a person's behavior manifestation (Khanafiyah & Yulianti, 2013).

The Relationship between Metacognition and Social Attitudes towards the Mastery of Concepts

Metacognition give effect to the process of thinking in solving problems. The correlation results showed a positive relationship between metacognition and concept mastery. These results are related with research results including Lee, et al. (2009) and Gok (2010) explain that metacognition is an important factor solving physics problems. Metacognition is a key element to achieve the critical thinking (Magno (2010) and Kelly & Irene (2010)). There is existence of powerful relationship between metacognitive knowledge and student outcome by solving problems which are indicated by an increase of the student test results after learning to develop metacognition (Cikmiyah & Lewis, 2012, Nulhakim, 2013, and Diella, 2014). Flavell describes metacognition abilities play an important role in cognitive activities, including solving problems (Schunk, 2012: 400).

Based on the data analysis, there is relationship positively between social attitudes and concepts mastery. These results are consistent with the statement of the implementation of character education in secondary schools will help improve the academic achievement of students (Berkowitz & Bier, 2005 and Chasanah, et al., 2014).

The success of students in problem solving is influenced by several factors. The performance of a person in solving depends

on effort, cognitive, and character (Heckman & Kautz, 2013: 13). Bandura stated that self-efficacy, motivation, and school climate will greatly affect the achievement of learners (Santrock, 2013: 534).

Conclusions and Recommendations

Conclusions

Metacognition pattern found in research that is the pattern of Metacognition *Expert Problem Solving*, Metacognition pattern of *Hypothetic Problem Solving*, and Metacognition pattern of *Primitive Problem Solving*. The entire metacognition pattern that is shows metacognition skills are needful in solving problem process. And the pattern of metacognition gives an idea of the importance of metacognition in problem solving and metacognition conditions of learners. A subject with Metacognition Pattern of Expert Problem Solving has effectively problem solving skills when compared with the other two patterns of metacognition.

All the subjects of this research of the three patterns of metacognition have honest attitude based on the indicators. The subject of Metacognition Pattern of Expert Problem Solving has the ability to work as a *problem solver* and *listener*. The subjects of Metacognition Pattern of *Hypothetic Problem Solving* and Metacognition Pattern of *Primitive Problem Solving* lack as a listener. The attitude of concerned about the environment can be observed on Metacognition Pattern of *Expert Problem Solving* and *Hypothetic Problem Solving*, so metacognition makes a person to have an attitude of care for the environment.

Metacognition and social attitudes has positively correlated with the mastery of concepts. The concept mastery of learners are determined by metacognition and social attitudes of learners together and other factors, so that the learners with Metacognition Pattern of *Expert Problem*

Solving has the best mastery of concepts between the others two of metacognition patterns.

Recommendations

Based on conducted the research then recommendations that can be given as follows.

1. The teachers should be develop learning strategies so that the learners with Metacognition pattern of *Primitive Problem Solving* and Metacognition pattern of *Hypothetic Problem Solving* can improve the metacognition and social attitudes.

2. Learning in groups to solve problems that have been used in order to be modified to suit the needs of learners who have Metacognition pattern of *Primitive Problem Solving* and Metacognition pattern of *Hypothetic Problem Solving* in order to achieve the Metacognition pattern *Expert Problem Solving*.

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PRANATACARA KRIDHAMADU: Master Of Ceremony's Community As The Effort Of Culture Preservation

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ABSTRACT

Pranatacara Kridhamadu is a community which Javanese language pranatacara (master of ceremony) study community and it is composed of Semarang State University's students. This community appears because of there are many anxieties of the decreasing of people who preserve Javanese language especially Javanese language's master of ceremony, yet master of ceremony is the important part in traditional events and Javanese tradition which must goes on. Because of that, some students of Semarang State University make a master of ceremony community, an organization which they can learn to be good master of ceremony and help to keep Javanese culture in the future. In this community, students can learn language, behavior, appearance and rules in pranatacara or master of ceremony. Other things or knowledge about Javanese event have to be had by a good pranatacara or master of ceremony.

Keywords - Pranatacara Kridhamadu, Javanese, Master of Ceremony, Culture

Introduction

The era of globalization are changing society in Indonesia. These changes occur in almost every aspect of life. Globalization gives a great influence on science and technology, especially information and communication technology, so that the world community can reach the same knowledge regardless of race and nation. Ease of communication and access to information to enable people to know the state of the people in the other hemisphere. This affects the homogeneity of the world community. Trends developing in countries with "more power" in the information field will be a trend all over the world who imitated the world community. This world trend leads to the homogeneity of the world community, which cause people leave the local culture. Modern culture is considered a fresh and dynamic compared to the local culture. Boredom and feeling dissatisfied of the human make modern culture quickly and easily followed and local culture is left. This is a necessity and absolute, yet nowadays, there are many people who are still aware of the importance of local culture. The local

culture is a wealth, uniqueness, wisdom of life, and the identity of a nation that must be maintained. If the local culture is lost, then, definitely, a tribe or nation will lose its identity too. Loss of identity for a tribe causes in dysfunction of human against nature which is occupied and also variously.

The preservation of the local culture then becomes the essential thing to be done by human in this era. Traditions, customs, language and all things that have already existed should still be used so that local soul of people can firmly entrenched. Many culture preservation or conservation efforts are encouraged continuously given. It is done considering that human have already too far left their original culture from the training of a small part of culture until high scientific about the local culture. In Indonesia, which has hundreds of ethnics, cultural preservation becomes very serious thing to do. Cultural preservation efforts should be maximized considering that there has been a lot of tradition in the small tribes that have been lost. If this is allowed or neglected, then Indonesia will lose its wealth and variety of its uniqueness and also the

strength identity of the nation. This disquiet has been already felt by the people from the older generation and the public who are aware of the importance of culture not to mention the students. As intellectuals, students become the foundation of the nation in the future. This is what makes Semarang State University students make KridhamaduPranatacara community. This community is a community of students learning about traditional Javanese host or pranatacara. They not only learn to be master of ceremonies in the Javanese language as well as the host of Indonesian does but they learn to be the host of Javanese traditional culture. This community stands in order students can be the master of ceremonies who have the appropriate attitude and style, know the customs arrangement of events and devices Javanese and all of ceremony's things, so that the ceremony can be run properly. This is one of the student efforts to help the preservation of the Javanese culture. Those who have graduated from the learning process in this community are expected to apply their knowledge and continue to preserve the Javanese tradition. In 2015, the learning community has graduated six forces that are ready to enter to the community.

Based on the curiosity about cultural preservation efforts of Javanese culture through the community Pranatacara Kridhamadu by the students, the author intends to observe the community as a learning material in the preservation of culture for the public and scientists.

Theoretical Review

In the journal paper by Suharti and friends, entitled *Nguri-Uri Kebudayaan Jawa Pada Paket Pernikahan Adat Jawa*, discusses the Javanese language student at the State University of Yogyakarta following the wedding package java training activities for the purpose of preserving the culture of Java through the profession, so the output of these activities are to be workers or

entrepreneurs Javanese custom service providers.

The purpose of this profession will make participants learn more to be a business rather than purely cultural practitioners who really aware of the importance of cultural preservation. Why should practitioners or experts who must really aware of the importance of culture? Is not it enough that a service business owner preserves the culture in order it still exists?

According Safril Mubah in his journal entitled *Strategi Meningkatkan Daya Tahan Budaya Lokal dalam Menghadapi Arus Globalisasi* or Strategies to Increase Durability Local Culture in Facing of Globalization Flow, in his discussion, strategies that can be done in the preservation of culture in the era of globalization are one of which is the understanding of cultural philosophy. The important step to do this is to improve the quality of educators and cultural stakeholders on an ongoing basis. Educators who are competent and cultural stakeholders who know and understand well the cultural values are important assets in the process of understanding the philosophy of culture.

To realize the strategy of understanding cultural philosophy is the establishment of learning communities in society.

In the community, the community is important, because the community is a social living environment, where changes or development happened because the community is social interdependence, which arises because the association between people who are members of the social system. Community as a system shows the relationship aggregation of individuals and objects having been patterned which functions as a whole is interdependent with some degree of regularity (Setiawan, 2012)

Based on this, the community has a great role and function in the community to make

significant changes. The rapid globalization and its effect which is very quickly have to be balanced in a way that is fast and effective too. Communities can be an effective alternative effort in the preservation of culture through cultural understanding strategies that its form is a learning community.

Research Methods

Research on Community KridhamaduPranatacara uses qualitative descriptive method. This study will answer the research question which is about how Pranatacara Kridhamadu becomes cultural preservation strategy. The object of this study is the community itself.

The technique of collecting data in this research was interviews and observation. Researchers conducted interviews with several members of the community, the head of the community, alumnae and community mentors of this learning community as the research subjects. After that the data were analyzed using qualitative descriptive analysis techniques by verifying the data which is proper with the purpose of research.

The step is determining the research models and techniques. Collecting data through interviews and observations is the further step. Analyzing the data that has been collected using qualitative descriptive analysis techniques to verify the data and concluding the research results.

Results and Discussion

Collecting data through interviews conducted by interviewing the founder and one of the coaches in Kridhamadu, Mr. Widodo, the chairman kridhamadu 2014, Munir, and some alumnae.

After the data were collected through interviews and observation data obtained as follows:

1. History

In 2008, in the Department of Language and Literature of Java FBS UNNES did not have pranatacara courses so that when a student wanted to learn the knowledge of pranatacara have to go outside the scope of the university. It made some of the lecturers and students had the initiative to create a learning community that students be able to have knowledge of pranatacara well. Community of Pranatacara Kridhamadu is one of Semi-Autonomous organization of HIMA (Student Association) of Department of Javanese language and literature in order to have the clear protection and structured well.

Pranatacara kridhamdu is a Javanese's master of ceremony community whose members are students UNNES from various departments. Despite in the fact that the Javanese language students have a higher interest in being perceived as supporting skills later when they graduated, This community is more focus in learning various techniques and knowledge of master of ceremony in Javanese custom, both Solo's (Surakarta) and Yogyakarta's custom.

2. Objectives

Pranatacara or master of ceremony in this community learns a variety of things such as language skills supporting competent and well mannered. It also notices the rhythm music which is accompanying the traditional procession, singing (nembang) to accompany the traditional procession, and also how to use traditional clothes and their meaning and symbol. All of them are learnt in order the graduates or alumnae of this community are able to be a good master of ceremony and understand various customs and their procession.

3. Learning activities

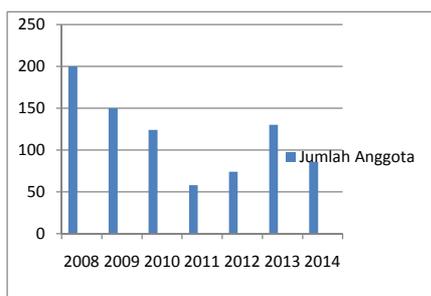
In every beginning of the lecturing activity, the community opens the recruitment of new members through the studium generale. This

step is done without going through the selection because all of new members are still considered to be a shared learning process. Because of this community is an independent community, the financing of supervisor and all of needs are shared by members through dues together. The learning process is done for a year and has its own curriculum. Meeting with teachers or tutors are scheduled 21 meetings. While the rest time is independent practice each members of the community.

Examinations are held twice a year. The first one is written examination to test the knowledge and practice in writing. Secondly, the exam was held the whole of traditional procession through demonstration. Each member has the book report and graduation certificate, which the one which distinguishes their quality is through the value which is stated in the certificate. The ceremony of the member's graduation or the graduation day is held in the end of the year.

Many alumnae of this community have been master of ceremony in their respective regions. It becomes as a main profession or the side profession than being a teacher or other main profession. Some of the new graduates who graduated and still active as college student also have started to be assistant of master of ceremony. All of this proves that this community is indeed as one of the cultural preservation. Each member is always equipped knowledge of pranatacara and Javanese culture and customs.

4. Graphics of Development



From the beginning till 2014, Pranatacara Kridhamdugets fluctuating number of members when it is seen by purely. On the other hand it is equivalent amount each year, because the number of new students each year is also different.

With the existence of this community, knowledge institutions about pranatacara and Javanese traditional customs are increasingly widespread. This community's member has particularly the role as learners when they learn, and also the knowledge they get currently is shared to society especially the Javanese people who do not know about the their tradition.

Becoming learners or the beginner, community members study hard so that they can get both of the knowledge and skills of pranatacara which are qualified. Society who has expertise in this field gives experience to community members, so there are teaching activities and active discussion about Javanese culture. Learning is done so that the members can be people who have the knowledge and skill of pranatacara which are qualified.

Community members who have graduated shared their knowledge which they got form Kridhamadu community when they become the part of society. It can also improve the experience through practicing that exists in the community. Additionally, he or she can be a model and a lecturer in society or the young generation who do not understand the knowledge and practice of Javanese traditions.

The graduates or alumnae of this community become a pioneer / agent in Javanese cultural preservation through the practice or their own efforts in doing pranatacara and do Javanese of custom, especially in the Javanese community that no longer do or apply the Javanese tradition. This is the major impact of kridhamadu in society. The public will be invited to back into preserving cultural identity and national pride. The

touches of Javanese culture that are growing from the roots of nature of the Java community will enter to the Javanese community although it has been transformed into a modern society.

Conclusions and Recommendations

Based on this research, the point-pound conclusions as follows:

1. Pranatacara Kridhamadu is a learning community about pranatacara (MC of Javanese language) consists of new students.
2. The objective of establishing this community is to equip pranatacara skill and knowledge of the indigenous organization of Java.
3. Percentage of enthusiasm each year new students to enroll pranatacara kridhamadu of all new students that there is no change significantly.

4. Effect of the community to the community cannot be presented in the form of concrete data.

Suggestions for this study is It is expected that further and more in-depth research on the influence of this community for the preservation of culture in society and valid data.

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DEVELOPMENT OF LEARNING DEVICE WITH RALLY COACH COOPERATIVE MODEL BASED ON REACT TO IMPROVE MATHEMATICAL COMMUNICATION ABILITY

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ABSTRACT

The purpose of this study is to develop a learning device use rally coach cooperative model based on REACT with learning scenarios as follows: (1) teachers begin teaching by linking the material in accordance with what students already know (Relating), (2) implement learning by setting rally coach cooperative model (Cooperating) with material that encourages students to construct new knowledge (Experiencing), (3) ends with giving test that encourage students to apply the concepts and knowledge in context (Applying and Transferring), then to know the development procedure of high quality mathematics learning device by : examine the validity of device, analyze the practicality of the mathematics learning application, and analyze the effectiveness of the mathematics learning application. Results of this study showed the average value validation for syllabus = 4.26, Lesson Plan (RPP) = 4.26, student books = 4.26, Student Worksheet (LKS) = 4.27 and Mathematical Communication Ability Test (TKKM) = 4.42. 83.12% positive response from the students towards learning and the average value of the ability of teachers to manage learning = 4.27. Activity and process skills of students, both variables are jointly influenced mathematical communications ability by 90,69%. The proportion of students with minimum value equal by 70 greater than 75 % . Average of mathematical communications ability students that learn use rally coach cooperative model based on REACT better than average of mathematical communications ability students that learn use conventional method.

Keywords – Rally Coach, REACT, Mathematical Communication Ability, Activity, Process Skills.

Introduction

Learning is a process and activities to modify or reinforce the behavior through experience, so learning is not the result or purpose. According Hudojo (1988) there are three main problems in the learning, namely: (1) the problem of the factors that influence the occurrence of learning; (2) the problem of how learning is taking place and which principles are implemented; and (3) the problem of learning outcomes.

Geometry as a branch of mathematics, which has been taught since elementary school, has a strategic position to develop reasoning ability of students and can be seen as an exercise to restructure the spatial reasoning or insight students, but research on learning geometry shows many junior high school students who do not understand

concepts of geometry. Soedjoko (2001) reported that many students make mistakes in solving the problem of the parallel lines. Other studies, reported that of 443 junior high school students in grade 3 there are 86.91% of students found square was not rectangular, 64.33% of students found a rhombus is not a parallelogram, and 36.34% of students believe in a square, two sides face perpendicular to each other. Lack of ability of students to the understanding of the concept is in accordance with research Sudiarta (2007), according to study mathematics at this time does not allow students to build their ideas and understanding of mathematical concepts broadly and deeply, to understand the relevance of mathematics to other fields of science and be able to apply to the various problems of life and lives. Another problem that occurs in learning due to the lack of

interaction of teachers and students so as to reduce student motivation, conventional learning activities that used too centered on the teacher so that the activities and process skills of the students in learning less, mathematical communication skills of students in the material quadrilateral which is low seen from the lack of the ability of students in developing the algorithm completion of and write with their own words. Mathematical communication skills classified as important as mathematical communication is the bridge for teachers to understand the way of thinking of students (Hock, 2007).

Theoretical Review

Rally coach cooperative learning model is a form of cooperative learning, which means students are placed in groups in pairs, then alternately do the problem and then friends in couples who are not currently do the problem to provide assistance to their couple on if necessary (coaching). Learning models rally coach developed by Kagan (2010) has the following steps: (1) Partner A do the problem (2) Partner B listen, see and help if needed (3) Partner B do the next problem (4) Partner A listening, look and help if needed (5) Repeat the process until all the matter is done (6) Compare and discuss the answers to the other partner. Based on research conducted by Kagan in some schools in the United States, the rally coach cooperative model effective in improving social skills, communication skills, knowledge buildings, procedure learning and thinking skills. As well as research conducted by Slavin (2008) that the Peer-Assisted Learning Strategy (PALS) of the same type with rally coach is a strong evidence of effectiveness in learning.

REACT is a collection of strategies used by the best teachers to obtain maximum results in learning (Crawford, 2001). There are five elements of REACT that is relating , experiencing, applying, cooperating and transferring. Relating is learning to associate

the material being studied in the context of real-life experience or previous knowledge. Experiencing is learning to make students learn by doing math activities through exploration, discovery and search. Various experiences in the classroom may include the use of manipulative, problem solving activities, and labs. Applying is learning by applying the concepts that have been studied for use, by providing exercises realistic and relevant. Cooperating is learning by conditioning students to collaborate, share, respond by communicating with the other learners. Then transferring is learning that encourages students to learn to use the knowledge they have learned into new contexts or situations that have not been learned in the classroom based on understanding. The fifth element is a reflection of contextual learning konstruktif arranged, so that strategies REACT can help improve students' understandings in depth the fundamental concepts. According to Saka (2010) REACT strategy is effective in improving the success, interest and positive responses of students. Correspondingly with saka research, research conducted by Marthen (2010) also concluded that the REACT strategy can improve students' mathematical abilities including mathematical communication skills.

Mathematical communication is the ability to determine and interpret mathematical ideas, either orally, in writing, tables or graphs (Depag, 2004). Mathematical communication is the ability to communicate ideas with symbols, charts or diagrams to explain the situation or problem. Boose (2006) said most educators and researchers agree that the key to understand, communicate and operate effectively mathematical concepts related to perform the conversion between the following representations: charts, tables, symbols and verbal. According to the NCTM (1989), indicators of mathematical communication includes: (1) The ability to express mathematical ideas through oral, written,

and demonstrate and depict visually, (2) ability to understand, interpret, and evaluate ideas mathematically either orally, in writing, as well as in other visual form, (3) Ability to use the term, mathematical notation and structure to present the idea, described the relationship with the situational model.

Mathematics learning activity is a process of communication between students and teachers in the classroom environment both processes result from the interaction of students and teachers, students with students to produce changes in the academic, attitude, behavior that can be observed through the students' attention, seriousness students, discipline students, the process of asking or answer (Sunaryo, 2003). Students learning activities can be positive or negative. Student activity a positive example; submit opinions or ideas, doing tasks or problems, communication with teachers actively in the learning and communication with fellow students in order to solve the problems being faced, while the student activity which negatively, for example disturb fellow students during the learning process in the classroom, doing another activity that is incompatible with the lesson being taught by the teacher (Hamalik, 2008).

Skills in mathematics learning is the ability to provide the right answers and the right (Karso, 1994). Math skills is one object directly in learning math with the concepts and theorems in mathematics itself. Indirect object can be either positive attitude towards mathematics, problem solving skills, independence and so on. Mathematical process skills is an active process quality demands of students in performing an activity in motoric which is a manifestation of mental function performed by students and systematically designed learning strategies by teachers to obtain a product with specific skills optimally (Syah, 2003).

Research Methods

This research was a type of study mathematics learning device development. Learning device developed such as the Syllabus, lesson plan (RPP), Students Books, Student Worksheet (LKS), and the Communications Mathematical Ability Test (TKKM). The development of mathematics learning with rally coach cooperative model based on material REACT Quadrilateral grade VII to improve mathematical communication. The development of learning device in this study refers to the model Thiagarajan (1974) that the modified namely stages Define, Design, Develop. The instrument used to collect data consists of sheets of validation, Communications Mathematical Ability Test (TKKM), observation sheets of ability of teachers to manage classes, sheet to questionnaire student responses, observation activities sheets, observation process skills sheets, guidance interview activities sheets, and guidance interview skills process sheet.

The collected data were analyzed further. Learning device is said to be valid by a team of experts. TKKM be analyzed validity, reliability, level of difficulty of questions and index of differentiated power. The learning device is said to be a practical (Trianto, 2009) if it meets the following criteria: (1) the ability of teachers to manage learning, and (2) the response of students to learning classified as positive. The instrument used is the observation teachers manage learning sheets. Data from the teacher's ability to manage learning scores were analyzed by finding the average value of the teacher's ability to manage learning. The ability of the teacher to manage the learning is said to be good if every aspect is considered to be good. The instruments used are student questionnaire responses sheets. The results of the acquisition of student questionnaire responses to learning activities analyzed by percentage, student responses categorized as positive if the percentage obtained more than 75%.

To view the complete or absence of individual student learning outcomes and classical as one of the criteria for the effectiveness of learning. Test used to test the individual mastery of the parties. The formula used to calculate the class average completeness is as follows.

$$t = \frac{\bar{x} - \mu_0}{\frac{s}{\sqrt{n}}}$$

To Test classical completeness used proportions two parties test . The formula used is as follows,

$$z = \frac{\frac{x}{n} - \pi_0}{\sqrt{\frac{\pi_0(1 - \pi_0)}{n}}}$$

Average difference test by one parties t test . The formula used statistical tests to the data are homogeneous,

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{s^2 \left(\frac{1}{n_1} + \frac{1}{n_2} \right)}}$$

Influence test on the attitudes and skills of mathematical communication skills. Statistical test used multiple linear regression (Suharyadi, 2004). Enhancement test using the formula Normality Gain (g) (Hake, 1999) the following,

$$g = \frac{S_{post} - S_{pre}}{S_{max} - S_{pre}}$$

Student mathematical communication ability is said to be increased if meets the criteria for an increase in medium or high. And the average communication skills mathematical classroom with the rally coach cooperative models based REACT is better than the conventional classroom, activities and process skills positive influence on the

mathematical communication skills, and continued with increased activity and process skills at each meeting.

Results and Discussion

Results of the assessment by the validator of the developed learning device: Syllabus = 4.26; RPP = 4.26; Student Books = 4.26; LKS = 4.27; and TKRM = 4.42 with a maximum score of 5 so the learning device that developed considered valid. Results of student response sheets to the learning activities have an average percentage of 83.12%, the student response categorized as positive. Observations obtained is a teacher for the learning activity, obtained an average score of 4.27, then the ability of teachers to manage classroom included in good categories. Thus the learning device that was developed placed on practical criteria.

Learning effectiveness test is measured through the following statistical tests: (1) The test of completeness, (2) the average difference test, (3) test the effect, and (4) test improvement. To test the median test was used an one party average test. The results of completeness mathematical communication ability test is the average mathematical communication abilities beyond 70. The classical completeness test for mathematical communication ability variables used one party test resulted proportion of students who are taught by the rally coach cooperative model based on REACT who achieve completeness at TKKM has exceeded 75%. Comparative test results show the average communication skills math students taught using rally coach cooperative model based on REACT better than communication skills math students taught using conventional learning models.

Calculations influence test of activity and process skills on the mathematical communication ability use multiple regression . Based on the calculations, the value of $F_{hitung} = 160,72 > F_{tabel} = 3,285$ means that H_0 is rejected or it can be

concluded that the activity and process skills together significant effect on students' mathematical communication skills. Based on the calculation results obtained from the regression equation is $\hat{Y} = -8,24 + 0,2X_1 + 1,34X_2$ means that each additional activity variables (X_1) of the unit it will add value of TKKM (Y) by 0.2 and each additional process skill variables (X_2) of the unit, there will be a value addition of TKRM (Y) by 1.34. R Square = 0.9069 = 90.69%, shows that the value of an independent variable activity and process skills together affect the mathematical communications ability at 90.69% 9.31% there is still the influence of other factors.

Calculations of students mathematical communication ability increasing test results normalized gain average of 0.71 which means increased communication capabilities mathematical occur including high category. Then, to test the appeal against the average difference between pretest-posttest result the average difference between pretest-posttest communication ability of students with the rally coach cooperative learning models based on REACT better than conventional models. This shows that the mathematical communication ability on the material quadrilateral of students who received mathematics instruction with learning device developed using rally coach cooperative learning models based on REACT increased.

Average activity and process skills of the students has increased at every meeting. Increased student activity starting from the lowest point at the meeting of 1 namely 58.6 and then continue to rise to 72.9 at the 5th meeting. A gradual increase in activity is relatively low at every meeting, but overall was in the medium category namely an increase of 45%. For process skills of students also increased starting at the lowest point in the meeting of 1 namely 54.4 and then continue to rise to 61.6 at the 5th meeting. Improving the process skills gradually classified in the low category, but the overall improvement of process skills

being classified in the medium category namely an increase of 42%. From both these increases we can conclude that in every meeting mathematical communication ability has increased.

Conclusions and Recommendations

By using the Thiagarajan development model generated mathematics learning device by rallycoach cooperative learning models based on REACT who has a high quality, so it can be used as a solution to the problems that occur in MTs Negeri Bangbajang. High quality learning device developed seen from the fulfillment of the following criteria: (1) The mathematics learning device by rally coach cooperative learning based on REACT valid according to a team of experts. Details of the results are namely the syllabus included in good category with an average score of 4.26, RPP categories with an average score of 4.26, good category student book with an average score of 4.26, good categories LKS with a mean score average 4.27, and good category TKKM with an average score of 4.42. (2) The mathematical learning device by rally coach cooperative learning models based on REACT practical. Practicality is evident from the teacher's ability to manage classroom in the rally coach cooperative learning models based on REACT meet good criteria with an average score of 4.27, and the positive response of 83.12% of the students. (3) The mathematical learning device by rally coach cooperative learning models based on REACT effective, with details as follows: (a) Development learning device by rally coach cooperative learning models based on REACT successfully completed mathematical communication ability of students, because the average value obtained have exceeded the KKM. Then classically 75% more students scored above the KKM predetermined. (b) The student's mathematical communication ability in leaning with learning device by rally coach cooperative learning models based on REACT better than students with

the conventional learning. (c) Student activity and process skills positive influence on the mathematical communication ability, which affects at 90.63% and has a regression equation regresi $\hat{Y} = -8,24 + 0,2X_1 + 1,34X_2$. In other words, learning by rally coach cooperative learning models based on REACT can improve mathematical communication ability gradually, seen from the increased student activity on process skills at each meeting. (d) increasing students' mathematical communication ability can be seen from the results of comparative tests which states the average difference between pretest and posttest mathematical communication ability of students learning by rally coach cooperative learning models based on REACT better than conventional learning. It is supported pretest-posttest results of testing students' mathematical communication ability with the rally coach cooperative learning models based on REACT who obtained an index gain of 71%.

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DEVELOPING THE CHEMISTRY LEARNING THROUGH PROJECT-BASED LEARNING MODEL INTEGRATED WITH INFORMATION AND COMMUNICATION TECHNOLOGY AND CHARACTER EDUCATION

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ABSTRACT

The observation at the beginning at SPMA H. Moenadi gained several problems such as the students have low interest in studying chemistry because it was difficult to understand and unpleasant subject, they do not know the application of solution concept in the subject of expertise major, chemistry learning is not maximized in using ICT, and the values of character education has not appeared in the learning process yet. Based on these problems, the researcher developed the chemistry project-based learning (PjBL) model by making hydroponic nutrient solution integrated with ICT, Edmodo, and character education. Edmodo is an e-learning program social network-based dedicated to teachers, students and parents. The purpose of this study is to determine the Science Process Skills and characters in chemistry learning by using PjBL integrated with ICT. This study is a developmental research with the 4D model (Define, Design, Develop and Disseminate). The subjects were the students of class X of SPMA H. Moenadi Ungaran consisting of four parallel classes in the academic year 2014/2015 with competence expertise of Food Crops Agribusiness and Horticulture. The data were obtained by questionnaire, observation and tests. The data analysis used validation, feasibility test, effectiveness test, and student responses. Results of this study had valid criteria. It obtained an average value of 92 in validation by the experts. Moreover, a statistical validation gained $r_{11} = 0.516$ which was bigger than $r_{tabel} = 0.381$. Based on the result of t-test, this model was effective to be implemented. In the posttest of experimental and control class had signification of 0.000 which means that there was a significant difference between them. In addition, this developed model is feasible to be implemented. It is based on the response of learners, 68% (responded well) and 32% (responded very well). The Science Process Skills in this learning was well-qualified with an average score of 75.44. Responsible, discipline and religious characters of students scored 73, 77, and 85 with good and excellent qualifications.

Keywords - Project-based learning, ICT, character, science process skills.

Introduction

Learning is a process of interaction between teachers and students as well as the elements contained therein. Teachers is the most dominant factor that determines the quality of learning. The quality of teaching is good, it will produce good learning outcomes as well. Based Permendikbud No 70 of 2013, the learning process is a good start of the improvement mindset include learning patterns centered on the teacher be learning centered on learners, learning patterns in one direction (the interaction of teacher-learners) into interactive learning (interactive teacher-participants learner-society-natural environment, source / other means).

Based on the needs analysis and observations made in vocational-SPMA H. Moenadi, obtained information that the average learners are from the middle class economy and chose vocational schools with the aim of going to work after they graduate. Learners have the ability medium seen from the average value of SMP and the test results of selection of new admissions.

Learners have the interest is low on chemical subjects, according learners, chemical subjects are subjects that are very difficult, results of interviews and questionnaires, showed 90% of students prefer learning outside the classroom are not only thinking, but the practice or lab work,

other than that books or teaching materials used are books still stressing the concepts of chemistry alone is not directed learners to undertake learning that enable learners, utilization of information technology for example the use of the internet in learning activities both teachers and learners is not maximized.

Chemistry learning that teachers do during the many teaching concepts in class and rarely carry out learning outside the classroom and lab work, but this does not fit with the character of students in vocational school, the teacher is not much to enable learners to engage in learning, and this makes the learners are not active and sleepy in the following study, in addition to the teacher just talked about the application of chemicals in agriculture so that the students have not been so understand learning relationship with the agricultural chemical in accordance with competency skills they choose.

Sourced preliminary study will develop project-based learning with hydroponic plant nutrition products manufacture integrated Information and Communication Technology (ICT) using Edmodo to improve the science process skills and character of responsibility, discipline and religious students in vocational-SPMA H. Moenadi Ungaran. Because with authentic learning and contextual able to produce valuable and meaningful to learners, in addition to the PjBL emphasizes education that gives an opportunity to the learning system centered on the learner collaboratively, and integrate real problems and practical, teaching effective in building knowledge and creativity (Rais, 2010).

Products developed this research is to study chemical solution project of hydroponic nutrient solution integrates Information and Communication Technology which utilizes Edmodo and character education program consists of syllabi, lesson plans, teaching

materials, work sheets, assessment science process skills, and questionnaire characters.

The purpose of this study was to determine the validity, effectiveness and feasibility of project-based learning model integrates ICT chemistry, knowing Science Process Skills on chemistry-based learning model poyek integrated ICT. Character learners know the learning model poyek integrated ICT-based chemistry.

Theoretical Review

Project-based learning (PjBL) is a model or an innovative learning approach, which emphasizes learning through activities contextually complex (Cord, 2001). PPA focuses on the concepts and principles of the main (central) of a discipline, involving students in problem-solving activities and tasks meaningful others, provide opportunities learners to work autonomously construct their own learning, and ultimately produce works of participants students valuable, realistic (Okudan. Gul E. and Sarah E. Rzasa, 2004).

Active learning methods Project-based learning (PjBL) integrated Information and Communication Technology (ICT) that use the Internet through Edmodo that program e-learning-based social network that is intended for teachers, pupils at the same time parents, which apply a learning system that is easy, efficient and more fun, so as to make the communication between teachers and learners during the learning process becomes more memorable, the activity will run well and successfully mastered the learning material well too (Darmawan, 2012).

PjBL active learning methods, not only serves as a medium to develop skills alone, but also serves to form the character and civilization that dignity. From this, the actual character education (character) can not be left in the functioning of education. Therefore, as a function inherent in the

existence of national education to shape the character and civilization, character education is a manifestation of the role. To that end, character education is the duty of all those involved in education efforts (Haryanto, 2012).

According Dahar (1996), science process skills is the ability of students to apply scientific methods to understand, develop and discover science. Science process skills is very important for every learner in preparation to use scientific methods in developing science and are expected to acquire new knowledge or develop the knowledge that has been owned.

Research Methods

This research included in this type of research and development (R and D). using the 4D model (Define, Design, Develop and Disseminate). Subjects tested in this study were students of class X SMK SPMA H. Moenadi with competency skills Agribusiness Food Crops and Horticulture consisting of four parallel classes in the academic year 2014/2015. two classes as an experimental class with a class that is learning with the PjBL manufacture of plant nutrients in hydroponic cropping patterns, two classes as the control class learning classes that do not use the PjBL.

Research results collection techniques by questionnaire, observation, interview and test. Istrumen data collection with the learning method validation sheet, sheet questionnaires, observation sheets, sheets of interviews and tests the ability of the concept. The data analysis technique is a learning model analysis, validity analysis and feasibility and effectiveness analysis.

Results and Discussion

Project-based learning (PjBL)

Based on the results of the questionnaire responses of students, learners feel that learning chemistry with mengaplikasikan

directly into the activities of learners do in everyday life, making them feel learning more fun, not boring, it becomes understand why in agricultural chemical to be studied, but it makes the chemical is not the material is difficult because students have a high curiosity, and studied chemistry makes a necessity not a necessity forced. The research result is in line with the results Moerdiyanto (2012)

Chemical research development project-based learning model of integrated information and communications technology with the Character Education effectively performed by t test shown in Table 1.1

Table 1.1 Uji t

classroom	type Test	Sig	description	conclusion
Eksperimen	Uji t	0,00	Sig < 0,05	There are differences
	Paired Differences	–		
Kontrol	Uji Wilcoxon	0,00	Sig < 0,05	There are differences
	Pretest Postes	–		
Eksperimen	Uji t	0,00	Sig < 0,05	There are differences
	Independen Sampel Tes	–		
Kontrol	Pretest Postes	–		
	Postes	–		

The research is stated that there is a difference between the pretest and posttest experimental class, having given project

learning students better understand the material solution than prior to obtaining project learning, for the control class t-test, there is also a difference between the pretest and posttest, this is because the class control also got chemistry learning solution, although not using the project, but the results are better experimental class as evidenced by the average value posttest experimental class is higher than the control class.

However, the results of this study, the average gain value is still less than satisfactory which gained an average of 60, This is in contrast with the results of the research that has been Subuh Jailani (2014) which produces an average value of 80.47. according to the analysis researchers this happens because the subject of research is the students of SMK, they are naturally inclined to use his skills and less to optimize the ability to think, time spent in the study long enough so that the planting concept that usually must be repeated can not be done, other than that of researchers factors that need development models and a more complete instrument to increase creativity and proficiency in organizing learning activities. So the need for further research how the methods and the right tools for vocational students for subjects that are considered difficult as well as chemistry.

This study shows that the chemistry learning using projects more effective, evidenced by the t-test post-test experimental class and control class stating the difference in learning outcomes between classes using a learning project with a class that does not use a project, results are also consistent with studies Miswanto (2011)

ICT

This study, a project learning integrated Information and Communication Technology, the study researchers used Edmodo is a platform of social learning to use the Internet for teachers, students and for

parents / guardians as a means of learning between teachers and students outside the classroom face to face, with upload teaching materials, giving additional duties, and the media question and answer between teachers and students outside of instructional hours, from the student questionnaire responses Edmodo very effectively used as a medium of learning.

ICT in the classroom is also used by learners to find some literature on the Internet related to the project they planned and they write in a work sheet, except that when learners communicate the results of their project using the LCD and a lap top that utilize ICT. This is in accordance with the opinion of Darmawan (2012) that the development of Information Technology is able to package the conditions and realities of prior learning becomes more attractive and provide conditioning adaptively on the learners wherever they are.

Science Process Skills

Research project learning, one dependent variable is the science process skills, learning the material solution chemistry, by administering the project of making a nutrient solution hydroponic make learners have the science process skills are good and even some very good, from the data obtained as shown in Figure 1.1 as follows.

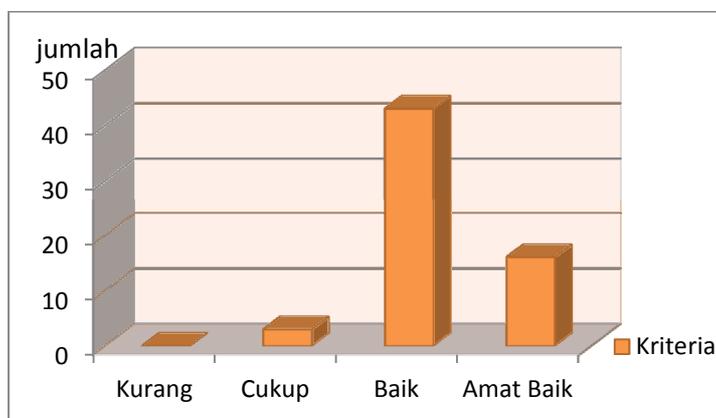


Image 1.1 Science Process Skills

The result is the average value of the five KPS owned learners is 75, 44 with good criteria other than that of total respondents amounted to 62, 43 learners acquire good criteria and 16 berkriteria very good learners look enthusiastic in carrying out learning activities, some of learners who are usually passive in following classroom learning, seemed to enjoy, participate actively and show their skills including observation of obtaining an average value of 66 with good criteria, use of tools and materials gained an average of 87.2 with the criteria very well, planned trial average gained 68 with good criteria, carrying out experiments on average gained 84.2 mengkomunikasika criteria very well and gained an average of 71.8 with both criteria.

Character

The value of the character seen in this study is the responsibility, discipline and religious, with the project of the hydroponic solution is expected that learners can practice and develop the character. With the creation of hydroponic nutrient solution which is directly used for growing hydroponic plants, making these characters must be owned by students, without responsibility, discipline and religious project of making the nutrients used to grow vegetables is not optimal.

In the implementation of the project every day learners have to take care of the plants they have planted, for example to check the pH, TDS content and temperature, so the plants are planted uncontrolled growth, if no day terlewatkan and uninterrupted growth misalakan pH to go down, and did not restore optimal pH , the plants can not survive, it is what makes these characters are needed in the implementation of this project,

Based on the results obtained that the learners in the learning solution chemistry with the project of making the hydroponic nutrient solution has the responsibility, discipline and religious good as shown in Table 1.2 below.

Table 1.2 Character Data Discipline, Responsibility And Religious

NO	CHARACTER	AVERAGE VALUE	CRITERIA
1	Responsibility	73	GOOD
2	Discipline	77	GOOD VERY
3	Religious	85	GOOD

Learners show high discipline seen from the daily care of the plants, almost all of the plants in their care grow well, because it is never too late to monitor of the things that interfere with growth ranging from always control the temperature, pH and the amount of nutrients in the solution as food for plants.

Based on the results of the religious character of 55% of students have a religious character is very good, it is based on the results of the questionnaire, they are by studying the chemical solution, through a project of the nutrient solution hydroponics, be reminded that the water used for the planting medium is the gift of God untold, so with the teachers of learners are always reminded to always be grateful, in addition to calculating the levels of plant nutrients and plant crops with nutrient solution hydroponic, arising out of gratitude and the spirit that God already provide anything for all creatures including plants and humans as creatures the most perfect to always learn about nature, because God already provides for prosperity manusia. Adanya any good character values shown in this study, according to the research results Sovhi Rintowati (2014).

Effectiveness and Feasibility Studies

Research "Development of Instructional Model Chemistry Project-Based Integrated Information and Communication Technology and Character Education" generate valid instrument based on the results of the validation results of experts who obtain an average value of 92 and a

validation statistik generated r11 of 0.516 exceeds rtable 0.381 were declared valid and reliable.

Learning model development project is effectively based on the results of t-test to post-test class experimental and control that produces significance 0,000 means that there are differences in learning outcomes between classes using model project with a class that does not use the learning project, in addition to the value of Skills Process Science learners average -rata 75.44 with good criteria, for the character of responsibility learners obtain 73 ber kriteria good value, character and religious disciplines respectively scored 77 and 85 with the criteria of good and very good.

Based on the above data that the research development project integrated learning model is valid and effective and supported by the response data 68% 32% responded well and respond very well terhadap project learning, so that the development of this learning model is feasible.

Learners respond very well to learning projects, they feel happy with pembelajaran that have been implemented, although in practice the students are more likely concentrated on projects hydroponics, chemistry learning that they should be prioritized even just as a supporter, this is seen when the learners pengkomunikasikan results their project through powerpoint, most learners discuss about hydroponics, and few chemicals they discussed, however this study has made learners know why chemistry lesson they have to learn, in agriculture, and based on obserfasi peserta students enjoy learning chemistry larutan this, compared to the previous chemistry learning.

Conclusions and Recommendations

From the results of this study concluded that: chemical Learning ICT-based integrated project developed, valid criteria

of the results of the validation experts who obtain an average value of 92 and a statistical validation of generated r11 exceed 0.516 0.381 rtable stating valid and reliable. In addition learners, 68% responded well and 32% responded very well so it deserves to be used. Also effective this study, based on results of t-test to post-test experimental and control class that produces significance 0,000 which means there is a difference in the results pembelajaran between control and experimental classes.

Science Process Skills in learning poyek integrated ICT-based chemistry, well qualified with an average value of 75.44. Character learners in learning poyek integrated ICT-based chemicals, and very well qualified based on the responsibilities of learners 73, discipline and religious character each scored 77 and 85.

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ETHNOMATEMATICS EKSPLORATION AND BE CONNECTED WITH MATHEMATIC CONCEPT'S IN AMANUBAN

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ABSTRACT

Humans are creatures of culture, living in a cultural environment, and helped create the culture. Cultural integration in learning of mathematics be said to be ethnomathematics. Cultural raised depending on where and to whom mathematics is taught. Assuming that ethnomathematics raised already known and can assist students in learning mathematics. The goals in this research is explore and connect ethnomathematics forms at Amanuban community in South Central Timor, focus to activities and artifacts with mathematical concepts. This research is a descriptive qualitative ethnographic method using triangulation techniques such as observation, interviews, and documentation. Data analysis it became two phase that is Miles & Huberman model for exploration phase and Glaser & Strauss for analysis connected phase. Results of study revealed that the form ethnomathematics community have a close relationship with mathematical concepts, especially in field of geometry and algebra. Appointed field geometry is a square, rectangle, rhombus, regular hexagon, circle, hexagonal prisms, cubes, blocks, cylinder, hexagonal pyramid, cone, and spheres. Concept's from ethnomathematics forms can be integrated in learning at the elementary school level and high school.

Keywords - ethnomatematics, culture of Amanuban, mathematic concept's.

Introduction

Hiebert & Carpenter (1992) reminds all parties that the teaching of mathematics in schools and mathematics are found in the child's daily life is very different. Therefore, learning of mathematics is necessary a charge or bridge between the world of mathematics in everyday based on the local culture with school mathematics. So, ethnomathematics is mathematics with cultural element.

Cultural raised depending on where and to whom mathematics is taught. Assuming that ethnomathematics raised are well known and can assist students to learn mathematics. Seeing the cultural wealth of Indonesia, a lot of culture that can be explored and linked with mathematical concepts can even be implemented on learning. This has been revealed by previous researchers. Hartoyo (2012) reveal the value ethnomathematics in West Kalimantan border area with Malaysia precisely Sanggau area inhabited by the Dayak clan. Hartoyo explore the

value that exists in the Dayak culture and implement in teaching mathematics. The material be adapted in accordance with the characteristics of each object.

Question in this research is how ethnomathematics forms that exist in people's culture Amanuban clan district of South Central Timor and how the relationship ethnomathematics forms in the culture of the clan with mathematical concepts. The goals of research is explore of ethnomathematics forms that exist in the culture of clan Amanuban people and analyze the relationship between ethnomathematics forms accordance with mathematical concepts.

Theoretical Review

William (1985) reveals the culture is a medium used by humans to solve the problems. Because these systems are adaptive, then its quite steady and unchanged. Unless the reference conditions adaptation or a human view of the changed

conditions. Culture describe a characteristic of a nation. As happens in education, innovation with involving cultural diversity that we have, becomes a unique learning.

Innovation in education is growing in accordance with the needs of curriculum, schools and student. Ibrahim (1988) said that the innovation usually comes from the willingness of the school organize to response for utilities in society and any attempt used the school for problem solving in society. The advances in technology now very fast and this gives contribution in developing educational technology and learning, especially in mathematics. But it should be known that the technology is not only associated with the tool and means all powerful. Isjoni, et al (2008) explains that the educational technology view about the learning process as a problem that must be dealt with rationally and scientifically. Application of the use of technology would be better if it is not to forget the existing culture in the everyday environment of student that culture that exists in society. In addition to maintaining the culture of the community, students were helped to recognize and appreciate their own culture.

Cultural integration in the learning of mathematics called ethnomathematics. Etymologically, the word comes from the ethnomathematics ethno and mathematics. Ethno means ethnic and matematic means mathematics. According to Gerdes (1994), ethnomathematics is mathematics applied by certain cultural groups, labor groups / farmers, children of a certain class of society, the professional classes, and so on. This means ethnomathematics not just talk about ethnicity or clan. Hiebert & Carpenter (1992) reminds all parties that the teaching of mathematics in schools and mathematics are found in the daily life student is very different. Therefore, learning of mathematics is necessary a charge or bridge between the world of mathematics in everyday based on the local culture with school mathematics. Cultural raised

depending on where and to whom mathematics is taught. Assuming that ethnomathematics raised are well known and can assist students in learning mathematics.

Seeing the cultural wealth of Indonesia, many culture that can be explored and connected with mathematical concepts can even be implemented on learning. This has been revealed by previous researchers. Hartoyo (2012) reveal the value ethnomathematics in West Kalimantan border area with Malaysia precisely Sanggau area inhabited by the Dayak tribe. Uloko and Imoko (2007) mentions about the success of Japanese nationals and Chinese in the learning of mathematics because they use ethnomathematics in learning math. This implementation has been done by Gerdes (1994), Lipka and Irhke (2009), Sirate (2012), and Tendeling (2013). Not only that, the development of learning tools nuanced ethnomathematics also been developed conducted by teachers and has been tested solely to improve performance and ability of student in learning mathematics. Sirate (2012) concluded that the application of ethnomathematics as a means to motivate and stimulate they student, can overcome boredom and give a new feel to the learning of mathematics. Because ethnomathematics already known by student so in invites students to identify and associate part of the culture they already know in a matter of mathematics with guidance will be easier with provided of teacher.

Research Methods

This research is a descriptive qualitative with ethnographic method using triangulation techniques. Descriptive qualitative study aimed to portray and describe in more detail with the intention of explaining, explaining and addressing the research. By learning as much as possible an individual, a group, or an event, researchers aim to provide a complete view and depth of the subject under study. The research was conducted in the clan areas Amanuban

sizeable majority in the South Central Timor was that Amanuban West districts, Batuputih district, Oenino district and Central Amanuban district. Cultures were explored in the form of activities and artifacts Amanuban clan society.

Data analysis phase consists of two phases: exploration and analysis phase ethnomathematics form in relationships with mathematical concepts. Exploration phase analysis using the method from Miles & Huberman, while the analysis phase relationships using constant comparison method. At the end of each stage will be the validation of the results obtained. Validation for the first phase carried out by community and traditional leaders, while the second phase of validation performed by math teachers at each school level both primary and secondary schools.

Result and Discussion

1) Result of Study

Research carried out has identified various forms ethnomathematics in the area of research and integrate the learning of mathematics in basic education (primary) and secondary (junior and senior high school) in the form of a case, as shown below.

2) Measurement Unit

Explored of measurement unit in Amanuban culture is a time unit, unit of length and speed unit. Units of time indicated in the farming society activity, a unit of length exposed to the weaving society and speed unit on traditional games is *faela* and *Huila beba*.



Figure 1. Huila Beba

3) Integer Operation

Kuti kelereng, *tiup karet* and *kayu do'i* game help someone learn about the operation mainly on integer numbers. Rules in the *kayu do'i* game namely:

- Short wood thrown and if it is not able to arrest the opponent then the player has the right to calculate the distance of a wood fall short to the hole with a distance of 1 (one) point per expanse of wood
- Short wooden back beaten and thrown as far as possible without hindrance from the opponent
- The amount of decisive blow timber fall short distance to the hole which is calculated using the long timber on the condition that one stretch of the long wooden multiplied by the number of blows before.



Figure 2. Kayu Do'i

Integer consists of the set of negative integers {..., -3, -2, -1}, zero {0}, and the set of positive integers {1, 2, 3, ...}. In a division operation, the remainder of the results of the so-called fractions. This fraction represents the ratio. Yields of society usually packaged before it is stored in the granary. Usually crops are mainly corn lace-and grouped according to size to make it look presentable when packing (Figure 3). Each one bond (*ais fes*) contains eight (8) ears of corn, one horse (*bikaes es*) contain corn belt 20, which means 20 x 8 grains, and 10 horses (*tuke mese*) containing 10 x (20 x 8) grains.



Figure 3. Jagung ais fes

4) Circle

Drum, floor of the house and brown sugar which is owned by the tribal community Amanuban related to the broad concept of a circle (see Figure 4).

One element that is circular arcs can be found in the *kil noni* or comb silver owned by the community. While the length of tangent circles concept can be found on the headband (*pilu*). See Figure 5.

5) 2D Shape

Mats (*nahe*) is bedding and cushion are commonly used as a substitute seat for public use rectangular (see Figure 6). In society, usage and mat illustrates that man (whoever is he) has the same dignity. The mats are stored in a manner resembling rolled cylinder. While *nyiru (tupa)* has a relationship with the concept of regular hexagons. For motive *buna* on society and woven wicker motif on the results of rhombus.

6) Polyhedron

Types of *sikidoka* were most played the Amanuban community is *sikidoka bendera*, *sikidoka salib* and *sikidoka 8* (see Figure 7). In (b), *sikidoka* sketch be depicted connected with nets cube.



Figure 4. Circle in Ethnomathematics

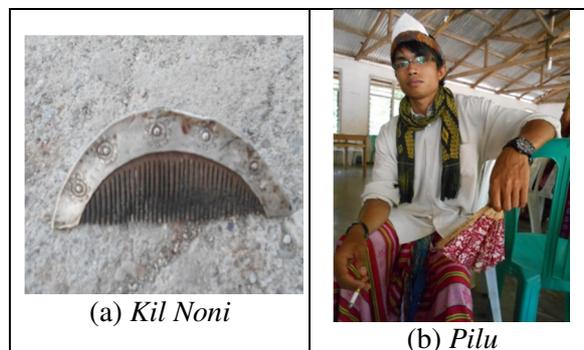


Figure 5. Element of Circle

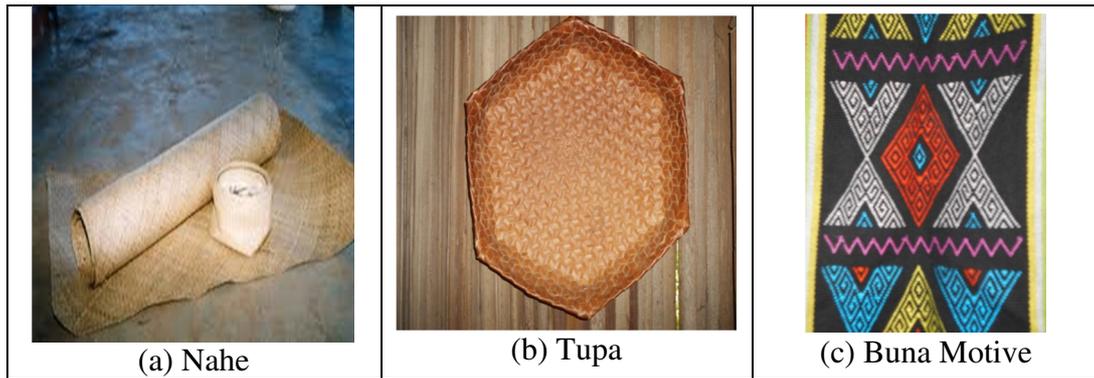
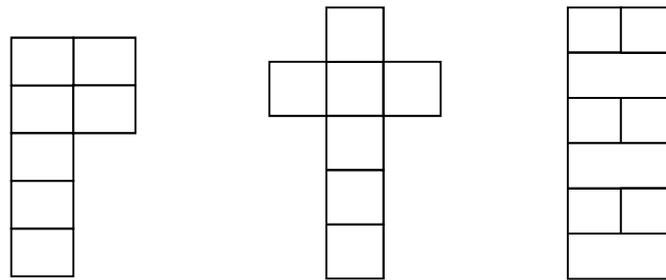


Figure 6. Parallelogram



(a) sikidoka bendera (b) sikidoka salib (c) sikidoka 8

Figure 7. Sikidoka Sketch

Oko Mama (tempat sirih) has an bases shaped cuboid with a pattern such as were contained in the weave (see Figure 8). While *Oko* used related to the hexagonal prism. *Dulang (tobe)* is used in traditional or other formal event as a place serving food or drinks as well as a place to put a scarf or other belongings to be given addressee as the award has hexagonal pyramid shape.

7) Geometry Curved Sides

Aluk (pocket / bag) usually containing betel nut and comes with a shape to present it called *ok tuke* and *kal ao*. *Kal ao* used as a lime and relating with cylinder concept. While in the game *piol* or *gasing* relate with cone concept. Similarly, cassava steamer (*toeb laku*) relate with cone concept. While the *ume kbubu*, *lopo* and plates in

community Amanuban connect with hemispherical concept.

1. Discussion

1) Circle

A circle is a shape with all points the same distance from its center. A circle is named by its center. Thus, the circle to the right is called circle A since its center is at point A. Some real world examples of a circle are a wheel, a dinner plate and (the surface of) a coin. From radius and diameter, can be find area and circumference of circle.

$$\text{Area of circle} = \pi r^2 = \pi d.$$

$$\text{Circumference of circle} = 2\pi r$$



(a) Oko Mama



(b) Oko



(c) Tobe

Figure 8. Cuboid and Prism



(a) Kal Ao dan Ok Tuke



(b) Toeb laku



(c) Piring

Figure 9. Geometry Curved Sides

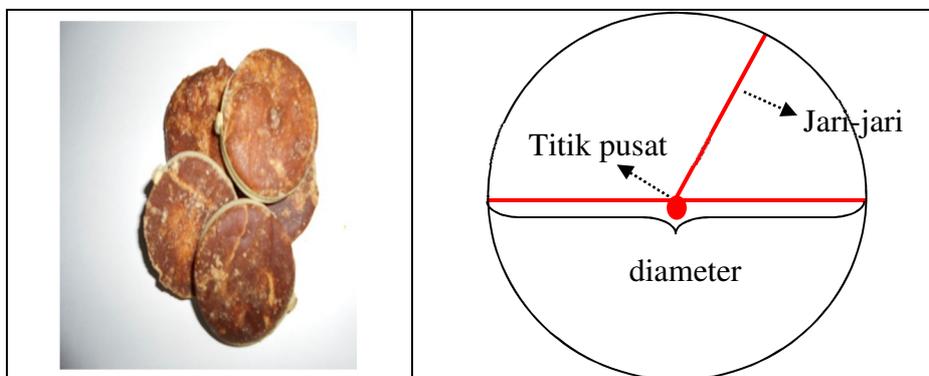


Figure 10. Area and Circumference of Circle

Destar or headband has a long connect with tangent of circle concept. From figure 10, the lines AB and BC is a tangent of circle centered at the point O. The length of the $OA = OC = r =$ radius of the circle. As the tangents always perpendicular to the radius of the circle so long tangents AB and BC can be calculated using the Pythagorean theorem.

square of length of the hypotenuse = square sum of length

$$c^2 = a^2 + b^2$$

$$b^2 = c^2 - a^2$$

$$a^2 = c^2 - b^2$$

2) Polygon

Nyiru its irregular hexagons shaped. Irregular hexagon consisting of six (6) pieces of equilateral triangles. Thus, the surface area of the hexagon can be calculated using the concept of equilateral triangles (see Figure 12). So,

Area of irregular hexagon = $6 \times$ area of triangle

$$= 6 \times \frac{1}{2} at$$

$$= 3at$$

3) Prism

Oko in used connected with hexagon prism. Hexagon prism is 3D shape with identic bases form hexagon lateral and laterak side rectangel. From Figure 13, surface area can be determined by looking for area of nets.

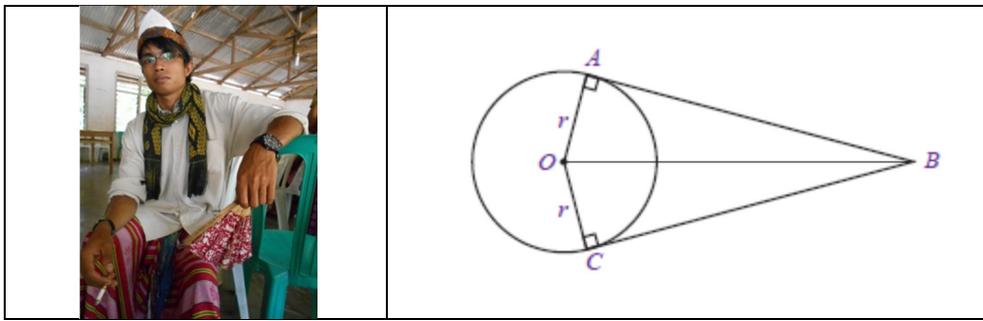


Figure 11. Tangent of Circle

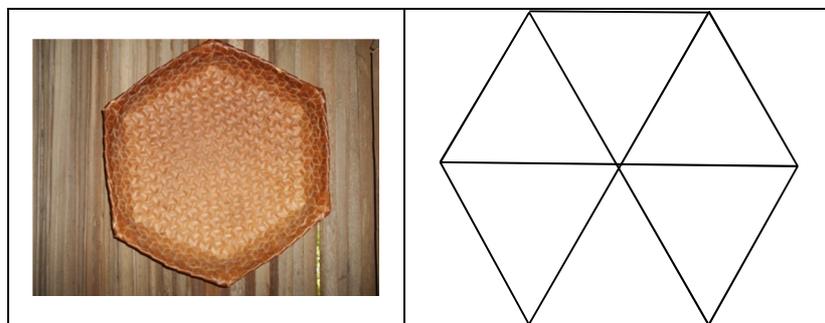


Figure 12. Polygon

$$\text{Surface area of prism} = (2 \times \text{area hexagon}) + (6 \times \text{rectangel})$$

$$= 2 \times \text{bases} + \text{lateral area}$$

$$= (2 \times 3at) + (6 \times pl)$$

$$= 6at + 6pl$$

$$= 6(at + pl)$$

$$\text{Volume prism} = \text{bases} \times \text{axis}$$

$$= 3at \times t$$

$$= 3at^2$$

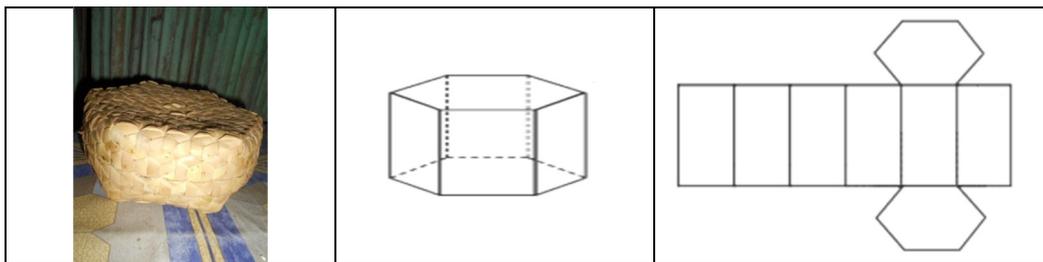


Figure 13. Hexagon Prism

4) Cylinder

The men's in dress equip themselves *aluk* (pocket/bag). These bags usually contain betel nut and comes with a shape to present it called *ok tuke* and *kal ao*. *Ok tuke* and *kal ao* relate with cylinder concept. Cylinder is a 3D geometry formed by two identical parallel circle and a rectangle were surrounds the circle.

Because the base of cylinder is then used two identical circles and cylinder lateral face form is rectangular, we can used circle concept to find bases area.

$$\begin{aligned}
 \text{lateral face of cylinder} &= L \text{ rectangular} \\
 &= p \times l \\
 &= 2\pi \times t \\
 &= 2\pi t
 \end{aligned}$$

So,

$$\begin{aligned}
 \text{Area of cylinder} &= 2\pi^2 \times 2\pi t \\
 &= 2\pi (r + t)
 \end{aligned}$$

Cylinder is in terms of the approach of prism with polygon side, where n

approaches infinity. That is, if the laterals axis the prism propagated it forms a cylinder where only approached bottom single base, up single base and one perimeter. Because it the base shape circle, so the cylinder volume is obtained by multiplying the area of a circle with a high the base cylinder.

$$\text{Volume cylinder} = \pi r^2 t$$

$$= \frac{1}{4} \pi d^2 t$$

Conclusions and Recommendations

Results of the analysis concluded that the mathematical concept has been owned and lived in society since long away. It is realized from the ethnomathematics form in clan Amanuban that contains many mathematical concepts, especially in the field of geometry and algebra. Its concept of geometry is the circle, square, rectangle, rhombus, cone, pyramid, prisms, polygons, beams and cubes. Besides surface area, volume concept can be analyzed from the forms existing ethnomathematics .

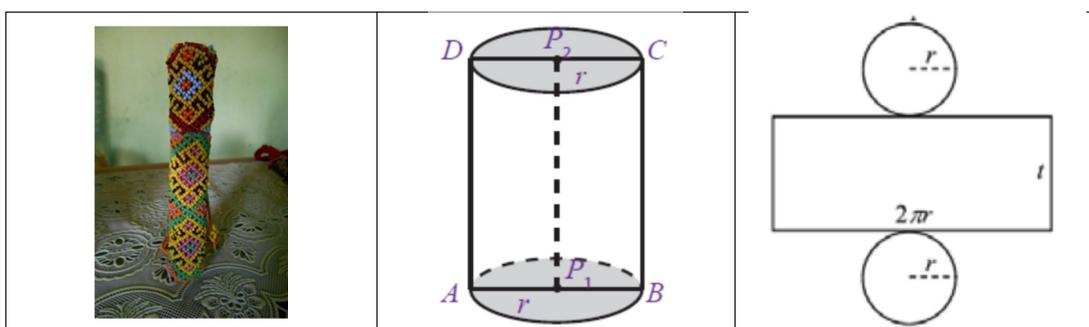


Figure 14. Cylinder

Operation either integer addition, subtraction, multiplication and division can be found in the traditional game which is owned by the community. These games help people (especially children) in the study of arithmetic operations. The concept of chance and arithmetic sequence as well as other concepts that need to be analyzed in depth. All forms of ethnomathematics can be integrated in the learning of mathematics at primary school level and secondary school.

Keep in mind that while all forms of ethnomathematics which have been analyzed in general can be integrated into learning but if not packed properly it will hamper the process of learning mathematics. For that need to be analyzed further and developed in accordance with the appropriate context. Ethnomathematics form of a culture that is owned by a group requires high precision in exploring and analyzing it into mathematical concepts. For that there needs to be further research deeper in discussing mathematical concepts in a culture, the development of teaching materials based ethnomathematics and measured levels of misconceptions learning.

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DEVELOPMENT OF STUDENTS' SELF-EFFICACY THROUGH MATHEMATICS PRACTICAL APPROACH TO IMPROVE PROBLEM SOLVING ABILITY IN GEOMETRY

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ABSTRACT

Mathematics learning today is not focusing on the development of self-efficacy, so that students still don't confident with their ability in complete tasks and challenges. This study applied the Mathematics Practical (MP) learning approach in geometry grade 7th. This learning gives opportunity for students to increase their confidence in completing task, to conduct exploration activities on variety of learning resources and to interpret information from experience, social persuasion, and emotional control. MP focused on problem solving activities that presents challenging problems, so that students can express their confidence. The purpose of this study was to analyze the students' self-efficacy and the effects in their problem-solving abilities. This study used mix-method design which started with qualitative to determine the initial conditions of students then followed by quantitative to test that learning's effectiveness. The results of preliminary study indicates that students still not confident to do the high degree of difficulty, new, and diverse tasks. Quantitative analysis indicates that MP learning has improved the students' self-efficacy in three dimension, with the value of the subjects' self-efficacy gain: SA1 (0.62); SA2 (0.61); ST1 (0.54); ST2 (0.64); SB1 (0.63); and SB2 (0.46). Students that were taught by MP could reach classical mastery of problem solving ability shown 89% of students get higher than 70. Meanwhile regression-test showed that self-efficacy have significant positive effect on problem solving ability with the equation of $Y = -19.089 + 0.698X$ and gives effect about 84.5%. In short, MP learning approach is believed could solve the problems faced.

Keywords – Mathematics practical, Problem solving, Self-efficacy

Introduction

Study of Havard University found that someone's successful was not only determined by their knowledge and technical abilities (hard skills), but also rather by their ability to manage themselves and others (soft skills) (Musclih, 2011). Next, that study revealed that the success is determined only about 20% by hard skills and 80% by soft skills, even the most successful people in the world could reach their success with the more supported of soft skills rather than hard skills. in short, the person's character has a major role in someone's successful. Therefore, the characters must be established early, one through education. Goverment should puts more attention to the character education although it's rather difficult to apply it due to the teachers knowlege.

Life is always evolving humans with various problems that must be solved. Much of the literature points to the fact that the problem solving was not implemented in the learning of mathematics in many parts of the world, or if it has been implemented then only a certain routine approach that adopted (English et al., 2008). That's relevant with the results of Culaste's research (2011) which states that many students have difficulty in solving mathematics problems. That problem also faced in Indonesia that the students tend to memorize the mathematical concepts only, so their ability to solve problems is still low (Rajagukguk, 2011).

Problem solver must have a tough character to achieve optimum results. Self-efficacy refers to the perception of the individual ability in organize and implement the actions to show certain skills (Bandura, 2006). Research showed that belief in

mathematical abilities (skills and knowledge) is an important factor for success as a problem solver (Zimmermann *et al.*, 2010). Self-efficacy was also a strong predictor for achievement in mathematical problem solving (Nicolaidou, 2003). These reasons indicate that learning that designed to develop student's self-efficacy will be more meaningful than only designed to increase knowledge.

The preliminary study conducted in SMP Negeri 2 Tuntang grade 7 to identify the problems of students's self-efficacy. Preliminary research showed that teachers still used conventional learning that didn't emphasize to develop students' problem-solving ability and self-efficacy. Next students still not confident to present problems in front of the class, to answer questions from the teacher and to express their opinions. That result indicates that students' self-efficacy in mathematics learning is still low.

Geometry is one of the important mathematics materials that are always tested in National Examination for Junior High School, formulated in the indicators: (1) solve problems related to the areas of quadrilaterals and (2) solve problems related to the circumference of quadrilaterals. The result of national examination showed that the absorption of students in geometry is still low, reaching only 25.98% for the first indicator and 39.71% for the second indicator (Balitbang, 2012).

The problems regarding self-efficacy and problem solving ability in this study will be solved by applying the Mathematics Practical (MP) learning approach. MP is a learning approach that is inspired by the activities of practical learning in science subjects, where students are involved in an activity such as asking something, planning, and investigating, and using simple instruments to measure, obtain and then using the data to draw conclusions (Dindyal, *et. al.*, 2009).

The purpose of this study is to develop students' self-efficacy in order to build the positive influence on the students' ability in solving geometry problems. This research is expected to form the students's mindset to be independent in dealing with problems at every subject. Moreover the teacher can facilitate students to involve them in problems solving activity.

Theoretical Review

Polya's theories became the main reference in analyzing the students' problem solving, but in fact there are still many obstacles in the application of these theories (Dindyal *et al.*, 2009; AME, 2011; Schoenfeld 2012). Therefore, to overcome the weaknesses of Polya's theory, this study combine it with Schoenfeld's theory. The main opinion of Schoenfeld (2012) is to explain the success or failure of people in their experiments to solve the problem, based on four things: knowledge, heuristics, control, and belief. Schoenfeld's framework is used as a basis for modifying the fourth of Polya's problem solving stage, which stages look back modified to be a check and extend (Dindyal *et al.*, 2011).

Bandura's theory be the basis of this study to analyze self-efficacy refers to the individuals perception of their ability in organize and implement actions to show certain skills (Bandura, 2006). Bandura & Adams (1977) states that self-efficacy influence a person to choose the activity and regulate the attitude, how hard she/he tried and resistant is in trouble and bad experience in the past. The higher level of self-efficacy, the more active a person in work. Empirical studies of Bandura & Adams (1977) suggested that a different treatment approach changed the expectations of one's self-efficacy. Next more reliable information on the efficacy, greater changes can occur in someone self-efficacy. Dimensions that can be used to measure self-efficacy related by Bandura's theory (1977), are: (1) magnitude, (2) strength, and (3) generality. Each

dimensions have implications on one's performance.

Mathematics Practical (MP) learning approach inspired by the practice learning activities on science subjects, where students are involved in an activity such as asking something, planing, and carrying out a simple investigation, and using simple instruments to measure and obtain data and using the data to draw conclusions (Dindyal, et. al, 2009). Dindyal et al. (2012) showed that by applying MP in the early adoption of the students showed perceptions in vary, but at the end of that application students could present a problem solving through four Polya's stages. MP learning stages focuses on problem-solving activities that are based on the theory of Polya-Schoenfeld. In addition to this study also includes teachers scaffolding activity. It was gave by teacher to the students according with the needs of the student to ensure that the student's self efficacy was not too bad because of their failure in solving problems.

In MP learning, students are given with structured tasks that must be done before learning. This is an opportunity for students to gain their confidence in completing the task, although the material is still not taught yet. Students are also required to carry out the exploration activities on a variety of learning resources. MP learning was started with activity to interpret the information from four sources, there are performance experience, vicarious experience, social persuasion, and emotional control. This activity is intended for students to build thinking strategic so that the failure of the past becomes the motivation to fix the maximum effort in the future. Classroom learning activities focused on problem solving and discussion that presents a new and challenge problem, so that students can express their self-efficacy. MP learning activities also focusing on the implementation of the Polya's four stages of problem solving and Schoenfeld's framework (heuristics, control, check and

expand). The theoretical basis on which the belief of researchers that study with MP approach can overcome the problems regarding problem solving and self-efficacy. Based on the theory, the quantitative research hypothesis in this study are (1) there is a positive significant influence of self-efficacy on the student's problem solving ability and (2) there is an increase in students' self-efficacy who received MP learning approach in geometry class VII.

Research Methods

This study used exploratory sequential combination method, that combines qualitative and quantitative research in order. The first phase of this study was conducted with qualitative methods to analyze the problem solving and self-efficacy of students before being given MP based learning theory Polya-Schoenfeld in class VII-G SMP Negeri 2 Tuntang. Qualitative research begins with the collection of data through the test of problem solving ability, self-efficacy questionnaire and then followed up with interviews. Problem solving ability test results and interviews that were analyzed based on Polya-Schoenfeld's theory covering aspects of the four stages of problem solving Polya, heuristics, control, confidence, to re-examine and expand. The data results of self-efficacy was analyzed based on Bandura's dimensions include the magnitude, strength and generality. Quantitative research goals was to analyze whether students can reach the mastery in problem solving ability. The test referred to this research is to test the classical completeness, that study is said to be complete if 75% of the problem solving ability of students exceeds individual mastery 70. Additionally, this study test the influences of improvement in students' self-efficacy to problem-solving ability with regression test. Gain test is done to test the enhancement of the self-efficacy of students per meeting. That result is reinforced by the

analysis of in increasing of six research subjects' self-efficacy. The research subject is divided it three groups, each group include two students from the high, middle, and low ability.

Results And Discussion

Result

At the first Problem Solving Ability Test (PSAT), students are faced to four problems about area and circumference of triangles. Based on interviews, some students stated that this type of problem given are different that they have not encountered before. PSAT presented in a practical worksheets that give two options for them to choose their own way or to follow the Polya-Schoenfeld stages. Based on the first PSAT results known that there are students trying to solve with their own way, but only few of them are successful, more students failed then continued with Polya-Schoenfeld's steps. Figure 1 shows the progress of students who didn't follow Polya-Schoenfeld steps.

AD dan EC = $2,5 \times 2 = 5$
 $= 9 + 5 = 14$
 Rumus : $L = \frac{1}{2} \times a \times t$
 $= \frac{1}{2} \times 4 \times 5$

Figure 1. Students Working on First PSAT with the Direct Method

Figure 1 shows that the students did not write the information of problems and the question. Students also showed no effort to present a problem in the picture or make a plan for solving the problem properly. In practice the students encountered cannot solve the problems even though the students have learned the area formula of a triangle. PSAT results also showed that was only few students that tried to follow the Polya-Schoenfeld problem solving steps.

The results of the initial questionnaire were confirmed through interviews showed that in the magnitude dimensions, students already

have the confidence to complete a task or a problem with a low degree of difficulty, but for the moderate to high level their confidence is still low. Selection behavior by students to complete the task is still monotonous. Students have not been able to invent creative ways to solve the given tasks. Students have the belief that they was only able to spell out simple tasks, therefore susceptible to pressure.

On the dimension of strength, some students considered that they were sufficiently confident to put all the ability to face tasks and challenges. However, some students feel that although they have tried, they remain unsuccessful in completing the task and challenge, because students feel that they are weak in mathematics and often fail to test or repeat earlier. When students are faced with the task and they have difficulty they will ask a friend who is smarter. Based on interviews with one of the students on the group obtained information that many students who copy the work without asking for an explanation from him. Bandura (1977: 194) states that individuals with high strength will have a strong belief in the ability of self that is not easily give up or frustrated in the face of obstacles.

Results of students' self-efficacy analysis showed that the experience of past failures to make students not confident of the ability of him. In addition, students also tried to do the task themselves to use all their capabilities, instead relying on the work of his students. This shows that students easily give up in the face of obstacles or barriers. Overall results of the analysis showed that the students' self-efficacy on the strength dimensions is still low. Students also not used to getting assignments that are diverse in terms of the another context or type. In the dimensions of generality, students are not sure that they could finish the task with new and diverse types.

The result analysis of the three self-efficacy dimensions before implementation of MP

showed that students: (1) still have difficulties and trying to stay away from tasks that are difficult, (2) easy to give up when confronted with difficulties, (3) have a low commitment to the achievement in mathematics, (4) previously failure built the belief that they cannot achieve better performance in future, (5) have not been able to maximize the effort to correct the failure, and (6) prone to degradation belief (not confidence). That conditions found in the analysis of lead in people who have low self-efficacy (Bandura, 1977: 196). Results of test calculations in classical completeness values obtained $z = 1,69 \geq z_{table} = 1.64$ with a standard error of 5% and then the null hypothesis is rejected. So it can be concluded that experimental class that taught by MP approach based Polya-Schoenfeld theory reached the classical mastery learning on the average value PSAT reached. Regression test in this study is used to determine the effect of self-efficacy on problem-solving ability. The result of the effect, giving by the model equation of $Y = -19\ 089 + 0.698X$.

Table 1. Regression Test Output

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.919 ^a	.845	.839	5.39812

a. Predictors: (Constant), Self-Efficacy

Simple regression analysis above shows the value of R Square = 0.845, it mean that 84.5% of students's problem solving ability is influenced by self-efficacy, while 15.5% are influenced by other factors.

Results analysis of the self-efficacy gain showed that from meeting to meeting students has increased in the three-dimensional of self-efficacy, especially in the magnitude and strength dimensionsHere

is the self-efficacy gain of the six research subjects in three groups.

Table 2. Gain of *Self-Efficacy*

Subject	Gain (/Meeting)				
	I to II	II to III	III to IV	IV to V	I to V
SA1	0.1 1	0.20	0.26	0.29	0.62
SA2	0.1 7	0.13	0.21	0.33	0.61
ST1	0.1 1	0.13	0.18	0.30	0.54
ST2	0.2 0	0.16	0.19	0.33	0.64
SB1	0.1 9	0.20	0.22	0.28	0.63
SB2	0.1 3	0.12	0.12	0.22	0.46

Discussion

To implement the learning that can develop students' self-efficacy is not an easy thing. Schunck (1995) mentions that there are several strategies that can be done to improve self-efficacy in learning. The first technique is to teach students with special strategy so that can improve their ability to focus on tasks. This research applied MP with syntax learning activities are the give student with structural tasks (homework) which is followed by a review of homework. Assignment given to students in a variety of contexts presented in the book include the tasks to construct concept, to associate with everyday problems and to apply the concept in a problem solving. At first the students still have objections to a given task, but after a few meetings the students become

accustomed and trained to solve structured tasks. The review of homework then followed by discussion with purpose of giving feedback to students, so that they know whether their work is correct or not.

MP learning techniques that can enhance students' self-efficacy that is at the preliminary activities students are encouraged to undertake activities interpret information from four sources. Fourth this information if properly planed believed to build the perception of students' self-efficacy (Bandura 1997). Activities of the formation of self-efficacy among others, activities to exchange experiences regarding the achievements of the students, observing the success of peer friend who actually has the same ability with them, becoming acquainted with the figures achieved success whose have confidence in their ability and willingness to work hard. Next guiding students to control their emotions, so not too worried for any reason, it would lower the students' self-efficacy. Teachers combined the strategy with emphasis on objectives to provide feedback to the students about the results of the discussion. Then teachers give rewards to the performance of students in the form of verbal reinforcement and additional value. All of this activity will encourage students to increase self-efficacy in mathematics learning.

Research showed that the modification of the fourth step of Polya has connection with the generality dimension of self-efficacy. In check and extend stage students are asked to correct and expand solutions through analyzing and evaluating whether the procedures adopted and the results obtained are correct, interprets the answers obtained, ask themselves if there are other ways to solve the problem or if there is another solution. Relation to the dimensions of generality that students who have high generality will be confident in their ability to complete tasks in a variety of contexts, therefore they are confident that it can find another way to

solve the problem though with diverse contexts (Bandura, 1977)

Schoenfeld (2012) mentioned that controls related to planning steps in problem solving that consequent on the right track. If progress is made then resumed, otherwise if faced with difficulties then it would be evaluated with alternatives considered. The controls relating to the magnitude dimensions of self-efficacy, which when fixers encounter problems with a high degree of difficulty student was required to bring the behavior which represents a variation of difficulty or the challenges task.

Students will trust themselves and the mathematical properties, derived from experience with mathematics, forms of knowledge created during problem solving and how they use or do not use such knowledge (Schoenfeld, 2012). The link between belief and dimensional aspects is the strength or weakness of beliefs about ability. Individuals who have belief that strongly about their ability will retain their effort in spite of all obstacles and difficulties. These results are relevant to the study of previous studies that showed the implementation of the strategy Schoenfeld in learning can improve student math belief (Fajemidagba & Olawoye, 2009).

Results showed that the theory of Polya-Schoenfeld on MP learning has a significant influence on improving students' problem-solving abilities. Nevertheless, the ability and self-efficacy also determine the beginning of the achievement. The findings show students with high ability, moderate, and low requires a different treatment. Hence the importance of a scaffolding for teachers to adjust to the needs of students, where the next level can only be granted if the level previously failed. At level 1 presented specific heuristics to mobilize students' work. Level 2 can be avoided as much as possible and can only be carried out only on the important aspects. Here the teacher gives specific instructions that

essentially be given by teachers of mathematics.

Other findings associated with implementing the framework Schoenfeld, where activity check and extend affect students' work in applying the Polya four-main steps of problem solving. Students tend to be in a hurry to solve the problem with the aim to carry out the stages of checking and expanding. Therefore, teachers should provide guidance so that students do these four Polya's main stages of problem solving, then ask students to check and expand their problem-solving solutions.

Other findings associated with data collection i.e self-efficacy belief in the ability of students turned out to be lower compared to that loaded on a questionnaire compiled based on Bandura's theory. These obstacles can be overcome by introducing and familiarize students to assess their self-efficacy, so that students can objectively assess the confidence possessed.

Conclusions

Based on qualitative analysis before and after students get lesson with MP approach showed that there was an increase in students' self-efficacy. Analysis of the questionnaire and interviews also indicate that the student in middle and low group still weak on the dimensions of magnitude, strength and generality, while the top group is still weak in the dimension of generality. After implementation of MP learning, students in three groups showed an increase in the three-dimensional of self-efficacy, especially in the magnitude and strength dimensions, while for the generality dimension should still be developed by challenge student with varying tasks. The increase of self-efficacy shown by the gain of in meeting I to V for the six research subjects with each of gain score: SA1 (0.62); SA2 (0.61); ST1 (0.54); ST2 (0.64); SB1 (0.63); and SB2 (0.46). Analysis of quantitative research result showed that the

problem solving ability of students who received learning material MP class VII in geometry could reach classical mastery with the results 89% of students could reach the of individual mastery (70). Regression test showed that there is a positive significant influence between self-efficacy toward problem solving ability of students with the model equation: $Y = -19\ 089 + 0.698X$, moreover it give impact of 84.5%.

Recommendations

Based on the conclusions obtained then there are some things that researchers recommend. For teachers, they should conduct an initial conditions analysis of the students to be followed up with appropriate learning plan. Learning innovations undertaken by teachers should focus on the objectives to be achieved. This study uncover that MP learning can be a reference for teachers to design a geometry learning or other material that emphasize on improving self-efficacy and problem solving ability. For students, self-efficacy and problem solving ability that have been developed during this learning, must continue to be developed in daily life and can be used as a basis for students to learn problem-solving in mathematics or other material in other subject.

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DEVELOPING CONFIDENCE CHARACTER OF STUDENT IN MATHEMATICS LERNING THROUGH TALKING STICK MODEL ASSISTED WITH OIC GAME

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ABSTRACT

Confidence is an important character implanted, the child's confidence must always be trained so that children do not deny yourself when it gets the activities required of teachers. Low confidence in learning can level through learning-aided model of Talking Stick OIC game. On learning of the students were given the responsibility of having to answer questions posed by the teacher, with habituation using the learning students are required to always be ready and rely on the confidence that students have. High confidence that it is possible to have good impact on students' mathematics literacy, mathematical literacy is an individual's ability to formulate, employ and interpret mathematics in a variety of contexts. The purpose of this study was to establish the character of self-confidence through learning to get up flat material and give effect to the mathematical literacy of students. The scope of this research is the students of SMP N 1 Brati.

At each lesson with the communication between students in completing tasks and implementing the above mentioned learning makes students increase confidence and improve mathematical literacy. Quantitatively these changes indicated by the gain with the score meeting is 0.232; 0.451; 0.185; 0.295; and 0.483. At the end of the literacy skills of students learning tests showed that the average results of the literacy skills to meet the standards of completeness 70. Regression test showed the influence of confidence in the ability of literacy at 84.4% and the equation $y = -29.491 + 1,646X$. So the establishment of confidence positive influence on the students' mathematical literacy skills.

Keywords - Confidence, Talking Stick, Game, Ability Literacy.

Introduction

Character education now is the main priority in learning which currently applied by the government. A teacher must be in-depth understanding of about character education. Because the values contained in character education that it would affect positively to the development of students and can support the achievement of the learning outcomes desired. If good character of students in learning, must be the purpose of learning will be optimal. The purpose of education character according to Asmani (2013; 42) is planting the value of the inner self students and renewal of life together that greater value is individual freedom.

Character education is a system planting values character to the community school which includes components knowledge, consciousness or the will and the act of to

implement those values are. In character education at the school, all components (stakeholders education) must be dealt with, including components education itself, namely the contents of curriculum, learning and judgment, handling or the management of subjects, school management, the implementation of the activity or activity kokulikuler, empowerment facilities and infrastructure, financing and work ethic all residents school.

Hartoyo (2010: 22) say education without character will only make the individuals be smart and smart, but of less having a growth as human beings whole. This indirectly indicates that education run luminance the level of education have to make element of character that students be human whole. Lumpkin (2008: 45), said character to a person memiliki wisdom to know that are true of something wrong, honest, fair,

appreciate, and responsibilities, and including recognize and learn from mistakes.

Confidence is its essential character implanted, confidence a child must always trained babies to not get too frightened and refuse self when receiving activity is asked which of teachers, like the students are doing the on board, narrate or presented to my friends sekelasnya in the front of the class, and in do their tasks from his teacher.

Hence, character confident have to implanted in education curriculum to improve their performance students in mathematics. One of learning mathematics that might improve the character confident the students were learning to the concept of playing. Nurla (2011; 60) revealed that confidence is a extraordinary power. Confident like reactor that arouses all energy that are with them someone to reach success. As young generation, attitude confident very important implanted in students to he grew up to be a figure able to develop the potential himself.

Based on the results of observation and information obtained in SMP N 1 Brati Grobogan City in teaching mathematics found that there are still a lot of students to the ability of mathematics low. The majority of students was not confident, fear, low self, and limp if heard the word mathematics. Shadiq (2008; 38) see that a lot of students who consider math is subjects difficult, drab, only relate to the number, only hooked with activities memorization, and others.

Confidence high possible an impact that good against literacy mathematics students, draft assessment framework pisa (OECD: 2006) define literasi mathematics as the ability of an individual to formulate, employing, and interpreting mathematics in a range of contexts. This capability help individual to admit that it had a role in every aspect of life, in other words students have to have a sense confident to make the

decisions reasoned and is also needed in constructive, involved and reflective. Scope mathematics SMP/Mts that must be controlled a class of mathematical VII SMP of them is quadrilateral. Material quadrilateral this is one of the material that it still becomes problem on class VII SMP that is competence counting mobile and broad wake up flat quadrilateral. Stacey (2011) mentioned that the literacy mathematics students in indonesia is still very low of average score OECD (organization for economic corporation and development) and also of some the participating countries in PISA (programme for international student assssment).

Theoretical Review

The atmosphere learn math who agreeable (joyfull learning) could cause interest and motivation students in following learning activities. A son shall be easily take heed when the son of learning without burden. Mood, the atmosphere class joyful about affect understanding children to matter learned and improve confidence. Learning model talking stick is one of learning model with the concept of the game. According to Huda (2013: 224), at first talking stick (a stick speaking) is the method used by the native americans for invite all a person in speaking or pass an opinion in a forum. OIC is a program smart careful packed in an event search of talents entertaining and by the look of modern. Besides rote the theory, the test every the more bervariatif with the approach interactive to be more dynamic with the help of material photo/video/audio. Furnished with game creativity, strategy and challenges that binds participants (wikipedia). The game in game OIC applied in this research was the right quick and the box.

So approach talking stick with game OIC would help teachers to improve character confident students. Because in learning model talking stick with game OIC this to character communicative and creative, and

confidence, for each student and group who holds a stick have to expressed his opinion, expected all students can communicative in learning ongoing. Purpose in this research is to form characters confident s through model talking stick with game OIC to the matter wake up flat, and give impact character confident of the ability of mathematical literacy students.

Learning theory is a theory that supports Peaget (Sugandi, 2008), Thondirk (Suherman, 2003), and the Dienes (Ruseffendi, 1992). Based on the theory of Thondirk, in game play OIC students sued plays an active role in the games has been determined. Each student in the team will be trying to win the game in sportsmanship. At the end of the meeting/study every student will be awarded a prize/has been prepared, the gift-giving views of the total score for the game is taking place. From the law due to this it can be concluded that if there is a strong association between learning, games, and the award, then it will hopefully provide motivation for students to prepare for and understand the material well. While in theory the Dienes, such models, students are invited to learn while playing in doing practice problems such as literacy. With the way the game like these students feel happy, so the confidence and ability of literacy students can rise well.

Research Methods

This research using the kind of research mix method (a mixture of quantitative and qualitative). A design used in this research is a modification of design sequential explanatory, namely research methodology combination that combines research methodology qualitative and quantitative simultaneously (sugiyono , 2013: 473) .

Qualitative analysis in this research using analysis diskriptif, that is described character confident SMP students at the time he gave learning. While the quantitative analysis in this research using statistical tests

influence regression and test appeal. Research carried out in SMP N 1 Brati Grobogan City. Sample in research taken with using a technique purposive sampling where the sample members of the population is written with a consideration and a particular purpose. To deepening about the confident students chosen five students different in the upper under SP-4 and SP-5, medium SP-3 and SP-2, and on SP-1. Variable this research confidence and literasi mathematics. Teknik the data with using interviews, observation, and tests the ability of literacy mathematical. Teknik data analysis using analysis diskriptif and statistical tests influence regerasi and test appeal.

Learning model talking stick with game oic done for six meeting. Every teaching observed based on an indicator character confidence is appointed. The six indicators of according to Syaifullah (2000) in this survey used as an indicator to the taste pecaya self the students were (1) in the ability yourself/the will and effort; (2) in and respect own efforts/sanguine; (3) bold their opinions; (4) give priority to their own businesses not dependent with others/self-supporting; (5) not readily surrender; (6) capable of being acclimated.

Results and Discussion

At the beginning of research before researchers apply learning model talking stick with game OIC, researchers get data that character confident students are in the low. Next in the process of research researchers supervise the as regards character confident students. Students observed luminance learning done, so the researchers had obtained data that been an increase in confidence students luminance meeting. Figure 1 the following was an image of the average a score confident students luminance meeting. Next picture was an image of a score confident students luminance meeting.

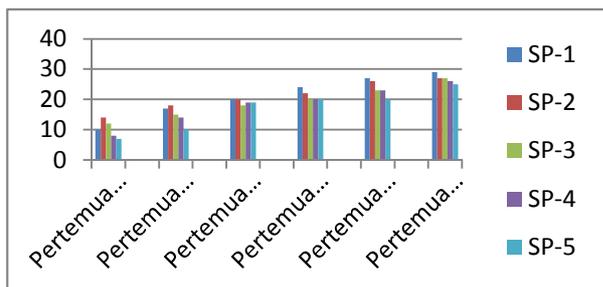


Figure 1 score confident students luminance meeting

Learning based confident designed through the learning model talking stick with game OIC. As a broad outline the process levels shown in table 1.

Table 1. The process of development device learning model talking stick with game OIC to form characters confident students.

Stage model talking stick berbantuan game oic	learning activities
1. The first phase talking (speak)	Provide the material to be learned and provide an opportunity for students to read and learn the material, at this stage the teachers deliver the subject matter to be studied, and then provides the opportunity for students to read and learn the material on the handle.
2. The second phase talking stick	Taking a stick, giving the question and answer it, at this stage the teacher invites the students to close the book and then the teacher took the baton and give to the students, after the teacher gave questions and students who hold the stick must be answered, and so forth until the majority of the students got a part to answer questions from the teacher.
3. The third stage evaluation	Give a summary of the material that has been studied, at this stage the teacher gives a summary and provide test questions to students.

Based on table 1, researchers trying to form the character of confidence in the soul of students especially fifth the subject of study that has been chosen based on the research done, obtained the development of character confidence is owned by the fifth the subject of study with the implementation of the learning model talking stick with game OIC.

The results of the analysis diskriptif express fifth the subject of study having different backgrounds so that each having the character of curiosity different also. The research and description informants have been known how character curiosity owned by each individual. The following a

description of an increase in character curiosity on 5 students choice.

Students of the upper group the initials MAD (SP-1)

The subject of study of the upper group is the subject of research with the ability literacy mathematical based on the outcome of pree test. At the beginning of research, from our observation obtained, SP-1 possess basically confidence good. Of treatment as was explained in table 1 be seen that character confident students gradually can increase. The end of the meeting sixth, confidence SP-1 increase by significant (high). It was because the higher a stage business so it will take greater to increase, including SP-1 have prove that learning model talking stick with game OIC become more confident.

After data collection through the observation, next hold interview deep. SP-1 were those who its ability highest in his class. Basically SP-1 having confidence good, procures data that at the beginning teaching do not have confidence because SP-1 still felt aliens in learning the researchers apply. Proven after SP-1 obtain lessons learned the and conducted a series of events diperoth the conclusion that students having a confidence is high good, which means been an increase in character confident SP-1.

1) Students the middle class the initials WA (SP-2)

The beginning of research find information as regards character confidence is owned SP-2 having the character of confidence is higher than SP-1. But the very unfortunate the high confidence owned SP-2 is a form of confidence not right. SP-2 tend to have confidence directionless, resulting in confidence is only is the way to obtain more attention against him. Through the passing of learning, SP-2 to guide that can be exactly apply confidence SP-2. Although in the first

meeting of SP-2 have less confidence, this because the process of adapting SP-2 in learning. On the fifth and sixth meetings not seen significant improvement against confidence SP-2, but the analysis is obtained after the student obtained the study showed that students have a high self-esteem/well.

2) Students the middle class the initial SBC (SP-3)

Different from SP-2 which in early learning has already had a sense of confidence is high, confident the SP-3 which is also a student in the group was giving the result that SP-3 have a sense of confidence that is being. According to the interviews the obstacles is the SP-3 are not confident with new things which he met, for example he found about that have previously not been met in, the SP-3 tend to avoid or did not believe that the results and capability owned the SP-3. To engagement with students of teachers in the learning, teaching capable of giving an impulse the good things which can increase confidence SP-3. In the first meeting of the SP-3 do not have a sense of confidence. Although confidence SP-3 higher than the SP-1 which are at group over, but the character confident the SP-3 still in category do not have a sense of confidence.

According to the interviews, through the passing of the learning, SP-3 admitted began to anticipate fear if appointed to representative of a group presented the results of discussion. In has the task mathematics formerly he had not meet, SP-3 confess want to try and confident by his work own. Proven after he did a series of the learning activities, in last meeting SP-3 students having a confidence is high good.

3) Students the bottom of the initial BNK (SP-4)

The beginning of learning SP-4 do not have confidence. SP-4 were those who are in the bottom of the, who its ability be in the low,

while being interviewed further SP-4 admitted to always struggled to answer questions given by teachers but sometimes she was quiet when given questions from teachers for fear of the answer wrong. Although ability to learn SP-4 are in the category of low, SP-4 admitted that they were not has ability to learn low of members of the group of learning. When has the task mathematics, subject admitted doubt with his work own, it trrsebut who drive belakangi a low confidence is owned SP-4. To the process learning in the 3--meeting of the than the 4-meeting of the and the 5-meeting of than right meeting 6 century, does not occur a significant increase. This was due to because SP-4 appointed by his group to be the head of the group in its group. From the results of interviews basically SP-4 admitted objected if appointed to representative of a group presented the results of discussion or become the head of the group. Although not happened a significant increase in the 3-meeting of the to meeting 6 century, in meeting last SP-4enough having confidence.

4) Students the bottom of the initialAA (SP-5)

The beginning of research researchers meet data that SP-5 lack of confidence. Required hard work high as well as encouragement and stimuli continuous that SP-5 can increase their sense of believes himself. Learning the to the process, researchers working so hard to get SP-5 able to increase confidence owned. In learning the when SP-5 asked to doing the in black board, SP-5 trying to refuse work in slates with various reasons. Confidence SP-5 were very low. Confidence is owned SP-5 lowest of your class. In the first meeting and 2 researchers make an effort for an increased occurrence of character confidence is owned SP-5. But in the 3-meeting of the until last meeting there were no a significant increase. In last meeting SP-5 have sufficient confidence.

The following table 2 presents the development confident a sort of descriptive set of the subject of study.

Table 2 the development of develop the character of confidence in subkjek research choice.

No	Subjek	Meeting							
		I	II	III	IV	V	VI		
1	SP-1	Not confident	Confident less	Confident enough	Confident enough	Confident enough	Confidence is good	confidence is good	
2	SP-2	Confident less	Confident less	Confident enough	Confident enough	Confident enough	Confidence is good	confidence is good	
3	SP-3	Not confident	Confident less	Confident less	Confident enough	Confident enough	Confidence is good	confidence is good	
4	SP-4	Not confident	Confident less	Confident enough	Confident enough	Confident enough	Confidence is good	Confident enough	
5	SP-5	Not confident	Not confident	Confident less	Confident enough	Confident enough	Confidence is good	Confident enough	
Average		Not confident	Confident less	Confident enough	Confident enough	Confident enough	Confidence is good	confidence is good	
Average keseluruhan		Confident students good enough							

Of table 2 obtained the conclusion that with development device learning can form the character of confidence students choice research in SMP N 1 Brati Grobogan City with procures the development of confidence until is widespread worth or character confidence in studies math. Learning has the activity of playing that stimulates confidence students to learning more comfortable, so that character confident students increased. Quantitatively the changes indicated by the gain with a score of his meeting is 0,232; 0,451; 0,185; 0,295; and 0,483.

At the end of learning the test is conducted the ability literacy mathematical students. Based on the exhaustiveness learn showed the calculation on use SPSS with the economic situation of real 5% obtained that the value significance in $0,003 < 0,05$, can be concluded that the literacy mathematics students on who had to learning model talking stick with game OIC has reached KKM (70). Regression test showed big the

influence of confidence in the ability of literacy of 84,4% and equally $y = -29,491 + 1,646x$. Thus the formation of confidence students have had a positive impact of the ability of literacy mathematics.

Conclusions and Recommendations

Based on questions research and the results of research outlined, obtained conclusion: character confident students basis of ranking bottom, medium, and on increased, the increase confidence students luminance his meeting to be demonstrated by test the gain namely 0,232; 0,451; 0,185; 0,295; and 0,483. The ability the average the results of tests the ability of literacy mathematical students meet the standard of exhaustiveness (70). Regression test show is the confidence of the ability of literacy of 84,4% and equally $y = -29,491 + 1,646x$. It suggested that is should be done further research about things whatever increase character confident students.

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DEVELOPING MATHEMATICS MATERIALS WITH COMIC BOOK SCIENTIFIC BASED IN FIFTH GRADER

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ABSTRACT

This research objective is to develop the resource materials in teaching Math with comic book based scientific for the fifth grader students in theme History of the Human civilization. This research is uses Borg & Gall's (1987) design with research variable of curious and interest. The data collecting uses documents assessment and questionnaire, teacher and student questionnaire, questionnaire of curious and interest. The data analysed with descriptive analysis. The research results found that the previous condition was untidy, there were worksheets which irrelevant, there were incomplete materials discussing procedures without illustration which is can lead to students misunderstanding, there was material not suitable or proper for Primary students. Teaching materials from developing consists of cover, figure, table of content, manual direction, worksheet, summary, and evaluation. The expert validation material was 84% can be categorized as very good. The result of expert comic design validation was 84% can be categorized as very good. The result of teacher and students were 89% categorized as very good practiced and 80% categorized as very good practiced. Students' interest comparing before and after research was 53% categorized as lack and 84% categorized as very good. The students' curious before and after research was 50% categorized as lack and 81% categorized as very good.

Keyword - Comic Saintifik, Curious, Interest, Mathematics Materials

Introduction

Learning material choice is considered as a concern to improve the students 'interest and curiosity. There are some cases in mathematics learning materials published by government of private institution. It is mentioned in the following illustrations.

Based on the figure 1.1 Case 1, there is a covered writing by other picture so the material is unclear. If the material consists of procedural steps, it is better to attach the illustration to ease the students having independent learning.

Based on figure 1.2 Case 2, there is an irrelevant exercise. It should not be given through angle sub material, but it should be given through angle determination sub material.

Based on students' questionnaire towards the mathematics learning material in the History of Human Civilization, it is obtained

information as follows: 1). Students feels hard to understand the learning materials independently; 2) the learning materials is full of writing; 3) the learning materials do not trigger students' interest; 4). The learning materials do not trigger students' curiosity.

Based on some cases in the learning materials and information from students, it is needed students' book with clear learning materials, relevant exercise, triggering students' interest and curiosity. Through the learning material of scientific-based comic, it can improve the interest and curiosity. Students are obliged to read all scientific materials presented in the form comic. Then, the students fill the students' worksheet, exercises and evaluation questions. Following those activities can improve students' curiosity and interest.

Based on the mentioned background, it can be concluded as follows: 1). How is the

previous condition of mathematics learning material in theme of the History of Human Civilization?; 2). How is mathematics learning material in theme of the History of Human Civilization developed?; 3). Is the mathematics learning material in the form of scientific-based comic valid?; 4). Is the mathematics learning material in the form of scientific-based comic practical?; 5). How is students' curiosity and interest after using the mathematics learning material in the form of scientific-based comic valid?

Methodology

This study aims to develop the mathematics learning materials in the form of scientific-based comic for grade V in theme the History of the Human Civilization. The research used the research design of Borg and Gall (1987) with the variable of interest and curiosity. The data collection used document assessment and questionnaire

using validation sheet's instrument, response of teachers and students questionnaires, curiosity and interest questionnaire.

The validity was obtained by assessment from three material expert lecturers and one comic designer experts' lecturer using instrument of validation sheet. The data was analyzed using this following analysis technique:

$$P = \frac{\sum Xi}{\sum Xj} \times 100 \%$$

Notes

P = Percentage

$\sum Xi$ = total score of answers from experts

$\sum Xj$ = maximum total score

Setelah memahami arti sudut, sekarang kita akan membandingkan besar dua sudut. Bagaimana caranya?

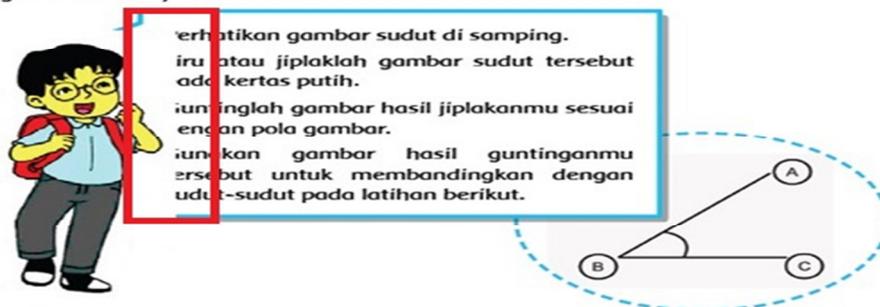


Figure 1.1 Case 1

2. Bagaimanakah cara menentukan besarnya sudut?



Figure 1.2 Case 2

The practicality was gained through teachers and students' response towards the learning material by questionnaire of teachers and students' response. The data was analyzed using this following analysis technique:

$$P = \frac{\sum Xi}{\sum Xj} \times 100 \%$$

Notes

P = Percentage

$\sum Xi$ = total score of teachers and students' response

$\sum Xj$ = maximum total score

Students' interest and curiosity was measured before and after using the mathematics learning materials in the form of scientific-based comic. Students' interest was measured by questionnaire of students' interest and students' curiosity was measured by questionnaire of students' curiosity. The data was analyzed using this following technique:

$$P = \frac{\sum Xi}{\sum Xj} \times 100 \%$$

Notes

P = Percentage

$\sum Xi$ = total score of students' answer

$\sum Xj$ = maximum total score

Results and Discussions

Previous conditions of mathematics learning materials published by government entitled Integrated Thematic in theme of the History of Human Civilization are: a). Mathematics material presented is unclear because the layout is covered by other picture. It makes students find difficulties in relating the material learned from the book and from previous students' understanding. According to Prastowo (2012:133), one of aspect to develop the learning material is presenting

the material as clear as possible, so the reader can relate the material learned and previous students' understanding. b). Material consisting procedural steps are not attached by the illustration. Through the illustration, students can have concrete understanding about the steps so elementary students can easily comprehend the material presented. It is as Piaget (in Rifai, 2009:29) stated that elementary students is based on operational concrete. Beside, being attached of supporting material as illustration picture can support and clarify the material. (Prastowo, 2012: 124). c). There are exercises that the questions are not valid because it is not based on the indicators presented. According to Sugiyono (2010: 348), the valid instrument means that it can be used to measure what it should be measured. Based on Sugiyono's statement, the measurement in students' book published by government is not valid.

On the other hand, previous conditions of mathematics learning material published by private institution entitled the History of Human Civilization was recognized some problems as follows: a). Impracticality used by elementary students because there are some questions instructing the students to draw angle in istiqlal mosque. It is not suitable for elementary students. b). Mistakes in clockwise picture c). Incompatibility of title and content, the content is "Measure the Building Angle", but the reality is that students are ordered to measure the angle in two-dimension.

The developed mathematics learning material in theme of the History of Human Civilizations consists of these learning material structure as follows: a). Before starting the material, there are book identity, preface, table of contents, comic characters and the guidelines. Pastowo (2012: 142) claims that the example format for book before starting the material consists of title, preface, table of contents, background, brief description, competency standard, concept mapping, the benefits, learning purposes and

brief guideline how to use the book. b). in the middle of delivering the material, there are main sub material, material explanation, exercises and summary. In the main sub material there are learning purposes. Material explanation is presented in scientific-based. The book format as same as Prastowo's ideas (2012: 412) that said that the format book when delivering the material consists of basic competency, main material, material explanation, heading, exercises, and summary. c). after delivering the material, there are evaluation questions. According to Prastowo (2012: 142) stated that the format after delivering the material consists of individual test, post test, follow up, hopes, keywords, bibliography and key answers.

The validation results from material experts of scientific-based mathematics learning material is 85%, having excellent criteria of validity. One of information gained in the developed learning material is that there is aspect of observing as in Education and Culture Ministerial Decree number 81a, they are: seeing, scrutinizing, listening, and reading. There is asking aspect as in Education and Culture Ministerial Decree number 81a, they are: asking about the unknown information observed, asking about additional information observed. Question words used are: what, how, why etc. There is aspect of gathering the information as in Education and Culture Ministerial Decree number 81a, they are: reading other resources besides text book, observing an object/event/interview with speakers. There is aspect of generalizing, concluding the information gained from the information gathering in oral and written. There is aspect of communicating as in Education and Culture Ministerial Decree number 81a; they are delivering the observation results, concluding the results in oral and written.

The validation results from comic designer towards scientific-based mathematics learning material are 84%, having excellent

criteria of validity. The comic design validity can be seen from the suitability for elementary students, such as the characters, color, and plots.

Teachers' response towards scientific-based mathematics learning material is 89%, having excellent criteria of practicality. The information gained is: 1). Material presenting reflects 5 components of science that can trigger students' curiosity. It is supported by Kurnik (2008:421), the implementation of scientific approach can trigger students' curiosity. 2). Physical appearance as color, picture and character in the comic can stimulate the students to learn about it. Prastowo (2012: 139) declared that format variation for instance using physical appearance can give stimulation to the students. 3). Students' worksheet, exercises, and valid evaluative question can train students' ability after learning the material. It is as Prastowo's ideas (2012: 139) stated that the elements of learning material as exercises can train the students after learning the material. 4). Illustration pictures in the scientific-based comic learning material can make easier understanding of the material and increase students' interest to learn about it. As mentioned by Prastowo (2012: 124), supporting and clarifying pictures of material are needed because to give clear explanation and increase the interest and reduce students' boredom. 5). Mathematics learning material in the form of scientific-based comics makes teachers easier to teach the students because in the learning material there are the guidelines and learning purpose each of sub material. According to Prastowo (2012: 151), learning purpose can help the reader about the target will be reached after learning the material. Through the learning purposes, teachers will be easy to map the target will be reached to the students. The guidelines will make the teachers easier to do how to use the learning material. As Prastowo (2012: 152) said that the guidelines shows what should be done by the readers when reading the module.

Students' response towards mathematics learning material in the form of scientific-based comic is 80%, having excellent criteria of practicality. Based on students' response, it is gained that, 1). The aspect of scientific-based material presenting that is noticed by words of "observing", "asking", "gathering the information", "generalizing" and "communicating" makes students easier to construct the material concept independently. The finding is supported by Machin (2014:28) who stated that scientific approach makes students to be active in constructing the material concept found. 2). Material presented in comic which has color, characters and interesting illustration can increase students' interest to learn. Prastowo (2012: 124) declared that the pictures can increase the interest and decrease the boredom to study. 3) Writing style such as short conversation, easy-to-read letters, and inviting sentence, "let's see", "let's try", and "let's do exercises", can help to deliver the message effectively. It is supported by Rowntree (in Prastowo, 2012: 137) who said that rule of writing style such as short sentence, active sentence and verbs can help to deliver the messages to the students.

Students' interest before using the mathematics learning material in the form of scientific-based comic is 53%, having fair criteria and students' interest after using the using the mathematics learning material in the form of scientific-based comic is 84%, having excellent criteria. Hence, students' interest increases after using the mathematics learning material in the form of scientific-based comic.

Students' interest increases because the story, color, character and illustration picture in the comic is interesting so students' interest and attention increase to learn mathematics. As Prastowo (2012: 124) stated that pictures can increase students' interest and decrease students' boredom to learn.

The students' interest can be seen from some following activities: repeating the material and willingness to use mathematics scientific comic in learning activities. The students' attention can be seen from some following activities: be serious and focus in learning activities. The students' interest and attention can make students being happy to learn mathematics and making students active involving in learning activities, such as reading all comic conversation, doing the exercise or evaluation. Interest, attention, happiness, and students' involvement are indicators that students' interest increases. Sudjana (2011: 68) stated that the role of comic in learning activity is to create students' interest. Botzakis (2009: 50) mentioned that comic has role and benefit to stimulate students' interest in reading and learning.

Students' curiosity before using the mathematics learning material in the form of scientific-based comic is 50%, having fair criteria and students' curiosity after using the mathematics learning material in the form of scientific-based comic is 80%, having excellent criteria. It means those students' curiosity increases after using the learning material. As Kurnik's ideas (2008: 421), the implementation of scientific approach can create students' curiosity.

Curiosity exists because of scientific components. The aspect of observing stimulates students' questions. The aspect of asking stimulates students to look for the answer and gather information through reading, then generalize it to the new information as the answer for asking stage. The aspect of communication supports the students to be active in writing the new information gained. Activities of asking, writing, looking the new information actively are indicators of the increase of students' curiosity. Prayitno and Widyantini (2014: 24) stated that indicators of curiosity are looking for information actively, asking to teachers or other students about the material.

Closing

Based on the results and discussion of the development of the mathematics learning material in the form of scientific-based comic, it can be concluded as follows: 1). There are some lack in the mathematics learning material, such as the layout which covered each other so the material presented is not clear, there are irrelevant exercises because the question is not based on the indicators, there are some materials presented that can be clearer through illustration but it is without the illustration, there is incompatibility between title and content, there is unpractical material used by elementary students, such as to find the angle in istiqlal mosque by drawing the angle. 2). The developed mathematics book in theme of the History of Human Civilization is divided into 3 formats; they are before delivering the material that consists of book identity, preface, table of contents, comic, the guidelines. In the middle of delivering the material that consists of main sub material, material explanation, exercises, and summary and after delivering the material that consists of evaluation questions. 3). The validation results from material experts towards mathematics learning material in the form of scientific-based comic is 84%, having excellent criteria of validity. The validation results from comic designer towards mathematics learning material in the form of scientific-based comic is 84%, having excellent criteria of validity. 4). Teachers response towards mathematics learning material in the form of scientific-based comic is 89%, having excellent criteria of practicality. Students' response towards mathematics learning material in the form of scientific-based comic is 80%, having excellent criteria of practicality. 5). Students' interest before using mathematics learning material in the form of scientific-based comic is 53%, having fair criteria and students' interest after using the mathematics learning material in the form of scientific-based comic is 84%, having

excellent criteria. Thus, the students' interest after using the mathematics learning material in the form of scientific-based comic is increase. More, students' curiosity before using the mathematics learning material in the form of scientific-based comic is 50%, having fair criteria. Students' curiosity after using the mathematics learning material in the form of scientific-based comic is 81%, having excellent criteria. Thus, students' curiosity increases after using the mathematics learning material in the form of scientific-based comic

To maximize the using of the mathematics learning material in the form of scientific-based comic, it is suggested: 1). for students, in using the mathematics learning material in the form of scientific-based comic, students should read, understand and do all exercises or evaluation questions. 2). for teachers, they should explain briefly about how to use the mathematics learning material in the form of scientific-based comic and explain about 5 scientific components so the students understand about it. 3). for schools, they should provide the learning material that can increase students' interest and curiosity through duplicating the mathematics scientific-based comic so students can read the comic whenever. 4). for the researcher in education, especially for elementary education, it is suggested to do the same research involving other variable that related to scientific-based comic.

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IMPLEMENTATION OF PROBLEM BASED LEARNING (PBL) TO STUDENT'S CRITICAL THINKING SKILL ON PROTIST MATTER

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ABSTRACT

This research aimed to determine the effect of problem based learning on student's critical thinking skills from class X State Senior High School 1 Rembang. This research method is Quasi experimental with Pretest - Posttest Non-Equivalent Control Group Design. The samples taken by technique cluster random sampling and obtained X SCIENCE 5 as class experiment and X SCIENCE 6 as class control. The analysis of post-test and n-gain t-test results the critical thinking skills of class experiment better than class control. The result of pot-test t-test obtained $t_{\text{calculated}} = 10.12$ and $t_{\text{table}} = 1.67$, concluded that critical thinking skills of class experiment is greater than class control. The result of n-gain t-test obtained $t_{\text{table}} = 1.67$, whereas $t_{\text{calculated}} = 3.55$. The value of $t_{\text{calculated}} > t_{\text{table}}$, and can be concluded as the enhancement of critical thinking skills of class experiment greater than class control. The implementation of PBL give positive effect on senior high school student's critical thinking skills.

Keywords - Problem Based Learning, Student's critical thinking skills, Implementation

Introduction

Based on observations in State Senior High School 1 Rembang in May 2014, learning biology is still not optimal. Interviews with the teacher obtained the fact that teachers are still fond of the use of power point and discussion instead of using PBL on Protist matter. Characteristic of the Protist matter requires observation of the matter directly to the original object. The observation covering various types of observations plant-like Protist (algae), animal-like Protist (protozoa), and fungi-like Protist. Most of the object of Protist are microscopic so that more easily understood by direct observation rather than simply reading from a text book. Direct observation of this will make students understand more and better of the Protist matter. The use of a discussion method is inappropriate for the Protist matter's characteristics. The process of learning was less encouraging students to develop the thinking skill especially critical thinking skills and the process science skills, as a result student thinking skills less used-well. According to teacher, students who are active only about 5 % and only certain

students. The results of final test obtained classic past number as much as 55% with minimum mark standard 76. Output from discussion method is students able to memorize the names of species or subclass of the Protist. This resulted in student thinking skills only until C1 (memorization) and C2 (understand).

Purwaningsih research results (2013) model PBL can improve student's critical thinking skills as much as 53,67 % on matter environmental, subjects geography.

This also happened to Yudiantari's research (2010) which gets the result student's critical thinking skills increase as much as 81% through model PBL on matter circular motion, physics subject. Hence in this research will test whether PBL will give a positive effect to critical thinking skill of State Senior High School 1 Rembang on Protist matter, subject biology.

Theoretical Review

Barrows and Tamblyn quoted as said by Baret and Diane (2010) define PBL as a learning from solving the problem.

Meanwhile Arends (2008) define PBL as a learning approach where the student is faced to the real authentic problem, so that they can construct their own knowledge. In conclusion, the focus of learning is on the student's learning process and not the teacher (Huda, 2014).

Ennis (1993) defines critical thinking skills as the highest three level of taxonomy bloom about the aim of learning these are, analysis (C4), synthesis (C5), and evaluate (C6). The indicators of critical thinking skills from Ennis (2011) have 5 indicators, these are give elementary clarification, give in-depth clarification, give judgement, give inference, and do strategies.

Research Methods

This research method is quasi experimental pretest - posttest nonequivalent control group design. Population of this research is student of class X science 5, X science 6, X science 7 at odd semester. The sample collection using a technique of clusters random sampling. Sample obtained is class X science 5 as class experiment and class X science 6 as class control.

Result and Discussion

1. Student Activity

The activity of student influences the outcome of student learning. Based on data analysis, generally students who have high learning activities will have high critical thinking skill, and vice versa. The research results by Masek (2012) have concluded that PBL increase mastery of the concepts and intrinsic motivation of students.

The results of the student activity presented in table 1.

While motivation to study increasing, it make students more active to ask or to answer for question. As many as 100 % of students said that problems related to the model PBL can increase the motivation to

participate in learning activities. This is supported by the results of interviews with teachers that model PBL highly favored by students and make them more enthusiastic learning the Protist matter. Previously in learning proces only certain students are often sees but with the implementation of the model PBL almost all students want to argue (table 1).

Table 1 shows that the class experiment learning activities entrance criteria very active, active and quite active as much as 41,94 %; 56,99 % and 1,08 %. Did not find students who come to a category less active and inactive in the process of learning. This is supported by 100 % of students who claimed that a model PBL make students more active in learning activities. Teachers also said that student learning activity has increased for the implementation of model PBL. According to the results of interviews with teachers students much more active than learning usually (Discovery Learning). It is seen from the number of the current debate group students presented the results of discussion.

Meanwhile, student activity of class control is lower i.e. 11.11%; 27,78%; 40.00% 21,11% for criteria very active, active, moderately active, and less active. The differences of both are located at valuing and giving a response to the opinions of their friends, give feedback/asking about the aperception that has been given and respond/answer questions while teachers deliver aperception in the form of a question. Class control gain low points for all three aforementioned aspects.

The difference test value of critical thinking skill between class experimentation and control occurred because the creation of teaching and learning atmosphere more live in class experiment. This is supported by 100 % students said that the learning atmosphere when using model PBL more attractive and exciting. In addition as many as 100 % of class experiment students said

that the atmosphere of learning is more live. Students said through that atmosphere class with PBL model is not quiet but more crowded and exclamation because there is debate about how to solve problems about booming algae, malaria or the potato famine in Ireland.

PBL is more attractive for students because they can come directly active in learning the Protist matter. It is to simplify students in understanding the matter of Protist. As many as 93,55 % of students said PBL helps understanding that matter. This is because the model PBL make students can understand the Protist matter with his own words that more can be understood. Table 1 shows that the student activity in class experiment higher than class control.

A group of discussion consist of four to five children, then they discuss problem in Student's Work Sheet and Student's Discussion Sheet. Next the results of discussion was presented. Student's Discussion Sheet and Student's Work Sheet serves as media for that matter. But characteristic of Student's Work Sheet and Student's Discussion Sheet for both classes are different. This discussion make students became more active because step up cooperation among students. This is supported by 100 % of students said that PBL step up cooperation among students. In addition, discussion through PBL this make students appreciate more students. As many as 100 % of students vote for it.

Class experiment use Student's Work Sheet and Student's Discussion Sheet based problems that it means in Student's Work Sheet and Student's Discussion Sheet there is an authentic problems that need to be solved by students. As many as 87,10 % of students said that model PBL made activities of discussion more attractive. This is because on the model of PBL there is solving problem activity as distinct from common discussion, whereby on the discussion model PBL students are required to think more critical and logical in order to solve the problems in Student's Work Sheet or the Student's Discussion Sheet. The problem cannot be said on the model of discovery learning that applied to class control where Student's Work Sheet used not based a problem so that not demanding students for thinking critically to be able to find a solution.

The first problem in Student's Work Sheet of class experiment related to the plant-like Protist which was about a booming algae. Second problems made in discussion sheets 1 which was about malaria caused by a *Plasmodium sp*, one of a breed of the plant-like animal. The last problem in Student's Discussion Sheet 2 which was about potato famine in Ireland caused by one type of slime mushroom, *Phytophthora infestans*. The problems are directly connected with surrounding communities students so that make students should be able to associate biology with daily life. This is supported by

Table 1. Result of student activity assessment

No	Activity criteria	Meeting I		Meeting II		Meeting III		Average	
		E**	K**	E	K	E	K	E	K
1.	Very active	3,2%	0,0%	22,6%	0,0%	51,6%	16,7%	25,8%	5,6%
2.	Active	87,1%	10,0%	67,7%	16,7%	48,4%	23,3%	67,7%	16,7%
3.	Enough active	9,7%	30,0%	9,7%	46,7%	0,0%	60,0%	6,5%	45,6%
4.	Less active	0,0%	26,7%	0,0%	26,7%	0,0%	0,0%	0,0%	17,8%
5.	Not active	0,0%	33,3%	0,0%	10,0%	0,0%	0,0%	0,0%	14,4%
Total		100%	100%	100%	100%	100%	100%	100%	100%

** E = Class Experiment, K = Class Control

100 % of students said that learning the Protist matter can be attributed to everyday life. This is because the model PBL study problems in daily life. These problems demands of students to think critically and active in seeking information to provide solutions to these problems. This is supported by 96,30 % of students said that learning the matter of Protist use model PBL motivate students to think more critically and logically.

Because of it, can be concluded that the model PBL can increase activity of students in studying. This is supported by Redhana's research result (2013) that student learning activity can be improved through cooperative model learning with the strategy of problem solving.

2. Student Critical Thinking Skill

Critical thinking skill on this research include the the level of critical thinking skill, increasing in critical thinking skill, final score students, classical passed score of students, learning outcomes of spiritual and social attitude. The results of the data analysis are presented in table 2 until table 6.

The percentage level of student's critical thinking skill before and after learning process using PBL model is presented in figure 1.

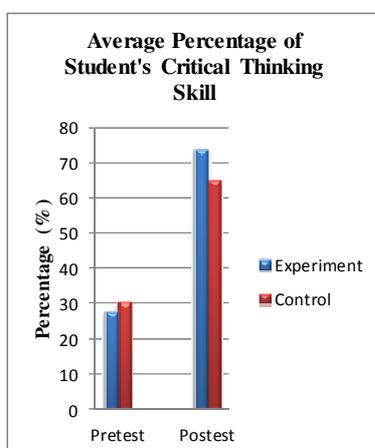


Figure 1. The percentage of the students critical thinking skills

Based on figure 1, the average percentage of student critical thinking skill had increased from early state (pre-test) to end state (post-test) of both class experiment and and control. Different result of critical thinking skills between class experiment and class control is strengthened with t-test. The goal is to know whether critical thinking skills of class experiment greater than class control. Based on results of T-test with uncertainty level of 5 % and dk = 59 obtained the value of $t_{table} = 1.98$ while the value of $t_{calculated} = 10.12$. The value of $t_{calculated} > t_{table}$, so H_0 rejected. The conclusion is critical thinking skill of class experiment greater than class control. Thus, the average critical thinking skill students on class experiment greater than average critical thinking skill class control after learning.

This happens because the learning process use real problem such as booming algae for matters plant-like Protist. They scrambled for the cause of booming algae and how to solve the problem. Thus, they stimulated to use their skills to collect information about booming algae, analyze and construct it again to find a solution to prevent boom alga.

PBL make real problem as trigger for learning process before they know formal concept. The student identify problems critically, identifying information related to booming algae, analyze it and had presented artefact about prevention of booming algae. The thought processes students directed in order and systematic as is the case build new knowledge and at the same time develop critical thinking skill and skill solves problems. PBL make a real problem as a trigger for process based on constructivism learning theory based on the theory of Piaget quoted by Rustaman (2000) that studying science is the process of constructive who want to active participation of students .So in learning the matter the Protist students already have basic knowledge the Protist that the process aimed at solving a problem to develop their

thinking skills especially critical thinking skills student learned before they know the concept of formal. Students identify with the critical problems booming algae, identifying information pertaining to the booming algae, analyse it and presented an artefact of the prevention of the booming algae. The thought process students order directed in such a systematic and build the new knowledge and skills and develop critical thinking skill and resolve the issue

The increasing amount of student critical thinking skill between class experiment and class control is analysed by n-gain. The result of n-gain calculation, class experiment obtain 0.62 and class control obtain 0.49 which both are in the criteria of being as presented in table 2.

Based on the results of the test-t using uncertainties standard of 5% and $dk = 59$ obtained price $t = 1.98$ while value of table t calculated = 3.55. Value of t -calculated $>$ t table, so H_0 is rejected, it can be concluded that increase in the average critical thinking skills class experiment is greater than class control. This is supported by research results of Yudiantari (2010) stating that the critical thinking skills of students increased 81% after using PBL model on the matter circular motion in physics subjects.

Student critical thinking skill has increased from the early state (pre-test) to the end

state (post-test). This shows that PBL influence on student critical thinking skill. According to the theory by Arends (2008) stated PBL help students to develop the skill of thinking and overcome the problem. This research is supported by that theory. Critical thinking skills and overcome the problems in a class experiment greater than the class of control. This also supported by the research been done by Kartika (2014), Marnita & Aisyah (2013), Ristiasari (2012), Pritasari (2011), and Redhana (2013).

The increasing of student critical thinking skill in class experiment because a change of learning model which covers activities that train the student critical thinking skill. A learning model is able to provide the opportunity for students to be more active in the learning process. Students are encouraged to do observation that allows them to break a problems. The learning process is no longer focused on teachers, but on each student. This is because according to Sanjaya quoted by Wulandari, *et al* (2011) PBL has several advantages, such as

1. Challenging students ability as well as give satisfaction to find new knowledge for students
2. Increasing learning activity
3. A technique that is good enough to understand the lessons

Table 2. The increase in students critical thinking skills (n-gain) of class experiment and class control

Data	Eksperiment class		N-gain	Control class		N-gain
	class			class		
	<i>Pre-test</i>	<i>Post-test</i>		<i>Pre-test</i>	<i>Post-test</i>	
Max value	55,00	88,00	0,82 (max)	64,00	76,00	0,72 (max)
Min value	10,00	56,00	0,20 (min)	11,00	53,00	0,08 (min)
Average	28,19	73,16	0,62 (mid)	30,60	66,10	0,49 (mid)

4. Demonstrate to students for each subject is basically ways of thinking, and something to be perceptible by student not just to learn from teachers or the books of course.
5. More pleasant and favored students
6. Develop student critical thinking skill
7. Provide an opportunity for the students to apply their knowledge in the real world
8. Develop student interest to learn in continuous though and have learned in formal education

Model *Problem Based Learning* (PBL) is different from discovery learning model. Model *Problem Based Learning* uses a case or matter as the basis to find the formal concept. Class control using discovery learning model by means of a student invited to discussions about the concept of the Protist matter that is in a book without presenting a real problem which is common in everyday life. Belland *et al* (2009) also stated that PBL students improve skills to solve a problem. Anderson (2007) said that students who use the model PBL in the process of learning have a higher cognitive. Distinct from PBL, discovery learning more emphasis on findings of the concept of or principle which is not previously known to (Kemdikbud, 2013). Student's Worksheets and student's discussion sheets also did not address used as the basis the learning process, but as a form of the application of the basic concept of the Protist matter which includes characteristic of the plant-like protist, the animal-like protist and the fungus-like protist.

Model *Problem Based Learning* make students engaged in groups working to solve the problem in Student's Work Sheet and Student's Discussion Sheet in the classroom nor in the laboratory. Each group consists of three to four students. Mutual group of students working together to solve problems related matter the Protist. First problems associated with the Protist similar herbs algae that is booming. Second problems relating to the plant-like animal namely malaria. The last related to the Protist similar fungi that is tragedy potato famine in ireland. Each problems represent each class the Protist namely the plant-like protist (algae), the animal-like protist (protozoa) and the fungus-like protist (slime mold). It was because the Protist matter have many topics that requires direct observation to the original object to distinguish with another class of protist. Finally students hard to understand the Protist matter if only by reading books.

As stated by Bruner, discovery learning is to understand the concept, meaning, and relations through intuitive process and finally come to a conclusion (Shen, 2007). There are no problems in Student's Work Sheet and Student's Discussion Sheet used. As a result the students do not discuss how to solve the real problems. Students only discuss to understand the Protist matter, the characteristics of the Protist, the classification and example of the Protist. Hence, the skill of thinking critically students less improve with this model.

The average of student critical thinking skill in class control is lower than class experiment. This proved that PBL related

Table 3. The end scores and students classical passing grade of class experiment and class control

Class	Total student	End score		Average	Total pass student	Total not pass student	Classical pass
		Max	Min				
Experiment	31	90,25	83,25	82,80	30	1	96,77%
Control	30	75,25	69,50	76,82	17	13	56,67%

to give students learning experience to make good understanding so that the result of learning students also became greater. This is supported by the research results from Muspita that problem based learning had a positive impact of the results of the student learning (Muspita, 2013). The research result by O'hare & carol (2009) also offer the same results that the critical thinking skill is better in the PBL class than the kind of conventional classroom.

The end score of class experiment and class control is also different. The average value of a class experiment higher than the class of control as indicated in table 3.

The analysis results for final score are different between class experiment and class control. The average final score for class experiment is 82,80 while class control is 76,82. The difference of final score exhibite difference mastery of the concept. This means that the mastery concept of Protist matter in class experiment better than class control. The research result from Sarwi & Liliasari (2010) shows that understanding the concept of some matter can be improve through collaborated cooperative and learning problem solving.

The aspect of attitude or affective is one important part of the assessment process in the curriculum 2013. Assessment is not only focus on cognitive aspect but also attitudes and psychomotor or skill. In this research there are two types of attitude that is the spiritual attitude and social attitudes. Both types of attitudes was referring to this core competency (KI 1) and (KI 2). The assessment results for KI 1 and KI 2 are presented in table 4 and 5 as follows

Table 4. Learning outcomes for student spiritual attitude (KI 1)

The Category of Attitude	Experimentation	Control
A (Very Good)	74,19%	73,33%
B (Good)	22,58%	23,33%
C (Enough)	3,23%	3,33%

D (Less)	0,00%	0,00%
Amount	100,00%	100%

Based on the data analysis on table 5, the spiritual attitude of class experiment and class control do not differ much. Attitude considered in this research are, pray before and after running every deed, grateful to the lord almighty for favors and grace, run of worship in accordance with religious teachings that involving , saluted at the beginning and end of learning, and maintain good relations with fellow creatures. This shows that the use of PBL less influence on the aspect of spiritual attitude. PBL had an impact on students ability to think in high order.

Table 5. Learning outcomes for student social attitudes (KI 2)

The Category of Attitude	Experimentation	Control
A (Very Good)	77,42%	76,67%
B (Good)	22,58%	23,33%
C (Enough)	0,00%	0,00%
D (Less)	0,00%	0,00%
Amount	100,00%	100%

From table 6, learning outcomes for social attitudes in class experiment and class control also not much different. Social attitudes considered from these aspects, not taking / copying the work of others without specifying the sources, wear uniform in accordance good governance, working on any task given, the performance of any a persentation, active in discussion of the group, and daring contends. PBL was less influence the outcomes of social attitudes. PBL stimulate students to solve a problem in a group. Through the group activities social attitudes of students are trained to be developed to be better. Both models PBL and the Discovery Learning both have the activities of the gregarious. So there is no difference of social attitudes between class experiment and class control. However as many as 96,43 % of students said that PBL could increase cooperation skill among

students through the discussion process which aims to solve problems.

Students learned skill is also being one thing considered in the curriculum 2013. The assessment results for KI 4 presented in table 6 as follows.

Tabel 6. The result of the students learned skills (KI 4)

Category	Experimentation	Control
A (Very Competen)	48,39%	0,00%
B (Competen)	51,61%	86,67%
C(Competen enough)	0,00%	12,90%
D (Not Competen)	0,00%	0,00%
Amount	100,00%	100%

Learning outcomes for students learned skills are different between class experiment and class control as shown by table 7. This is consistent with the theory that PBL can improved student learned skills (Arends, 2008). Critical thinking skill is one part of higher order thinking. The skill discerned from student competency to design experiment for solving problem. Having a class experiment whose competence is superior to control the class.

Conclusion

Based on the analysis and discussion can be concluded that the PBL model give positive effect on the critical thinking skill of students class X science State Senior High School 1 Rembang. Increasing of critical thinking skill on class experiment is greater than class control.

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CURIOSITY DEVELOPMENT ON SSCS MEDIA LEARNING USING FRACTION PUZZLE

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ABSTRACT

Students tend to find it difficult to understand the material fractions so that the level of creative thinking and character curiosity of students in this material is relatively low. Developed media-aided learning SSCS models puzzles to solve these problems. The purpose of this study was to describe the curiosity and creative thinking mathematically students before the learning, determine the effectiveness of the implementation of the model and to describe mathematically creative thinking and curiosity of students after learning. This study population of fourth grade students of elementary school 2 Gujeg Panguragan Cirebon. The research variables curiosity, creative thinking skills and creative thinking abilities of students. Data were taken by observation and tests, and processed with descriptive analysis and comparative test t and regression. The results of the development of learning tools: (1) The device developed learning valid; Syllabus with an average score of 3.82 (good); RPP with a score of 3.95 (good); LKS with a score of 4.02 (very good); Book student with a score of 3.95 (good); and KBKM test with a score of 3.78 (good); (2) Learning mathematics is declared effective, namely: 1) KBKM achieve mastery; 2) There is a positive influence on the character of curiosity and creative thinking skills mathematical against KBKM; 3) The average KBKM experimental class better than the control class KBKM; and 4) There is a growing curiosity and KBKM value.

Keywords - Curiosity, SSCS, Puzzle

Introduction

Problems in learning fractions discovered when researchers teach at State Elementary School 2 Gujeg where fractions less well understood. In addition to the facts on the ground indicate the level of curiosity of students and low understanding of the material fractions. Daily test data indicate that the absorption of the material fraction fourth grade elementary school is still low in the learning material fractions.

Preliminary research conducted at the State Primary School 2 Gujeg Cirebon Class IV to know the problems associated with the character curiosity of students in solving problems. The interview with the homeroom teacher IV shows that teachers have implemented several models of learning in the classroom, but it is still dominated by the conventional learning that has not emphasized on character building curiosity of students. Teachers found with

conventional learning material delivery targets can be achieved because the learning just focuses on the delivery of material in the direction of the teacher to the student. The low student curiosity and creative thinking of students in the learning of mathematics is that teachers made little use of instructional media. The observation result shows that there are still many students who do not ask about the material related to the teacher, no student interest in learning. This means indicates the character of the curiosity of students in the learning process that has been happening not succeed as expected.

Issues about the character of curiosity and creative thinking abilities of students in this study is solved by applying the learning Search, Solve, Create and Share (SSCS), where students are required to apply mathematical problems, building experience and knowledge of students, develop the ability to think mathematical convince

students about the validity of a state, a solution, allegations and answers, cultivate students' intellectual, ask questions and tasks that involve students, and challenging the thinking of students, develop the knowledge and skills of math students, stimulate students to make connections and develop a framework for dealing with mathematical ideas, instill the ability formulation of the problem, problem-solving and mathematical reasoning, as well as develop the whole disposition of the student to do the work of mathematics (Irwan, 2011: 4).

Relating to the background and the identification of problems that have been described, the goal of this research, which is to form the character curiosity of students in order to positively influence the members and completeness of the ability to think creatively in solving the problems of fractions. This study is expected to provide benefits for students to shape the character of curiosity in dealing with problems in learning, and for teachers to be members of innovations empower students involved in solving various problems.

Theoretical Review

Character education is character education plus, namely that involve aspects of the theory of knowledge (cognitive), feeling (feeling), and action (action) (Muslich, 2011: 29). Implementation of character education in mathematics education in schools can begin by defining the nature of mathematics in schools. Implementation of character education in mathematics has implications for the function of the teacher as a facilitator so that students can learn math optimally (Marsigit, 2011: 9). Teachers assigned to create an atmosphere, facilities and act more as a manager than a teacher because mathematics is deemed not to be taught by the teacher but to be learned by the students.

Value character imparted to students through mathematics courses are values that are

closest to the characteristics of elementary subjects, and called the value of the main characters mathematics courses elementary school consisting of logical thinking, critical, creative, innovative, hard work, curiosity, independence and confident.

Character formation of students curiosity and creative thinking abilities of students refers to the steps of creative thinking by Torrance (Munandar 2012: 65). The explanation of the four components are as follows. (1) The ability to think smooth is the process by which a person is able to generate a lot of ideas or solving problems in a short time. The indicators include the ability to think smoothness. (a) sparked a lot of ideas, ideas, answers, solving problems or questions, (b) provide many ways or suggestions to do various things (c) always give more than one answer. (2) Flexibility is the ability to use a variety of approaches in addressing the issues. An indicator of flexibility covers. (a) generate ideas, answers, or questions varied. (b) capable of changing the way of thinking or approach. (c) way of thinking is different. (c) be able to see a problem from the point of view is different. (d) search for many alternative or direction that is different. (3) Authenticity is the ability to spark an idea or resolution of a problem in an original way, the idea is very rarely even has not been disclosed previously. Indicators of original thinking ability are as follows. (a) provide an answer that is not unusual, (b) able to create different and unique expression (c) other than in the others. (4) The detailed Thinking is the ability to develop ideas and break down in detail. The indicator of detail as follows. (a) develop, augment and enrich an idea, (b) itemize in detail, (c) expanding an idea.

SSCS media-assisted learning puzzle is a learning strategy that can reveal the initial conception of the students with the learning process that consists of several components that interact and relate to one another. The component in question is the planning,

implementation, and assessment. These three components must always be associated so as to create teaching and learning process quality. Slamet (Surgian, 2008: 61) says poses learning quality teaching can be seen in aspects, among others: (1) the teacher should be able to make preparations to teach a systematic, (2) the learning process should be of high quality demonstrated by the submission, methods, media, and assessment, (3) time during the learning process takes place is used effectively, (4) the motivation to teach teachers and students' motivation is high, and (5) interaction between teachers and students in the classroom, so that each of difficulty learning in the classroom can be overcome.

Media-assisted learning stages SSCS puzzle begins at search phase, students are required to find ideas in identifying pieces of a puzzle media and to develop questions that can be investigated. In the phase-centered solve specific problems specified in the search phase and requires students to produce and implement their plans to obtain an answer. To create phase requires students to produce a product-related issues. For further communicated to other students in the phase of share. The basics of the theory is the basis for the belief of researchers that media-aided learning SSCS puzzle can enhance students' character by habituation-conditioning provided, so that will have an impact on improving the ability of creative thinking.

Research Methods

This study is a mix design with sequential exploratory method, which is a combination of research method that combines qualitative and quantitative research methods respectively, where the first phase of research using qualitative methods and in the second phase of quantitative methods (Sugiyono, 2013: 473). The first phase of the research done by taking five fourth grade students of State Elementary School 2 Gujeg Cirebon. Qualitative research aims to analyze the increase in character curiosity of

students on media-assisted learning SSCS puzzle. Qualitative research begins with the collection of data through TKBM, observations character curiosity and followed up with interviews. TKBM results, observations and interviews were analyzed based on indicators which refer to measures of creative thinking by Torrance (Munandar 2012: 65). The explanation of the four components are as follows. (1) The ability to think well, (2) the ability to think flexibly, (3) the ability to think authenticity, and (4) the ability to think in detail.

Quantitative research aims to look at the effect of curiosity and determine the thoroughness of the creative thinking abilities of students who get the media-assisted learning SSCS puzzle. Test enhancement is done to test the gain of the character curiosity of students at each meeting, reinforced by the analysis of qualitative improvement observed in five students choices, each two of the above, one of the middle group, and two of the bottom. Test the effect of the character of the curiosity of the ability to think creatively done with regression test, and test completeness referred to in this research is to test the completeness of the individual, the learning is said to be complete if the average results of creative thinking abilities of students exceeds the minimum completeness criteria individual is 70.

Results and Discussion

Observations were confirmed through interviews showed that an increase of character curiosity of students after participating in a media-assisted learning SSCS puzzle, especially in the indicator to ask the teacher about the relevance of the material. Here are excerpts of interviews with one of the students choice.

Researcher : “Are you always trying to ask the teacher about the subject matter in the

process of learning mathematics?"

Student : "Yes Mrs, I always ask".

Researcher : "What do you usually ask?"

Student : "Usually I ask about the material I understand".

Researcher : "What steps did you do to solve the creative thinking?"

Student : "By providing ideas, answers, solving problems or questions relating to materials, to solve the problem in several ways, to find the solution of the problem in their own way and are able to develop ideas or opinions".

Researcher : "At school or home usually you often ask questions or discussions with anyone?"

Student : "I prefer to ask the teacher if the school, but when at home I tried to discuss with friends".

Results of interviews character curiosity of students showed that students try to ask about the material he did not understand and asked if having difficulties. Steps to resolve the matter of creative thinking also is in conformity with the steps in the indicators of creative thinking by Torrance (Munandar 2012) as providing ideas, solve problems with diverse, finding the solution of the problem in its own way and is able to develop ideas or opinions. Results of this increase can be seen by the gain obtained by the students choice in Table 1.

Tabel 1. Gain Curiosity Character

Subjek	Pertemuan				
	I&II	II&III	III&IV	IV&V	I&V
SP-1	0.15	0.26	0.41	0.60	0.85
SP-2	0.11	0.18	0.26	0.30	0.65
SP-3	0.11	0.18	0.25	0.29	0.61
SP-4	0.09	0.15	0.21	0.23	0.53
SP-5	0.09	0.15	0.20	0.21	0.51
	Rata-rata				0.63

From Table 1, it appears that the character of curiosity fifth choice students has increased at each meeting. Overall the five students the option to experience a significant increase by an average of 0.63. This is because learning SSCS aided media puzzle allows creating a situation that can facilitate the emergence of a question, is actively involved in group discussions to solve problems together, with scaffolding from teachers and friends so that students continue to work to establish the character of the curiosity of students.

Having seen an increase character curiosity of students, then see its effect on students' ability to think creatively. The independent variable in this study is the ability to think creatively student (Y). Data about character curiosity of students drawn from the observations in observation sheet character curiosity of students. While the creative thinking ability of data retrieved through TKBKM held at the end of the meeting. Results of the analysis of the influence of character curiosity of students of the ability to think creatively by using SPSS acquired sig. = 0.000 <0.05, which means H0 rejected. This means that the linear regression, meaning that there is significant influence character curiosity about mathematical creative thinking abilities gained students. In addition, the value of R square of 0.616 or 61.6%. That is the curiosity of students affect students' ability to think creatively mathematically by 61.6% or 38.4% there are other variables that affect the ability of creative thinking mathematically. With the regression equation $Y = -0.769 + 0,020X$. The influence of the character of the curiosity of students to creative thinking abilities of students can be presented in Table 2.

Table 2. Regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.785 ^a	.616	.596	.06165

After seeing that character curiosity positive effect on the ability to think creatively, then see if the effect is to make an average of creative thinking ability due KKM (70).

Based on the calculations, the value of $t = 7.39$. Significant level of 5% and $dk = (n-1) = 20$ obtained the value table = 1.72, then $t_{count} > t_{table}$, then H_0 is rejected, it means also that the average mathematical ability of creative thinking of students in the experimental class beyond the KKM.

Realize that learning can shape the character curiosity of students is not an easy thing. Therefore, it is referred to several theories and the results of previous research on which to base the implementation of a learning that really can improve the character curiosity of students. This fits the theory raised by Berkowitz (Siswono, 2012) which explains that the character can be seen as a measure or means to measure the goodness or the eccentricity of an individual related to morality. In addition, can also be associated with non morality (such as cognitive functions). Berkowitz define the character as a collection of individual psychological characteristics that make an impact on a person's ability and improved functions of morality. Thus the meaning of the character can be interpreted as a character, disposition, or other psychological aspects inherent in an individual.

This study apply learning SSCS assisted media puzzle in every phase of students directed to a discussion, create challenging situations for students to think, help students associate the experience that is being developed with the ideas, opinions or ideas of these students and create interaction between the group / class discussion.

Conclusions and Recommendations

Based on qualitative analysis, found that an increase in the character curiosity of students. After the lesson, the students in all three groups showed improvements in all

indicators of creative thinking of students, especially in the indicator think smoothly by providing ideas, answers, solving problems or questions relating to materials, in thinking flexibly, to solve the problem in several ways, while the ability to think authenticity in finding a settlement of the problem in their own way still to be developed with assignments are varied and contextual learning, and to indicators detailed thinking skills students are able to develop ideas or opinions well. Improved character curiosity shown by the students gain from the meeting of 1 and 5 for the fifth student choice, where the SP-1 (0.85), SP-2 (0.65), SP-3 (0.61), SP-4 (0.53), SP-5 (0.51). Analysis of the results of quantitative research shows that there is a positive influence between characters curiosity of students' creative thinking abilities of students who obtain a media-assisted learning SSCS puzzle on the material fraction IV grade of 61.6% with the equation $Y = -0.769 + 0,020X$. based on individual mastery test, the average ability of students who obtain a media-assisted learning SSCS puzzle on the material beyond the fourth grade fractions KKM (70). Based on the conclusions obtained then there are some things that researchers recommend them for teachers should provide learning innovations that focus on the objectives to be achieved. In this study, media-assisted learning SSCS puzzle can be used as a reference for teachers in stimulating learning pecaha material or other material that emphasizes on improving the character curiosity of students. Then for students, the character of curiosity and creative thinking skills that have been formed during the learning fractions should continue to be developed in daily life and can be used as a basis for studying other material.

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DEVELOPMENT OF STUDENTS' SHEET ACTIVITIES (LKPD) CONTAINED WITH LOCAL WISDOM ON ECOSYSTEM MATERIAL IN SENIOR HIGH SCHOOL

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ABSTRACT

The values of local wisdom are necessary to invest for learners, one of them through learning in school. Teachers should be able to utilize learning tools, one of them by developing Students' Sheet Activities (LKPD) with adapted to the problems in everyday life, the potential of the area and learners. The purpose of this research to develop LKPD contained with local wisdom on ecosystem material in senior high school, determining the validity and examining the effectiveness of LKPD in learning. This research is categorized as development research (*Research and Development*) with adopts eight steps model developed by Sugiyono, included: (1) potential problem (2) data collection (3) product design (4) validity design (5) revision design (6) test product and (7) revision product (8) final product. Stages of development research consists of three phases, namely the validation stage, small-scale pilot phase to 6 learners and large-scale testing stage to 25 learners, sampling taken by using random *cluster sampling technique* in research design of *one-shot case study*. Learning tools with syllabus, lesson plan, LKPD, cognitive tests, observation instruments activities, observation instruments attitudes and questionnaire responses were all validated by experts and practitioners. Data validity of LKPD is developed as well as analyzed using descriptive analysis. The research results showed the level of validity LKPD based on category ratings validator is valid. LKPD contained with local wisdom are effectively used in learning, based on analysis the results of cognitive tests, activities and attitudes of learners. Students' result on cognitive test in classically above was 75%, the activities excellent categories and attitudes good categories.

Keyword - LKPD, local wisdom, ecosystem

Introduction

The values of local wisdom needs to be imparted to students, one of them through learning in school (Indrawardana, 2012). The necessity of investing the values of local wisdom to the youngers generation to increase the love of the culture, one of the ways through learning in school. Damayanti *et al.* (2013) suggested a *Compact Disk* (CD) based on local wisdom learning theme vibrations and waves to eight grades students of junior high schoolclass may increase the love of learners towards local wisdom. According Kasa (2011), the important of local wisdom must also be considered as one of supporting efforts of a decreasingly natural environment.

Teachers should be able to take advantages of learning resources, one of them by developing LKPD centered on the potential, development, the needs of learners and the environment (Ruhana & Yuliana, 2010). LKPD is a learning resource that can be developed by the teacher as a facilitator in the learning activities. According Arsyad (2004), the use of LKPD provide benefits in the learning process, namely: clarify the messages and in formations so that the learning process more smoothly and improve learning outcomes; increase the motivation of learners and overcome the limitations of the senses, space and time.

North Lombok is one area that rich in local wisdom values, especially those related to environmental conservation, such as indigenous forest management through

integrated system. There are 30 indigenous forests in North Lombok, one of the indigenous forests Mandala has *awig-awig* or customary law in preserving the forest, so that in 2012 won the first ever race Protection Springs National level (Sugeti, 2012).

Based on observations in public school of Pemenang senior high school, North Lombok showed that the syllabus, lesson plans and LKPD used local knowledge has not been charged. This prompted the need to develop "LKPD which contained local wisdom in senior high school".

The problems in this research are: (1) Is charged LKPD local wisdom on materials developed ecosystem valid based on expert judgment? (2) Do LKPD charged local wisdom on effective ecosystem material used in Pemenang senior high school, North Lombok?

The aims of this study were to (1) determine the validity LKPD charged local knowledge on the ecosystem materials developed by expert judgment; and (2) determine the effectiveness of the charged LKPD ecosystem indigenous to the material used in Pemenang senior high school, North Lombok.

Methods

This research is categorized as *Research and Development* method (Sugiyono, 2010). The research conducted at Pemenang senior high school, North Lombok. Steps of the study consisted of three phases, namely the validation stage, small-scale pilot phase to 6 learners and stage large-scale trials of the 25 learners, sampling with random *cluster sampling technique* research design one-shot case study. Sources data were taken from teachers, learners, and documentations. Data was the validity of LKPD, the cognitive learning results, activity and attitudes of learners. Data were analyzed using descriptive analysis and validation

tools. LKPD was considered valid if the average expert validation $0,75 \leq V < 1$ (Aiken, 1980). LKPD was considered effective if the cognitive learning of at least 75% of students pass the study by the KKM > 70 (Mulyasa, 2004); activities and attitudes of students categorized as good (Widoyoko, 2012).

Result and Discussion

Needs Analysis

Based on observations in Pemenang senior high school, North Lombok, indicating that the syllabus, lesson plans, textbooks and LKPD used has not been contained local wisdom (Table 1).

Table 1. Results of the analysis of observational learning tools

Learning Tools	Specification			Description
	Curriculum	Title	Publisher	
Syllabus lesson plan	KTSP 2006	Silabus	-	Not contained with local wisdom
textbooks	KTSP 2006	RPP	Erlangga	Not contained with local wisdom
textbooks	KTSP 2006	Biologi X	Yudhistira	Not contained with local wisdom
textbooks	KTSP 2006	Biologi X	-	Not contained with local wisdom
LKPD	KTSP 2006	Biologi X	-	Not contained with local wisdom

The observation of the learning device supported the results of questionnaires to 31 learners. The questionnaire was given to tenth grades students in Pemenang senior high school, North Lombok. Based on the questionnaire results showed that necessary to be developed that LKPD which contains with local wisdom.

Table 2. The questionnaire results of students'

No	Question	Choice answers and percentage	
		Yes	No
1	The meaning of symbol North Lombok	5 (16%)	26 (84%)
2	Indigenous forests		29 (94%)
3	The notion of local wisdom	2 (6%)	20 (65%)
4	The local wisdom relating to environmental conservation in North Lombok	11 (35%)	18 (58%)

5	Kemangkuan system	(42%)	31 (100%)
6	The role of traditional leaders in maintaining the forest	0	23 (74%)
7		0	17 (55%)
8	Meaning of the <i>awig-awig</i> Custom prince	8 (26%)	31 (100%)
		14 (45%)	0

Achievement of validity and feasibility LKPD would be caused because in the process of developing LKPD selection procedure followed by instructional principles, so as to meet the criteria LKPD accordingly.

Effectiveness of LKPD

Learning by using LKPD contains with local wisdom is demanding learners to be able to explore local wisdom through exploration and elaboration. The activities in LKPD makes learners active in learning, increasing the love to value of local wisdom. Mungmachon (2012) states the importance of comprehending the local wisdom for the community to build a generation that has a positive impact on the social environment. Learning that conducted in schools is one of the means to maintain the value of local wisdom. Biology is one of subjects that has relation to the cultural aspects. Biology teachers are expected to be able to explore the potential value of local wisdom then compiled into a learning resource.

Based on the analysis obtained on test small-scale and large-scale showed that LKPD was developed effectively. Cognitive learning outcomes of students in small-scale trials by 83%, amounting to 88% large-scale classical above was 75%, including the category of excellent activity and attitude good category. Results of this study were supported by Dewi *et al.* (2014) there were significant differences between the science learning results of students that learned the nuances of local wisdom thematic model of media-aided animation and that learned through conventional learning.

Validity of LKPD

Table 3. Results of students' activity in small-scale trials

The result of analysis the proposed by validators show that the development of LKPD was valid and feasible for use in learning. LKPD good if pay attention to the principles of consistency, relevance, adequacy and usefulness (Asyhar, 2011).

No	Indicator	The average score of each indicator			
		First meeting	Second meeting	Third meeting	Fourth meeting
1	Attention	3,00	3,33	4,00	3,50
2	Cooperation	3,00	3,33	3,00	3,17
3	Answer	3,00	4,00	4,00	3,33
4	Building ideas	3,00	3,83	4,00	3,33
5	Utilizing time	3,00	3,50	3,00	3,50
6	Respond opinions	3,00	3,33	3,00	3,00
7	Confirm	3,00	3,50	4,00	3,67
	Average Categories	3,00 Good	3,55 Excellent	3,43 Excellent	3,36 Excellent

Table 2. The results of summary validation constructs in LKPD contained local wisdom

Tools that are Validated	Average (Va)	Categories	Description
Syllabus	0,86	Valid	Can be used with slight revisions
RPP	0,86	Valid	Can be used with slight revisions
LKPD	0,87	Valid	Can be used with slight revisions
Observation instruments activity	0,88	Valid	Can be used with slight revisions
Observation instruments attitude	0,94	Valid	Can be used with slight revisions
Instrument response	0,94	Valid	Can be used with slight revisions

Learners' activities at the first meeting were on good category, the second, third and fourth meeting were excellent. There were an increasing activities and attitudes of students' at the second meeting of the first meeting. It is supported by visiting to the Mandala indigenous forests, learners are very interested in the field trips because most of students have never been came to

location, directly involved to find information and explore the value of local wisdom, high curiosity to know about the existence *awig-awig* and sanctions Mandala indigenous forests. The learners' attitude at the first meeting was in good category, the second meeting was in excellent, the third and fourth meetings were in good.

Table 4. Results of students'attitudes in large scale-trials

No	Indicator	The average score of each indicator			
		First meeting	Second meeting	Third meeting	Fourth meeting
1	Curiosity	2,50	3,83	3,33	2,17
2	Creative	2,33	3,50	3,17	2,50
3	Mandiri	2,67	3,67	3,17	2,50
4	Asking	3,17	3,17	3,00	2,67
5	Discipline	2,67	3,33	2,50	2,00
6	Contend	2,67	3,83	3,00	2,67
7	Seeing the potential of local wisdom	2,83	3,17	3,17	3,00
8	Digging local wisdom	2,33	3,67	3,17	3,17
9	Concerned local wisdom	2,33	3,50	2,83	3,17
10	Responsible	2,67	3,33	3,33	2,67
	Average	2,62	3,50	3,07	2,65
	Categories	Good	Excellent	Good	Good

Visiting to Mandala indigenous forests allows learners to explore information and the value of local wisdom through interviewing with traditional leader and local residents, including to find *awig-awig* there. Through interviewing with traditional leaders and the people around Mandala, making learners more active to give attention, work in teams, build ideas, take advantage of the time and respond opinions. Interviewing with traditional leader and local residents had made the field trips to be more interesting, because it requires learners to be able to communicate in tapping local wisdom which is related to environmental conservation in Mandala. Mandala is very unique, because it is located near by residential area, but it is sustainable. It is

caused by existence of *awig awig* or tadtion law, as well a high respecting from sociaty awareness to protect the forest.

Table 5. Results of students' activity in large scale-trials

No	Indicator	The average score of each indicator			
		First meeting	Second meeting	Third meeting	Fourth meeting
1	Attention	2,80	3,60	3,48	3,24
2	Cooperation	2,96	3,48	3,44	3,32
3	Answer	3,08	3,48	3,20	3,32
4	Building ideas	3,00	3,44	3,52	3,24
5	Utilizing time	3,00	3,36	3,48	3,48
6	Respond opinions	3,08	3,28	3,16	3,28
7	Confirm	2,84	3,60	3,40	3,32
	Average	2,97	3,46	3,38	3,31
	Categories	Good	Excellent	Excellent	Excellent

Learners' activities in the first meeting were in good category, second meeting were in excellent. Learners' activities at the third and fourth meeting were excellent. Learners' attitude at the first meeting was in good category, the second and third meeting were in excellent, and in the fourth meeting was good category. By providing the questions and direction in LKPD requires learners to be active in learning and in also field trips, include of the demanding learners are able to communicate with traditional leader and local residents to explore the value of local wisdom related to environmental preservation.

Table 6. Results of students'attitudes in large scale-trials

N o	Indicato r	The average score of each indicator			
		First meeti ng	Second meetin g	Third meetin g	Fourt h meeti ng
1	Curiosity	2,76	3,56	3,44	3,04
2	Creative	2,88	3,44	3,28	2,84
3	Mandiri	2,88	3,40	3,16	3,08
4	Asking	2,92	3,48	3,28	3,04
5	Disciplin e	2,80	3,48	3,24	3,00
6	Contend	2,96	3,48	3,44	3,24
7	Seeing the potentia	2,92	3,56	3,48	3,36

8	I of local wisdom Digging local wisdom	2,88	3,40	3,36	3,28
9	Concern ed local wisdom	2,96	3,32	3,32	3,48
10	Responsible	2,76	3,60	3,36	3,32
	Average Categories	2,87 Good	3,47 Excell ent	3,34 Excell ent	3,17 Good

Over all activities were include in the excellent category and attitudes of learners were in good category through learning by utilized LKPD which contains with local wisdom, in other side, it was improved the outcomes cognitive learners' learning. This phenomenon shows that is necessary to develop LKPD which contains with local wisdom, it is support by Suastra *et al.* (2011) suggested there are differences in basic competencies in science, scientific performance and achievements of learners, between the local culture-based learning model with the regular model.

Learning with LKPD which is contained by local wisdom is one way to exploit the potential of local wisdom knowledge, as well as to encourage the activities and attitudes of learners in learning process. Learning which was helping by LKPD that contained with local wisdom was demanding learners to be active in learning which have some stages, Lets Think, Lets Learn, Lets Explore, Lets Elaborate and Lets Confirmation. It is supported by the results of Sarah (2013) on the use of local potential in learning physics get a positive result, local potential based learning is effective in improving living values (honesty, responsibility and cooperation) learners.

The response of students' in small-scale trial with a average of 4.06, large-scale trial a average of 4.35 and teachers a average of 4.80. Based on the results on response of students' in small-scale trials, large-scale and the response of teachers in general

strongly agree to learning which was helping by LKPD that contained with local wisdom.

Learners were being actively in seeking information and explored local wisdom knowledge with native people in the field , so that learners can understand by relating to the environmental conservation in North Lombok. It is supported by the results of research Nur (2012) local wisdom plays an important role in the prevention of environmental damage in forests, springs and soil management in farming in the mountains of North Kendeng Pati. Stages Lets Exploration and Lets Elaboration encourages students to be active in learning, cooperation in groups, build ideas, use the time, curiosity is high, creative, independent, asked, discipline, thought, responsibility, explore and care about the local wisdom.

Conclusion

The results showed that the level of validity in LKPD based on the values that given by validators which was including a valid categories. The LKPD which was contained with local wisdom was very effectively used in learning, based on cognitive test results of students' in small-scale trials and large-scale thoroughly studied classical above was 75%, the activities being excellent and attitudes of good categories.

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ORIENTED LEARNING ENVIRONMENT IN THE CONTEXT OF EARLY CHILDHOOD EDUCATION

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ABSTRACT

The aim of this study are as follows, (1) Determine the objective conditions of the learning process of environmental education in early childhood education today and (2) Finding environmental education learning model to improve the competence of early childhood. Typically this research involves four components: (1) Development of a solution (for example, an instructional approach; design and learning objects, such as museum exhibits or media; or education policy) based on a well-specified theory of action appropriate to a well-defined end user; (2) Creation of measures to assess the implementation of the solution(s); (3) Collection of data on the feasibility of implementing the solution(s) in typical delivery settings by intended users; and (4) Conducting a pilot study to examine the promise of generating the intended outcomes. Results of research related to the objective conditions of the applicable environmental education today shows that in general, teachers know of Environmental Education, as well as looking at environmental education can shape a child become a person who has concern for the environment. In general, the teacher looked Environment Education is very important and consider any learning model can be used for learning Environment Education. Based on the results and discussion can be concluded that environmental education will be more meaningful if carried out with a more contextual approach is real and concrete, according to the characteristics of early childhood.

Keywords: learning, the environment, early childhood education

Introduction

Environmental education is a process that aims to build the world's population conscious and have concern for the environment as a whole, as well as a variety of problems associated with it. Imparting knowledge, attitudes, skills, motivation, and commitment to work individually and together to find solutions to the problems that currently arise and prevent new problems. Early age was the "golden age" for someone, does it mean when someone at that time got a proper education, he gained a good learning readiness and one of the main keys to the success of learning to the next level.

Young children are active and inquisitive. Everything is worth exploration with all of their senses. Their minds and bodies are growing at a phenomenal pace, developing neural connections they will use for the rest

of their lives. Learning is everything; experience is everything. Whether it is the taste of a carrot freshly picked from the garden, the sight of sunlight on a dewdrop, or the sound of music made with some rocks found in the yard, young children are making discoveries and creating connections. They are beginning to understand their individuality and the individuality of others. They are beginning to build relationships between themselves and others and between themselves and the world around them. Providing opportunities for the growth and development of the whole child, opportunities to develop a sense of wonder about nature, and earnest engagement in discovery about the real world are the foundation for learning in early childhood. It is vital for early childhood environmental education programs to build this foundation (NAAEE, 2010).

From the environmental side, children have proven to be popular subjects of study, as well as being of social concern, for behavioral scientists and professionals who have entered the field of environment and behavior. This may be the case, in part, because children often respond more immediately to environmental conditions, freer of the overlay of symbolic, cultural, and past experiences that may obscure or distort adult reactions. In addition, children may be more subject to adverse impacts of particular environmental problems and to be in need of protection from them. Indeed, if we compare the evidence on effects of environmental stressors, such as noise and crowding, on children with those found in adults, it appears that the most deleterious effects may be reserved for the young, perhaps because they have not had an opportunity to adapt. Conversely, the opportunity for achieving a positive impact on their development through suitable design of the environment may be correspondingly greater in the case of a young child (Altman & Wohlwill, 1978).

The introduction of the environment for early childhood aims to build awareness from an early age the importance of education to give more attention to the environment. Additionally, it will get closer to the natural environment so that the child more quickly interact that nature is so essential for survival. The scope chosen at the primary level, which is to give more recognition to the child about the environment and natural diversity. As well as the provision of knowledge-based environment that can be applied to the wider community.

Environmental education is a central aspect of the process of change towards sustainable development. It is time we realized that the environment is not just a factor in this game, but a game in itself; a game in which we are all players and on which our future existence depends. Environmental problems such as climate change our prosperity and our

economic development. We all contribute to environmental problems and, as a result, we can only solve them on the basis of cooperative action. Environmental education, like education for sustainable development, is based on building awareness and identification with personal living environments. It is therefore not merely the conveyance of knowledge, but a processor learning about the concept of political action (Rue, 2005).

The development of environmental awareness is increasingly important to continue to be disseminated to all elements of society have a responsibility to maintain and preserve the environment for sustainability that are relevant to the nature. In this case, need guidance on environmental awareness through the organization whose name the school. It is intended for school-age children have an awareness of the importance of environmental aspects in defense of life today and in the future due to environmental education is the responsibility of the entire society, including government and educational institutions.

Efforts to increase awareness of the importance of managing life will be more meaningful if it is done at an early age or childhood. Considering at this time the potential of every child to develop optimally if obtaining a positive stimulus. The introduction of the child's early environment is expected the process of internalization of environmental values that will ultimately affect the attitudes, perceptions and behavior towards the environment.

In the implementation of Environment in collaboration with stakeholders in order to encourage the school community to carry out the process of learning about the material environment. It is also expected school community can participate in preserving and maintaining the environment in the school and the area. Created good conditions for schools to be a place of learning and school community awareness

of the importance of preserving the environment. So that the school community can participate in charge of efforts to save the environment and sustainable development.

Environmental education is an important factor in achieving success in environmental management, is also a very important tool in generating human resources which can implement the principle of sustainable development. Like a lamp in the darkness of night, environmental education is present in an effort to improve understanding of and concern for the environment. Environmental education will not change the circumstances that have been damaged to be good in a short time, it takes time, processes and resources. It is necessary for a study that will result in a form of implementation in the learning process that can be a reference for early childhood education teachers in implementing education-oriented environment for Early Childhood Education degree.

In accordance with the above description, the formulation of the problem posed in this research is: "How is the implementation of Environmental Education in early childhood education? More specifically, the formulation of the problem posed is, (1) How the objective conditions of the learning process of environmental education in early childhood education today ?, (2) How is the learning process of the implementation of environmental education to improve the competence of early childhood ?. Based on the problems above, the purpose of this study is as follows, (1) Determine the objective conditions of the learning process of environmental education in early childhood education today and (2) Finding environmental education learning model to improve the competence of early childhood

This research is expected to produce some proposition, principles and guidelines development of environmental education learning to optimize the knowledge, attitude

and skills of early childhood in the environmental aspect. Learning model development environmental education to increase the competence of young children have the following benefits: (1) Provide a valuable learning experience for children related to environmental education oriented to the characteristics and needs of students, (2) As a reference to develop programs planning and implementation of learning for Environmental Education in institutions of Early Childhood Education in an effort to instill awareness and awareness of the preservation of the environment from an early age, and (3) Provide input related to the implementation of the Education Program of Environment carried out on the level of early childhood education so as to enrich regulation who have been there before.

Literature review

The first years of every human being's life are the most favorable ones for developing the attitudes and values that form the basis of their personalities. The structure of values and attitudes built in the early years are the strong and permanent roots for one's entire life. They will always be used as References for main decisions that challenge men and women. Those first values determine ethical and moral behavior throughout life. When a person has to face difficult and complex situations, or when a new challenge demands important decisions, those values that originally carved the personality will guide options and resolutions, reactions or behaviors. Therefore, if we desire that adults, in the next generation, respect nature and care for the planet, it is important to include now, in the early childhood education curriculum or program, the study of nature, and the interdependence between human beings and the environment. Everything deeply lived, practice and felt in the early years of human development remains for the rest of one's life (Samuelsson & Kaga, 2008).

Children are very sensitive to nature and its elements – animals, plants, flowers, the phenomena of fire, water, the land, wind, etc. They are emotionally touched by, and intellectually interested in it. Experience shows that many adults who live in big towns remember with pleasure unforgettable moments of their infancy, in rural areas, with plants and their seeds, trees and their shapes, the little river and its sources, gardens and flowers, horses and cattle, birds and domestic animals. They often recall those memories. It is an efficient strategy in education to take into consideration these early dispositions, curiosity and interests. Therefore, the study of nature has long been included as one of the areas of activity in ECCE. Currently, with the worldwide concern for the degradation of the environment, this subject has been attracting political interest, and will probably gain in relevance in early childhood education. In many countries, ECCE curricula include guidelines and even content on that subject.

The curriculum of ECCE usually addresses two areas related to the environment: (a) knowledge by concrete and direct experience of nature; and (b) transformation and recycling. The first line of action involves the study, exploration, adventure and experiences with nature elements (seeds, plants, water, soil, sand, wind, fire, little animals, etc.). The second one – recycling and using discarded materials for didactical activities – has been part of early childhood education practically from its origin. In other words, since the beginning, ECCE has worked on a daily basis with elements of nature (seeds, barks, shells, etc.), transforming them into toys, musical instruments, play and art materials for example. Moreover, discarded objects, such as boxes, plastic cups and bottles, pieces of paper and tissues, used clothes, hats, shoes, glasses, mirrors, tubes, wood scraps, acquire interesting forms, figures and uses, e.g. houses and tents, telescopes and observatories, boats and ships, submarines and rockets, trucks and trains, industries and

factories. What was used before and discarded is able to give children the experience of discovering the world and its secrets. Those things, thought of as ‘dead’, come back to life again in the hands and imagination of children. The lesson we learn from this activity is that the objects of nature do not die, they remain here, they exist and have meaning, they belong to the world, and they can be transformed into other beings.

In other words, they can be given a different meaning; they can be re-signified and be with us longer. Therefore, they are not supposed to be seen as garbage, or as pollution. This is a philosophical dimension of the relation man/nature, and has a deep ethical meaning. Obviously, not all discarded objects are suited to recycling. In the early childhood development centre, we can use a wide diversity of materials – but not everything. My point is the possibility and the significance of those activities can have for children, given suitable materials.

In ECCE, transformation (by recycling or by giving a different meaning to elements of nature or industrial products) has a philosophical, psychological and pedagogical purpose. Industrialization has prompted the emergence of the consumer society, stimulating artificial needs and the increasing accumulation of industrial garbage. All over the world, the ‘common, average person’ believes that ‘we can’t live without the goods produced by industrial technology’. The amount, the diversity and the relative reduction in the prices of industrialized products create the desire to buy and use more and more developed products. Replacement is carried out with increasing velocity. We are living in a vicious circle of production–consumption–replacement–garbage. Marketing strategies tempt people to buy the most recently launched and sophisticated products, discarding those in use (but which are still useful). These objects tend to lose their value, and are seen as outdated. Thus, behavior of substitution is created in our

minds and habits; a race after the new, an attitude of disdain for the old, an annoyance with the used one. Consumerism is only one way of expressing the new attitude that leads the industrial production world. Another one is the disdain for what has already been used, which is not new, which is technologically behind. These attitudes make people discard cars, household-appliances, clothes, footwear, personal effects, telephones and cell phones, computers, television sets, sound, cameras, and so on. We have now started worrying about electronic garbage (batteries, radioactive chips, etc.).

Most serious, certainly, is its consequence on human relationships: love as an ephemeral emotion, friendship as a superficial feeling, human relationships are being placed under the same utility criterion. Therefore, people may be easily betrayed, abandoned, substituted. People may be viewed as discarded objects: a little misunderstanding or an occasional conflict is enough to cut the ties that had joined dad/mum and son/daughter, girlfriend and boyfriend, husband and wife. Aged people witness how easily they are abandoned and discarded by their families. Re-evaluating some discarded objects by finding a new meaning in people's lives awakens a feeling of permanence, a sense of belonging. Prizing nature and human beings remakes the ties between them and develops an attitude of conservation and respect towards both what the objects and people were, and can be. Giving meaning again (re-meaning) an object by transforming its first purpose into another one (for example, transforming a plastic bottle into a truck, a plastic cup into a rattle, a light bulb into an object of art with a ship inside) may contribute to the development of two values: there is something beyond the utility (an already used plastic cup is not valid any more according to its former utility, but it is now valid by the other meaning that we can give to it). Things have a multi-significant existence. The trans-utility deepens human

vision in the meaning of existence (Hérodin & Zühlsdorff, 2008).

Recycling (apart from its economic and ecological values) has a psychological, philosophical and pedagogical value: the re-assigning of meaning, the permanence and the belonging, especially in the case of the attitudes related to people. This behavior can also rediscover the understanding of a person's value: one's intrinsic dignity, one's longing for being more, one's dreams of happiness and love. Are global warming, the hole in the ozone layer, the reduction in the water reserves, desertification, air pollution, illnesses caused by the environment degradation, toxic and atomic garbage accessible issues and interesting to children? The presence of the issues on the environment in newspapers, on television and in daily chat shows reaches children's sensitivity, emotions and cognitive interests. As the problems of the environment are part of children's lives, they are challenged to speak of, think and worry about them. Nothing that surrounds me is strange to me. It is the same to children. It means that the dreams, desires, necessities, language, problems of social, cultural and physical environment, in which I am inserted, are the raw materials that form my personality.

Methods of Research

Research development according to Borg and Gall (1983) is a process used to develop and validate a method of educational research. R & D, initial stage is to conduct a preliminary study (preliminary research). This study aims to collect information whether it be a problem and the potential that could be developed in the research. The information is then collected and analyzed by the researchers as a material consideration in the development of a model that is expected to solve the problems encountered. In this preliminary study required a separate research methods. The method used for the study depends on the issues and objectives to be achieved.

The purpose of Design and Development Research is to develop new or improved interventions or strategies to achieve well-specified learning goals or objectives, including making refinements on the basis of small-scale testing. Typically this research involves four components: (1) Development of a solution (for example, an instructional approach; design and learning objects, such as museum exhibits or media; or education policy) based on a well-specified theory of action appropriate to a well-defined end user; (2) Creation of measures to assess the implementation of the solution(s); (3) Collection of data on the feasibility of implementing the solution(s) in typical delivery settings by intended users; and (4) Conducting a pilot study to examine the promise of generating the intended outcomes. In some cases, funders will expect all four stages to be completed within a single project; in other cases, Design and Development Projects may entail sequential projects.

Result of the study was part of research and development, the preliminary study phase and the development phase. The stage of preliminary study conducted by the engineering survey using a questionnaire distributed to 37 teachers from 20 kindergartens in the city of Makassar. While the development stage include limited testing conducted in kindergarten Lotus Makassar City, as well as more extensive testing conducted at TK Pertiwi kindergarten, TK Rahmah and TK Minasa Upa in Makassar city.

Results and Discussion

Results of research related to the objective conditions of the applicable environmental education today shows that in general, teachers know of Environmental Education, as well as looking at environmental education can shape a child become a person who has concern for the environment. In general, the teacher looked Environment Education is very important and consider

any learning model can be used for learning Environment Education. Related to the learning situation that is expected to increase environmental awareness in children, in general, teachers expect any direct involvement with the neighborhood children. Related to the obstacles encountered in the learning environment Education Life, in general, the absence of teachers said learning model that can be used as a reference by teachers, is a major obstacle.

Results of the research related to curriculum development, in general, teachers have a reference in developing a learning device. In general, teachers use Regulation of the Minister of National Education of the Republic of Indonesia No. 58 of 2009 on Early Childhood Education Standards as a reference in determining the theme of learning, strategy, media and learning assessment conducted in Environment Education. Related development planning, all teachers develop planning a semester, weekly and daily. They consider learning plan is very important and intends to develop tools for curriculum development in the form of the semester program, weekly and daily for the sake of Life Education learning environment.

Results of research related to the implementation of environmental education learning, in general, the guidelines are used as a reference in formulating objectives and developing learning materials is a basic competence, competence standards and indicators of learning outcomes contained in the curriculum. However, in general, the teachers develop a theme that fits the needs and interests of children. Associated with the response of the students, in general, the teacher stated that active children answer and ask questions. Class organizations are most often chosen is classical. The method most often chosen is a question and answer session, chat and assignments. Learning resources that are most frequently used is the utilization of the environment and story

books, picture series as well as tools manipulative game. In general, teachers report students' progress as much as one times on semester, the technique used in the report is written and spoken. In general, teachers are ready to accept new innovations related to environmental education learning model.

Results of research on the development stage which limited testing indicates that the application of learning models of environmental education by using models Contextual Teaching Learning (CTL) that is focused on the process of inquiry to help improve the knowledge, attitudes and skills of children of kindergarten associated with knowledge about the environment also on a wider pilot phase carried out in a number of kindergartens show that an increase in knowledge, attitude and skills of kindergarten children after the implementation of environmental education learning model by using the model of Contextual Teaching Learning (CTL).

Based on the presentation of research results, it appears that the Education Environment has been known even applied at each school, only teachers face obstacles because of the lack of learning model that can be used as a reference. The teacher did not use the local curriculum on environmental education as a reference support. So that the learning outcomes of children was not associated with Environmental Education directly. Strategies related to the selection and organization of the classroom, the teacher seems to still feel comfortable using a strategy that is teacher-oriented, with organization students in classical form. It is certainly less relevant to the characteristics and needs of the child as well as perceptions of how children learn.

As expressed by (Masitoh: 2003) that children construct their own knowledge because they have so many ideas that never actually taught to them. In line with this Coughlin (2000) revealed that the

constructivists believe that learning occurs when the child tried to understand the world around them. Learning is an interactive process that involves friends, adults and the environment. In the constructivist view of children seen as active learners, who built his own understanding.

Associated with the selection of learning resources, in general, the teacher chose the environment as a learning resource. It is appropriate, given the surrounding environment is rich and able to deliver meaningful learning experiences, especially if associated with Environmental Education. As expressed by Sutrisno et al (2005) that the introduction of the natural surroundings through environmental education to children from an early age for children is the first step in respecting the environment. Sutrisno (2005) revealed that concern for the environment can be cultivated in children from an early age. The best way to bring the results relatively quickly and satisfactorily is to consciously raise our children to love the environment.

In another section, Sutrisno (2005) states that through direct interaction with the surrounding natural environment will arise will arise in children a new appreciation of ecological relevance. Horizon appreciation of ecological relevance will be more profound and widespread when supported by educational praxis planned and sustainable environment.

The application of these four principles in everyday life need the support of adults around the child who will be the facilitator for the child in an effort to understand and love the environment. The success of environmental education for early childhood should be implemented through an integrated learning process, the element of the example of the teacher as well as an opportunity for children to take action related to environmental education.

According Murtono (2007) Methods Contextual Teaching And Learning (CTL) is learning where the teacher brings the real world into the classroom and encourage students relationship between the knowledge possessed by its application in everyday life, while students acquire the knowledge and skills of context unconfined little by little and in the process of constructing itself as a provision to problem solve life as members of society. Based on the above it can be concluded Contextual Teaching And Learning (CTL) is a learning method that is holistic and aims to help students to understand the teaching materials to relate to the context of their day-to-day (personal context, social and cultural), so students have the knowledge / skills that are dynamic and flexible to actively construct their own understanding.

In Basic Skills as a Foundation for Student Success in the California Community Colleges, Contextualized Teaching and Learning (CTL) is identified as a promising strategy that actively engages students and promotes improved learning and skills development. CTL has been defined in different ways, based on the intent of the group championing its use. Most recently, the United States Department of Education Office of Vocational and Adult Education (2001) characterized CTL as a “conception of teaching and learning that helps teachers relate subject matter content to real world situations” (Berns & Erickson, 2001, p. 2). Chris Mazzeo (2008) broadened the definition, describing CTL as a “diverse family of instructional strategies designed to more seamlessly link the learning of foundational skills.

Conclusion And Recommendation

Environmental education has a very important role in addressing the environmental problems that arise today. Environmental education is expected to develop early instilled a positive attitude towards environmental sustainability

research results at the stage of preliminary studies indicate that the Environmental Education held in kindergarten is still not optimal. Teachers are still stuck on learning activities that are teacher-center. Children's participation is still limited. While environmental education will be more meaningful if carried out with a more contextual approach is real and concrete, according to the characteristics of early childhood. Besides local curriculum on Environmental Education has not been a reference for teachers in learning implementation. At the implementation level, there are still many obstacles including the lack of environmental education learning model that can be a reference for teachers in implementing the learning environment better education. The preliminary study results become input for the development of Environmental Education learning model that can be a reference for teachers.

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INOVATION OF SCIENCE ENTREPRENEURSHIP LEARNING THROUGH AUTHENTIC LEARNING MODEL BASED ON COMPETENCY AND CONSERVATION

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ABSTRACT

Semarang State University (Unnes) is a conservation university that has a strong determination in achieving a healthy university, competent and prospers. It was stated clearly in the vision and mission and strategic plan of Unnes 2020 forward. To support and realize the Conservation of Unnes not only the fulfillment of infrastructure strategy or infra structure but also the preparation of the mental attitude of the entire academic community, including students with quality learning, character, entrepreneurship development and conservation vision. The aims of this study are to develop authentic learning model based on competency and conservation to increase student interest and entrepreneurial attitude. Research and Development (R and D) Method was applied to reach the aims of the research. Based on analysis of the data indicates that authentic learning model based on competency and conservation effectively increase the academic activities, interest and an entrepreneurial attitude of the student, because the thoroughness of achievement and learning activities of students in the experimental class > 75%. Interest in entrepreneurship of the students reached 94%, and an entrepreneurial attitude of students reached 88%. Based on these results can be conclude that authentic learning model based on competency and conservation effectively applied in science entrepreneurship learning and succesful to increase student interest and an entrepreneurial attitude.

Keywords - authentic learning, competency and conservation, interest and attitude of entrepreneurship

Introduction

Unnes (Semarang State University) as a conservation university has a strong determination in creating and managing renewable energy. It was stated clearly in the vision and mission and strategic plan Unnes 2020 forward. To support and realize the Conservation Unnes not only the fulfillment of infrastructure strategy or infra structure but also the preparation of the mental attitude of the entire academic community, including students with quality learning and character. Lickona (2004) states that the formation of character and academic ability in the learning process can be done if a teacher / lecturer is able to select and use appropriate learning models.

The use of the learning model as a means of character education seems to be more effective and tend to approach the concept of character education really is. Through a

problem-solving model, for example, a lot of the value of the character to be built, for example, honesty, hard work, discipline, curiosity, creativity, and several others. Similarly, through the constructivist model, the students will be built up value of character for example the character concerned about the environment, religious, recognize excellence, independent, and democratic. Similarly, through some other learning models (Abidin, 2012). Authentic learning (authentic learning) is a learning approach that allows students to explore, discuss, and build significantly concepts and relationships, which involves real issues and projects that are relevant to the student (Donovan, Bransford & Pallegirino, 1999). Authentic Learning Model potentially developed in science teaching and adapted to the existing lecture material, making projects, and learning outside the classroom to discuss solutions to environmental problems related to the

conservation with the aim of getting used to behave energy saving and harnessing renewable energy sources.

Previous research on the theme of conservation is on the development of learning modules integrated conservation science subjects to cultivate students who love the natural character (Sudarmin and Widiyatmoko, 2012). Expected with the theme of conservation can combine several subjects from the fields of physics, chemistry and biology which can shorten the time in the learning process. Referring to the results of research Taufiq, et. al (2014⁽¹⁾), that there is a significant relationship between the quality of science teaching and learning outcomes with attitude (character) environmentally conscious students. Lecturer or teacher can improve the quality of learning such as by learning innovation through the development of the model. This research will develop authentic learning model based on competency and conservation, which is adapted to the lecture material, create projects, and learning outside the classroom to discuss solutions to environmental problems related to the conservation with the aim to cultivate interest and attitude on entrepreneurship of college student.

Theoretical Review

Innovative learning is learning that applying the learning model and unique creative liveliness that tend to involve students in the learning process. Innovative learning created by paying particular attention to the characteristics of the student, the student environmental conditions and infrastructure are available, making it more challenging and exciting students to learn independently, and facilitate the achievement of the desired learning objectives. In general, learning approaches can be grouped into two expository and inquiry approach. Expository approach is learning that is centered on the lecturer. In this approach, students tend to act as an object of study, while the lecturer

acting as an "agent" of knowledge that will be transferred to the students. Interactions that occur tend to be one-way and can be up to two-way. The learning method that is widely used is lectures, with possible variations debriefing. Inquiry approach that is also called discovery approach is a learning approach that is centered on students. In this approach, students tend to be actively involved as a subject of study, while the faculty to act more as a facilitator and at times can act as mediators (mediators and aligning). Interactions that occur tend to be multi interactions. Learning methods are used, among others, problem solving, discussion, question and answer, assignments, field studies, simulations, and demonstrations.

According to Taufiq, et. al (2014⁽²⁾), Application of active learning models can support the internationalization of the curriculum readiness for supporting the readiness of learning and active learning models enhances the activity of the learning process so that student achievement can be increased and students are also getting active learning environment. With active learning through participation in each learning activity, will be trained and formed competence is the ability of students to do things that are positive that will eventually form a life skill as a provision live of his or her life. In order for the above to happen, professors should know how students learn and master various ways to educate learners. In other words, teachers/ professors need to know the different models of learning that discusses how students learn, and master a variety of learning models that discuss how to educate learners with different variations, so avoid the boredom and create a learning environment that is comfortable and fun , This is in line with research conducted by Taufiq, et. al (2014⁽¹⁾), that pleasure pupil / student in learning to use the media to follow a positive impact on student curiosity, so the learning activity increased notably reasoning that the independence of the students is also increasing. Contextual

learning is a learning environment that emphasizes life and experiences of students in the learning process, so that learning becomes more alive and more meaningful learning activities increased particularly reasoning that the independence of students also increased (Nurhadi, et al., 2004). Principles of contextual learning are expected to emphasize the following points:

1. Problem-based learning
Learning should always be rooted in real problems as a context for students to think critically and find solutions strategy, in order to obtain a knowlege/ new concept.
2. Teaching authentic (authentic construction).
Learning should provide opportunities for students to learn the context of a meaningful life for him.
3. Inquiry-base learning
Learning must use strategy and methodology of science meaningful and capable of weeks to train students to think critically, and were able to find and solve problems.
4. Project-base learning
Learning should be able to design an environment so that students can conduct investigations / research on the object of study, and be able to carry out meaningful tasks.
5. The work-based learning
Learning should allow students to use the context of the workplace to learn certain material, so that the material can be reused in the workplace.
6. Service learning
Learning should emphasize the relationship between experience services-services that are practical and academic learning.
7. Cooperative Learning
Learning requires the use of a small group to work together to maximize student learning conditions.

Authentic learning is a learning approach that allows students to explore, discuss, and

build significantly concepts and relationships, which involves real issues and projects that are relevant to the student (Donovan, Bransford & Pallegirino, 1999). The principles of authentic learning are (1) student centered; (2) Students learn actively; (3) Using an authentic task.

The characteristics of authentic learning are (1) Learning centered on authentic tasks that arouse the curiosity of students. Authentic tasks such as solving real problems that are relevant to students' lives; (2) Students are involved in exploring and investigating; (3) Learning is interdisciplinary; (4) Learning is closely related to the world outside the walls of the classroom; (5) Students work on complex tasks that involve high-level thinking skills, such as analyzing, synthesizing, designing, process and evaluate information; (6) Students produce a product that can be distributed to an audience beyond the classroom; (7) Learning is active and is driven by the students themselves, while teachers, parents, and the speakers are helping or directing; (8) Teachers implement the provision of the strut (scaffolding), which provide the necessary assistance and let the students work independently when they can do it themselves; (9) Students have the opportunity to engage in public discourse; (10) Students work with many sources; 11. Students often work together and have ample opportunity for discussion in order to solve the problem.

In 2011, based on the Regulation of the Minister of National Education Republic of Indonesia Number 8 of 2011 on the Statute of the State University of Semarang, the vision of the University of Conservation increasingly Unnes as Resolute. Since then Unnes has a vision of "becoming a university of international conservation, healthy, superior, and prosperous 2020". Unnes campus-based governance is realized through the conservation of 7 (seven) main

pillars of conservation University. Seven main pillars of the University of Conservation include:

1. Conservation of biological diversity.
2. Green architecture and internal transport systems.
3. Waste management.
4. Policy paperless.
5. Clean energy.
6. Conservation, ethics, art, and culture.
7. Conservation Agent.

Conservation vision for the purpose of conservation as a way of looking at basing on seven main pillars of conservation in solving environmental problems and realize the goal. There are 11 conservation value character developed in Unnes, namely: religious, honest, intelligent, fair, responsibility, caring, tolerant, democratic, patriotism, tough, and well mannered.

Relevant research studies include Borthwick, et al (2007) declare that as the university is moving towards a more vocationally oriented programs, students hoping pedagogical practices that create a closer relationship with potential pedagogical approaches Workplaces. Authentic learning is suitable for this purpose because the proposed model of apprenticeship-type and model that brings simulated work tasks in the classroom. Rule (2006) asserted that the four themes that support authentic learning, which are identified through analysis of the contents of forty-five articles describing authentic learning in different disciplines: 1) activity involves real-world problems that mimics professional work in the discipline with the presentation of findings to an audience beyond the classroom; 2) open the investigation, thinking skills, and metacognition handled; 3) students engage in discourse and social learning in a community of learners; and 4) students are empowered through choice to direct their

own learning in the work of the relevant project.

Research Methods

The research applied Research and Development (R and D) methods, which is directed to develop Authentic Learning Model based on competency and conservation. The subjects of the research are students majoring in Integrated Science Faculty UNNES 4th semester of the school year 2014/2015. The steps of research and development (Adapted from Sugiyono, 2009) are:

1. Identification of Potential and Problems
2. Data Collection
3. Design Model
4. Design Validation
5. Revised Design
6. Test Model
7. Revised Model
8. Field Trial
9. Completion of Final Products

Limited scale trials test using one-shot case study design, samples are first class. While large-scale trials using the design of the control group pre-test to post-test samples are 2 classes, experimental and control classes. The main focus of this research is to increase student interest and an entrepreneurial attitude. Data collection techniques used is documentation, assessment of student achievement, student activity assessment, assessment of students' interests and entrepreneurial attitudes. Analysis of data on research and development include: Qualitative analysis of a competency-based learning model and the conservation and study of entrepreneurial practice authentic tasks.

Results and Discussion

Student entrepreneurial interest calculation results indicate there is differences in the percentage of interest in entrepreneurship between experimental and control classes. Results can be seen in table 1. Differences

between the experimental class of entrepreneurial interest and control strengthened by comparisons between the study samples. Comparative test results showed no differences between the experimental class entrepreneurial interest, but there are significant differences between the experimental and control classes. The calculation and analysis show that authentic learning model based on competency and conservation can increase student interest in entrepreneurship.

Table 1. Student entrepreneurial interest

Class	Criteria			
	<i>Very high</i>	<i>Hight</i>	<i>Enough</i>	<i>Lower</i>
Exp.	18%	70%	12%	-
Con.	-	22%	72%	6%

Increased interest in entrepreneurship on student self-learning due to be implemented to encourage students to understand more in matters relating to entrepreneurship through the delivery of teaching materials and practices directly. This is in line with the opinion of Atmono (2008) which states entrepreneurial education that emphasizes the direct practice have a major contribution to the success of students' increased interest in entrepreneurship. In addition to practical activities undertaken, other factors that can foster student interest in entrepreneurship is the personal encouragement of the students themselves (Purwaningsih & Ninggarwati, 2006). The increasment of student interest in entrepreneurship from within the students themselves after a learning experience that will impress them for their entrepreneurial activity. The calculation of student entrepreneurial attitude observations indicates that there are differences in entrepreneurial attitudes between the experimental and control classes. Results can be seen in Table 2. Based on these results it can be shown that learning to use a competency-based learning model authentic and conservation can improve the entrepreneurial attitude in students.

Table 2. The entrepreneurial attitude differences between the experimental and control classes

Class	Criteria	
	<i>Good</i>	<i>Enought</i>
Exp.	94%	6%
Con.	-	100%

Increased entrepreneurial attitude on students is influenced by the quality of programs and educational planning (Muhadi and Saptono, 2005). Improving the quality of educational programs can be done by improving the quality of learning in schools, in this case the selection and planning learning activities undertaken by the students. Entrepreneurial attitudes of students are growing because of the learning activities undertaken to stimulate the students to behave positively. According to Bayu (2009) positive attitude of students, allow students to express the values it stands for. In other words, each student will attempt to translate the values he believed in a context more real attitude.

Based on all the autehentic learning model based on competency and conservation are considered effective applied in science entrepreneurship lecture. In addition this model can also increase interest and entrepreneurial attitudes of students because of all the activities and learning tools that others are prepared to allow students to work directly in entrepreneurial activity based on science and conservation vision through authentic task completion, also a student can understand and love things related to entrepreneurship. These results underlie the feasibility of authentic learning model based on competency and conservation to be used in the actual learning activities in the field.

Conclusions and Recommendations

Based on analysis of the data indicates that authentic learning model based on competency and conservation effectively

increase the academic activities, interest and an entrepreneurial attitude of the student, because the thoroughness of achievement and learning activities of students in the experimental class > 75%. Interest in entrepreneurship of the students reached 94%, and an entrepreneurial attitude of students reached 88%. Based on these results can be conclude that authentic learning model based on competency and conservation effectively applied in science entrepreneurship learning and succesful to increase student interest and an entrepreneurial attitude.

Autentic learning model based on competency and conservation are considered effective applied in science entrepreneurship lecture. In addition this model can also increase interest and entrepreneurial attitudes of students because of all the activities and learning tools that others are prepared to allow students to work directly in entrepreneurial activity based on science and conservation vision through authentic task completion, also a student can understand and love things related to entrepreneurship. Authentic learning model based on competency and conservation recommended to be used in the actual learning activities in the field.

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IMPLEMENTATION OF CRITICAL REVIEW IN SCIENCE CURRICULUM STUDY COURSE TO DEVELOP “INTELLIGENT AND STRONG” CONSERVATION CHARACTER IN DEALING WITH CURRICULA DUALISM IN INDONESIA

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ABSTRACT

The purpose of this study is 1) to determine whether the implementation of the critical review in the study of science curriculum course can develop the conservation character of prospective science teachers in facing curriculum dualism in Indonesia, 2) to determine the response to the application of students' critical review of learning. The approach used in this study was quantitative approach. This research was quasi-experimental. The design was pretest-posttest design experiment. Subjects in this study were second semester students of Department of Integrated Science Faculty of Mathematics and Natural Sciences Semarang State University who took Science Curriculum Study course. The study was conducted at Department of Integrated Science Faculty of Mathematics and Natural Sciences Semarang State University to students. The study was conducted in the Academic Year 2014/2015. Data collection was done by using test, observation and questionnaire. The questionnaire was used to assess the character of smart and strong, and the implementation of students' interest in learning activity. Therefore the research found that smart and strong of students' character began to develop and entrenched, and 87.5% of students were interested in the application of critical review.

Keywords – critical review, conservation character, curriculum dualism

Introduction

Based on the circular letter of Minister of Education and Culture number 179 342 / MPK / KR / 2014 showed the fact that in the second semester of 2014/2015 Indonesia education experienced curriculum dualism. Curricula dualism means Indonesia used two different curricula, they are 2013 and KTSP curriculum. This situation is considered to be irrelevant with the mandate of 1945 Constitution which states on equal justice for the people of Indonesia in the world of education.

According to Alawiyah (2015) Ministry of Primary, Secondary Education and Culture decided to stop Curriculum 2013 (K13) because of many obstacles to be faced in the field, mainly it is related to the low competence of teachers and book references distribution barriers. Referring to Law No. 14/2005 on Teachers and Lecturers, this fact seems very sad in the world of education

because to be a good teachers, they should have four basic skills that are needed in support of the implementation of the curriculum, every teacher should have that competency of pedagogic, personal, professional and social. However, by looking at the number of complaints of teachers in preparing for the implementation of Curriculum 2013 it showed that teacher education has not been able to produce teachers with those competencies (Alawiyah, 2014).

Study Program of Science Education as the place to train qualified prospective teachers should prepare students to master the four basic competencies. One of them is through Science Curriculum Study course. In this course, students should master science curriculum development from time to time, strengths and weaknesses of each science curriculum, characteristics of science education curriculum for junior high school / vocational school, and science curriculum

analysis from several countries. Based on this description the students are expected to master the content of existing curricula in Indonesia and some other countries, in addition to the various developments in the curriculum, students are expected to master, adapt and use the curriculum that is used in the country where they teach.

Efforts made by the lecturer to address student confusion when facing different conditions of the school curriculum is a way to give some preparatory steps. One of them is by using a critical review of the study. Critical review is the task of writing to summarize and evaluate a discourse. It can be the review of book, chapter, or journal article. In writing a critical review, students should read carefully and also read other similar posts to give comprehensive, objective and factual review and evaluation, (Mort, Hallion and Downey, 2005).

The problems of this study whether the implementation of the critical review on the Science Curriculum Study course can develop the conservation character of science prospective teachers to face curricula dualism in Indonesia? and what is the response of the application of critical review in student learning activity?

The purpose of this study is 1) to determine whether the implementation of the critical review in Science Curriculum Study course can develop intelligent and strong character of the conservation of science prospective teachers to face curricula dualism in Indonesia, 2) determine the response of the application of critical review in student learning activity.

The benefits of this research are to add variety and learning methods as an effort to develop the conservation character science of prospective science teachers to face curricula dualism in Indonesia.

Theoretical Review

Khusniati (2014) mentioned that the critical review can be proven giving impact on students' ability in learning science as well as Parmin (2014) said that application of critical review or critical assessment of scientific articles can improve students' ability to develop a research proposal. According to the document the University of Saskatchewan (2011) it is written that critical review of academic exercise helps improving the basic skills of researching, being familiar with the evaluation process on the social research and building critical thinking skills. By improving critical thinking skill, students are expected to develop intelligent and strong as character of conservation. Thus, science education students as prospective science teacher are expected to be able to adapt in the changes of curriculum. So, they will be ready to apply the curriculum that is used in schools where they teach for example KTSP or 2013 curriculum, and the national curriculum in Indonesia in case there will be some changes.

The values of noble character that has been developed can be developed further to some characters of religious values, honest, caring, tolerant, democratic, polite, intelligent, and strong. Those are derived from the main values of Semarang State University, consisting of healthy, excellent, and prosperous. Religious, honest, tolerant, democratic, and polite values are derived from healthy values. Smart and strong are derived from excellent value. Therefore caring is a reflection of prosperous value. Those eight characters should be developed comprehensively and integrally not partially because those life values are supporting each other (Handoyo and Tijan, 2010)

Research Methods

The approach used in this study was quantitative approach. According to Sugiyono (2007: 13), research data on a quantitative approach are in the form of figure and analysis using statistics. Referring

to the research objectives, this research was a quasi-experimental. The study design used pretest-posttest design experiment.

The steps of research can be seen in Figure 1.

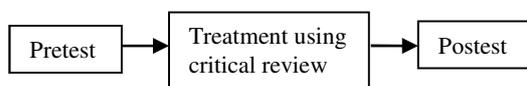


Figure 1. Steps of Research Experiment

Subjects in this study were second semester students of Department of Integrated Science Faculty of Mathematics and Natural Sciences Semarang State University who took Science Curriculum Study course. The study was conducted at Department of Integrated Science Faculty of Mathematics and Natural Sciences Semarang State University to students. The study was conducted in the Academic Year 2014/2015.

Data collection was done by using test, observation and questionnaire. The questionnaire was used to assess the character of smart and strong, and the implementation of students' interest in learning activity. Observation assessment sheet was used to collect critical review of the curriculum.

As stated by Sugiyono (2007: 207), data analysis is classifying data based on activity variables and types of respondents, tabulating the data based on the variables and the type of respondent, presenting data for each variable studied, and performing hypothesis test. The data in this study obtained data from direct observation to reveal the increasing students' understanding.

Questionnaire for students was used to find out the character of intelligent and strong and students' interest in the application of critical review. It was analyzed by using the following formula:

$$P = n / N \times 100\%$$

Description :

P = Percentage of intelligent/strong character

n = number of scores obtained

N = Total maximum score

Table 1. Categories Character smart / strong

Interval scores%	Criteria
81,25 < skor ≤ 100,00	MK (entrenched)
62.50 < skor ≤ 81,25	MB (Start to Develop)
43.75 < skor ≤ 62,50	MT (Start to Appear)
25.00 < skor ≤ 43,75	BT (Not Visible)

This study is successful if 1) Students character smart and strong reach criteria of MB (Start to Develop) 2) 75% of the students are interested in the implementation of critical review on Science Curriculum Study course to develop critical thinking skills based on character of conservation to face curricula dualism in Indonesia.

Results and Discussion

This study was conducted to determine the role of critical review on the implementation of Science Curriculum Study course to develop the conservation character science of prospective science teachers to face curricula dualism in Indonesia. In addition, it also analyzed the students' responses related to implementation of critical review.

The results of the data analysis are explained respectively as: 1) intelligent and strong characters of students, 2) students' responses related to implementation of critical review.

1. Conservation character in Implementation of Critical Review towards KTSP and C13.

Conservation character examined in this study is intelligent and strong character. Intelligent character assessment is obtained from the results of the questionnaire and described in Figure 2:

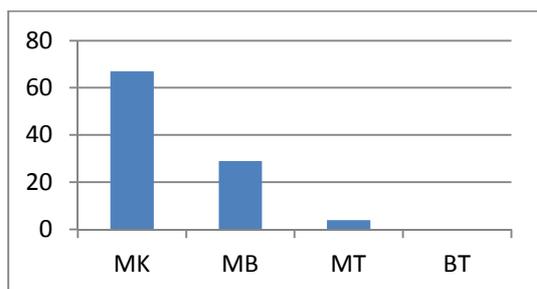


Figure 2. Students' Intelligent Character Profile

Based on Figure 3, 67% of students begin to be entrenched intelligent character, 29% start to develop and 4% start to appear. Intelligent character has the characteristics of (1) thinking logically consistent with the concept of science; (2) finding the truth logically and methodologically; (3) solving problems accurately based on empirical data; (4) being creative in developing a model or new ways; (5) finding a rapid solution based on logical thinking (Handoyo and Tijan, 2010).

Assessment strong character is determined from the results of the questionnaire and described in Figure 3:

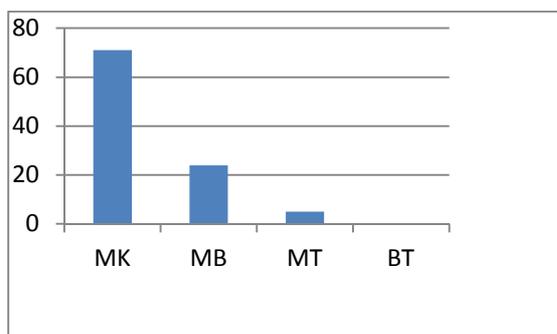


Figure 3. Students' Strong Character Profile

Based on Figure 4, 71% of students begin to be entrenched strong characters, 24% start to develop and 5% start to appear. Strong character is the attitude and behavior of people who take courage to face of problems, challenges, and development of a dynamic life with all of the risks. Strong characters have the characteristics of:

a. being strong in facing the problems;

- b. being eager to achieve optimal work results;
- c. not easily being provoked by inaccurate issues;
- d. being able to work under pressure;
- e. believing in themselves;
- f. conquering the challenges (Handoyo and Tijan, 2010).

2. Students' responses related to implementation of critical review

Based on the questionnaire distributed to students, data showed that 87.5% of students enjoy the application of critical review. According to them, this learning activity is different from other activities. In addition, the application of critical review to make them understand what the observation results of curriculum presented in class.

From the explanation that has been elaborated, it showed that the application of critical reviews can improve students' critical thinking skills. Students are also expected to master a variety of changes to the existing curriculum in Indonesia and other countries. In addition, parallel with intelligent and strong characters that start to develop, students are expected to master, adapt and use a curriculum that is used in the country where they teach.

Conclusions and Recommendations

Intelligent and strong characters of students start to develop and to be entrenched during learning process by using critical review, and 87.5% of the students are interested in the application of critical review.

Suggestion for Application of critical review could be used in some different subjects to find out how it affects the character of students in other courses.

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IMPROVEMENT OF STUDENTS COMPETENCE-BASED ON CONSERVATION IN ELEARNING COURSES USING PROJECT-BASED LEARNING METHOD

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ABSTRACT

The world of education has entered a new phase, where there has been a change in the direction of the learning process to capitalize on Information and Communication Technology (ICT) as a jib. ICT is a technological device that provides the facility to users with a wide range of ease in accessing the information needed. Thus ICT giving birth e-learning that support the learning process. E-learning is done by optimizing the use of information systems, which is in line with the direction of learning Unnes conservation, ie paperless policy pillar (Rector, 2012). In addition, it can also strengthen the understanding, appreciation, and conservation-based measures to students as the embodiment of the regeneration of conservation. Project Based Learning method is considered appropriate as an effort to increase the creativity of students and the quality of learning and teaching e-learning. The results showed: (1) Creativity of students, especially in e-learning, (2) Increased understanding of the concept or the student's knowledge in more depth about e-learning, (3) Increased cooperation among students in completing the task group.

Keywords – e-Learning, Paperless, Project Based Learning

Introduction

ICT is a set of technologies that provide the facility to users with a broad range of ease in accessing the information needed. Neither the information presented in the form of voice, text, image, or in any other form. Based on the function of ICT in learning, the ICT has two primary functions: 1) ICT as a learning medium and 2) ICT as a teaching and learning resource (Prawiradilaga, Ariani, & Handoko, 2013). It favored the emergence of e-learning.

E-learning is done by optimizing the use of information systems, which is in line with the direction of learning Unnes conservation, i.e., paperless policy pillars (Rector, 2012). Also, it can also strengthen the understanding, appreciation, and conservation-based measures to students as the embodiment of the regeneration of conservation.

In this e-learning, students are given the breadth to gain experience and

understanding of the information gleaned from discoveries or experiments they made. It is expected to add to the power of creativity (soft skills) students.

Anggoro (2013) has conducted research on improving the soft skills with project-based learning. Through project-based learning, learners will be together in one team, so it will find the skills to plan, organize, negotiate and create a consensus on that will be done, who is responsible for each task, and how the information will be collected and presented scientifically. Project-based learning model created with the principles of construction of learning could be expected to foster the values that will be built in soft skills such as problem solving, creativity, innovation, teamwork, communication and presentation skills.

Theoretical Review

According to Derek Stockley (in Prawiradilaga, Ariani, & Handoko, 2013) e-learning is the delivery of learning

programs, training, or education using electronic means such as computers or other electronic devices such as mobile phones with a variety of ways to provide training, education, or material teaching. According to Effendi and Zuang (2005) e-learning terminology itself can refer to all the training using electronic media or information technology. In line with Effendi and Zuang, Garrison (2011) states that e-learning is an open system. With the power of the internet, learning activities are faced with an unexpected amount of information. Clark and Mayer in Prawiradilaga, Ariani, & Handoko (2013) has defined e-learning as an education delivered using a computer via a CD-ROM, the Internet or intranet.

Bell and Federman (2013) conducted research on e-learning in postsecondary education. Based on the review of the study, they concluded that e-learning can be an effective way to provide postsecondary education. They also urged the researchers to examine how different aspects affect the effectiveness of this program and to overcome various obstacles adoption of online instruction in higher education.

Kidney et al. (2007) conducted a study on the quality of e-learning. They find ways to ensure the quality of e-learning is an important endeavor. Their research identified eight strategies for quality WARRANTIES used at the University of Houston-Clear Lake. The strategy is to review eight of instructional design, web development, editing, usability and accessibility, sustainability, copyright, infrastructure impact, and the content and rigor.

As well as distance education, e-learning has the characteristics of a more or less the same, namely the institution of an organizer, a system clear management, material / substance being studied and those who study it, strategy or learning process in place, the technology selected communication and is used, the system support services and the

rules (ethics) imposed (Prawiradilaga, Ariani, & Handoko, 2013).

E-learning itself is divided into 2 (two), namely (Effendi & Zuang, 2005): 1) Synchronous Training, is a type of training in which the learning process takes place at the same time when teachers are teaching, and students are learning. E-learning type is more widely used in seminars and conferences with participants from several countries. Such use is often called a web conference; 2) Asynchronous Training, training lessons in the form of a package that can be run on any computer, and do not involve interaction with teachers or other students. Therefore, students can start classes and complete it at any time. Package shaped reading lessons with animations, educational games, as well as exercises or tests with answers.

E-learning can be quickly accepted and adopted, because e-learning has several advantages, among others: 1) Reduce training costs; 2) Has the flexibility of time in the learning process; 3) Has the flexibility of the place, because e-learning can be accessed from anywhere over the network connected to the internet or intranet; 4) Has the flexibility of speed learning, e-learning can be tailored to the student's pace; 5) Has the standardization of teaching.

Various efforts in growing competence of learners in the education process continue to try, ranging from education-based training to increase the values of creative students. One approach is through Project-Based Learning

Anggoro (2013) has conducted innovative research-oriented learning soft skills by using Project-Based Learning. The author states that through project-based learning, learners will work together, then find the skills to plan, organize, negotiate and divide the tasks to be done. Project-based learning model that is constructed from the principles of constructivist learning could be expected to foster the values that will be built in soft

skills such as problem solving, creativity, innovation, teamwork, communication and presentation skills.

Boondee, Kidrakarn, and Sa-Ngiamvibool (2011) has conducted research learning model using the approach of Project-Based Learning (PBL) on the web to promote cooperative learning engineering students. Learning and teaching model is designed based on the principles of PBL using the internet as a tool for learning management, motivation, and cooperative learning activities. Impact, learning model designed to improve learning and teaching methods can improve the real participation of students in the learning process. The students will be assigned to work together to create a project on the web and put the projects completed on the web in real practice in the classroom. This model helps improve student cooperative learning useful to every day and work life after graduation.

Research Methods

The research design used in this study is one group pretest-posttest by Figure 1. In this design, the observation was done two times, i.e., before the experiment called pretest (O_1) and after the test called the posttest (O_2).



Figur 1. One Group Pretest-Posttest

The stages of the procedure adopted in this study are as follows: 1) pretest, students were given a test to determine the ability of pupils to the control of e-learning before the enforced treatment. 2) Treatment, after the students were given a pretest, then given treatment or treatment that students can apply methods of learning. Treatment is given providing an e-learning project of making pursuant to the theory study in the can. 3) posttest, the final process of the experiment aims to measure the extent to which the student's ability to learn the

results of e-learning through projects that have been awarded.

Results and Discussion

At the beginning of the lecture conducted preliminary tests to 30 students who are taking e-learning courses. Study results as presented in Table 1.

Table 1. Pretest Score

Score	Pretest	
	Frequensi	Prosentase
A	2	6,67 %
AB	2	6,67 %
B	5	16,67 %
BC	1	3,33 %
C	6	20,00 %
CD	2	6,67 %
D	5	16,67 %
E	7	23,33 %

Based on Table 1 it can be seen that the frequency value is E, which amounted to 23.33%, C 20%, then D as much as 16.67%, and the CD as much as 6.67%. The data shows that 66.67% of the students do not understand e-learning lectures. These conditions will least affect the study process in taking the next lecture. While students who are considered able to understand e-learning lectures by 33.33%.

Efforts improve the quality of e-learning lecture conducted with the aid of project-based learning approach. Initial preparations are 1) make a planned lecture, 2) prepare the lecture materials, 3) arrange the tasks that need to be accomplished student, 4) develop an evaluation instrument.

Implementation of the action which lasted for nine weeks (9 x 150 minutes) performed learning using project-based learning approach. Activities performed at week 1 is a learning contract and pre-test, and week 2 to week 9 discusses the theoretical material on e-learning and e-learning development.

After the action carried out for nine weeks and then be evaluated to see success and mastery of the lecture material. It is through the provision of testing and observation to the students. Based on the results of the tests and observations can be said to have increased as in Table 2.

Table 2. Posttest Score

Score	Post test	
	Frequensi	Prosentase
A	10	33.33 %
AB	7	23.33 %
B	8	26.67 %
BC	3	10.00 %
C	1	3.33 %
CD	1	3.33 %
D	0	0
E	0	0

From Table 2 it appears the significant changes in value, the original value of A only 6.67% to 33.33%, the value of AB from 6.67% to 23.33%, then the value of B 16.67% to 26.67%, and the value of BC from 3.33% to 10.00%. So that overall as much as 93.33% of the students are considered able to control the course of e-learning.

Besides, the results of the project also increase the performance better. Students showed enthusiasm and seriousness in work and presenting the project, and students appear to be active in the discussions. That is in line with research that has been done by Baran and Maskan (2011), that the results showed a significant difference. Results of observations and interviews, the students are taught by project-based learning approach shows that for project-based learning activities, they are more active and have more fun time. Its means that both project-based learning to be an alternative in efforts to improve learning outcomes of e-learning courses.

Conclusions and Recommendations

Based on the analysis of the data showed that the implementation of project-based learning can improve student results in e-learning courses. The number of pupils who understand e-learning courses increased significantly from 33.33% to 93.33%.

Lecture using project-based learning approach can improve liveliness, sincerity and cooperation of students in the upper division courses.

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DEVELOPMENT OF TEACHING MATERIALS WITH SCIENTIFIC APPROACH TO IMPROVED STUDENTS' CRITICAL THINKING SKILL

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ABSTRACT

Learning is a system that aims to help students' learning process through a series of activities has been designed to support students' learning process. One supporter of the establishment of the learning process is to use appropriate teaching materials and in accordance with the applicable curriculum in schools. Education in Indonesia is now implementing the curriculum in 2013 which has a special characteristic that is using the scientific approach. A scientific approach to learning that is designed so that students are able to construct concepts through the stages-resistance: observe, ask, try, associate and communicate. Development of teaching materials using the scientific approach is expected to facilitate learning in school. The aim in this study was to determine the validity and effectiveness of teaching materials with a scientific approach to the critical thinking skills of students. This study is a modification of Sugiyono Research and Development. The results showed that using the teaching materials developed scientific approach is a valid and effective way to improve students' critical thinking skills. The average yield scores validation assessment by experts reached 72.31 which is valid with good criteria, improved critical thinking skills of students using the formula N-Gain by 0.73. Based on the results of the study concluded that the teaching material with a viable scientific approach and effective use of the students' critical thinking skills.

Keywords – Scientific Approach, Teaching Material, Critical Thinking

Introduction

The learning process in schools is affected by the development of a curriculum imposed by the government. The learning process in education in Indonesia has been implementing Curriculum 2013. The curriculum adopted by this government is the curriculum that uses a traditional scientific approach in the learning process.

Aragon (2007) revealed that the scientific approach is an orderly process of learning to acquire new knowledge and have a basic principle of inductive and deductive reasoning. So that the learning process by using a scientific approach learners will be able to explain and analyze causal relationships related phenomena in learning.

The learning process using a scientific approach is also expressed by Machin (2014) which revealed that the stages of

learning the scientific approach capable of delivering students to construct the concept of the learning material. In addition, in its application the scientific approach has several advantages it has, among others, is the ability of the intellect possessed by the student is able to be improved. One of the capabilities of the intellect is the ability to think critically. Critical thinking skills is an important foundation of the other three patterns of thinking that problem solving, creative thinking, and decision making (Costa, 1995).

Excellence where students have the ability to think critically mentioned by Hill (2013) which revealed that students who have the scientific capabilities such as high critical thinking skills that are better than students who have the ability to think critically low. So is the claim of the Burris (2006) that students who have the ability to think

critically high tend to have higher achievement than students who have the ability to think critically low.

The use of media in learning should be in accordance with the learning process that is used as the use of appropriate teaching materials should be in accordance with the approach used in the applicable curriculum at the school is a scientific approach to achieve learning objectives.

Based on observations in SMP Islam Roudlotus Saidiyah, obtained information that the school has been using the curriculum in 2013 with a scientific approach, but the implementation is still not optimal because it still uses the previous curriculum teaching material in the form of textbooks that do not use a scientific approach. Additionally in the learning process happens on the field not in accordance with the conditions expected. During the study carried out by the teacher usually transfer their knowledge through the definition and exercise. The learning process is done by providing material and questions to the students on the blackboard by the teacher, the students lack role in the learning process. It reflects the ability to think critically low student at the school.

Low student critical thinking skills is also evident from the learning process that the students do not dare argue or argued during the learning process takes place.

Based on observations and the issues mentioned above will require an innovative form of teaching materials developed using a scientific approach that can enhance students' critical thinking skills. The purpose of this study were: 1) test the validity of teaching materials using a scientific approach developed, 2) describe the critical thinking skills of students after using teaching materials using a scientific approach.

Research Methods

This type of research used in this research is the development, The subject of research is in junior high school students of class VII Islam Roudlhotus Saidiyah Lessons Semarang year 2014/2015 consisting of 32 students.

Products developed in this study is the impact of environmental pollution teaching materials with scientific-oriented approach to improve students' critical thinking skills. The steps in this development is a step-by-step research and development of modified Sugiyono (2011) which includes: (1) find the problem, (2) the design of the product, (3) design validation, (4) pilot scale is limited, (5) revision of product design, (6) large-scale trials, (7) product revision.

Retrieval techniques and data collection instruments used in this study is covering validation, test and observation techniques. Instrument collecting data on validation techniques are expert validation sheet, matter in the form of descriptions used for data retrieval students' critical thinking skills, while the questioner or the questionnaire used to retrieve data legibility teaching materials by students.

The research process in the development of teaching materials is also using experimental designs that pre-experimental design one group pretest posttest design for a class of small-scale trials, while for large-scale trials using quasi-experimental design that is Nonequivalent Control Group Design (Sugiyono, 2011).

The instrument descriptions about the critical thinking skills of students first conducted trials to determine the level of validity, reliability, level of difficulty and distinguishing matter. This is done to determine the feasibility of a description about the instruments used before it is used to measure students' critical thinking skills.

Hypothesis testing using nonparametric statistical Manny Whitney (U test), the use

of the test statistic is based on electoral considerations prerequisite test statistical test that is test data normality and homogeneity of data. This study measured the Effectiveness of use of teaching materials for students' critical thinking skills (Nachar, 2008).

Results and Discussion

Based on the results of the validation by experts, which the experts who provide assessment consists of 3 people who generally provide an assessment of the teaching materials developed using scientific approach is valid with the criteria of "good" that the average gain the scores given by the experts of 72.31.

The criteria of "good" given by all the experts is a total of criteria given by the expert teaching materials with well-developed scientific approach that aspect of assessing the feasibility of the contents of teaching materials, as well as evaluating the presentation of appropriate language used in teaching materials. In addition to providing an assessment of the teaching materials developed by the scientific approach, the expert also gave a good assessment of the syllabus and lesson plan used in this study.

Results of the assessment showed that the assessment scores given by experts to plan the implementation of learning used had average scores of all experts is 91.67 with the criteria of "very good", while the syllabus for the assessment of the average score given by the experts was 96, 67 with the criteria of "very good". So that the device in the form of lesson plan and syllabus of learning used in this study could be used in the research process. Results validation by expert instructional materials have averaged criteria of "good" but at first experts provide an assessment of teaching materials, namely the criteria of "Enough". Results validation teaching materials provided by the expert can be seen in Table 1.

Expert	Score	Criteria	Description
I	58,87	Satisfactory	invalid
II	80,65	Good	invalid
III	77,42	Good	invalid
Mean	72,31	Good	invalid

Devices and teaching materials that have the criteria of "good" can then be used for the research stage to the next. On research and development is the next step is to use the card at a small-scale trials.

Small-scale trials conducted as a prelude to enter the preparation for the use of teaching materials developed by the scientific approach and to know the legibility of the instructional materials before use in the wider class. To determine the readability level of teaching materials on students, conducted questionnaire form questionnaire responses of students to use teaching materials as applied in the classroom. The data were obtained on a limited scale trial is the student response data to be analyzed to determine the deficiencies found in the small-scale trials.

Stages small scale trial using one group pretest posttest design so that at this stage the data is a value obtained pre-test and post-test. Pre test at this stage given the treatment given before the application of teaching materials using a scientific approach developed, while the post-test was given after a given treatment application of teaching materials using a scientific approach developed.

Stages of research on small-scale trials using a single class sample of 10 students were selected using sampling techniques purposive sampling. Results of data analysis in the class of small-scale trials showed that all of the students responded positively to the teaching materials using a scientific approach that learned in class.

Results of the data analysis of critical thinking skills in the class of small-scale

trials show that there are 4 students to the value of critical thinking skills were, three students with low grades and there are 3 students to the value of critical thinking skills is very low. The effectiveness of the use of teaching materials were tested on a small scale trial class has a criteria of "being", it is seen in the calculation of the value of gain that indicates the value of 0.51 which means an increase in critical thinking skills with the criteria of "being".

In addition to calculating the students' response to the use of teaching materials used as well as the calculation of the value of Gain, also calculated the value of the average difference in critical thinking skills possessed by students before taught by teaching materials with approaches scientific compared with the critical thinking skills possessed by students after taught use of teaching materials using a scientific approach.

Results of tests of significance differences in average ability to think critically analyzed using the t-test Paired Samples Test, the results of the calculation that the average yield critical thinking skills between the pretest to post-test values are significantly different. The calculation result is an indicator to proceed to the next stage of large-scale trial.

Stages in this study is a large-scale trials in the study conducted on a class consisting of 32 students each number of students per class is 15 students VIIA and VIIB grade 17 students. The data collected by the researchers in a large-scale trial is the response of the students to the teaching materials, grades pre-test and post-test and students' critical thinking skills. Average yield critical thinking skills of students in each class of experiments, the control and the class of small-scale trials are presented in Figure 1.

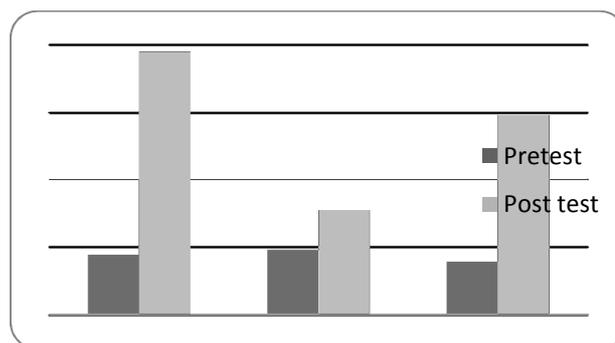


Figure 1. Average Student Critical Thinking Ability

One purpose of this study was to determine how effective the teaching materials developed if used in learning. The effectiveness of teaching materials were analyzed in the same way to test a limited scale. Teaching materials are said to be effective if it meets the criteria that teaching material is said to be effective if the critical thinking skills of students achieving scores were. According to Scott (2007), there are many ways to assess critical thinking skills in the classroom, including the use of pre-test and posttest, case studies, telling stories, questions, role playing and debates.

Based on the results of research and data analysis that critical thinking skills possessed by the experimental class has an average of critical thinking skills in the post-test score was 73.89, which means having the criteria being while the average critical thinking skills is the control class 30.88 with the criteria of "very low". To find out the average difference between the critical thinking skills with classroom control classroom experiments to test the hypothesis the average difference.

Before the test the hypothesis first tested among other prerequisites normality test and homogeneity of data pre-test and post-test the data that will determine the type of statistics that will be selected to test the average difference between the critical thinking skills and classroom control classroom experiments.

Prerequisite test results showed that normality test data is not normally distributed with significant value smaller than the value of alpha is 0.028. This value is an indicator of H_0 is rejected and it shows the data were not normally distributed. In addition to normality test, homogeneity test result data homogeneity test data shows homogeneous with a significance value greater than the value of alpha, it is an indicator H_0 is rejected and the data showed the data homogeneous.

Based on the test results conducted prerequisite before investigators determine the statistical test that is used to calculate the average difference. Prerequisite test shows that the selection of the test statistic to test the average difference between the critical thinking skills class experiment with using a subset of the statistics control class that is using the non-parametric U test or Manny-Whitney because the data were not normally distributed and homogeneous. According Nachar (2008) discloses the use of statistical Manny-Whitney test was performed to compare the two independent groups that do not require the sample to be normally distributed.

Sugiyono (2012) revealed the selection nonparametric statistical Manny-Whitney followed by Z test if a large number of samples (greater than 20 samples). This study used a sample of two classes totaling 32 students so that in addition to using the Manny-Whitney test also continued with test Z. Based on test results obtained using the Manny-Whitney U value of 6.500 When converted to the value Z, the magnitude of -4.597. Sig value 0.000 <0.05. If sig <0.05 critical limit then there is a difference between the two groups (experimental group and the control group) which means that H_0 is accepted.

In addition to calculating the average difference in students' critical thinking skills on a large scale trial, Gain values are also calculated to determine the effectiveness of

the use of a large teaching materials using a scientific approach to improving the critical thinking skills of students. Gain results in large scale trials show the value of 0,73 with the criteria of "high"

Conclusions

Development of teaching materials using a scientific approach to improve students' critical thinking skills that have been developed is valid according to experts at the level of validity of "good" with an average score of 72.31 and able to enhance students' critical thinking skills by 0.73 with the criteria of "high"

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EFFECTIVITY OF PBL LEARNING SETS VISION ASSISTED FACEBOOK COLLOID SYSTEM MAN MODEL GORONTALO

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ABSTRACT

This study aims to understand the effectiveness of facebook assisted PBL learning that feature SETS vision on the learning outcomes of students in achieving competencies related to the colloidal system, in Gorontalo Model of MAN. The population of the study comprised all students registered in grade XI semester 2014/2015 academic year. The nonequivalent control group design was applied in the study. The research samples were taken purposively from two classes. The first one was treated as an experiment class applied facebook-assisted PBL learning that feature SETS vision. The second class was treated as a control group, applied PBL learning that feature SETS vision without facebook. Both classes comprise of 27 students. On the analysis, result of post test showed the average value 81 on the experimental class, classical mastery 25 from 27 students reached KKM. The average result of its counterpart was 78, classical mastery 23 from 27 students reached KKM. the average of total scores of affective aspect was 17 in both experimental and control group. While the average total scores on psychomotor aspect (Practical) of experimental and control groups was 20. Based on this study, it can be concluded that the facebook assisted PBL learning that feature SETS vision effectively support the cognitive learning in the Gorontalo Model of MAN.

Keywords - Learning that Features SETS Vision, PBL, Colloidal Systems, Facebook, Learning Outcomes.

Introduction

Chemistry is the science that is seeking answers to the questions of what, why, and how natural phenomena in the environment associated with the composition, structure and properties, changes, dynamics and energetics substances. Therefore, subjects learn everything about the chemical substances that involves skill and reasoning. One chemical learning approaches that are considered to have the characteristics of scientific learning is Problem Based Learning / Problem Based Learning (PBL). Chemical linking of learning science and technology in everyday life is a visionary learning SETS (Science, Environment, Technology and Society) in general it can be said education with science teaching SETS meaning associated with other elements, namely the environment, technology and society. In the context of SETS (Science, Environment, Technology and Society), the development of science considered to be

influenced by changes in the environment, technology, as well as the interests and expectations of society. At the same time it should be understood that the development of science it also has an influence on the development of technology, society and the environment (Binadja, 1999a: 173). Thus, the evolution of technology push on the location and time of learning. Learning is no longer only take place at school and in the classroom, learning can take place anywhere as long as there are teaching materials and media which support the students feel comfortable with the situation. One way to encourage the achievement of effective learning, is used learning aids, or commonly called learning media. Facebook as a medium of learning can help students interact and communicate outside class hours. Many benefits can be obtained by joining the social networking sites like facebook. Which can connect with friends, whether it is new or old friends or family, without being obstructed by the distance.

facebook has great potential to be used in education and learning, especially for the chemistry in order to overcome the limitations of the number of hours of lessons.

Methodology

The population in this study is a class XI student EXCELLENT, XI IPA 1, XI IPA 2, XI IPA 3, XI IPA 4, MAN Model Gorontalo school year 2014/2015. The sample in this research is class XI IPA 1 as an experimental class and class XI IPA 2 as the control class.

This type of research is an experimental research design with pelitian used in this study is the nonequivalent control group. The design can be described as follows:

Table 1 Design Research the nonequivalent control group design.

KE	O ₁	X	O ₂
KK	O ₁		O ₂

Keterangan:

- KE : Experiment class
- KK : Control class
- X : Different treatment
- O₁ : *Pre test*
- O₂ : *Post test*

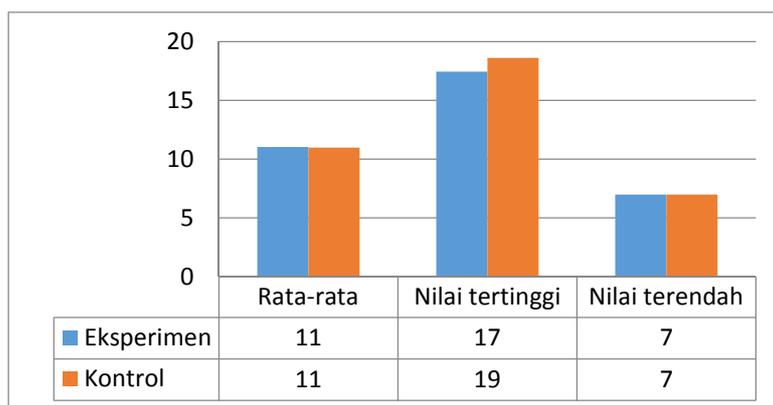
Results and Discussion

Result

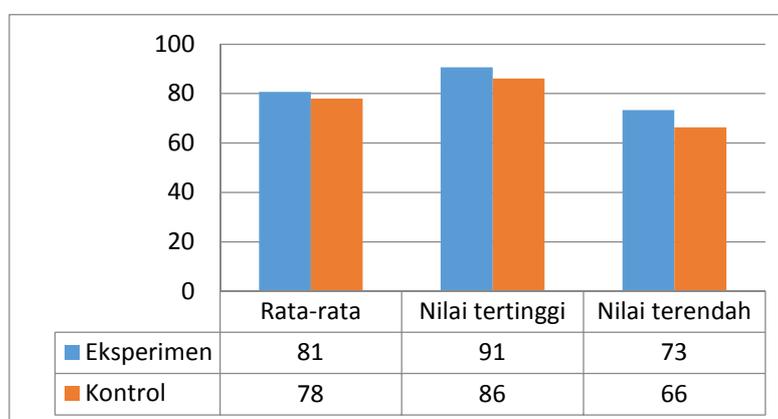
Analysis of the data based on the results obtained from the research using three main devices namely 1) tilapia pre test and post test mastery of the concept of the colloidal system, 2) student activity observation sheet, 3) questionnaire responses of students towards learning. Based on data collection on research that has been done in MAN Model Gorontalo, on the competence of the colloidal system obtained the following data: The data used is data result of learning the mastery test instruments at the colloidal system concept, ie the pre-test and post-test. Figure 1 and Figure 2 is an experimental class learning outcome data and control classes.

Table 2 Design Research

Group	Early	Treatment	And
Experiment Class	<i>Pre test</i>	PBL Learning SETS vision assisted facebook	<i>Post test</i>
Control Class	<i>Pre test</i>	PBL Learning SETS vision without assisted <i>facebook</i>	<i>Post test</i>



Picture 1 Data value pretest experimental class and control class



Picture 2 Data value of post test experimental class and control class

b. Discussion

This study was conducted on June 6 until May 26, 2014 at MAN Model Gorontalo. This study aims to determine ekeefektifan learning Problem Based Learning (PBL) SETS assisted facebook vision on learning outcomes in the competence of the colloidal system. Learning implemented in eight meetings. Learning begins with pre test the experimental class and control class at the 1st meeting, to determine the initial state before the second class was given a different treatment. At a meeting of the 3rd and 6th performed in the laboratory to pass practicum. While at the meeting of the 2nd, 4th, 5th and 7th done teaching and learning in the classroom. 8th meeting held post test to measure the success of teaching after

second grade were given a different treatment.

In the experimental group and the control group was given the same learning is learning vision SETS learning model PBL (Problem Based Learning). Learning begins by giving the problem at every meeting. Students are required to solve the problem by working in their respective groups. The difference in the experimental class learning SETS assisted facebook vision while using a learning model PBL (Problem Based Learning). Unlike the case with the control class, learning vision SETS without facebook assisted by still using the model PBL (Problem Based Learning). Learning is always associated with aspects of science, environment, technology and society as a

whole that influence each other reciprocally. Learning PBL (Problem Based Learning) SETS vision on the competence of colloidal aided facebook expected to motivate students and affect learning outcomes. Winkel (1996: 58) motivation to learn is the overall driving force of psychic within the students that lead to learning activities, ensure continuity of learning activities and provide guidance on the learning activities in order to achieve the goal. Motivation to learn can determine learning outcomes achieved by students. Learning outcomes can be defined as the level of the actual capabilities that are measured in the form of mastery of knowledge, skills, and attitudes that achieved by students of what is learned.

Learning using PBL (Problem Based Learning) vision SETS done pembagiannya groups randomly. The group is permanent during the study, it aims to facilitate classroom management in the learning process takes place. Learning to control classroom learning by applying PBL (Problem Based Learning) vision-aided SETS without facebook. Learning The same is done by using model PBL (Problem Based Learning) SETS vision, the division of the same group during the study. Learning outcomes of the second class compared to determine whether the experimental class learning effective than learning in classroom control. Based on the initial stage of the analysis, obtained results which indicate that the data value of pre-test experimental class and control class normal distribution has a variance that is no different, and having an average value is almost the same. This means that both classes departs from state / the same initial conditions.

Has found the analysis of the final stage, the average value of post test between the experimental class with the control class. Student learning outcomes-assisted learning with facebook better than students without pembelajarannya assisted facebook. This is evident from the analysis of the parties the right, which shows the learning PBL

(Problem Based Learning) vision SETS assisted facebook the experimental class learning outcomes better towards learning PBL (Problem Based Learning) vision SETS without assisted facebook the control class. Binadja (2002: 72) states that learning vision SETS membentuk positive impression in students and positive impression arising from visionary learning SETS positive effect on student learning outcomes. Similar Akinoglu et al., (2006: 80) states that the application of problem-based learning model affect students' conceptual development positively. As well as on the results of descriptive analysis shows that learning outcomes affective (character) and psychomotor (practical) through observation sheet activities of students who were learning PBL (Problem Based Learning) vision SETS assisted facebook lebih well against students who were learning PBL (Problem Based Learning) vision-aided SETS without facebook.

The learning process after being given the different treatment, obtained an average value of post test experimental class of cognitive learning outcomes at 81 and 78. In the control class is a test post test data normality using the Kolmogorov-Smirnov assisted SPSS 22, both normal bedistribusi class. Expressed with a significance value (Asymp. Sig. 2-tailed) > 0.05, ie the value of the experimental class and control class 0.083 0.131. In the test the average difference of the right hand, acquired $t = 2.141$, while $t_{table} = 1.675$, because $t_{count} > t_{table}$ then H_0 is rejected, which means that the hypothesis is accepted. So it can be drawn the conclusion that the results of experimental class learning better than the control class, in other words, learning PBL (Problem Based Learning) vision SETS assisted facebook competence colloid provide good learning outcomes of the learning PBL (Problem Based Learning) vision SETS without assisted facebook on colloidal competence.

Seen from the average results of experimental class learning and control classes already reached the limit of minimum mastery. With a population of 25 experimental class of 27 students reached KKM, more than the control group at 23 of the 27 students reached KKM. In addition the average value of post test grade students experiment better than the control class. Mulyasa (2006: 99) the success of the class can be seen from at least 3/4 of the amount that is in a class of individuals that have achieved mastery. Based on the criteria of effectiveness of learning, it can be concluded that learning PBL (Problem Based Learning) SETS vision-aided learning facebook and PBL (Problem Based Learning) SETS vision without facebook assisted effectively used to help students achieve mastery limits.

The average score value gain experimental class learning outcomes by 70 while the control class is 67. In the second class of the sample, there is a significant increase in learning outcomes. Experimental class and control class, learning outcome categorized as high but has a different gain value. In the experimental group the average value gain of 0.78 is not much different from the control class 0.75. Although the increase in both classes in the same category, but the experimental class has a higher gain value. It can be concluded learning PBL (Problem Based Learning) SETS aided facebook vision can help improve learning outcomes, especially in colloidal competence. But generally speaking, facebook assisted learning has not been optimally contribute to the affective and psychomotor learning outcomes of students. This is because the rocky learning students only focus on facebook facebook account, resulting in less attention to aspects afektif (character) and psychomotor (practicum). Students are actively engaged in discussions with the group through facebook account group (virtual classroom), through the stages orientasi problems encountered, then conduct scientific investigations, develop

and present through the presentation. The next step is to analyze and evaluate the results of students' presentation, so students get their own knowledge of the problem solving process. However, the vision of SETS in learning has helped students achieve minimum competency affective and psychomotor.

The use of the learning model PBL (Problem Based Learning) assessed in accordance with the vision of learning SETS. According to Koh et al., (2008: 54) PBL in student-centered learning process, students learn independently, and its main purpose to improve problem-solving skills in students. Luo, (2014: 127) states that PBL can be a solution if the students do not innovate and provoke students' motivation. Giving the problem at a meeting at the beginning of the learning, aims to foster the curiosity of students to instructional material and the way of solving the problem through the four elements SETS. Binadja (2005a) states that for a discussion on SETS, can be started from any direction and the starting point. Performance learning process students are not only given the knowledge of the science of colloidal material only, but students are taught about the use of colloids in everyday life. McCare (2011: 130) states that stimulate student learning will be more active when used as a stimulus issues.

Problem-based learning invites students to better understand the issues that are evolving in the environment, is able to interpret environmental problems and solutions. Because students are required to solve problems and find alternative solutions. Problem-based learning stimulate students to think critically in any solve existing problems, both in the context of the colloidal material as well as in everyday life.

Descriptive analysis of the activity of students in the learning process, grouped by affective assessment (character). Obtained average scores for each aspect of the character aspects. Based on the average

value of the character / morality of students in the experimental class and control class both have a good rating, which is keeluruhan scores total on aspek aspect (character) experimental class and control class together 17 (of the score range 04-20) , The average value of the indicator of cooperation, discipline, curiosity, and communicative have an average score almost the same, ie the same category with a score of 3 (good). But the visible aspects of honesty experimental class is higher than the control class in succession 4 (very good) and 3 (good). Students in the experimental class in character honest with indicators of assessment in the form of (a) do not cheat, (b) do not commit plagiarism, (c) express things as they are, (d) reporting of data or information is in accordance observations and (e) admit fault or disadvantages that are likely to obtain a score of 4 (very good) .. It shows messages displayed character education has not been effective in improving students' character. Education requires habituation and exemplary character so it takes a long time. This is in accordance with the opinion of Agboola (2012: 165) does not function as a character education improvement students' deviant behavior that goes fast, because there are other factors that influence their behavior such as family, social and cultural.

Activity can be seen in the control class, search and troubleshooting information on the group woke up. Aspects of cooperation and discipline in receiving advice or input in the group is needed. By contrast, the experimental class seem less cooperation and discipline were awakened. Look busy with the hardware (hadware) used. This is because the experimental class students accustomed to conduct its activities through facebook to find information and solving problems independently. So that students are less cooperation in group.

Learning that connects the material studied by students around the event or phenomenon, it makes students more easily

understand the material presented as topics in the learning environment of students themselves. Learning The same is done by using model PBL (Problem Based Learning) SETS vision, but there is a difference between the experimental class with the control class. Students in the experimental class tend to be silent or indifferent, they are busy with activities on facebook. Students in the control group were active in learning. This is due to discussions with learning model PBL (Problem Based Learning) could lead to active students in cooperation. So that the students' ability to analyze and solve problems very well. When learning takes place in the experimental class many students do not ask questions. It is not assure you that the students have grasped the material but be a sign of more active student with a social media facebook the experimental class.

The learning process does not only take place in the classroom with the help of facebook, but also made the learning process in the lab to perform the lab. Purpose does the lab aims to apply the theory and basic concepts acquired during the learning in the classroom and then adjusted colloidal material, as a topic of study. Assessment process should be implemented practicum either systemically and transparent, ranging from the practical to produce. Assessment process lab in question is the activities undertaken by the students associated with the lab. While the final assessment is practical product assessment in accordance with the expected outcomes.

Based on data from students in practical activities that dirty water purification and manufacture of colloids of maize by producing yoghurt. Data obtained from the analysis of the results of peer assessment. In the experimental group and control group total score obtained both 20 (of about a score of 06-24), the total score results obtained in the experimental class and control class that is a good category. The total scores showed no difference in

psychomotor learning outcomes of both classes.

The descriptive analysis of student activity on the facebook account during the learning takes place through seven aspects are observed, such as 1) Students read course materials via facebook, 2) Students are given like the material presented via facebook, 3) Students comment on the material presented via facebook, 4) Students answer exercises through facebook, 5) Students are asking questions through facebook, and 6) Students conduct discussions through facebook, 7) Students provide advice with regard to things that must be added in learning through facebook. Most conduct its activities on facebook. Just seen that the observed aspects that students give suggestions regarding the things that had been added in learning through facebook has never categories. The absence of the advice of students in the learning process, proving that learning PBL (Problem Based Learning) vision SETS with facebook assisted to good use. It just looks that facebook is not optimal role in the assessment of affective and psychomotor. Facebook assisted learning, giving freedom to the students to always access the information related to the problems and find solutions to problems that occur in the neighborhood.

Analysis of responses expressed the majority of students strongly agree with pembelajaran PBL (Problem Based Learning) SETS vision-aided facebook. Most of the students stated strongly agree and agree. This means that students are interested in and easily understand the learning material with PBL (Problem Based Learning) SETS vision-aided facebook. Learning PBL (Problem Based Learning) vision SETS open the horizons of students about the phenomenon in everyday life that relate to the concept of colloidal they learned. Student response data showed that students' interest towards learning PBL (Problem Based Learning) vision SETS average facebook aided both categories.

Thus it can be said that the application of learning PBL (Problem Based Learning) vision-aided facebook SETS can encourage students' interest in learning. (Nur, 2001: 39), aroused the interest of students is important to reassure students and pull the material to be covered to make sure students how knowledge will be useful for students to solve problems that exist in the surrounding environment.

Thus the application of learning PBL (Problem Based Learning) SETS aided facebook vision can motivate students to learn. Conformity with the opinion (Nur, 2001: 43), motivation is one of the most important elements of effective teaching or teaching works. Further according to (Woolfolk, 2009: 167) suggested to involve the students in group work as group work to create the conditions for learning motivation, even in a group there are members of groups that contribute very little.

Conclusion and Suggestion

a. Conclusion

Learning PBL (Problem Based Learning) SETS assisted facebook vision effectively to the learning outcomes on achieving competency colloid. This is indicated by an average value of 81 in the class of cognitive experiments and the average value of cognitive control class is 78. The total score affective (character) experimental class and control class equally 17. The total score on the psychomotor aspect (Practical) experimental class and control class equally 20. evidenced by the value of N-gain experimental class and control class respectively at 0.78 and 0.75 are included in the high category.

b. Suggestion

Need to do more research on learning PBL (Problem Based Learning) SETS vision-aided facebook with some modifications by

adding some variables eg scientific literacy and critical thinking.

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ESTABLISHING STUDENTS' RESPONSIBILITY CHARACTER IN FORMULATE SHARE LISTEN CREATE LEARNING ASSISTED BY COMIC ON QUADRILATERAL

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ABSTRACT

Character education is included in the materials should be realized into daily life. Character education which is applied during this time is still low. It can be improved by doing *Formulate Share Listen Create* (FSLC) learning assisted by comic on material quadrilateral, which students are given chances to improve their responsibility character. Through FLSC learning, students may express their ability by sharing to classmate so their responsibility character will be improved. The aims of the research are establishing responsibility character and giving influence toward mathematical communication ability and its completeness. This is a mixed research. Its scope is SMPN 13 Semarang students by selecting six students. Data are collected by observing, interviewing, and testing. Data analysis is using descriptive analysis, regression analysis, and t test analysis.

Based on the interview, from the first meeting until the sixth meeting by using structured task, the students start showing their responsibility. At every meeting, students hold discussion assisted by comic and so it takes them to establish responsibility character and support communication ability in solving problems. FLSC model counts on individual's work and partner selection, so every student attends learning process actively, more responsible, comfort, and coordinate well in learning process. Communication ability test shows the average score is 82,19 higher than minimum score criteria 75. The average of responsibility improvements in each meeting are 0,10; 0,22; 0,31; 0,38; 0,57; and 0,68. Regression analysis shows equation $\hat{Y} = 24,837 + 0,766X$ is 94,1% which means that responsibility character affects mathematical communication ability.

Keyword: Formulate Share Listen Create Assisted by Comic, Responsibility Character, Mathematical Communication, Quadrilateral

Introduction

Education is an essential condition for the development and progress of a nation. Without education, a state will not be developed and aligned to other nations in the world. Improving the quality of education also means improving the quality of human resources. To achieve the goal, a continuous renewal should be held in education to establish educated and honourable next generation. Education successfulness in the 21st century depends on the extent to which the development of new skills to follow the development of science and technology. Therefore, the education sector needs to get serious attention and handling by

government, society, and education managers.

Fundamentally, character education is a very essential part of the school project, but it lacks of attention. Lickona states due to lack of attention toward character education at school life causes various social ills in society (Zubaedi, 2012:14). Regardless of the various deficiencies in Indonesian education practice, character development is included to material that should be taught and mastered by students and be realized in their daily life. This is in accordance with UU No. 20 Tahun 2003 section 3 about National Education System which states that national education functions to develop

ability, build nation character and prestigious civilization in the context of the intellectual life of the nation.

The characters are implanted in this study is responsibility character (affective area). Responsible is the attitude and behavior of people to carry out the duties and obligations as he should do to ourselves, community, environment (natural, social, and cultural), country and God The Almighty (Fathurrohman *et al.*, 2013: 124). Responsibility character is the attitude and behavior of people who carry out their duties and obligations consciously.

According to Bacon (Bartlett, 2009: 51-60) there are six categories that represent important elements of responsibility character of students in learning, namely (1) *Do the Work*, to complete the task of learning in the classroom in a certain period. (2) *Obey the Rules*, follow the rules and behavior set by the school and arranged by teachers and respect the teachers and avoid doing anything unintended, and subject to the consequences. (3) *Pay Attention*, listen to the teacher, or cast their eyes on the teacher. (4) *Learn or Study*, acquire knowledge. (5) *Try or Make an Effort*, the students make some effort or try to finish the work. (6) *Responsibility as something that given or taken*, the students make a choice for the quantity and quality of their work (responsibility which is taken) and/or students are given the responsibility by the teacher or school (responsibility which is given).

Mathematics communication needs to be the focus of attention in the study of mathematics, because through communication, students can organize and consolidate their mathematical thinking, and students can explore their mathematical ideas (NCTM, 2000). Also according to Atkins (1999) verbal communication mathematics (*mathematical conversation*) is a tool for measuring the growth of understanding, which allows students to learn

about the mathematical construct from others, and provides an opportunity to reflect on their own understanding of mathematics. According to Lindquist and Elliott (1996), if we agree that mathematics is a language, and that is the best discussion in the community, it is easy to understand that communication is the essence of teaching, learning, and assessing mathematics.

According to Tandaliling (Umar, 2012) attempts to anticipate the development of more advanced science and technology and Indonesia's deterioration in the measurement of the quality of human resources in mathematics learning in the classroom needs to be reformed. Teacher's tasks and role are no longer as a conduit of information (*transfer of knowledge*), but as a facilitator of student learning (*stimulation of learning*) in order to construct their own knowledge through a variety of activities including communication aspects. According to Smith and Silver (1996), teacher should: (1) involve students in any mathematical tasks; (2) set the intellectual activity of students in the classroom as a discussion and communication; and (3) help students understand mathematical ideas and monitor their comprehension. Both of Smith and Silver opinions turn mathematical communication ability is necessary to be developed among students.

Baroody (1993: 107) states that learning should be able to help students communicate mathematical ideas through five aspects namely *representing communication, listening, reading, discussing and writing*. Further mentioned there are at least two important reasons why communication in mathematics learning need to be developed among students. First, *mathematics as language*, means that mathematics is not just a tool to think (*a tool to aid thinking*), tool to find patterns, solve problems or draw conclusions, but mathematics is also a valuable tool for communicating ideas clearly, precisely, and succinct. Secondly, *mathematics learning as a social activity*,

means mathematics as a social activity in the learning of mathematics, as a vehicle for interaction among students, as well as a communication tool between teachers and students.

One of the subject matter which is still problematic is quadrilateral material in class VII SMP such as competence of calculating the perimeter and area of quadrilateral. Based on the facts that the results of national examination of SMPN 13 Semarang students on quadrilateral in academic year 2013/2014 is low.

Teacher needs to make improvements in quadrilateral learning to change the situation. This improvement is certainly expected to be effective to improve mathematical communication. Quadrilateral material will more easily be learned by students through discussions. Through discussion activity, students can exchange ideas and help each other. This can be done by applying cooperative learning model. Cooperative learning model can provide a significant positive effect on academic achievement (Johnson, Johnson, Stanne, 2000). In addition, cooperative learning has also proven to be very useful for heterogeneous students (Suherman, 2003).

One of cooperative learning model which provides flexibility to students to think actively is *Formulate Share Listen Create* (FSLC) cooperative learning model. FSLC cooperative learning is a modification of the model *Think Pairs Share* (TPS), which was first designed by Frank Lyman and his colleagues at the University of Maryland, Arends (Trianto, 2012). FSLC is a learning structure which gives students the opportunity to work in small groups of 5-6 students. Prior to working with the group, the students are given some time to formulate their ideas or individually and then seek partners to deliver the results of their work.

Instructional media is also needed to convey information, thoughts, or ideas. Instructional media rules as a tool for students. Instructional media can help students when they communicate ideas and thoughts to others. Instructional media mentioned above is a comic. This comic contains about material that is packaged in the form of reading a picture in order to attract students' interest to learn the material. Instructional media, the comic, is part of the learning tools that assist teachers in implementing learning. In addition to learning models, instructional media is a solution or a proper strategy and planned learning activities so that the basic competencies expected can be achieved.

Based on the problems that have been formulated, the objectives of this study are: (1) Establish responsibility character in *Formulate Share Listen Create* learning; (2) Determine the positive influence of responsibility character for mathematical communication ability; (3) Knowing the students' mastery of specified minimum score criteria (KKM) in mathematical communication ability.

Based on the problems that have been formulated, the benefits of this study are: (1) For students, practicing bring themselves to responsibility character that helps them to achieve optimal mathematical communication ability; (2) For the teacher, has a focus on learning and teacher as facilitator.

Literature Review

Character education aims to improve process quality and outcomes of education that leads to establish students' character and noble character as a whole, integrated and balanced, in accordance with competency standards in each educational unit (Mulyasa, 2012: 9). According to Muslich (2013: 81) the goal of character education is to improve the quality of the implementation and outcomes of education that leads to the

achievement of establishing character and noble character as a whole, integrated and balanced. Students's character education are expected to independently increase and use of knowledge, assess, and insert character values that manifest in everyday behavior.

Communication is an important part of mathematics. Kosko and Wilkins (2010: 81) states that both writing and discussion are integral parts of mathematical communication which can facilitate the understanding of mathematical concepts. Besides, writing can also help students articulate strategies that can improve cognitive abilities. While the discussion is a device to deepen the understanding of the concept through social interaction to enable students better understand mathematical concepts. Harris (2006) states that the dialogue is also the key. Dialogue refers to discussions, questions and answers, and feedback that occurs during the process of reading and understanding a text message that contains mathematics material which students learn, for example in the form of concepts, formulas, or a problem-solving strategies. Parties involved in the events of communication in the classroom is the teacher and the student. How to transfer the message can be verbal or written.

FSLC Comic-assisted cooperative learning consists of 5-6 students have faster formation, more opportunity for each member to express their ideas, and interactions between members will be more easy and convenient because they are in discussions with partners they choose.

Research Methods

This study uses a *mixed* research design consisted of two types, namely qualitative and quantitative research. The scope of this study is the students of SMPN 13 Semarang which selected six students. The variables in this study are the responsibility character and mathematical communication ability. Data collection techniques in this study are

observation, interview and test. Observation and interview methods use to obtain data on the process of establishing responsibility character at each of meeting. The test method uses to evaluate mathematical communications ability after their responsibility character is formed. The data are processed by descriptive analysis, regression analysis, and completeness test by t test.

Prior to the learning, students are given a preliminary test to determine the initial capabilities of each student and to determine the selection of six students as research subjects. After determining the initial capabilities then can be made best learning design to fix the initial condition.

RESULTS And DISCUSSION

Research Result

At the first meeting, quadrilateral material is preceded by studying the sub material rectangular circumference. In the first lesson the students still feel difficulty in finding the rectangular circumference, it is because the students still confuse to differentiate between circumference and area. To overcome these teachers form students into small groups to discuss the problem, so that students will be able to distinguish between circumference and area.

Based on observations of character formation through FSLC learning which increased at each meeting are presented in Table 1.

Table 1 Results of Character Improvement

Meeti ng	SBR 1	SBR 2	SBS 1	SBS 2	SBT 1	SBT 2
1	0,15	0,13	0,03	0,06	0,10	0,15
2	0,20	0,16	0,13	0,14	0,38	0,30
3	0,25	0,18	0,25	0,27	0,44	0,45
4	0,29	0,19	0,33	0,49	0,44	0,51
5	0,51	0,52	0,41	0,57	0,73	0,70
6	0,64	0,67	0,48	0,65	0,85	0,78
	0,10	0,22	0,31	0,38	0,57	0,68

Students' responsibility character improvement brings them more active in communicating mathematically. In this case they complete the process of resolving mathematics communication problems. This suggests that the effect is quite good, with a regression equation of $\hat{Y} = 24,837 + 0,766X$ is 94.1%. The consequence is delivering students achieve mastery of mathematical communication target based on calculations by t test gained an average of mathematical communication ability is 82.19 which reach the standard of KKM 75.

During the learning activities, most of students follow teacher's design of learning, it indicates that all students meet achievement indicator of responsibility character. Based on observations at the first meeting until the sixth meeting, there are some students slightly increased after learning. The result of student's responsibility character improvement can be seen in Table 1.

Discussion

FSLC Comic-assisted learning has an important role in establishing character and mathematical communication ability. Comics media utilizes as a structured task which bring students to explore during learning. Comic influences on learning because it helps students in communicating ideas and thoughts to others (Novianti and Syaichudin, 2010: 78). This comic contains material that is packaged in the form of reading a picture in order to attract students' interest in learning the material. During the learning process, students work as a team to do a task or solve problem to achieve a common goal, which shows students' responsibility character. Regards to quadrilateral learning material, when students work in a team, they exchange ideas in understanding the concepts of material. In addition, students help each other so that all team members can achieve the desired objectives, namely to understand

the concept of rectangle, the result is in line with (Ornelas, 2004).

Nevertheless, it is possible for some students in the team have difficulty, even can not understand the material although it has been discussed and obtained help from other group members. This is which individual guidance from teachers to students is needed. Therefore, FSLC comic-assisted learning may be an option to be applied in quadrilateral learning.

Generally the steps of comic-assisted learning can bring: (1) students learn the material that will be studied with the help of the comic; (2) students with a sense of responsibility work and answer questions contained in the worksheets so that can be resolved properly. Through working group students train their social life. Each group discuss tasks assigned by the teacher. Students share the answers to questions from teacher. Furthermore, the students have a discussion group once more. After discussing each student records every answer has to be heard in order to see the similarities and differences in the answers. Students create new answers by combining the best ideas together so that only obtained one final answer.

Students' sense of responsibility improvement in the proceeding can provide a positive influence on their mathematical communication ability. This is in line with Rasyidah, et al (2011) that the students need to develop their sense of responsibility prior to complete the work. In addition to discussion groups, students socialize and try to work with a few teacher involvement.

The final results on students' learning can bring they achieve completeness of mathematical communication ability. These results are consistent with findings of Prayitno (2012), Apriyanti (2012), Anggraini (2013), and Hidayati (2014) which states that in principle, learning gives students the opportunity of trying to develop

his character that will be able to bring them to solve problems in learning.

Conclusion

The quadrilateral material of grade VII by Formulate Share Listen Create comic-assisted learning can: (1) Bring six selected students increase their sense of responsibility at each meeting with a score of 0.10; 0.22; 0.31; 0.38; 0.57; and 0.68; (2) as a whole (eg 1 class) sense of responsibility gives a positive influence on mathematical communication ability by equations $\hat{Y} = 24,837 + 0,766X$ is 94.1%; (3) The average of students' mathematical communication ability achieves the standard of KKM 75; (4) The comic media may deliver students learn to spur their sense of responsibility so that gradually reduce teacher's participation in learning. Furthermore, the group working on FSLC learning bring students learn communicate mathematically successfully.

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TEACHING MATERIALS MODEL -BASED PROBLEM BASED LEARNING (PBL) TO HABITUATE STUDENTS' CONSERVATION AWARENESS

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ABSTRACT

Study about Conservation of natural resources and environment need to teach the attitude, knowledge and skills that is supported by teaching materials and methods are used in classes. Problem Based Learning methods (PBL) can habituate student's conservation awareness through activities involving problems of natural resources and the environmental that exist in their surrounding. This research aims to developed a model teaching materials Conservation of natural resources and environment based PBL that can habituate an attitude of conservation awareness. The method used development research and steps consisted of analyzing, planning, designing and developing. The Results was developed the teaching material model of conservation of natural resources based PBL that can habituate an attitude of conservation awareness.

Keywords – teaching material model, PBL, conservation awareness

Introduction

All students of the Faculty of Mathematics and Natural Sciences-Unesa for the first year will be planned to study Conservation of natural resources and the environment lesson. The lesson will teach students about the attitude, knowledge and skills about the importance of conservation of natural resources and the environment. It will run well if it is supported by teaching materials and methods appropriate to the learning objectives. Problem-based learning methods Learning (PBL) can be to habituate students' conservation awareness attitude through activities involving natural resources and the environmental problems that exist in the surrounding environment.

Currently teaching materials based PBL that can habituate an attitude of conservation awareness is still rare to be used in the lecture. This research aims to develop a teaching materials model of conservation of natural resources study based PBL that can habituate students' conservation awareness.

Theoretical Review

Individuals' environmental awareness would appear if they have a positive attitude towards the environment, they will agree on everything related to environmental protection activities. Environmental awareness is also associated with social support, where strong social support to the environmental protection so the awareness of will be stronger. One of social support is school environment that teaches the environment knowledge, reasoning or logic in the maintenance or protection of the environment, practices to strengthen skills in the protection or preservation of the environment, provide an example to protect or preserve the environment as the case should be handled, dialogue with community leaders and community members to solve environmental problems in the community (Iskandar, 2012).

Conservation awareness can be trained through learning activities based approach to conservation issues that surround the student environment. Problem Based Learning-PBL

is a learning method that uses a problem as the first step in collecting and integrating new knowledge (Suyanto, 2009). Problem Based Learning can be develop strategic thinking skills, problem solving, and intellectual skills; learn as the "adult" through the involvement of learners in real experience; and become autonomous and independent learners. There are five syntax/steps in PBL, which consists of 1) orientation problems, 2) Organize learning activities, 3) Investigate individual/group, 4) Develop and present the works, 5) Analyze and evaluate process solution to problem. (Ibrahim and Nur, 2005).

Some researches noted that PBL in environment study could increase attitude and critical thinking skills of learners (Priadi et al, 2012; Khanafiyah and Yulianti, 2013; Samwar et al: 2013, Yurnalis et al, 2014). Students' environment such as college/schools areas, homes neighborhoods, or their other surrounding environments can be used as a medium of learning to understand the material lectures (Faizah et al, 2012a, 2012b; Faizah et al, 2013).

Research Methods

The steps of development were 1) analyzed in advance the problems that exist in learning related to instructional materials, 2) planned use of PBL method in teaching materials conservation of natural resources study, 3) made the design and modeling of teaching materials of conservation of natural resources study that contained of PBL elements.

The research data was analyzed based on a suitability between the development results from teaching materials conservation of natural resource study with elements of and PBL the purpose learning.

Results and Discussion

This research has developed a teaching material model of conservation and natural resources based PBL that aims to habituate

students' conservation awareness through solving their surrounding problems. Attitudes and skills to carry out conservation awareness needs to be developed with sufficient knowledge so that students can learn and understand the conservation material in accordance with the goal of achieving conservation awareness among students (Setyawati et al, 2013).

The material developed in the course of conservation and natural resources are Chapter 1. Conservation Scopes, Chapter 2. Environmental Ethics, Chapter 3. Natural Resources, Chapter 4. Local Wisdom, Chapter 5. Problems and Management of Natural Resources and Environment, Chapter 6. Conservation Awareness. For the initial material Chapter 1, students are introduced on the conservation scopes which consists are understanding, purpose, benefits and efforts of conservation of natural resources and the environment. Chapter 2, students identifies on environmental ethics to understand in carrying out conservation. This chapter contain are the understanding of environmental ethics, environmental paradigm and the principles of environmental ethics. Chapter 3, students identifies about the natural resources as the object of conservation. The material described about the understanding, the types and the benefits of natural resources. Chapter 4 identifies about local wisdom that illustrates to the students about the behavior of people who have been there before in implementing conservation. The material are the understanding, the approach, the challenge and local wisdom in public life future. Chapter 5, students identifies the current state about the issues and the management of natural resources and the environment. The materials are issues, the problems and management of natural resources and the environment. Chapter 6 describes the conservation awareness by encouraging students to actively carry out conscious conservation activities in their surrounding environment. The material are the awareness of the importance of

conservation of natural resources and environment, eco-campus and campus conservation.

Problem Based Learning-PBL is well to develop thinking skills, problem solving, and intellectual skills; learn as the "adult" through the involvement of students in a real experience; and become autonomous and independent learners (Ibrahim and Nur, 2005). The use of PBL in teaching materials are the phases of PBL that included with part of each chapter. Stage 1. Orientation problems, Matters conveyed in the orientation problem are students' problems surrounding with form of photographs of the condition of natural resources and the environment and articles from the media related to the matter. For example an article about junk in Mount Semeru and country poor in natural resources from the web Kompasiana, articles on local wisdom and conditions of Sumatran tiger this time from the National Geographic Indonesia web, articles about alternative energy from the WWF web, articles eco campus from Unesa web. Students can learn the matters conservation of natural resources and the environment from the various references representative. Step 2. Organize learning activities contained in the Organizational Learning section in which students analyze problems and propose ideas to resolve the issue. Step 3. individual/ group investigate carried out in the investigation, which students develop ideas to solve the problem based on the results of the investigation or in-depth literature review. Step 4. Develop and present the work contained in the work in which students present the results of the analysis and investigation of them in a paper assignment. Stage 5. Analyze and evaluate the problem solving process is done in the analysis and evaluation where students presented the results of his paper that will be analyzed and evaluated together with classmates and lecturer.

The teaching material used 5W + 1H analysis. This analysis is a good way to

problem solvers analysis, which involves thinking investigation. These questions consist of: what, who, where, when, why and how. These six questions can help to solve problems and spark ideas. It can to produce a complete analysis of the problems and solutions that will achieve the proper and efficient.

In the teaching materials also used project task which is ongoing task of Chapter 1-6. Students are asked to make solutions to the problems of conservation of natural resources and the environment by taking into account compliance with the theory taught each chapter. Project tasks can train student responsibility to independently carry out tasks (Faizah et al, 2012a, 2012b).

For each chapter there is also the provision of information in the web links section gives insight into the students to obtain more extensive information. There is also a section Sadarkah I ??? Which is a self-evaluation for the students' awareness of conservation.

With the teaching materials have been prepared by incorporating materials conservation of natural resources and the environment and stages of PBL in the learning process. This teaching material can be a model of instructional materials study conservation of natural resources and environment that can habituate of students' conservation awareness.

Conclusions and Recommendations

The conclusion from research had developed teaching material model of conservation of natural resources study based PBL that can habituate students' conservation awareness. Recommendations relating to the development of models of teaching materials are necessary to add more commands in implementing the operational syntax of PBL so the students can be easier to understand in carrying out the problem-solving task.

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DEVELOPING TRAFFIC AND TRANSPORTATION PSYCHOLOGY IN INDONESIA: INTERDISCIPLINARY EXPERT'S PERSPECTIVE

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ABSTRACT

Indonesia is one of the most populous countries in the world. The development of the auto industry and the financial condition affects patterns of transportation in Indonesia. However, the transport situation in Indonesia is hard enough with fairly poor driver's behavior and lack of road safety awareness (Hanum, 2014). Therefore, the contribution of transport psychology in Indonesia is very important to participate in solving transportation problems such as involvement of psychologists transport in developing countries, such as Germany and some countries in Europe. In this study, 25 inter-disciplinary experts interviewed about the importance of the role of transport psychology and solution to the problems of transportation in Indonesia.

Keywords - transportation, traffic and transportation psychology

Introduction

Indonesia is an independent countrz consisting of more than 17,500 islands, spreading over 3,000 miles (from east to west), located between 06°08' North and 11°15' South latitude, and from 94°45' to 141°05' East longitude. Indonesia's economy is growing and relies on the oil, gas, small-scale industry, and tourism sectors. Since 2001, Indonesia has been divided administratively into 33 provinces, including four new provinces: Banten, Gorontalo, Kepulauan Bangka Belitung, and Maluku Utara. The climate is tropical (hot, humid, and rainy), with two distinct monsoon seasons: dry season (April-September) and rainy season (October-March) (Ministry of Transportation of Indonesia, 2006).

Indonesia covers a total area of 9.8 million square kilometers (km²). As an archipelago, it comprises a sea area of 7.9 million km (including an exclusive economic zone), or 81% of the total area, and a land area of about 1.9 million km². It is also a country with many volcanoes and rivers. The total population of Indonesia, according to the 2004 Population Census is 227 million (Ministry of Transportation of Indonesia, 2006).

All road accidents are required to be reported and will involve the role of traffic police, but reporting is not always done. For example, minor accidents and those that occur in remote areas or that are settled by the parties involved are usually not reported. Police normally will record fatal or serious injury accidents or those involving serious traffic violations. Accident casualty data recorded by Indonesian National Police (INP) over the last 30 years. In the last 20 years, the number of accidents has decreased by 69%, in contrast with the 225% increase in the total number of vehicles. The decreased number of accidents resulted in an increase of 4% in fatalities. These data are suspect since no road safety improvement effort has been exerted. Further analysis and discussion indicate severe underreporting of cases (Ministry of Transportation of Indonesia, 2006).

As a typical developing country, motorization is still low with a majority of motorized vehicles being two-wheeled: 70 percent at the national level, 50 percent in the capital area of Jakarta. At national level, the vehicle ownership in 1989 was 48 vehicles per 1000 population (Sutomo, Dikun, & Tumewu, 1993).

As many other countries may recognize that there are three main causes of traffic accidents namely, human factors, vehicle factors, and road and environmental factors, Indonesia also has there. The human factor occupies the largest portion for the total number as well as categorized in their impacts, namely deaths, heavily injured and slightly injured that remain above 90%. It is, however, true that non-human factors in Indonesia have a greater percentage as compared to other countries' figures, and implicitly indicate human errors too, such as ignorance of human to vehicle and road maintenance (Soehodho, 2009).

Accidents caused by human error or due to poor driving behavior on the road was a lot going on, but unfortunately these cases get a little portion in a study that the lack of reference that can be the basis of this study. Examine and analyze the phenomena of human error or human behavior on the road is one of the objectives of transport psychology.

In some countries, traffic and transportation psychology is developed enough to minimize accidents that occurred due to human error. The German Psychological Society has a traffic psychology division for over 35 years. In early 1982, the innovative volume of that subject was published (Klebensberg, 1982 in Rothengatter, 1998). It should be noted that in the countries where there is a traffic psychology tradition, the term usually refers to a practice of diagnosis, testing and driver rehabilitation (Blasco, 1994 in Rothengatter, 1998).

Theoretical Review

Traffic and Transportation Psychology (TTP) is a young and expanding field in psychology. The roots of this discipline are the work of Hugo Münsterberg, a scholar of Wilhelm Wundt and the Psychological Institute of Leipzig University Germany (Temming, Reschke & Kranich, 2009). German traffic psychology, remarks subtly

that where officially the main concerns are traffic safety and reduction of the impact of traffic on the environment, almost all of Germany's 600 traffic psychologists earn their daily bread in the testing practice (Kroj, 1997 in Rothengatter, 1998). Practice rather than research seems to determine whether psychologists working in the field of traffic are identified as traffic psychologists, and whether behavioral studies are identified as psychology (Rothengatter, 1998).

There is no single theoretical framework in TTP, but many specific models explaining, e.g., perceptual, attention, cognitive, social, motivational and emotional determinants of mobility and traffic behavior (Schlag & Schade, 2003). Traffic psychology is primarily related to "the study of the behavior of road users and the psychological processes underlying that behavior" (Rothengatter, 1997, in Temming, Reschke & Kranich, 2009) and to the relation between behavior and accidents (Temming, Reschke & Kranich, 2009).

There are six areas of traffic and transportation psychology which can be distinguished (Schlag, 1999):

1. Behavior and accident research

Particularly in relation to different groups of road users (age groups, modes of transport), but also in relation to road design and motor vehicles. Explaining and predicting road user behavior depends on the development of valid and reliable models about the role of human factors in mobility behavior and especially driver performance. Psychological traffic accident and behavior research deals with, e.g.

- a. analysis of the driving task, changing conceptually from a traditionally rather sensomotoric task to a task with high monitoring impact,
- b. perception, cognition and attentiveness when driving, driver information processing and expectations,

- c. driver state, workload, alertness and fatigue,
- d. driver personality, risk-taking, attitudes, motives for driving, arousal and emotion,
- e. interactions and the social psychology of driving,
- f. the relation between the personal and environmental background of behavior, overt behavior, emerging conflicts and accidents.

2. Accident prevention and improvement of traffic safety

Education and information, but overall following the “4 E’s”: enforcement, education, engineering, encouragement/economy. Main goal is promoting safety by influencing and modifying behavior with legal, educational, vehicle- and road-specific measures; driver training, driving-instructor education, information on traffic issues, campaign design and marketing, effective enforcement.

3. Research and counseling in questions of mobility, transport economy and engineering.

Main objective is user-oriented and best-usable supply and design. This includes differentiation between transportation needs of special groups (elderly, handicapped, young people etc.). Main topics are:

- a. mobility needs and travel demand, choice of means of transport,
- b. travel behavior research, above all activity-based approaches,
- c. altering mobility behavior and modal split, problems of habituation and resistance to change, car dependence,
- d. design and acceptance of travel demand management, above all of pricing measures Schade & Schlag, 2003),
- e. psychological aspects in road design and traffic environment,
- f. quality management, especially quality of service, usability and well-being.

4. Vehicle construction and design

Psychology in car manufacturing traditionally deals with questions of ergonomics, but since the 1980’s new in-car devices as well as related new infrastructure has emerged as a rapidly growing field. Advanced Driver Assistance Systems (ADAS) and new information systems are designed to support the driver in a suitable and user-oriented way. Based on analyses of driving tasks which drivers have to cope with, e.g. multiple tasks requiring divided attention, psychologists’ primary orientation in the design process is towards human needs defining the technical requirements, human-centered development, usability of ADAS, operability of human-machine interfaces, behavioral adaptation and risk compensation, acceptance of innovations, and social impacts.

5. Psychological assessment and counseling/rehabilitation

For drivers who have become conspicuous: driver selection, training and rehabilitation, above all for drivers with offences (driving while intoxicated, severe offences against traffic laws), aptitude assessment for driving, selection and training for professional drivers.

6. Rail and flight psychology

Parts of the mentioned domains not only apply to road traffic but also to rail and air transport. Nevertheless, rail and flight psychology have historically developed in part separately from the dominantly road-related traffic and transportation psychology. One major new direction in rail as well as in flight psychology is the focus shift from the professional operator (selection and training) to the customer perspective (quality of service, usability).

Moreover there are the basic concept of traffic and transportation psychology. They are:

1. Human Factors Science

2. Studies are analyzing human-machine (or human-systems) interactions in order to design machines and systems that are compatible with human capabilities and limitations.

3. As a Human Factors Sciences combines and applies knowledge about human senses (including vision, hearing and touch), cognition/thinking (such as memory and decision- making) and physiology (load bearing, force exerting capacity and so on) to maximize the human-machine fit.

The traffic and transportation psychology has been developed well enough in developed countries, especially in research. Using traffic and transportation psychology research is expected to grow in Indonesia, so it can play a role in efforts to reduce the rate of accidents on the road caused by human error.

Research Methods

Design of this study is mix-method research. This approach approaches associated with field methods such as observations and interviews (qualitative data) were combined with traditional surveys (quantitative data) (Sieber, 1973). 25 interdisciplinary experts (economists, psychologists, anthropologist, ministries, engineers, police officers, and private companies owner) from difference university in three cities (Jakarta, Semarang and Yogyakarta). It used questionnaire of A European Road Safety: Policy Orientations on Road Safety 2011-2020 which translated and modified in Bahasa Indonesia and also as interview protocol. The data analysis of this study used matrix (coding). Matrix is form on which can be recorded systematically particular features of multiple cases or instances that a qualitative data analyst needs to examine (Miles and Huberman, 1994 in Eagle, 1994).

Results and Discussion

We interviewed several experts from several disciplines, both from several universities, ministries and police. By interviewing experts from multiple disciplines field we got an overview of the problems of transportation in Indonesia, from several points of view of science, about the transportation psychologist needs and solutions to these problems.

In the interview process we have a form of a survey questionnaire. The results of the survey can be seen in table 1. The number of answers to the questions are given in total and percentage of the experts and policy makers.

Table 1: Frequencies of survey

No	Questions	Frequencies	
		Yes (abs. & %)	No (abs. & %)
1.	Have you ever heard about traffic and transportation psychology?	12	13
2.	What is the meaning and goal of traffic and transportation psychology?	11 of experts could describe with their own words the meaning and the goal of traffic and transportation psychology	14 of experts couldn't describe the meaning and goal of traffic and transportation psychology even though they have been ever heard about it

3. Have your institution known/employed traffic and transportation psychology? 23
4. How important is traffic and transportation psychologist in your institution? 23 of 2 of experts stated that traffic and transportation psychology is important 2 of experts stated that traffic and transportation psychology is not important
5. Are there any studies relating the road safety management in your institution? 9 16
6. Have you adopted any measurement to protect vulnerable groups, such as cyclists or pedestrians, in the context of your road safety strategy? 7 18
7. Does your strategy include education and awareness of raising campaigns? 13 12
8. Does your strategy cover road infrastructure safety management? 7 18
9. Does your strategy include specific road

before.
23

safety
enforcement
measures or
initiatives?

10. Does your strategy include actions or measures in the field of first aid assistance? 5 20

Interdisciplinary Experts

Psychologist

The results of the survey interview 9 psychologists who is also lecturers of various universities were not many of them are already familiar with the traffic and transport psychology. They have ever heard of this psychology, but not deeply and thoroughly. This shows that the traffic and transportation psychology has not been widely recognized by psychologist in Indonesia. The absence of any seminars or research on the theme of transport which are connected by the field of psychology make traffic and transportation psychology not yet developed, but from the psychologists themselves are aware that there is so many issues of transportation especially driving behavior problems in Indonesia. The results of this survey psychologists offer solutions that can be offered to resolve the transportation problems of the psychology of such a campaign, socialization and individual consultations. Knowledge of driving procedures, ethics and awareness is critical traffic applied since childhood so important to have traffic module manufacturing for children.

Economist

The results of the survey interview to 2 economic academics from various universities aims to look at transport phenomena from the economic side. Human behavior is not only influenced by the economic situation of a family but also on a country, mainly in Indonesia as a developing country that distribution of economic

development is uneven and high social inequalities. Economic pressures can affect driving behavior on the road and can cause loss of driving ethics against each other.

Engineers

Transport cannot be separated from the infrastructure of roads and infrastructure is the job of the engineer. We interviewed 3 engineers from several fields, namely civil engineering and urban planning and space engineering. The reason is a civil engineer knows how the infrastructure on a country road, how to set it up, the criteria and the regulation, while engineers from urban planning and space know how the characteristics of spatial structure in the city and even the country, can be the benchmark of how good the construction of the highway so that drivers can be comfortable driving and avoid accidents.

Anthropologist

We interviewed an anthropologist as his capacity as an expert who understands the culture and community characteristics. Human behavior is influenced by the cultures that exist in society, though not one hundred percent. As well as economic expert's opinion, the driving behavior of people in Indonesia are heavily influenced by the state of their economy. For example, as was the case by public transport riders competing for customers while the number of public transport and the customer is not balanced, but if they do not get a lot of customers, they are also not able to get enough money for their family. In addition, to the differences between the poor and the rich is large enough, so a large social gap affects their behavior on the road as a form of imaging their identity on the highway.

Police officers

One of the unity in police of the republic of Indonesia is a traffic police. Their duty to enforce the regulations, provide penalties for violators and have full rights in granting a

driving license. From interviews with 2 traffic police chief in the capital city (Jakarta) and the capital city of Central Java (Semarang), we get the information that the unity of the traffic police have driver clinics and there are psychologists who work there. Psychologists have task to assess whether a person is entitled to a driving license or not. Unfortunately not all cities office of traffic police have driver clinics, only in big cities and programs for road safety was not the same in every region. For example, a program conducted by the traffic police in Semarang as a specific form of road safety enforcement is Pre-emptive (socialization in school and society), Persuasive (Patrol) and Repressive (Law enforcement). The strategy is 4-4-2 or 40% of pre-emptive, 40% of persuasive, 20% of law enforcement, but in fact less effective, so it must be changed 8-1-1 or 80% of law enforcement, 10% of pre-emptive, 10% persuasive.

Ministries

We interviewed the ministries for this study, they were the Ministry of Public Work (responsible for road infrastructure), Ministry of Transportation (responsible for the operations of transportation between cities, provinces, and island), the Regional Transportation Organization (responsible for public transportation in a province) and the Ministry of Health (responsible for the handling of the accident and the accident victim healing). These ministries are the one who has the authority to make regulations relating to the transport and the drivers and in law enforcement will be under the authority of the police. From some of these ministries have noted many problems of transport in Indonesia, especially in big cities. Accidents which have occurred many factors, as does the lack of adequate infrastructure, inadequate drivers road safety instruments, lack of adherence to the drivers of traffic signs, and lack of drivers personal safety awareness and other drivers. Some of these ministries have done some research in collaboration with several universities in

Indonesia to discover new innovations and new ways of handling that can be done to reduce the number of accidents on the highway. As performed by the Department of Transportation, they have a speed management system for drivers on the highway by setting maximum and minimum speed when passing through certain areas in the city or in the inter-provincial roads. Tools of speed management is the education/ campaign, engineering (encouragement) and tools/ infrastructure. The purpose of this speed management is for reducing accident.

Private Company Owner

We interviewed two private companies engaged in public transportation, bus. In any transport company must have rules or standards that must be adhered to in order to protect the driver and passengers to keep a license to operate from the Ministry of Transportation. From the both we get the data that is not much of traffic accidents happened by their drivers. Policy made by the company by doing a rigorous selection of the drivers who will join them with aim to prevent an accident caused by human error. In addition, driver evaluation program conducted by the company and the Ministry of Transportation as a place for drivers to submit comments and suggestions based on their experience of driving on the highway, such as invisible traffic signs on the roads and decayed infrastructure. As an appreciation for their work, every month, the company gave a gift to the best drivers of the month, so they can be motivated to always be a good driver on the highway.

The behavior of the road user (of which aggression is one aspect) needs to be considered within the framework of the social and psychological context in which it occurs. The view is expressed that the road user's behavior is seen as reflecting a balance between personal motives (for example, thrills, the desire for speed or position in the traffic stream) and the

subjective risk of crash involvement (Grey et. al, 1989). This is in line with the opinion of Prof. Dr. Tohir as an anthropologist who argues that road is as an arena or area to express driver's own interest. The driving behavior of people in Indonesia are heavily influenced by the status of their economy condition. The differences between the poor and the rich are large enough, so that a large social gap affects their behavior on the road as a form of imaging their identity on the highway.

The economists argue that economic development in Indonesia rapidly increases in short time after financial crisis in 1998. People is not ready enough for those changes. Hedonism culture began to abound in the people. Gap between rich and poor is even greater. Community groups that have a greater economic capability want to show their social status by buying goods that have luxurious symbol like cars or motorcycles. They drive it on the street often at high speed with the purpose of attracting attention or as an expression of freedom. It is also equally committed by the poor. They drive the vehicle at high speeds, not obey traffic regulations with the aim to express distress over the state of the economy. For example, it was the case by public transport drivers competing for customers while the number of public transport and the customer is not balanced, but if they do not get a lot of customers, they can't earn enough money for their family.

From the explanation above can be explained the behavior of drivers in Indonesia, especially in the selected cities that including the big cities in Indonesia. Bad driving behavior can lead to an accident, although accidents that occurred in Indonesia cannot be said 100% caused by human error. The factors presented by Büschges (1993) are also presented by the experts. According to the experts, the present situation of infrastructure in Indonesia is yet inadequate. Traffic signs are less suitable placement can make drivers

confusing and decided to ignore these signs. Economic conditions in the cities in Indonesia also is not evenly good distributed, so the construction of road infrastructure to be less qualified. For example, the number of damaged roads can pose the risk of a single accident. In addition, in terms of economy, the purchasing power of the vehicle is still fairly poor, so the tendency to buy a vehicle with poor quality with a capacity of safety level is also not good. These things can lead to a lack of road safety awareness of drivers.

However, this situation is not problem without solution. Ministries, police and experts try to offer solution for this problem. Ministry as the government is obliged, prior to make a law for transportation traffic and road safety. Currently the ministry, police and experts are working together to make laws of road safety (Draft National Public Safety). Law enforcement duties will be on the Police. They do not make law but to enforce the law.

The description above, it can be concluded that the traffic and transportation psychology can be developed in Indonesia. Although currently not many psychologists, experts, ministries or police have heard about the traffic and transportation psychology, but they argue that traffic and transportation psychology is important to solve the problems of transportation in Indonesia. By providing the facilities like the law of the ministry about the convenience by the traffic and transportation, psychologist can participate in addressing the problem of transportation in Indonesia, especially in terms of personality of driver, behavior and health or fitness of driver.

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TRANS JOGJA BUS PASSENGER'S DISTRIBUTION ON THE UGM CAMPUS

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ABSTRACT

Passenger's distribution patterns of attraction and generation of Trans Jogja bus becomes one of the main foundation of the operational policies. The pattern shown by probability distribution of the number of passenger's load and unload. This paper reveal the methods and patterns emerge from campuses dominant land use .

Because of data outliers, data cleansing procedure is needed. it was processed using extreme quartiles boundary method. Since its ratio scaled dependent variable , parametric statistical was used. For nominal data, we have used non-parametric tests. For its four nominal groups, which are the date, day, hour and stops, the chi-square test was used to test the difference variance data independence. Chi-square test does not require a specific distribution of a population. But requires data that represent population, which is complete pairs include 8 stops, 17 operating hours. To filter that completeness, we developed specific algorithm. Data were collected from eight (8) bus stops around the campus, seven (7) days in row, 17 operating hours (5 - 21) , from January 2014 to May 2014. The output of this study covers all day-to-day operations of Trans Jogja bus ,

It was found that the level of incomplete variable occur in all variables, ie Date, Day, Hour and bus stop. Overall data normality test results showed, there were no normal distribution of data. The results of Chi-squared Test of Independence, showed that there were significant variance of datum between bus stops, and days. Variance also occur between load or unload passengers data at each stops-days pairs. So that normality test were performed on all stop-day pairs.

We can be concluded that the data were grouped in days and stops, mostly showed normal distribution. There are 11 pairs of day-stop that are not normally distributed, of total 112 pairs. Distribution fitted to day-stop pairs either normal is the Cauchy distribution, uniform (constant), and exponential.

Keywords – probability distribution, passenger, trans jogja's bus, universitas gadjah mada.

Introduction

DI.Yogyakarta Provincial Government has developed Trans-Jogja bus service since 2008. For the development of the Trans Jogja future, we need a solid foundation of policy making. Simulation and agent-based modeling approach offers a more detailed, in terms of objects, processes and results. Such an approach could be used as the basis of policy making. The distribution pattern of Trans Jogja's passengers in this study will be

part of the Trans Jogja.'s simulation and modeling.

This article will reveal how the get on-off passenger's probability distribution of the shelters are located around the campus of the University of Gadjah Mada. Although dominated by the activities of the campus, around the University of Gadjah Mada are located other land uses, such as hospitals and commercial activities. Of the distribution pattern obtained can be summed

up the general pattern of on and off of the passengers in the bus stops.

Theoretical Review

Before normality test begin, outlier identification is needed to avoid data mislead (K and Kannan K 2013). Simple visual outlier identification could use box and whiskers plot (McKillup 2011). If needed, we use extreme quartile method to cleaning up the data from outlier (K and Kannan K 2013).

Shapiro–Wilk test, known as the best normality test, but it has limited sample number to handle with. There are various maximum sample number suggestion based on a transformation of W to normality. The largest sample number to be processed in Shapiro–Wilk test is 5000 (Thode 2002, 27; The R Core Team 2015, 675:1539) . But it solved in the Anderson–Darling test. (Tuffery 2011, 54–55).

Normality test is done before the chi-square test. Because the chi-square test requires a complete pairs of population data (Montgomery 2014; McKillup 2011).

Chi-square test are used for test of variance, since there are many grups of population variables compared with unknown distribution (Kelley and Donnelly 2009; McKillup 2011).

Initial distribution test of normality are using anderson-darling test. If the data does not fit the test , we need to looking at skewness and kurtosis of the data, which is shown in the Cullen and Frey graph which plotted by gofstat function in fitdistrplus package in R (Delignette-Muller and Dutang 2015; The R Core Team 2015).

Research Methods

In this paper, one of the output is the variance of the number of passengers getting on and off the Trans Jogja bus .

Four variance seen from variables, hours of arrival of the bus, the bus arrival, the location (stop), bus route.

With respect to the above purposes, the null and alternative hypotheses set :

Null hypothesis, H0: all the time have the same mean value, there is no relationship between the number of passengers who boarded the bus.

The alternative hypothesis, H1: not all the time have the same mean value, so that there is a relationship between the number of passengers who boarded the bus.

The hypothesis for similar data pairs, can be applied to the variable day, location, and service, to a variable number of passengers who got off the bus.

Variance tests our data were using the chi-square test, due to non-parametric data, requires no particular distribution, and the 4 variables tested. $X_c^2 = \sum \frac{(O_i - E_i)^2}{E_i}$

Where O is the value of observation , and E is the Expected value . P-value is used to measure the difference. If the P-value less than the significance level (0.05), we can not accept the null hypothesis. Thus concluded that Ha is accepted that there is a relationship between two variables were compared.

Five testing steps are performed , which are filtering and grouping data, outlier-elimination of outliers, normality test, different test, and distribution fitting.

The software used to process the data, and the report is LibreOffice writer and calc, and R, (The R Core Team 2015; Fox 2005; Delignette-Muller and Dutang 2015; Fox and Weisberg 2011; Pinheiro et al. 2015; Gross and Ligges 2015; Turner 2015; Adler, Murdoch, and others 2014).

Data Discription

Bus Stop where the data collected are located around the campus of the University of Gadjah Mada. The following is a list of bus stops:

Table 1. Bus Stop Location

No	Location	Halte Name	Landuse
19	Faculty of Agriculture UGM	Jl.Kaliurang (Pertanian UGM)	Campus, Commercial
20	Kopma UGM	Jl.Kaliurang (Kopma UGM)	Campus, Commercial
21	Kosudgama UGM	Jl.Colombo (Kosudgama)	Campus, Hospital
22	Panti Rapih Hospital	Jl.Colombo (Panti Rapih)	Campus, Hospital
23	Universitas Negeri Yogyakarta	Jl.Colombo (UNY)	Campus, Commercial
24	Universitas Negeri Yogyakarta	Jl.Colombo (Samirono)	Campus, Commercial
37	Faculty of Medicine UGM	FK (Sardjito Timur)	Campus, Hospital
38	Masjid Mardiyah, Sendowo	RSUP Dr. Sardjito (Sardjito Barat)	Campus, Hospital

Source : (Dishubkominformo 2012), Survey.

Data Grouping

From the data that is already available, they grouped based on data dependent and independent as in Table Tabel

Table 2. Data Groups

Dependent	Independent
1 Loaded Passenger	1 Arrival Times (18 Class of Hour)
2 Un-loaded Passenger	2 Arrival Days (7 Class)
	3 Arrival Date
	4 Bus Stop Location (8 Class)
	5 – 22 Sunday / Holiday-Saturday
	19, 20, 21, 22, 23, 24, 37, 38

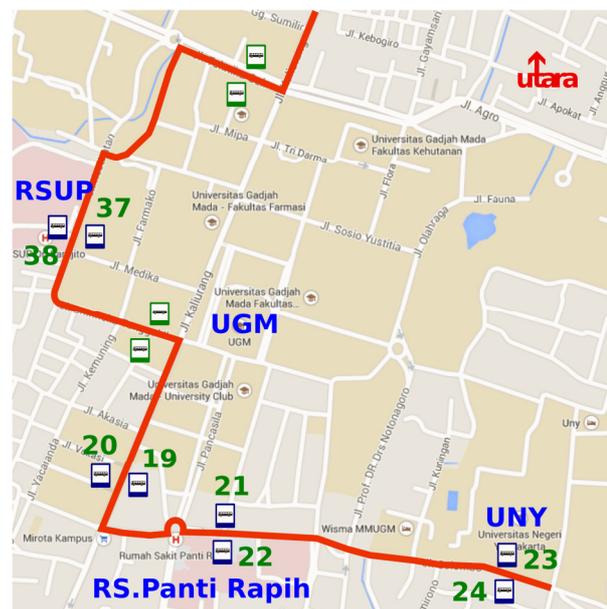


Figure 1. Survey Location

Levels of Independent Variable

The existing data in the independent variables were then grouped by detail hours, days, stop, and its route as mentioned in Table Tabel. Classification used to help measuring whether there is a variation between groups. So that further analysis be conducted on different classes only.

Data Summary

Results of the summary data in the form of values the smallest (Min), quartile 25% (1stQu.), Median, mean, quartile 75%, and

the largest value (max). Function used in R is “summary”.

Visual inspection of the outlier, with box and whiskers plot.

Box and whiskers plot provide visual summaries that quickly and easily from the dataset. The circle represented the outliers. In general, outlier set as a value greater than $1.5 \times \text{IQR}$ (interquartile range) (Teetor 2011).

Regarding the determination limit outlier values, we used extreme outliers which have a range of $3 \times \text{IQR}$ (K and Kannan K 2013) Figure below shows a picture box-plot of the raw data, the number of passengers who get on the bus (1) and the number of passengers get off bis (2).

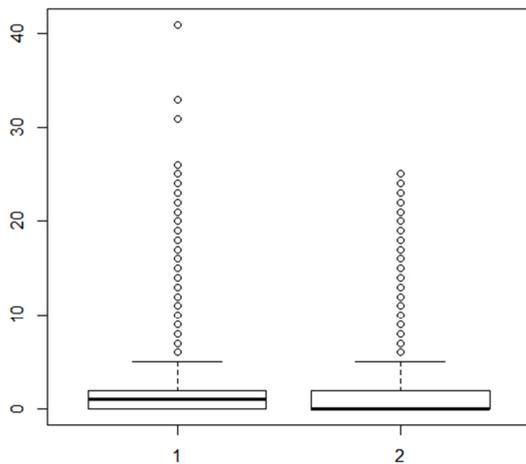


Figure 1. Raw Data Boxplot with Outlier

Arrival Time	Get On Pass	Get Off Pass	Bus Route	Bus Stop	Days	Time
Min. : 5.083	Min. : 0.000	Min. : 0.000	1B : 9810	23 : 11138	1 : 11109	6 : 3720
1stQu. : 8.950	1stQu. : 0.000	1stQu. : 0.000	2A : 11420	21 : 10092	2 : 6497	7 : 3603
Median : 12.867	Median : 1.000	Median : 0.000	2B : 11659	22 : 5996	3 : 6258	20 : 3490
Mean : 13.070	Mean : 1.331	Mean : 1.066	3A : 10064	24 : 5663	4 : 8467	8 : 3483
3rdQu. : 17.183	3rdQu. : 2.000	3rdQu. : 2.000	3B : 9749	19 : 5318	5 : 6839	12 : 3417
Max. : 22.050	Max. : 8.000	Max. : 8.000		20 : 5167	6 : 6092	11 : 3385
					(Other) 7	:
					: 9328	7440 31604

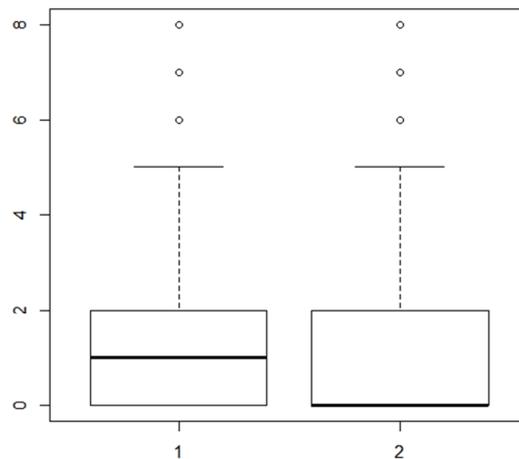


Figure 2. Box Plot of Clean Data

Analysis of the summary and picture box

From Figure above, there are many outliers in raw data. This can be seen from the circles above the "whiskers"line . Both in getting on and off passengers.

With the approach of extreme outliers, raw data are cleaned of outliers. The following is a summary table of data after cleaning.

Table 3. Data Summary without Outlier

Table Tabel and Figure shows some distance still occur between the passengers up and down the largest with a value kuartilnya. outliers circles are still visible. But this should not be a problem because of the range of distance that is small, and the number of outliers were little.

Filtering

For the purposes of the distribution test, it should be the average of the same number of days, then used the data on three different dates, used 3 in each of the first date the same day.

The data needed for analysis is in 17-hour continuous operation, for 7 days, at 8 stops were observed. For that purpose we developed a filter, as in Figure

Variance test

We used Chi-squared test, to see the value of $p < 0.05$. can be summarized as follows.

1. There are differences between the passengers up and down pattern, Trans Jogja bus.
2. There are four (4) groups are dependent, namely (1) stops 19, 23, 37, (2) stop 20 (3) stops 21, 22, 24, (4) stops 38

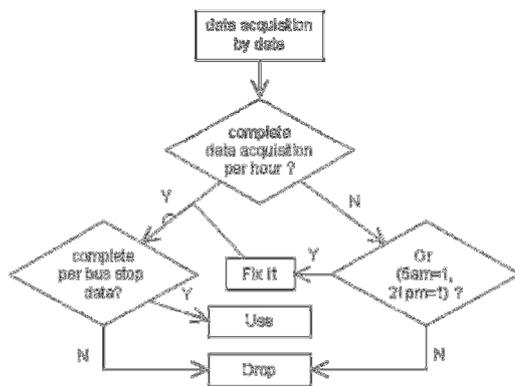


Figure 3. Data Filtering for Chi-Square Test

Four groups were then tested stop day-to-day variation at each stop. From the chi square test above, it appears that couples today are dependent does not have a pattern of similarities between shelters. So that the distribution of test needs to be done on each day at all stop there.

Normality Test of Groups

The next step to examined the data for distribution fitting is :

1. Test normality of each day
2. Matching distribution.

By looking at the p-value of the Anderson-Darling normality test. Also see p, the number of days with a p-value ≤ 0.05 it can be concluded that

1. The shelters have a distribution of passengers up and down a different,
2. The distribution of variation is also seen in the pattern of passengers on and off between the day,

Because it has not recognized as common distribution pattern, the data are tested by the same day, the same shelters, but on different date groups.

Because of varying normality variance of 21 shelters and day-to-day on a different date. We looking for average number of passengers that go up or down. Then the data is tested with anderson-darling to see its normality.

The result of the tests of most passengers up and down at bus stop data are normal distributed. Just a few bus stops in a few days are not. p-value of the test anderson-darling, required > 0.1 to be judged normal distribution.

For day-stops that do not qualify on normality anderson-darling test, we used the package fitdistrplus in R for it ((Delignette-Muller and Dutang 2015). In Table Tabel summarized the distribution of day-stop non-normal.

Table 4. Other Probability Distribution of Bus Passenger

No	Hari	Bus Stop	L / UL ?	Distribution
1	Tuesday	37	UL	Cauchy

2	Wednesday	19	U	Uniform (cont.)
3	Wednesday	22	UL	Uniform (cont.)
4	Wednesday	24	UL	Exponential
5	Wednesday	37	UL	Exponential
6	Thursday	22	UL	Exponential
7	Friday	22	UL	Exponential
8	Friday	24	UL	Exponential
9	Saturday	19	UL	Cauchy
10	Saturday	22	UL	Uniform (cont.)
11	Saturday	24	UL	Exponential

L = Load, UL = Unload

Conclusion

From the results of data processing of the above, we can conclude several things:

Data of the Trans Jogja can not be directly processed because there are outliers, and there is a variable level that is incomplete. That incomplete data and variables are occur in all variables, ie Date, Day, Hour and stop

The results of whole data per variable normality test indicates the data are not normally distributed,

The results of different test with chi-square test showed that there were significant variances between stops, and between days. Variances also occur between passenger data up or down passengers at all stops and a couple days. So that normality test was performed on all pair-bus stop and day.

Data after grouped in a typical day-to-stop, mostly showed normal distribution.

Pair data of bus stops that are not normally distributed are presented in Table Tabel.

Various suitable distribution on pairs of bus stop and day that is not normal is the Cauchy distribution, uniform (constant), and exponential, as written in Table Tabel.

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ISOBARIC VAPOR-LIQUID EQUILIBRIUM FOR THE BINARY MIXTURE OF ETHANOL (1) + 1-HEXANOL (2) AT 100 kPa

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ABSTRACT

The isobaric vapor-liquid equilibrium (VLE) data for the binary mixture of ethanol + 1-hexanol were determined at 100 kPa through the measurements of boiling point temperature by using modified Othmer recirculation still. No azeotrope was formed in the investigated binary system. The Wilson, nonrandom two-liquid (NRTL), and universal quasichemical (UNIQUAC) models were used to correlate the experimental data to obtain binary interaction parameters. These three models yield satisfactory results.

Keywords : ethanol, 1-hexanol, vapor-liquid equilibrium

Introduction

In the recent years, the oil price has been rising globally. On the other hand, the number of new oil resources are significantly decrease. Alcohol is one of the promising alternative energy to overcome these problem. Mixed alcohols which consists of C1-C8 alcohols can be produced by using coal through new chemical synthesis technology (Wang & Bao, 2013). Distillation process is employed to separate those mixed alcohols in order to obtain single alcohol such as ethanol, 2-butanol, 1-pentanol, 1-hexanol, etc. To develop the separation process, vapor-liquid equilibrium (VLE) data of the related mixtures are essential and play important rule in the design and optimization of the process.

Several studies on the VLE measurement of mixed alcohols have been published. The isobaric VLE data for binary systems of methanol with 1-propanol, 1-butanol, and 1-pentanol at 101.3 kPa were reported by Hill & Van Winkle (1952). For the system containing ethanol, isobaric VLE data of ethanol with 1-butanol, 2-butanol, and 1-pentanol at 101.3 kPa were reported by Hellwig & Van Winkle (1953), with isobutanol at 101.3 kPa by Resa et al.

(2004), with tert-butanol at 101.3 kPa by Yang & Wang (2002). For 1-propanol system, Ballard & Van Winkle (1952) reported the isobaric VLE of 1-propanol with 2-propanol at 101.3 kPa. For the binary mixture containing 2-propanol, isobaric VLE data of 2-propanol with methanol, ethanol, and 2-butanol at 101.3 kPa were determined by Ballard & Van Winkle (1952), with 1-butanol and 1-pentanol at 101.3 kPa by Wang & Bao (2013), with 2-butanol at 101.3 kPa by Tamir & Wisniak (1975). The isobaric VLE data at 101.3 kPa of 1-butanol with 2-butanol and tert-butanol were reported by Wisniak & Tamir (1976), with isobutanol at 101.3 kPa by Tamir & Wisniak (1975), with 1-propanol at (53.3 and 91.3) kPa by Mohsen-Nia & Memarzadeh (2010). The other binary mixture, isobutanol + tert-butanol was measured at 94.9 kPa by Darwish & Al-Anber (1997). The systems containing binary mixture of ethanol + 1-hexanol has not been fully investigated.

In this present study, the isobaric VLE data were measured through boiling point for the binary systems of ethanol with 1-hexanol at 100 kPa by using an Othmer-type recirculation still. The VLE data of ethanol + 1-hexanol measured in this study have not

been found in the investigated pressure. The experimental data were correlated using the activity coefficients models such as the Wilson (Wilson 1964), NRTL (Renon & Prausnitz 1968), and UNIQUAC (Abrams & Prausnitz 1975).

Research Methods

Materials

The specification of materials used in this study were listed in Table 1. Ethanol was used without additional purification. 1-Hexanol was dried using 3A molecular sieve adsorption with final mass fraction purity better than 0.989.

Table 1. The Specification of Materials

Compound	Source	Mass Fraction Purity	MW (g·mol ⁻¹)
Ethanol	Merck	0.999	46.069
1-Hexanol	Merck	0.989	102.177

Apparatus and procedures

The boiling temperatures were measured using an Othmer-type recirculation still. The detailed diagram and working procedure of the apparatus were explained by Morrison et al. (1990). The top part of the equilibrium still condenser was opened to the air to ensure the pressure inside the still in standard atmospheric condition. The pressure condition of the experimental environment was 100±0.2 kPa. The atmospheric pressure was measured using calibrated-TFA barometer (Germany) which has stability ±0.1 kPa. The mixture was injected about 150 cm³ in each experimental run. The temperature of the mixtures was kept for at least 1 hour to ensure equilibrium conditions achieved. The equilibrium temperature was measured by using a calibrated K type-digital thermometer (TK4S-14RN, USA) with uncertainty ±0.1 K. As equilibrium temperature was attained, liquids in equilibrium condition were collected for analysis. A gas chromatograph (GC) (Agilent 6820, USA) equipped with

flame ionization detector (FID), HP-5 Column (P/N : 19091J-413) and a carrier gas of helium with purity >0.9995 in mass fraction was used to analyze the liquid phase composition. The temperature operations of GC were 384.15 K for the front inlet, 573.15 K for the column, and 523.15 K for the detector temperature.

Results and Discussion

The boiling temperature data have been measured for the binary system of ethanol (1) + 1-hexanol (2) at 100 kPa as listed in Table 2 and the *T*-*x*-*y* diagram was shown in Figure 1.

Table 2. Vapor-Liquid Equilibrium Data for Binary System of Ethanol (1) + 1-Hexanol (2) at 100 kPa^a

<i>x</i> ₁	<i>T</i> (K)
0.0000	429.2
0.0195	419.0
0.1499	395.7
0.2045	391.1
0.3128	376.5
0.3778	374.3
0.4647	368.5
0.5448	365.0
0.6179	364.4
0.6855	359.8
0.7662	357.9
0.8273	354.4
0.8649	352.5
0.9157	351.7
1.0000	351.6

^a *u*(*x*₁) = 0.001, and *u*(*T*) = 0.1 K

The experimental VLE data were correlated using the Wilson, NRTL, and UNIQUAC models. The relationship of vapor and liquid phases in equilibrium is described as follows:

$$y_i \Phi_i P = x_i \gamma_i P_i^{sat} \quad (1)$$

where *y*_{*i*}, *x*_{*i*}, Φ_i , γ_i , and *P* refer to vapor phase composition, liquid phase composition,

vapor phase correction factor, activity coefficient and pressure, respectively. The superscript *sat* stands for saturated, and the subscript *i* represent component *i*. The vapor phase correction factor in this work was considered 1 as represent the ideal vapor phase.

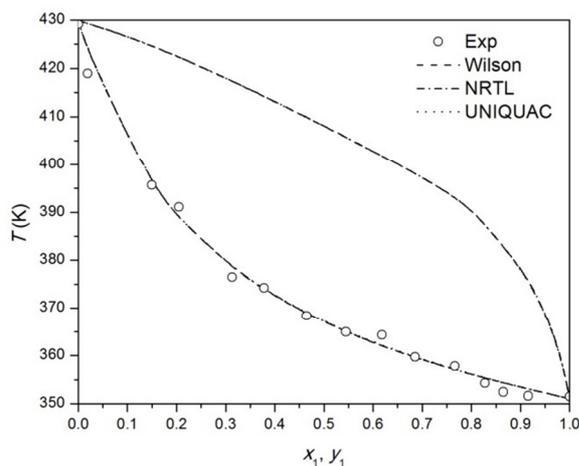


Figure 1. VLE phase ($T-x_1-y_1$) diagram for binary system of ethanol (1) + 1-hexanol (2) at 100 kPa

The objective function used for the optimization is shown in equation 2.

$$OF = \sum_k^N (T_k^{\text{exp}} - T_k^{\text{cal}}) \quad (2)$$

where N and k are the total number of experimental data points and the point, respectively. T_k^{exp} and T_k^{cal} refer to experimental temperature and calculated temperature in equilibrium, respectively.

Antoine equation was used to calculate the saturated pressure of pure component as shown in equation 3.

$$\log P^{\text{sat}} = A - \frac{B}{T + C - 273.15} \quad (3)$$

where P^{sat} is in bar and T is in K. A , B , and C are the parameters of the Antoine

equation for each component as listed in Table 3 (Poling et al., 2001).

Table 3. Parameters of the Antoine Equation for Pure Compounds

Component	A	B	C
Ethanol	5.33675	1648.22	230.918
1-Hexanol	4.18948	1295.59	152.510

The physical properties and parameters of each component used in the activity coefficients correlation for the Wilson, NRTL, and UNIQUAC models are given in Table 4.

Table 4. Physical Properties and Parameters of Pure Components Used in the Activity Coefficients Correlation

Component	V^a ($\text{cm}^3 \cdot \text{mol}^{-1}$)	r^b	q^b
Ethanol	58.68	2.5755	2.588
1-Hexanol	125.19	5.2731	4.748

^a Poling et al., 2001

^b Hansen et al., 1991

The activity coefficients models used in this study are able to correlate well to the experimental data. As shown in Figure 1, the deviations between the experimental and calculated points are small. The best fitted binary interaction parameters and the average absolute deviations (AAD) for each model were listed in Table 5.

Table 5. Fitted Binary Interaction Parameters of Activity Coefficient Models and Average Absolute Deviations (AAD) for Binary System of Ethanol (1) + 1-Hexanol (2) at 100 kPa.

Model	Parameters		AAD ^a (%)
	A_{12} (K)	A_{21} (K)	
Wilson ^b	-91.214	-45.200	0.32
NRTL ^c	513.665	-331.956	0.32
UNIQUAC ^d	-11.287	-17.367	0.32

^a $AAD = (1/n) \sum_{i=1}^n |(T_{\text{cal}} - T_{\text{exp}})| / T_{\text{exp}} \cdot 100\%$, where n is the number of data points.

^b $\Lambda_{ij} = (V_j/V_i) \exp(A_{ij}/T)$, where V is the molar volume of the component.

^c $\tau_{ij} = A_{ij}/T$, the value of α was fixed to be 0.3.

^d $\tau_{ij} = \exp(A_{ij}/T)$

Conclusions

The isobaric VLE data have been measured experimentally for the binary system of ethanol (1) + 1-hexanol (2) at 100 kPa by using modified Othmer recirculation still through boiling points temperatures. The binary system investigated in this study has no azeotrope formation. The Wilson, NRTL, and UNIQUAC models were used to correlate the VLE data of binary system. These models showed satisfactory results in the VLE data correlation.

Acknowledgments

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DEVELOPMENT OF SOLAR POWER PLANT CONSERVATION IN CAMPUS SEMARANG STATE UNIVERSITY

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ABSTRACT

Energy needs in the institution / campus of the State University of Semarang getting bigger, this is in line with the development of infrastructures in the conservation campus, such as the increase in new buildings. The main electric energy interests are increasingly required better lighting, power electric pumps, elevators, air conditioners, refrigerators, computers and other equipment. For that we need no thought to help ease the burden of the power supplied to the interests of the institution. Abundant sunlight shining on campus Unnes have now is a natural potential is enormous. On the other side of the solar power plants can be used for research purposes both faculty and students. Sunlight is converted into electrical energy. Results relocation solar modules (PV) derived from the bus shelters on campus have now, are collected to be designed as a Solar Power Plant Communal. The system used is a stand alone system.

Keywords - electricity, solar, campus

Introduction

Electrical energy needs at the State University of Semarang has increased significantly with increasing infrastructure owned by the institute.

Hence the need for a real effort to make savings and innovation to not totally dependent on electricity. One of the use of sunlight to be converted into electrical energy. Given that the campus Unnes in Gunungpati have now very abundant receive sunlight so it has great potential to procure solar power plants.

Research roadmap

Road map research related to solar energy generation in Unnes campus, starting with the scientific study through the Workshop organized by the Solar Energy division of Clean Energy Conservation Development Agency Unnes 2012. At the workshop featured two energy expert Prof. Dr. Rusiyana Hotman deputy Minister for Energy Research and Technology, Ministry of Research and Technology of Indonesia, and energy expert Dr. Hermawan, DEA of Diponegoro University. Results of workshop recommended that the first, sekaran campus

area has great potential for solar energy generation is built. It is based on observations of sunlight throughout the year are very abundant. Secondly that in the campus area have now less strong enough gust of wind so it can only be used as a micro-scale wind energy generation. (Activity Report Clean Energy Division 2012).

The focus of the assessment of implementation of solar energy generation in the campus are doing brain storming with solar module technology expert Prof. Toto Winata, M.Eng consultant and lecturer ITB solar cells, through Focus Group Discussions (FGD). FGD technically concluded the solar modules can not be made in the country so that the price can not be suppressed, but for economically very profitable investment in the long term. On campus can be built "home solar energy" that is one of the few buildings roofed solar modules for purposes such as research S1, S2 S3 also. (Clean Energy Division Activity Report, 2013)

In the program activities of the Division of Clean Energy 2014, which did FGD prototype solar energy houses on campus.

As a recommendation FGD, that prototype solar energy generation are realized as home solar energy can be implemented in a laboratory or other buildings having direct access to the benefit of solar energy such as for research students and faculty. (Clean Energy Division Activity Report, 2014).

FGD conducted in 2015 that concluded the prototype Solar Power Communal reservoir Unnes campus have now need to begin using the model stand alone system, before it developed into on-grid system connected to the grid.

Research Methods

This study was designed using a "research and development" (research and development) is a research program initiated a needs analysis. subsequently drafted a development program and test its effectiveness (Sugiyono. 2006). There are five stages in this study, needs analysis, prototype design, testing, evaluation and implementation. Results of prototype development of solar energy plants were then analyzed for feasibility (feasibility) carried out by a team of: Department of Electrical Engineering FT Unnes. The results of this feasibility study will determine whether the prototype solar energy generation developed and economically feasible to implement.

Results and Discussion

Development of Solar Power Plants in the reservoir campus is currently at the stage of the needs analysis and design of prototypes not yet reached the implementation and feasibility analysis. Stages that have been carried out as follows:

1. Phase analysis of the needs of the development of the following components:
 - a. Procurement of solar modules communal buffer size (2 x 8) m, includes: 4 pole (4 inches, a thickness of 3 mm); 2 pipe

- elbow 5 mm thick, 4 iron anchors 19 mm thick;
 - b. Inverter DC to AC, the model SP 2000 DC 24 V, size 420 x 169 x 152 mm
 - c. VRLA batteries, 100 Ah capacity, voltage 12 V
 - d. Lighting installation: 15 pieces of LED bulbs 20 watts, 1 unit MCB, cable 2 x 1.5 mm, 1 Piece socket
 - e. Solar Charge Controller: Model SP 12 V/24 V/ 48 V
 - f. 20 pieces of solar modules, type Polychristaline, max power of 50 W, Isc: 5.48 A; Imp: 18.42 V per module.
 - g. Instrument gauges: ampermeter, voltmeter, and wattmeter
 - h. Battery Rack
 2. Phase buffer module communal establishment, namely :
 - a. The location determination is based on the intensity of the maximum amount of sunlight that falls to the location.
 - b. Determination of the foundation legs buffer is by casting.
 - c. Assemble buffer made of galvanized iron
 3. The installation phase include:
 - a. Connecting each solar module In te buffer.
 - b. Connecting the solar modules to the communal dry batteries, inverters and Solar Charge Control and tool ampermeter And voltmeter.
 3. Step is done in sequence and control is done carefully to obtain optimal result. Things that get attention in these stages is the galvanizing process that is related to the time required. Given that the buffer is located outdoors exposed to sun and rain should be protected from heat and contamination which cause corrosion. So process coating or galvanizing sought as much as possible,

in order to buffer the communal solar module longevity. On the other hand a model system that allowed at this stage is that the model stand alone system.

Conclusions and Recommendations

Based on research in the development of solar power plants in ponds campus Unnes have now, at this stage apply the model stand alone system, the solar power plant communal listrik supplying electrical energy without connecting the network from PLN.

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THE PRESSURE OF CARRYING CAPACITY OF AGRICULTURAL LAND TOWARDS THE CONSERVATION OF NATIONAL PARK OF MOUNT MERBABU IN GETASAN SEMARANG

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ABSTRACT

The purpose of this study is to determine the carrying capacity of agricultural land and its influence on changes in the conservation area of the National Park of Mount Merbabu. The research was done in Getasan district of Semarang Regency. Research analysis techniques included population pressure index calculation, calculation of the carrying capacity of agricultural lands and image interpretation to determine changes in land use. The results showed that the population pressure on agricultural land in the district Getasan tends to increase although relatively light, which in 2010 amounted to 0.346 and in 2014 reached 0.502. Carrying capacity of agricultural land in the district Getasan Semarang in 2010 and 2014 have entered the phase of deficit. The availability of agricultural land in 2010 was 352.96 ha of land needs 2014 4825.4 ha and 325.07 ha land availability with the needs of 4486.6 ha of land. The deficit of carrying capacity of agricultural land leads to the tendency of society in Getasan to expand the agricultural land. When it was observed through satellite images in 2010 and 2014, there had been a change of land use around the conservation area of Mount Merbabu National Park, although in a quite small area.

Keywords - Pressure of Population, Carrying Capacity of Land, National Park

Introduction

Land is a natural resource that is vital to human survival because of land resource is the input (input) necessary for every human activity such as agriculture, industry, housing and so forth. Extensive land is used for agriculture sector which includes food crops, agricultural crops, forestry and herd as well as freshwater fisheries (Fitriany, 2005: 13).

In order to meet the needs of the increasing number of living population, land requirements have also increased and has led to shifts in land use that are less favorable for the realization of environmental conservation efforts. Kusumawati (2013: 8) stated that the agricultural sector has been increasingly displaced by the industrial sector, with the high conversion of the vast agricultural land and degraded land. This shows that the agricultural land will continue to decrease, driven by population growth and the advancement of development

in Indonesia. The higher the population density per km² or per hectare, the less agricultural land available.

The area around Mount Merbabu is designated as national park area by the Minister of Forestry's decree No. 135 / Menhut-II / 2004 on Function Change of Protected Forest Areas and Ecopark on Merbabu forest area of 5,725 hectares. This area is considered important because it has high conservation value as water sources, erosion prevention and habitat for protected flora and fauna. Like other forest areas in Java, the Merbabu National Park is not inevitable from the damages caused by the illegal activity of the surrounding community. Among those recorder activities are the activities of unlicensed sand and stone mining, illegal logging and forest clearing to grow vegetables.

To explore the issue of land use change on protected areas, it needs a calculation of the carrying capacity of agricultural land.

Calculation of carrying capacity of agricultural land is useful for estimating whether the agricultural land in the Getasan is still capable of supporting life and is there a viable farmers influence on changes in protected areas and conservation areas (Merbabu National Park). It is getting common recently that the areas which are supposed to be protected area are converted into agricultural areas. As described earlier, this is caused by the constantly increasing need for agricultural land, while agricultural land itself continues to decrease because of being pressured by the continued increase of the population using agricultural land for other purposes.

Research Methods

The location study on the carrying capacity of agricultural land is in District Getasan, which is one of the districts in Semarang. The study focused on the area around the Merbabu National Park which is an important conservation area in the preservation of living creatures, water resources and erosion prevention. The objects in this study are residents of Getasan, agricultural land, and the land area of the National Park of Mount Merbabu. The determination of sample is done by using purposive sampling method, which is carried out with the aim that the sample points are chosen to represent the population in the study area.

This research includes studies of causative correlation. This study aimed to determine whether there is a correlation between population pressure on agricultural land to land changes in Merbabu National Park. Researchers assume that population pressure on agricultural land led to agricultural land decreasing, while the food needs of the population increases, so that the population would open agricultural land other than the existing agricultural areas, in this case devoted to the conservation area of the National Park of Mount Merbabu.

1. Calculation of Population Pressure

Formula II model was used to calculate the population pressure on land. Population pressures formula II model is as follows:

$$TK_t = (1 - \alpha_t) \cdot z_t \frac{f_t \cdot P_0(1 + r)^t}{L_t}$$

Description:

TK: population pressure on agricultural land.

t : The period of time of calculation.

α : Fraction of agricultural income or a percentage. Contribution revenue outside the agricultural sector on average magnitude of X is 35% (Mantra, 2003)

z : The land area required to support the life of a farmers at a decent level of life (ha / person).

f : The percentage of farmers in the population.

Po: The size of the population at the time of the reference time t0 (people).

r : The average annual rate of population growth.

L : Agricultural land in the area concerned.

The critical level of population pressure in an area can be seen from the value of TKT. If the value is greater than one, the region has been critical (Mantra, 2003: 76-78). Then the results are included in the standard evaluation (TK < 1 = mild pressure; TK ≤ 1-2 = moderate pressure; TK ≥ 2 = high pressure).

2. Calculation of Agricultural Carrying Capacity

To determine the carrying capacity of an area, the stages are as follows:

a. Calculation of the availability (supply) of land the formula:

$$SL = \frac{\sum (P_i \times H_i)}{H_b} \times \frac{1}{P_{tvb}}$$

Description:

SL: The availability of land (ha).

Pi : Actual production of each type of commodity (units depend on commodities) Reckoned commodities

cover agriculture, farming, forestry, animal husbandry and fishery.

Hi: The unit price of each type of commodity (USD / unit) at the level of manufacturers.

Hb: rice price (USD / kg) at the producer level.

Ptvb: Productivity of rice (kg / ha).

b. Calculation of needs (demand) of land using the formula:

$$DL = N \times KHLL$$

Description:

DL: The total land requirement of rice equivalent (ha).

N : Total population (people).

KHLL: The land area needed for a decent life needs per population.

c. Determination of the status of the land carrying capacity

Status of land carrying capacity is obtained from the comparison between the availability of land (SL) and the land requirement (DL). If $SL > DL$, the carrying capacity of the land is considered surplus, when $SL < DL$, the carrying capacity of the land is considered as deficit or exceeded.

3. Image Interpretation to Find Out the Shift of Land Use

a. Classification results of interpretation

Classification of the results of interpretation is aimed at grouping or segmenting the homogeneous appearances which are then delineated (giving the boundary between one use and another) directly on computer monitors (digitation on screen).

b. Analysis interpretation validity

This analysis method is obtained from a field survey by means of the form validity table. The table contains the locations of interpretation, the survey location and coordinates (Adyatama, 2010: 26).

In this study, the overlay is used to determine the rate of change of protected area in time series. Overlaid map is a map of protected areas and land use maps. In this study the technical analysis of the data used is descriptive analysis which includes descriptive qualitative and quantitative descriptive.

Results And Discussion

1. Population Pressure on Agricultural Land

One of the factors that affected the carrying capacity of agricultural land was the index of population pressure on agricultural areas were calculated based on the formula II model that added a number of off-farm income. This formula was used because the study area was an area that has developed so that farmers were not dependent fully on the farm.

Under these conditions, the population pressure on agricultural land in Getasan in 2010 were:

$$TK_{2010} = (1 - 35\%) \cdot 0,10 \frac{43,5\% \cdot 48.254 (1+1,09\%)}{3.983,5}$$

$$TK_{2010} = 0,346$$

In 2014, population pressure on agricultural land in Getasan were:

$$TK_{2014} = (1 - 35\%) \cdot 0,09 \frac{65,54\% \cdot 49.851 (1+1,77\%)}{3907,07}$$

$$TK_{2014} = 0,502$$

Based on the above calculation, the pressure of Getasan residents in 2010 was 0,346 and in 2014 reached 0,502. This value was still below 1. Therefore, it could be stated that the population pressure was relatively light.

2. Agricultural Land Carrying Capacity

Land carrying capacity was calculated in accordance with the Regulation of the Minister of Environment Number 17 Year 2009 on Guidelines for Determination of Carrying Capacity of the Environment in Spatial Planning.

a. Calculation of the availability (supply) of land.

In 2010 the availability of land in the District Getasan were as follows:

$$SL_{2010} = \frac{Rp5.336.828.780,00}{6.300} \times \frac{1}{2.400} SL_{2010} = \frac{\sum (Pi \times Hi)}{Hb} \times \frac{1}{Ptvb}$$

$$SL_{2010} = 352,96 \text{ ha}$$

Whereas in 2014 the availability of land in the District Getasan were as follows:

$$SL_{2014} = \frac{Rp6.587.496.920,00}{7.100} \times \frac{1}{2.854,2}$$

$$SL_{2014} = 325,07 \text{ ha}$$

b. Calculation of the demand of land.

Calculation of level land requirement in 2010 and 2014 are as follows:

$$DL_{2010} = N \times KHLL$$

$$DL_{2010} = 48\,254 \times 0.10$$

$$DL_{2010} = 4825.4 \text{ ha}$$

$$DL_{2014} = N \times KHLL$$

$$DL_{2014} = 49\,851 \times 0.09$$

$$DL_{2014} = 4486.6 \text{ ha}$$

c. Determination of the status of the land carrying capacity

Based on the calculation of the availability of the land needs of the District Getasan, the obtained data on the level of availability and the needs of the District Getasan land in 2010 and 2014 according to the Table 1.

Based on the results of the calculation of the carrying capacity of agricultural land, it can

be concluded that the carrying capacity of agricultural land in the district Getasan was deficit.

3. Changes in Land Use

Based on the results if the satellite image by means of digitization on a screen, in the area around the Merbabu National Park, there were some changes in land use during the period of 2010-2014. These changes had not reached the National Park area, but tended to approach the area. It can be seen from the appearance of the image results of 2010 and 2014 were overlay with the boundary of Merbabu National Park.

In Figure 1, there were 12 changes including vegetated shrubs land which turned into agriculture as well as changes in vegetation density. All changes covered less than 1 hectare, but more than 100 m². This related to the carrying capacity of agricultural land in the district Getasan in 2010 and 2014 which revealed a deficit because the availability of land was smaller than the needs of the public land. From these calculations, it can be seen that the needs of the agricultural land in the district Getasan had not met properly. It raised a tendency in society in District Getasan to expand the farm. When seen in satellite images in 2010 and 2014, there was a change in the surrounding area of Merbabu National Park, although still in a small percentage (Figure 1).

Table 1. Level of Land Availability and Requirements in Getasan in 2010 and 2014.

Year	Agricultural Land Availability (SL)	Agricultural Land Demand (DL)	Agricultural Land Carrying Capacity
2010	352,96 ha	4.825,4 ha	SL < DL
2014	325,07 ha	4.486,6 ha	SL < DL

Source : Calculation data, 2015.

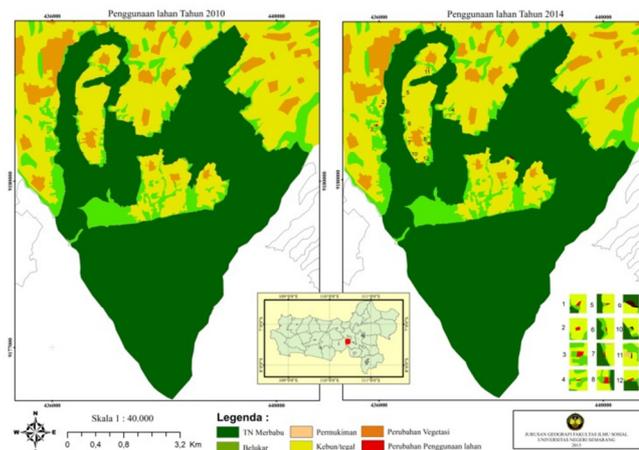


Figure 1. Map of the Image Analysis Result to find out the changes in land use

Factors that affected the population pressure on agricultural land in the district Getasan is a decrease in the amount of agricultural land, the ratio of production, farming systems, the number and population growth, and the minimum land area. Those five factors were the factors that affected the population pressure in the District Getasan. In further observation, there might be many more factors that affected the population pressure in the District Getasan.

As mentioned earlier, population pressure on agricultural land will affect the carrying capacity of agricultural land. Factors that affect the population pressure also affects the carrying capacity of agricultural land. The higher the population pressure on agricultural land, the lower the carrying capacity of agricultural land in an area. Deficit carrying capacity of agricultural land in the district Getasan signifies farmland inability to meet the needs of the population lives, although agricultural land in the district Getasan is still widespread. This is due to the lack of agricultural management, so that the amount of agricultural production is still lacking, production costs is raising and farmgate prices is plummeting.

The influence of the carrying capacity of the farm is visible from the occurrence of non-agricultural land use change to agriculture.

Changes in agricultural land due to the increasing needs of land in District Getasan due to the increased number of people who are mostly working in the agricultural sector. Based on survey data and satellite image processing, it is identified the change in non-agricultural land into agricultural land. However, the numbers are still very small compared to the total number of farms in the District Getasan. Changes in land use have not threatened the existence of the National Park of Mount Merbabu because the changes only occur in the surrounding area. But the population increase from year to year will occur, which will result in increasing demand for life and the need for land for a living. So it will have an impact on the functioning of the national park area.

In addition to changes in land use for agriculture, a decrease in the density of vegetation also occurred in a traditional zone of the national park and around the national park area. Vegetation decline is the impact of land uses, most of whom were gardens / moor, while the garden / moor cannot meet the needs of the firewood population. The lack of land that to meet the needs of firewood caused people to go deeper into the national park to look for firewood. A decrease in the density of vegetation may lead to increased risk of critical land in Getasan. It was due to the lack of absorptive

capacity of land to absorb the rain water, so that much water moving at the surface and little was absorbed into the ground. If the situation occurred on the land such as in mountainous area, then the risk of erosion will increase, even landslides could happen. It was feared to impair the function of Mount Merbabu National Park area, such as reducing water sources, increasing the risk of soil erosion, losing wildlife habitat and increasing other damages.

Conclusion

Based on the calculation, the carrying capacity of agricultural land in the district Getasan is classified as deficit. The main influencing factor is the unstable production value of agricultural land, causing ups and downs of the farmers' income. This is compounded by the increasing number of people who influence the increase in land demands, so that the carrying value of agricultural land in the district Getasan also declined. Carrying capacity of agricultural land in the district Getasan turns to affect the forms of land use. Changes in land use are not yet threaten the preservation of Mount Merbabu National Park, because it is still relatively small and mostly occurs in the surrounding area. However, the decrease in the density of vegetation is feared would damage the function of the conservation area of the National Park of Mount Merbabu.

Suggestion for relevant government is the need for better agricultural system, given this involves the carrying capacity of agricultural land in the district Getasan. For

the managers of Merbabu National Park, it is necessary to clarify the boundaries of a national park to the community and increase surveillance system towards the boundary of Merbabu National Park.

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GREEN SPACE MANAGEMENT TRAINING IN SUSUKAN VILLAGE, EAST UNGARAN DISTRICT

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ABSTRACT

This training aims to develop a sense of love to environment among the community by cultivate crops that can be used both for medicine and cooking spices. In addition, bio-pore infiltration holes planting around the resident houses in Susukan village expected to keep the ground water level, so the well's water will continue to exist during the dry season. With the youth group which is still active in the village, the program is expected to keep continued well.

The training method are brainstorming and simulation which focused to housewife and youth group of the village. They are rationally could have more leisure time to think about their neighborhood.

The outcomes of this training were enhancement of the community's sense of love to environment and their awareness about the importance of planting medicinal plants in the house and their backyard. Then, the application of appropriate technology to increase water absorption by using bio-pore infiltration holes within Susukan village of East Ungaran District could keep the draw well's water level.

Keywords - sense of love to environment, cultivate crops, bio-pore infiltration holes planting

Introduction

Dynamics and demands of urban social and economic development in general also have an impact on the utilization of physical space area of the city, so that this condition would reduce the presence of green open space in urban areas. The high development in urban areas is accompanied by an increase in the number of people over time lead to more widespread use of land for urban residential towards suburban areas including open space, protected areas, and agriculturally productive land. The green open space has decreased because of the lack of ecological considerations in urban land use.

The impact of the reduction of green open spaces in urban areas one of which leads to the reducing oxygen supply and the increasing of microclimate in urban areas which would result in the decreasing level of environmental comfort in the city. Therefore, it needs to do reforestation to add more green open spaces in urban areas. With

the addition of green open space, it is expected not only to improve the quality of the environment but also will provide coolness and beauty of the city that will produce sustainability, beauty, and harmony in the ecosystem of the city. The existence of adequate green open space will create healthy and comfortable urban environment, improve the society's quality of life, and create sustainable cities (Ginting, 2006).

Susukan Village in East Ungaran subdistrict is located in the tropical area and has biological potentials which allows all kinds of plants to grow well. Some residents in Susukan still use wells to meet their daily need of water, however some wells are dry during the dry season. Corresponding to the potential and the problems, the role of medicinal plants / vegetables and the production biopori (absorbing holes) require an intensive attention for the sake of environmental sustainability. Of the various types of plant, there are some plants that can be used as medicine, vegetables or spices for cooking. However, the majority of the

people, especially the young generation, do not realize the great benefits to be gained from some of the plants that grow around the house.

Based on these considerations, green space management training is necessary as an effort to foster a sense of caring towards the environment and maintain the availability of water in the people's wells.

Theoretical Review

a. Green Space Management

City green space management is a part of the arrangement of urban space that serves as protected areas, which consist of city parks, city forest green areas, city recreational green areas, green areas for sports activities and green area for personal yard. City green space management status are classified by region, not by the shape and structure of the vegetation (Fandeli, 2004).

According to the theory of Fandeli (2004) it required criteria to determine the form and extent of city green space. Important criteria that can be used is the environmental criteria. This relates to the important benefits of city green space management in the form of environmental benefits consisting of conservation microclimates, aesthetics and conservation of flora and wildlife. One type of city green space management in urban areas is the urban forest. Fandeli (2004) stated that urban forest is a plot of land in the city or around the city marked on the association of plant species of trees whose presence is able to create a microclimate that is different to the one on the outside.

b. City Green Space Management Advantages

City green space management in an urban area which has a high benefit. Its main function is as a guard for the city ecosystem balance, namely for the sustainability of ecological functions towards a healthy and harmonious city (Decree No. 14 of 1988). In

addition, the existence of city green space in a city can be used as a place of outdoor recreation both for short-term and long-term use (Caspersen et al, 2006).

Fandeli (2004) stated that the city green space is useful as the city's shades which makes it more comfortable for society and increases the aesthetic value of the environment. The city green space can decimate air pollution when dust and smoke particles are trapped by vegetation. From the research that has been conducted, it shows that on average 85% of air pollution can be filtered by city green space (Shan, 2011).

According to the minister's instructions, the Director General of Spatial Planning (2006) in terms of the purpose of their use, there are nine benefits of city green space, namely:

- 1) Balancing between the natural environment with artificial environment, namely as a function of environmental sustainability functions such as water resources, soil and air as well as the conservation of biological resources of flora and fauna;
- 2) Plants in RTH as the largest producers of oxygen (O₂) and absorbent of carbon dioxide (CO₂) and other air pollutants;
- 3) Establish the comfortable climate;
- 4) Helping air circulation;
- 5) As a custodian for the continuation of groundwater resources;
- 6) As the guarantee of the natural balance, ecologically can accommodate the needs of human life, including as natural habitat for flora, fauna, and microbes that are required in the human life cycle;
- 7) As a formers of architectural aesthetics factor;
- 8) As the medium and the object of education, research, and training in the study of nature;
- 9) As recreational facilities.

c. Environmental comfort

According to KBBI (Depdiknas, 2008), comfort means a state that is comfortable,

cool and fresh. The comfort of a city park is shown by the ability of the park to reduce air pollution, maintain the stability of the city's air temperature, and maintain the availability of water. The city park is expected to help improve the comfort of the city environment and prevent temperature rise of the city (Frick and Suskiyanto, 2007). Convenience can be presented with the use of these types of vegetation such as microclimate controller trees (Carpenter et al, 1975).

Urban land that has been packed with a wide variety of physical buildings (concrete, asphalt, iron / steel, glass, and other materials) and the density of humans and their activities can increase the temperature of the air in urban centers in contrast to the surrounding areas. This phenomenon is called the heat island. Trees can provide a sense of comfort in its surroundings because the crowns of trees are able to reduce solar radiation for the environment underneath (lower air temperatures) as well as through physiological processes such as transpiration which can provide moisture to the surrounding environment (Ginting, 2006). Because of the process, trees can also reduce the amplitude of daily temperature and shade when they arranged in appropriate setting.

According Lakitan (2002), the comfort of a region is also strongly influenced by the local microclimate, because directly, the elements of the climate will be involved in the activity and metabolism of humans. In determining the level of comfort in an area, we cannot include all climate parameters directly. It requires an equation containing two or more parameters to determine the level of comfort. Temperature and relative humidity are climate parameters commonly used in air comfort issues (Gates, 1972) that is explained using the temperature humidity index (THI) or discomfortability index (DI).

d. Oxygen Requirement

Human needs air in every second of their life. The average human being cannot

survive without air or more than 3 minutes (Slamet, 1994). In the resting state, the normal frequency of human respiration ranged between 12-15 times per minute. One breathes the air of 500 ml, or 6-8 liters of air per minute in and out of the lungs. The amount of the vital capacity of the lung depends on the age, sex, occupation, height, weight, body posture when measured, environmental conditions (temperature, humidity, air pressure), and type of food consumed (Gansing, 1995, in Kintamani, 2004).

Air is in the form of gas and exists anywhere that humans never thought would be a shortage of air (Slamet, 1994). However, the development of air quality in major cities has been mixed with toxic pollutant gases and solid particles which is dangerous or human health (Soemarwoto, 1997). Vegetation is the producer / major manufacturers of oxygen in nature through the process of photosynthesis that occurs in the leaves. Oxygen is the essential gas or respiration process of living creatures, including humans.

e. Absorbtion Holes Biopori

The existence of the land as a source of community life needs to be preserved. Not only for the life at the present time, but also for the next generation. Therefore, it requires natural conservation movement conducted by all parties jointly and sustainably. Recently, new innovation of eco-friendly technologies to cope with flooding was invented. The technology known as Biopori. This technology uses absorption holes in the ground to store water. The holes are formed by various activities of the organisms in it, such as worms, root crops, termites and other soil animals. The holes will be filled with air, and will be the passage of water in the soil.

The concept is then developed to make absorption holes biopori. This technology automatically creates a greater water infiltration. Increased water absorption

power is one solution to overcome the flood. In addition, Absorbing holes Biopori (LRB) can turn organic waste into compost and reduce greenhouse gas emissions (CO₂ and methane). By utilizing the role of soil fauna activity and plant roots, this method can overcome the problems posed by stagnant water such as dengue fever and malaria.

The meaning of the definition and understanding of biopori hole is a hole with a diameter of 10 to 30 cm with a length of 30 to 100 cm covered with organic waste which serves to trap water flowing around it so it can become a source of water supply for underground water, vegetation in the surrounding areas and can also help weathering organic waste into compost that can be used as fertilizers.

Biopori absorption holes have great benefits, although it cannot be felt directly by humans. In general, the presence of LRB in large quantities will allow surface water for longer stagnant while proceeding to seep into the ground. Thus the existence of the LRB will reduce the runoff. Specifically, the functions of the LRB is:

- 1) Maximize water to seep into the ground thereby increasing the ground water.
- 2) Create a natural composting of organic waste rather than burned.
- 3) Reduce the puddles that cause disease.
- 4) Reduce the useless rain water discharged into the sea.
- 5) Reduce the risk of flooding in the rainy season.
- 6) Maximize the role and activity of soil flora and fauna.
- 7) Prevent soil erosion and landslides.

Appropriate technologies bring real benefits to people's lives without spending huge costs. LRB is a simple example of appropriate technology, because of the benefits that can be felt. Biopori can be made almost on the entire surface of the earth. However, in order to generate more optimal benefits, places which are appropriate for LRB are a) on the bottom of the

rainwater channel around the house, office, school, etc., b) around the tree, and c) the vacant land between plants / border plant.

The making of LRB is very easy because of the size and depth is not based on the size of a rigid rules, as long as it is enough to restrain the rate of surface water. Steps should be taken to make the LRB are:

- 1) Create a cylindrical hole in the ground with a diameter of 10-30 cm and a depth of 30-100 cm and the distance between the holes of 50-100 cm.
- 2) The mouth of the hole can be reinforced with cement with the thickness of 2 cm and a width of 2-3 centimeters and a conciliator is given so that no children or people will fall in it.
- 3) The hole is filled with organic waste such as leaves, kitchen waste, tree branches, non-chemical kitchen food waste, etc. The waste in the hole will shrink so it needs to be recharged and at the end of the dry season can be drained to be compost as a natural fertilizer.
- 4) The number of biopori holes should be calculated based on the amount of rain, infiltration rate of water and areas that do not sink in the water with the formula = $\text{rainfall (mm / h)} \times \text{wide field of impermeable (sqm)} / \text{rate of water absorption on each hole (liters / hour)}$.

Methods

The training methods used were brainstorming and simulation. Brainstorming is an excellent tool for getting groups to work together. However, the group gets nowhere without follow-up analysis of the ideas collected. Patterns begin to emerge, the consensus is built, and the initial ideas that might have seemed "off the wall" at first can be thought through carefully and built into something great. While a simulation is an excellent training method that has great potential for presenting a complete message to the group. But its use is limited to situations that are not easy to prepare, and

those often fit some day-long training session (www.abahe.co.uk).

The training includes the following steps;

- 1) Provide socialization to the residents about the importance of medicinal plants and absorption holes biopori and their benefits.
- 2) Provide training and demonstrate how to make absorption holes biopori to the residents.
- 3) Residents practice to make biopori. Socialization was done indoors while for demonstration and practical way of making a hole of biopori was conducted on the field in accordance with the characteristics of the equipment used.

Results and Discussion

The results of the implementation of the training showed the increasing enthusiasm of residents in the socialization of medicinal herbs and biopori. It reflects the society's caring to the environment and a high awareness among citizens to preserve their neighborhood. The series of events "Green space management training in Susukan village, East Ungaran district" can be described as follows:

1) Planning Phase

At this stage the community service team did observation and consultation with local community leaders proposing the idea of giving socialization and training. The people gave a positive response and supported the implementation of these activities.

In addition, the team was also preparing administrative and technical requirements. Administratively, the team had to make a letter of reerence and permission so that the activities could be jistified. Technically, the team prepared the material to be presented to the people and the equipment required in the implementation of these activities.

The next activity was to determine the place of activity. The decision was based on the affordability and feasibility of the space of

the activities. After that, the planned activities were announced to the society.

2) Implementation Phase

The "Green space management training in Susukan village, east Ungaran district" was conducted twice, namely:

Day I : Saturday, October 11, 2014

Time : 15:30 to 17:30 pm

Place : Husna Fauzia's house in Susukan

Activity: Socialization of growing medicinal herbs around the house

Participants of this activity consisted of 25 people.



Figure 1. Socialization of growing medicinal herbs in the house yard

Day II : Saturday, 18 October 2014

Time : 15.30 – 17.30 WIB

Place : Husna Fauzia's house in Susukan

Activity : Making biopori training

There were 40 people participated in this activity.



Figure 2. Training on making biopori

3) Discussion

The programs that included socialization, training on making biopori and planting medicinal herbs, and the evaluation were able to foster a sense of caring for the environment for young people in the Susukan. It can be seen from both their enthusiasm in participating in socialization, training and planting. Thus what was planned from planning, implementation, monitoring and evaluation has reached the completion.

In the implementation of a series of activities ranging from socialization and training, the people who participated in the programs increased from 25 to 40 people. Furthermore, the medicinal herbs that have been grown become the property of youth in order to put into good use. The program that has been given through this community service is subsequently carried on by citizens and youth / youth group in Susukan, East Ungaran.

Conclusions and Recommendations

This community service program is intended to foster a sense of caring for the environment for the younger generation and people around to make use of their environment to grow medicinal plants that can be used for medicine or for seasoning and training on making biopori to help the process of infiltration of water during the rainy season so as to balance groundwater conditions to maintain the availability of water in the wells. The active teenagers can become the motor of other citizens to care for their environment by utilizing the yard as beneficial as possible.

Advice that can be given by the author, among others are the need for sustainability of similar activities carried out independently by the citizens / the public, so that the environment around the residence of citizens become more beautiful and useful. In addition, each resident is expected to grow beneficial plants and make biopori on their yards.

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INTERNALIZATION OF VALUES THROUGH ART AND LITERATURE FOR CHILDREN AS A CULTURAL CONSERVATION PROGRAM

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ABSTRACT

Art and literature as learning materials are very attractive when packed properly. This can be done by understanding the needs of the children because every child has a different desire and motivation towards art and literature. Art and literature are also used as a means of cultivation of value to the children as a part of cultural conservation. The limited interest of youth and students on arts and literature, especially traditional art, is caused by inattractive packaging of arts when they were kids. It also happens to literature which is less desirable because it is considered as boring. Attractive packaging of art and literature can be done in various ways. Teachers as the spearhead of learning provision should be given a simple way in order to achieve the goal of internalizing values through art and literature for children as a cultural conservation.

Keywords - internalization, art and literature, culture

Introduction

In order to live a life, man creates culture. Art as a form of culture has become a benchmark of the existence of a culture. Art becomes a concrete manifestation of culture. Koentjaraningrat (2004: 5) added that the manifestation of culture included (1) culture as a complex of ideas, values, norms, rules, etc., (2) culture as a complex patterned behavioral activities of human in the society, (3) culture as the objects of human work. The first manifestation of culture is the idea / notion which exists in the mind of every cultural actors. The second form is the pattern of human behavior such as wedding ceremonies and the others. The third form is the most concrete because of its physical configuration. It can be observed through the objects of culture.

The unity of the whole forms of culture can be reflected in arts. In other words, art and culture have an important role in the society. Of course art and culture is not defined only as sculpture, carving, and so forth. Arts and culture is also defined in the language (literature), songs (rhythm), typical musical instruments, dances, and so forth. The

balance between science, technology and art will also generate tactful work according to the local wisdom of each culture. This theory is corroborated by Abidin (2014: 80) who stated that "art and work of art; music, stories, fairy tales, epic, drama, and dance, belongs to the manifestation of culture which develops in Indonesia. Aesthetic value (art) is an expression of values and ideas of a culture. Abidin (2014: 82) also suggested that art refers to the aesthetic value that comes from the expression of human desire towards beauty that can be enjoyed audiovisually. As a creature that has a high sense and taste, humans produce various shades of art, ranging from the simple to the complex embodiment.

Art grows and develops in human civilization because basically human requires the satisfaction of feeling towards things that are beautiful or aesthetic, in addition to other material needs. This beauty is expressed through the performing arts, visual arts, recorded arts, etc. The category of performing arts consist of music, dance, and theater. Then category of visual arts consists of fine arts, sculpture, design, crafts, etc. While the art of recording media

generally includes radio, television, internet, etc. However, the study of art also includes several aspects in human culture such as ritual, circus, cabaret, pilgrimage, the funeral procession, sports, etc. Even in various activities of everyday life, people often use the word art such as the art of cooking (culinary), art of fashion (dressmaking), the art of flower arranging, architectural art, art of management, art of oratory, and so on. It can be felt and seen that art is functional in the lives of people all over the world (Syahril, 2008)

In addition, arts will continue to thrive in a community, either in small group as in rural communities, or in large community such as ethnic group, nation and even the world. The development of art must still be followed by continuity. Almost all traditional arts in the world implement the the policy of continuity and changes as two sides that cannot be separated.

Literature is a work of art of which existence reveals life events in the community by using language as a medium (Sutresna, 2006: 2). Literature is a manifestation of the experience of the writer on something (objects, people, or ideas) expressed using a creative language to establish the illustration of the facts (in Sutresna Effendi, 2006: 4). The experience can be achieved through sensory experiences (what is seen, heard, felt) which eventually would appear in the form of literature.

Departing from this notion, literature is inseparable from the values it contains. The values in literature is the result of the expression and aesthetic creations of the writer drawn from the culture of the community (Sumardjo, 1999: 2). The ideal value of the author is in the form of *das sollen* about the aspects of life values, especially the value of education. A literary work can be considered as good if it contains educative values.

Educational values can be captured by humans through various ways including

through the understanding and enjoyment of literature. There are four kinds of educational value in literature, the value of religious, moral, social, and cultural education. Those values are of course no different from the values that exist in the real life of a community. In fact, these values are the values idealized by the author to explore a problem that occurs in real life (Sumardjo, 1999: 3).

Discussion

Culture

Culture (*budaya*) is derived from the Sanskrit word *budhayah*, which is the plural form of *buddhi* which means the mind or reason. Culture can be defined as anything related to human reason. Culture also comes from the word *budi-daya*, which means the power of the mind, in the form of creativity, initiative, and sense (Koenjaraningrat, 2000: 181). In general there are several definitions of culture. Taylor (in Soekanto, 2002: 172) defined culture as a complex that includes knowledge, belief, art, law, customs, and other capabilities and habits acquired by man as a member of a society. Koentjaraningrat (2000: 180) defined culture as a whole system of ideas, actions, and man's work in the context of a society that used to belong to human beings by learning. Seloemardjan and Soelaeman Soemardi (in Soekanto, 2002: 173) formulated culture as all the work, sense, and creativity of the society.

Honigmann in his book "The World of Man" (1959) distinguished three states of culture, namely (1) ideas; (2) activities; and (3) artifacts. The idea is abstract, it cannot be read or photographed. Its location is in the heads, or in the minds of citizens where the related culture lives. Those ideas gives spirit to the community. Another term to describe the ideal form of culture is customary, or customs (Koentjaraningrat, 2000: 186-187).

Activities consist of the activities of human beings who interact, relate and get along

with one another over time, always according to certain patterns which are based on customary codes. Activities are concrete, happens around us everyday, and can be observed, photographed and documented (Koentjaraningrat, 2000: 187).

Artifacts are the total of the physical results of the activities, actions and work of all human beings in the society. Artifacts are the concrete form of objects or things that can be touched, seen and photographed (Koentjaraningrat, 2000: 188).

Kluckhohn in his book "Universal Categories of Culture" (1953) mentioned the seven elements of culture that could be found in all nations of the world. The seven element of this culture included (1) language; (2) knowledge system; (3) social organization; (4) living equipment and technology systems; (5) occupational system; (6) religious system; and (7) art (Koentjaraningrat, 2000: 203-204).

Although it may vary from one to another, every culture shares the same essential nature. Among the essential natures of culture are (1) culture is materialized and delivered through human behavior; (2) culture has existed beforehand that it precedes the birth of a certain generation, and will not die with the end to the age of the corresponding generation; (3) culture is required by human and embodied through their behavior; and (4) culture includes rules containing obligations, actions which are accepted and rejected, and actions which are prohibited and permitted (Soekanto, 2002: 182-183).

Conservation

Conservation is an effort or action to maintain the presence of something constantly and sustainably concerning its both quality and quantity. Unnes chose to become a conservation university because Unnes is not meant as a campus that only promotes the quality of education and educational institutions, but more than that.

In its activities, Unnes wants to get closer to the environment as part of the Tri Dharma Perguruan Tinggi.

The university's task is not only to produce professional educators, but also empowers people around campus so that their lives become more prosperous. Moreover, it invites the people around the campus to preserve the environment in order to make it remain stable and balanced.

The rector has also determined to make Unnes become one of the Green Campus who care about the environment. To support the green campus program, Unnes has made various efforts, among them are procuring and planting thousands of trees and implementing waste management, urban forests, lake in campus and bicycle paths. The spirit of making Unnes as a Conservation Campus has been performed by involving the rector as the pioneer, faculty, students, and all community in campus including the gradeners who still actively plant trees in holiday. In the future, the rector said that fossil fueled vehicles are nolonger allowed to pass inside the campus area. They are only allowed to be parked in certain area onlu. Since the past few years, Unnes has been utilizing IT technology in conducting the lecture, such as the less use of paper, both in lectures and various announcements which must be known by the students in campus. This effort is considered quite effective to reduce the use of paper by more than a half.

By saving paper on campus, Unnes has indirectly played an active role in reducing wood consumption in Indonesia as a raw material for making paper. In addition to saving paper, on-line system makes the information can be distributed faster, can be read and known transparently by the fellow faculties, rector and students. Furthermore, the rector said that the use of IT is also intended to make all members of the university aware of the use of technology.

Since the beginning of 2009, Unnes has formed a conservation team. It consists of people who have a big commitment in this case under the direction of vice rector I and III and has been pretty much proven through their work so it is appropriate to identify Unnes as a conservation university. The upcoming programs that will be developed include: Conservation of Biodiversity, Environmental Management, Green Space Management, Green Architecture, Green Internal Transportation, Waste Management, Paperless Policy, and Green Energy Policy.

Unnes conservation is not only in the realm of the natural environment, but also in cultural conservation. Cultural diversity which is growing and developing in Indonesia must be preserved. Unnes also pays attention to this effort. Through the tag line of Conservation Campus, the university also attempts to implement cultural conservation efforts. To support the cultural conservation, research on cultural mapping is important. Results of this study will be taken into consideration in determining the future policy of cultural conservation.

Children's Literature

Conceptually, children's literature is not much different from the adult literature. Both are in the area of literature that covers the life with all the feelings, thoughts and insights of life. What distinguishes it is only in terms of the focus of the provision of meaningful picture of life for children which is decomposed in these works.

Literature (in children's literature) is a form of imaginative creations with exposure to a particular language that describes imaginary world, presenting particular understanding and experience, and containing a certain aesthetic value that can be created by both adults and children. Whether it is children's literature is literature written by adults aimed at children or literature written for children among themselves is not something to dispute. Huck (1987) suggested that it does not matter who writes children's

literature, as long as the depiction emphasized in a child's life has value for their significance. Children's literature is a literature that reflects the feelings and experiences of children through the eyes of children. However, in reality, the value of meaningfulness for children is sometimes seen and measured from the perspective of an adult.

As a work, children's literature promises something for the readers that is the values contained which are packed both intrinsically and extrinsically. Therefore, the position of children's literature is important for children's development. A work with the effective use of language would produce an aesthetic experience for children. The use of language can generate intellectual and emotional responses where the children can feel and appreciate the role of the characters and conflict in the story which helps them appreciate beauty, magic, humor, sadness and injustice. Children will experience how to suffer and to take risks, also will be challenged to envision a variety of dreams as well as to ponder and put forward various problems about himself, others and the world around them (Huck, 1987).

Values in Literature

Literature is a work of art of which existence reveals life events and life in the community by using language as a medium (Sutresna, 2006: 2). Literature is a manifestation of literary experience of something (objects, people, or ideas) expressed using a creative language so that the realization reflects the facts (in Sutresna Effendi, 2006: 4). The experience can be achieved through sensory experience (what is seen, heard, felt), and eventually the experience of reason would appear in the form of literature.

Literature tells us about the concept of literature as one of the disciplines of humanities that will take us towards an understanding and enjoyment of the phenomena contained. Literature is a form of creative work of art placing human and

their life as the object using language as a medium (Semi Atar in Sutresna: 2006).

Departing from this notion, literature is inseparable from the values it contains. The values in literature is the result of the expression and aesthetic creations which is drawn from the cultural community (Sumardjo, 1999: 2). The ideal value of the author is in the form of *das sollen* about the aspects of life values, especially the value of education. A literary work can be considered as good if it contains educative values.

Educational values can be captured by humans through various ways including through the understanding and enjoyment of literature. There are four kinds of educational value in literature, the value of religious, moral, social, and cultural education. Those values are of course no different from the values that exist in the real life of a community. In fact, these values are the values idealized by the author to explore a problem that occurs in real life (Sumardjo, 1999: 3).

Speaking of value, of course, each writer might has different ways in expressing their values. Nurgiantoro (1995: 36), stated that there are two kinds of disclosure of the value in the form of fiction, namely direct and indirect. Direct delivery means the value delivered by the author was apparently written, while indirect delivery means the value delivered by the author is implied in the story and combined with other elements cohesively.

Internalization of Values in Learning

In learning process, in addition to the internalization of values related to children's personal character, it is necessary to introduce components of cultural value system that can be studied through human's self-awareness, which are classified into five components: awareness of life, awareness of work, awareness of space and time, awareness of human relationships with their

surroundings or natural environment, and awareness of human's social relationship.

Values internalization through art and literature in learning can be done in several ways. One of which is by optimizing various types of art and literature. The type of art that can be optimized in children's learning among others are dance, visual arts, and music.

1. Dance

The point of learning dance for children is to introduce physical movements. The movements which are taught to children contain values and philosophy. Thus the children will understand the value of what they do.

2. Visual Arts

The point emphasized in teaching visual arts to children is a creative drawing. Creative drawing for children generates imagination so that children can express their imagination through their drawings. Thus, the drawings contain message that can be understood by the children.

3. Music

The point emphasized in learning of music is tone and voice recognition. In addition, children should be given the songs they could understand and are appropriate to their age. Thus, they can develop the imagination through music.

In terms of literature, Lukens (2003: 14-34) outlined the genres of children's literature, namely: realism, formulated fiction, fantasy, traditional literature, poetry, and nonfiction each having various types in detail.

1. Realism

There are some stories that can be categorized into realism: realistic stories, animal realisms, historical realism, and sports stories. The most popular type of realism applied in learning process is animal

realism. This is because animal realism can provide a simple concept to facilitate the children in understanding the plot. Thus the internalized values can easily be absorbed by the children.

2. Formulated Fiction

Types of children's literature that can be categorized into formulated fiction is mystery and detective stories, romantic story, and series. Formulated fiction is quite attractive for children, especially detective stories. Those stories are able to arouse the curiosity of children towards the problem in the story. Through this way, the internalization of values would be easy to do.

3. Fantasy

Types of children's literature which can be grouped into fantasy are fantasy stories, high-leveled fantasy and science fiction. Fantasy is closely related to the imagination. The children's world is still very close with imagination. Fantasy literature is demanded by children as well as parents. Many fantasy stories have been adapted into movies, comics, cartoon series etc. Parents also often take advantage of this fantasy story as children's bedtime stories.

4. Traditional Literature

Types of stories which are grouped in this genre are fables, folklores, mythologies, legends, and epics. This type of literature is very close to cultural life. Fable, folklore, mythology, and epics are traditional literature which almost everyone knows without reading. This literature is spread through oral tradition of the community. Usually propagated from generation to generation, either from parent to child or from the narrator / community leaders to the audience.

5. Poetry

Children poetry can be in the form of lyrical poetry, traditional nursery rhymes, lullabies,

narrative poems, and personal poems. Children poetry is closely related to the presentation of poetry in noncontextual forms. These poems are commonly sung to facilitate the internalization of values in children.

6. Non-fiction

For practical reasons, reading nonfiction can be grouped into the subgenres of informational and biographical books. Nonfiction books are made for the sake of knowledge of children about all kinds of knowledge, from simple local things to things that are more global (general knowledge).

Conclusion and Suggestion

Conclusion

Based on these descriptions, it can be concluded that the internalization of values in children can be done through art and literature. The closest arts to children include dance, visual arts, and music. Children's literature includes realism, formulated fiction, fantasy, traditional literature, poetry, and nonfiction.

Suggestion

Suggestions corresponding to the topic of the research among others are (1) educators should do variety in delivering art and literature, so that students have a sensitivity towards the value; (2) internalization of values in art and literature must be emerged by filtering the themes of art and literature being taught to the children.

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THE REALIZATION OF CONSERVATION IN SEMARANG STATE UNIVERSITY CAMPUS

Dewi Liesnoor Setyowati

ABSTRACT

Conservation program in Semarang State University has been going for five years since it was declared by the Minister of Education Prof. Muhammad Nuh on 12 March 2010. Conservation has been embodied in UNNES's vision. "Conservation University" is defined as a university in which the implementation of Tri Dharma Perguruan Tinggi is based on the conservation principles including the perpetual acts of protecting, preserving, and utilizing the natural resources, ethics, arts and culture. Initially, UNNES used conservation as its trademark. Conservation branding has succeeded to popularize UNNES as a green campus. The next step is the conservation movement both inside and outside of the campus. Innovation is sustainably developed to establish conservation in UNNES both physically and non-physicaly in both academic and non-academic activities. The seven pillars of conservation have proceeded UNNES in implementing the seven values of conservation which should be possessed by people in UNNES and implemented as the media for conservation education. UNNES keeps on improving by applying the aspect of conservation in both academic activities of Tri Dharma Perguruan Tinggi and non academic activities by stimulizing the acts and ethics of conservation in UNNES as well as establishing a green campus through eco-friendly buildings, waste management, energy efficiency, solar panels, water waste treatment and conservation masterplan.

Key words - realization of conservation, conservation campus

Introduction

UNNES is a public university that continues to grow. As a consequence of the change of status from the Institute of Teacher Training and Education (Teachers' Training College) became a university, UNNES should be willing to answer every challenge in order to survive in the increasingly more competitive world of education both at national and international levels. One university that emphasizes the importance of conservation is UNNES. On March 12, 2010 UNNES declared itself as a conservation university. The inauguration was done by the National Education Minister Prof. Muhammad Nuh. The foundation of the declaration as a conservation university is the Rector's Decree No. 22 of 2009 dated on June 8, 2009 on the Semarang State University as A Conservation University.

As a conservation university, UNNES has determined to apply the principles of the protection, preservation and sustainable use of natural resources and cultural arts, as well

as eco-friendly implementation of Tri Dharma Perguruan Tinggi. To oversee the policy, the conservation team was formed in 2009. The Conservation Team was in charge of composing draft and blueprint to prepare Unnes as the conservation university. The existence of the conservation team has an important value because Unnes requires a systematic design, implementation, and monitoring in terms of conservation development, both physical and nonphysical.

In 2010, the conservation team was re-established as an effort to develop Unnes as a conservation university. This team has the task to develop some policies and activity in terms of biodiversity, green architecture and governance of the campus internal transport, waste management, clean energy, paperless policy, conservation of art and culture, as well as the handling of conservation cadres. The fields are increasingly specialized in the conservation team which aims to address the areas that become the focus of the

development of Unnes as the conservation university.

In 2011, based on the Regulation of the Minister of National Education of the Republic of Indonesia Number 8 of 2011 on the Statute of the Semarang State University, the vision of the university as a conservation university is getting more resolute. Since then, Unnes has a vision of "becoming a world class conservation university which is healthy, outstanding, and prosperous in 2020". It confirms the position of the Conservation Development Agency as a body that is important to realize the vision of Unnes. Since then, the Conservation Team in 2011 became the Conservation University Development Agency by virtue of rector's decree No. 924 / H37 / TU / 2011.

Currently, Conservation Development Agency has seven divisions in charge of implementing the activities in the field of biodiversity, green architecture and governance of internal transport, waste management, clean energy, paperless policy, art conservation, ethics, and culture, as well as conservation cadres. Conservation programs keeps on being developed each year. The Strategic Plan of conservation began to be formulated in 2015 so that conservation activities can run on an ongoing basis (Conservation Development Agency, 2014).

The conservation activities which includes physical, social, and cultural environment, behavioral aspects and value conservation are increasingly more dominant. Conservation activities program is also included in each program of academic and non academic activities in UNNES.

The Concept Of Conservation

In the Regulation of UNNES Rector No. 27 Year 2012 on Conservation-Based Campus Management in Semarang State University, Article 2 states that the conservation-based management aims to create a campus atmosphere that promotes the protection,

preservation and wise utilization of the environment through a sustainable development and participation of the people in UNNES. Suyitno, et al. (2015) states that conservation is an attempt to protect and preserve cultural values and human behavior in interacting with the natural environment both physical and non-physical.

Conservation and preservation of the environment today is one of the implemented development agenda. Climate change and other environmental problems nowadays are the reasons that confirm the urgency of implementing conservation-based policies. Corresponding to this issue, in 2000, world leaders agreed to formulate the Millennium Development Goals (MDGs). One of the important agenda in the international commitment is the preservation of the environment. As part of its contribution to the achievement of the MDGs in the areas of environment, Semarang State University (Unnes) has been actively developing a conservation policy. It has been realized among others through the campus greening program since 2005. As the embodiment of ethical ideals in the field of environment and national culture, on March 12, 2010 Unnes declared itself into a conservation university (Conservation Development Agency, 2014).

Each unit in UNNES is responsible for conservation programs to support, maintain, monitor, and coordinate to achieve the active participation of the people in UNNES. The people in UNNES's obligation is to support the implementation of conservation-based campus management and each unit shall encourage and facilitate the development of conservation-based campus management. In Article 3 states that the governance of the conservation-based campus is realized through seven (7) main pillars of conservation, namely:

- Pillar 1 - Biodiversity Conservation
- Pillar 2 - Green building and internal transport systems
- Pillar 3 - Waste management

- Pillar 4 – Paperless policy;
- Pillar 5 - Clean Energy;
- Pillar 6 - Ethics, art, and culture
- Pillar 7 – Conservation Cadres.

Each person in UNNES is obliged to carry out conservation activities include coverage seven pillars of conservation. All units in UNNES must implement the seven pillars of conservation in their programs (Margaret, et al., 2009). The seven pillars complement each other, work together, and support each other as shown in Figure 1.

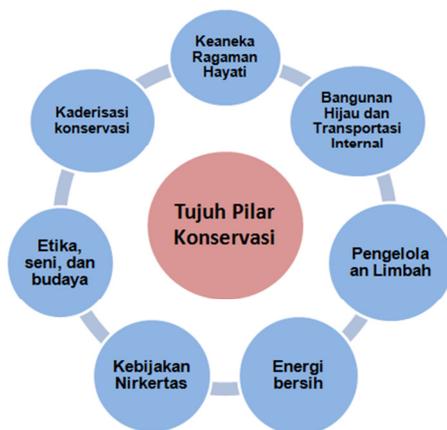


Figure 1. The Seven Pillars of Conservation in UNNES

Biodiversity conservation pillar aims to the wise and sustainable protection, preservation, utilization and development of the environment in Unnes and its surrounding areas. This pillar activities include seeding, planting and growing plants, as well as the monitoring of biodiversity in Unnes campus and its surrounding areas to maintain the ecosystem. The work unit is obliged to implement, monitor and evaluate programs that promote the protection, preservation and sustainable use of the environment, as well as to provide facilities to support the environmental support capacity.

The pillar of green buildings and the internal transport system aims to develop and manage the buildings and environments that

support the vision of conservation, and to realize the internal transport system that is effective, efficient, and eco-friendly. Programs under the pillar of green architecture and internal transport systems include: campus building management in accordance with the principles of green buildings that are environmentally friendly; eco-friendly and user-friendly campus environment management; and management of the internal transport system in accordance with the principles of transportation, humanism and eco-friendly concept. Related to this, the unit is obliged to do the following things: 1) implement, develop, manage, monitor, and evaluate the building according to the principles of green building; 2) implement, develop, manage, monitor, and evaluate the internal transportation system in accordance with the principle of transportation, humanism, and eco-friendly concept; 3) provide green open spaces; 4) provide facilities and infrastructure to support the implementation of the internal transport systems that are environmentally friendly; 5) apply rules to restrict the use of vehicles that use fossil fuels. Instead, residents of Unnes are obliged to use environmentally friendly modes of transportation around campus.

Waste management pillar aims to reduce, manage, and supervise the production of waste, and improve the condition of the environment in Unnes to create a clean and healthy environment. The programs under the pillar of waste management are realized through the following activities. 1) reuse unused goods (reuse); 2) reduce the activity or objects that could potentially result in the trash or waste (reduce); 3) recycle or reuse waste (recycle); 4) perform the recovery of the functions of the facilities at Unnes (recovery). The unit is obliged to implement, develop, manage, monitor, and evaluate the waste management system according to the principles of conservation and provide facilities that support the implementation of waste management policy. Residents in Unnes's obligation is to implement the

principles of waste management according to the principles of conservation. Provisions to implement the waste management program pillars arranged in quality procedures pillars of waste management program.

Paperless policy pillar aims to implement paperless administration and conservation-minded administration efficiently. Paperless policy pillar programs are implemented through the optimization of systems based on information technology, efficient use of paper, the use of recycled paper, and the use of environmentally friendly paper. In this regard, the work unit is obliged to implement, develop, manage, monitor, and evaluate paperless policies, as well as the obligation to provide facilities that support the implementation of paperless policy. To support these rules. Unnes residents are obliged to apply the efficiency of administrative management and conservation-minded administration.

Clean energy pillar aims to make energy savings through a series of policies and measures to harness energy wisely, as well as the development of environmentally friendly renewable energy. Clean energy pillar programs are implemented in the following manner. 1) reduce the use appliances using electricity-based or fossil fuel-based energy in accordance with the strategy of the university; 2) develop campus facilities that support the efficient use of energy; and 3) use environmentally friendly renewable energy. The work units are obliged to implement, develop, manage, monitor, and evaluate clean energy policies, as well as the obligation to apply the strategy of energy use to save energy and use eco-friendly renewable energy. Residents in Unnes are obliged to implement energy savings in their neighborhood.

The pillar of ethics, art, and culture conservation aims to maintain, preserve and develop the ethics, art and local culture to strengthen national identity. The programs

are implemented through the preservation, documentation, education, dissemination, and promotion of local culture. The working unit is obliged to explore the values of the local culture as well as implement, develop, manage, monitor, and evaluate the programs of ethics, art, and culture conservation, and is obliged to organize activities and provide facilities to support the preservation and development of ethics, art, and culture of the region, whereas Unnes residents are obliged to develop and preserve local culture in activities on campus and its surrounding areas.

Conservation cadre aims to inculcate the value of conservation in a sustainable manner. Pillars of the regeneration program includes the socialization, training, education, and implementation of conservation activities to residents of Unnes to strengthen the understanding, appreciation, and conservation-based attitudes. To cultivate a cadre of conservation, the work unit is obliged to implement, develop, manage, monitor, and evaluate conservation programs under this pillar. Work units are also obliged to develop a cadre of conservation groups that consist of faculty, staff, students, and residents of Unnes. Likewise, they are obliged to actively participate in implementing conservation values in everyday life.

The basic concept of conservation in UNNES is developed from the seven pillars of conservation. Seven pillars of conservation are carried out by th people through 8 UNNES conservation values, namely: inspiring, humanist, caring, innovative, creative, fair, honest, and fair. Conservation values are appreciated in the form of the ethics of the people in UNNES. Ethics are moral philosophy, or science which critically discusses the issue of morally right and wrong, about how to act in a concrete situation.

Value, Character, and Conservation Behavior

According to Keraf (2006), theoretically, ethics can be defined as follows: 1) etymologically, ethics comes from the Greek word "ethos" (plural: ta etha), which means "custom" or "habit" in the sense that the ethics is related to good living habits, the way of life, both in a person or society. Good living habits is adopted and passed on from one generation to the next; 2) Ethics is defined as critical reflection about how people should live and act in a concrete particular situation.

Environmental ethics is a philosophical discipline that talks about the moral relationship between humans and the environment, the universe, and how human behavior should cope with the environment. Therefore, environmental ethic can be understood as a discipline that talks about norms and moral rules that govern human behavior corresponding to the nature and the values and moral principles that animate human behavior in touch with the nature. Although both the ethics and moral discuss the same object, that is human action, but both have different meanings. Conservation ethic can be constructed with two principles of approach, namely anthropocentric and biocentric (Burhanuddin, 2005). Anthropocentric approach emphasizes the result of the action, the natural resources or the environment for the benefit of others. Here are presented the definition of values, character, and behavior related to conservation.

Values are traits or things that are important or useful to humanity. Those values is something that can improve people according to their nature. It means that the value has a variety of meanings: containing a value (ie, useful); being a value (that is, good or true or beautiful); having a value (that is, an object of desire, has a quality that can cause people to take a stand approve, or have the nature of a specific value; being a value member (that is, respond to something

as desirable or as depicting certain value). Based on the meaning of these values, the values referred to in this discussion is the value of a character.

Character is defined as a trait; psychological properties; morals or manners that distinguish one person to another; a character. Character reflect's a person's personality. Thus a character could be interpreted as a personal attitude that is stable as a result of the progressive and dynamic consolidation process, integration of statements and actions (Khan, 2010). Furthermore, it is also explained that there are four types of character education, which is based on religion, which is the truth of God's revelation (moral conservation); cultural-based values, which is an aspect of character, Pancasila, the appreciation of literature, exemplary historical figure and the nation's leaders (cultural conservation); environmental-based conservation; potential-based conservation, which includes personal attitude, the result of a process of empowering self-consciousness that is directed to increase the quality of education (humanist conservation).

Behavior is a movement that can be observed from the outside. Human behavior is all the activities, either directly observable or unobservable by the outsiders (Atmadja 2003). Sniker (1938) formulated a response or behavior is a person's reaction to the stimulus. Therefore, the behavior occurs through the stimulus of the organisms including humans and will then respond.

On the pocket book of character of the conservation ethic for UNNES students, it is argued that ethics is the norm or the rules established and used as a standard guideline for student behavior in interacting with fellow students, faculty and staff, alumni, and the community within the scope of curricular and extracurricular activities. Conservation character or behavior is the behavior and attitudes that are owned by people in Unnes associated with the Seven

Pillars of Conservation, covering biodiversity, clean energy, green building and internal transportation, paperless policy, waste management, ethics, arts & culture, a cadre of conservation (Suyitno, et al., 2015). Indonesian society is rich in values which is already believed to be true and is believed to be the basis of life in the society.

Eight conservation value used as a reference for the development of conservation in UNNES. Here are presented the notion of eight conservation values.

1. **Inspirational Value**, means having an idea or ideas to act, to do something that is intentionally or unintentionally come to our minds all of a sudden at any circumstances ..
2. **Humanist Value**, the attitude of someone who respect others, expect, and struggle for a better social life, based on the principle of humanity.
3. **Caring Value**, the ability to take care, to pay attention. Care for the environment is the attitude and actions which seeks to prevent damage to the environment and develop efforts to repair the environmental damage that has occurred. Social care is the attitude and actions of always wanting to help other people and communities in need.
4. **Innovative value**, leverage capability of thought, imagination, stimulants and environment in producing the new products (innovatory)
5. **Sportive Value**, chivalrous, honest. Sportsmanship means being fair to the opponent; willing to recognize excellence, strength, truth opponents or lose, weakness. Unforced errors.
6. **Creative value**, the ability to think or act to resolve the problem intelligently, and do something to generate new ways or the result of something that has been owned.
7. **Honesty Value**, honesty is the behavior that is based on an attempt to make

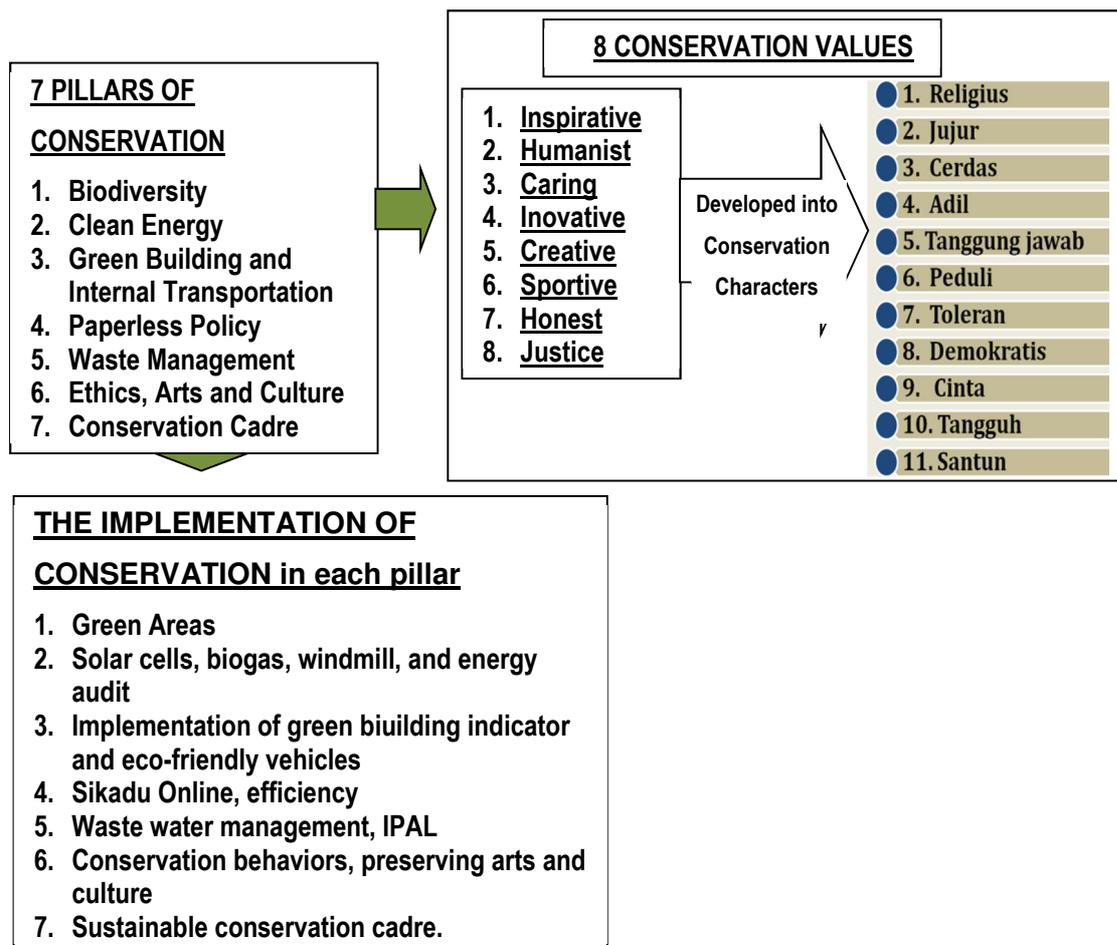
himself as a person who always trustworthy in word, action and work.

8. **Justice Value**, the nature to act fairly. Fair means not siding, siding with the right.

Designing The Realization Of Conservation In Unnes

UNNES has 7 pillars of conservation and 8 values of conservation, more specifically in the description for the achievement of academic activities can be developed the character of conservation. Each pillar can develop or can have 8 conservation values. Related to academic activities of each pillar and conservation values can be developed character of the conservation, among others, as many as 11 characters of conservation. Each pillar of conservation should be realized in the campus in the form of physical and non-physical.

For example, on the pillar of biodiversity, containing 8 conservation value which are translated from inspiring aspect, it would appear the idea of this pillar for example there is an idea to make the area around the building H into a region for fauna and flora with birds and butterflies fluttering, causing splendor of biodiversity in Unnes campus. Humanist values and caring will come up with more diverse biodiversity in UNNES campus. Innovation will continue to be made to develop biological diversity, such as making the orchard area, expand the mini forest area in campus. Creative value, fair, honest, and fair can be translated or not depends on the description of each pillar of conservation. UNNES Ecopark, located in the area of Mount Ledek, will be developed in particular program development activities that support biodiversity in UNNES campus and in the surrounding area.



Conclusion

Conservation through community efforts to achieve conservation (Conservation Society) in UNNES must continue and be developed over time. Conservation society is a society that is in interacting with the environment continue to uphold and act in accordance with ethical principles, rules and norms, as well as the capability and the capacity. The development of Conservation Pillar, Conservation Values, and Character Conservation as well as the correlation between one and another should be conducted. A guide, indicator, size, limitation, as well as an assessment of how one individual and community should act on the environment so that it can be considered as true or not true, good or bad, appropriate or inappropriate. It is where the sources of values, norms, and foundations is digged and will serve as the formulation of

conservation values as the characteristic of UNNES.

The strategy to build conservation in UNNES should be designed in the short-term, mid-term and long-term period. Monitoring and evaluation can also be done on a regular basis to assess the achievement of the stages of conservation. The implementation of conservation in both academic and non academic, physical and non-physical, visible and invisible matters must always be evaluated on an ongoing basis. Socialization of the program of conservation and regeneration of the cadres at each unit in UNNES will continue to be done in order to optimally attain the successful establishment of conservation.

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CAMPUS BUILDING STUDY BASED ON THE CONCEPT OF GREEN OFFICE

Case Studies Building G and H Semarang State University

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ABSTRACT

The existence of the building reflects the carrying capacity of the environment and the people who work in it. It is becoming a strong bond, how a building will give effect to the surrounding environment, and vice versa. If the building is good, then the effect on the environment would be better. A workspace is designed by using the concepts of green office certainly has an edge, either risk-free convenience and environmental destruction. Related to the above, it appears that office buildings in campus Unnes in the Western Region, especially Building G and H are not yet fully apply the concept in the management of green office space. The purpose of this study are: (a) Assess the potential of working space in campus buildings that can be developed based green office; (b) Finding an alternative application of the basic principles of green office on campus buildings in order to increase the carrying capacity of the user's work. The research was conducted in one year with four stages, namely: (a) Determination of samples of office space that has a high activity level; (b) exploration samples with variable based on a functional, spatial, thermal comfort, visual comfort and aesthetics; (c) correlate the field data and reference standards / planning that already exist; (d) perumuasan layout according to the field conditions and the user who refers to the principles of green office. The variables used were: functional, spatial, thermal comfort, visual comfort, and aesthetics. This study is expected to provide benefits and contributions to: (a) the treasures of knowledge in the field of green architecture (green architecture); (b) Academic Insights on the application of the principles of green office; (c) Amendments to the application of the design office campus that are not environmentally friendly; (d) The foundation for further research on the same theme; (e) The cornerstone of the development of cooperation with various related parties in accordance with the theme of the research.

Keywords - green office, building, campus

Introduction

The industrial revolution, capitalistic system, and the birth of large factories creating a negative impact on the environment such as the existence of global warming, El Nino, and various other disasters associated with the destruction of nature. The emergence of various problems and issues we must address the above environment with a sense of responsibility. In the academic sphere, a scholar can bring these issues into the realm of academia. College that cares about sustainability to create a green campus movement as a new icon in the world of academia. The movement is a concrete step in responding to environmental issues. Icon green campus is expected to grow a concern, especially for

managers and employees who have stay on campus longer than the student for more attention to environmental sustainability. Green campus can be socialized in small acts such as taking out the trash in its place, the presence of organic and inorganic trash, planting more trees campus environment or even creating a campus building architecture friendly for the environment. In addition to creating a cool campus, we also created a conducive campus as a place of learning and working in the educational environment.

Semarang State University (Unnes) is one of the universities in the world who care about the environment. With jargon "University of Conservation", Unnes always develop conservation-based academic life. Ranking

73rd out of 360 universities worldwide and ranks third greenest in Indonesia is evidence of the seriousness Unnes to care about environmental sustainability (based UI Green Metric). It also imparts an environmentally conscious life in the course of Environmental Education and a variety of other activities based conservation. Improving the quality of the environment is not solely be seen from the outside area of the building, but also in terms of the (interior). How can a building interior reflects the carrying capacity of the environment and the people who work in it. It is becoming a strong bond, how a building will give effect to the surrounding environment, and vice versa. If the building is good, then the effect on the environment would be better. Well here means no negative impact on the environment, in other words have a very small negative impact on the patterns of environmental performance. A workspace is designed by using the concepts of green office certainly has an edge, either risk-free convenience and environmental destruction.

Literatures

Designing A Good Space

According to the Green Building Council of Indonesia, there are five things to consider in designing a good space, they are:

a. Prioritize Health and Welfare

An effective workplace should be designed in such a way as to support and improve the health and well-being of its occupants through the principles of eco design and sustainable help achieve this goal.

- 1) Provides maximum access to natural lighting and visual access to the outside of the building
- 2) Using a solar lighting analysis tools to help design.
- 3) Considering the elements forming the interior (color, blinds, or curtains) and the exterior (roof

eaves, the color of the outer wall and the tree) to the sun

- 4) Integrate natural lighting with electric lighting systems.
 - 5) The design of the ventilation system in accordance with the applicable building code standards.
 - 6) Provide access hole straight out to remove the air from the room in order to distribute the heat to the outside of the building
 - 7) Considering installing CO2 sensors for monitoring air quality.
 - 8) When using the AC, placing it far from the vents
 - 9) Determine the materials and furnishings that have a low emittance contaminants
 - 10) Considering "modular zoning" for air distribution
 - 11) Controlling the humidity in the room (at least 30% of the total ventilation space)
 - 12) Design space to avoid condensation of water vapor.
- b. Providing a Comfortable Environment
- Workplaces are designed and operated to be able to provide a high level of comfort in terms of visual, acoustic, and thermal to occupants, which supports the effectiveness and creativity of workers. As well as :
- 1) Designing spaces that allow workers to move freely
 - 2) Providing mobile technology (phones, computers, wi-fi), which supports the work force, so it does not require large space and permanent
 - 3) Designing for stress reduction and relaxation of conditions facilitating backs
 - 4) Provide an attractive visual environment according to the function and aesthetics.
 - 5) Provide additional green elements in the form of natural vegetation in the room

- 6) Create a 'sense of place' so that the workplace has a unique character
 - 7) Reduce sound reverberation time in a room with sound absorbing materials and by configuring the layout and arrangement of space
 - 8) Minimize background noise from the HVAC systems (Heating, Ventilation and Air Conditioning) systems, building and other equipment
 - 9) Provide thermal comfort and ventilation quality
 - 10) Providing air directly to each individual and the temperature control at every workstation location.
 - 11) Provide furniture and tools that improve comfort and performance
 - 12) Determine the furniture that supports the human body posture, body mechanics, and engineering work
 - 13) Provide workstation that allows users to adjust the seat, computer equipment placement, lighting levels, the height of the work surface, the layout of the workspace, and ventilation.
- c. Following changes to the design
Providing space with a high degree of flexibility, support social and technological developments to introduce new ways of working, is the foundation of innovation in design that can be implemented as:
- 1) Incorporating the principles of sustainable design
 - 2) Supports mobility with wireless technology and mobile
 - 3) Provides connections to the internal network across the workplace.
 - 4) The design space for different sizes and types of activities
- d. Integrating the latest technology and Support Tools
Effectively integrate ancillary equipment, the latest technology and distribution networks and telecommunications systems to environmental conditions where work is currently allow workers to perform their tasks easier and more efficient:
- 1) Considering the wireless and mobile technologies
 - 2) Combining voice and data systems, through a network of Ethernet-IP
 - 3) Monitor the condition of the working environment with a centralized system
 - 4) Considering tele-conferencing to reduce travel to the conference site
 - 5) Applying the technology of safe, high-speed access to the desktop to the data, voice, security, and environmental information
 - 6) Set the electrical plans under the floor or vertically through a patch panel which reduces equipment in excess and simplify maintenance
 - 7) Choose the information technology systems are energy efficient, durable, disassembly, maintenance, and efficient
- e. Providing Reliable Building Systems and Human Resources Educating available
Building system reliability is one of the biggest concerns for the users of the building that affect the safety, health and comfort. This can be done through:
- 1) Provide adequate training to human resources to use and maintain the system.
 - 2) Considering the alternative fuel to spare building systems
 - 3) Providing easy access to every user of the building for the maintenance and repair of the system.
 - 4) Provide a building system that minimizes reliance on building management / maintenance personnel
- f. Implement a computerized system of integrated sensor network to monitor and manage the control of each of the following systems: HVAC, energy,

lighting, accessibility, security, fire suppression, and alarm

The Building Requirements In The Humid Tropics

Comfort in a building standing in wet tropical environments depend on the physical conditioning of buildings, especially on the issue of penghawaan and lighting because in this humid tropics the sun shines all year long and relatively slow movement of the wind. Therefore, the openings in the facade of the building should be enough and big enough, the consequences of the amount of light and solar heat incoming radiation should be limited in a way that is good filtering so that the room still feels comfortable. In addition, the distance between the mass of the building should not be too tightly, so that air can continue to flow into the room. (Lippsmeir, 1994: 106). Based on the views in the planning of the building needs to pay attention to climatological factors, they are:

- a. Solar radiation. Troubleshooting solar radiation, especially to overcome overheat and overlighting are:
 - 1) Reflection of sunlight from the pond water on the sides of buildings to reduce heat radiation.
 - 2) The use of overhang, to obtain a shadowing effect (sun shading).
 - 3) The existence of a terrace, which can effectively reduce solar radiation into the building.
 - 4) Filtering solar radiation, the fundamental principles seek to protect the openings from direct sunlight
 - 5) Utilization of vegetation as a plant barrier
- b. The level of glare. A solution to overcome the problem of glare is done by: (1) reflection of sunlight; (2) Avoid the use of transparent or shiny material excess in the building, to reduce glare on the exterior.
- c. Respiration (rainfall) and humidity. Reached by way of: (1) Development stage house with a floor made of high

buildings above ground level (Mangunwijaya, 1988); (2) Selection of water-resistant building materials; (3) Use of overhang.

- d. Wind. Some design solution that allows to overcome the insistence of wind pressure and wind suction:
 - 1) The calculation of the proper construction and the selection of appropriate construction.
 - 2) Selection of the type of building construction must be adapted to wind conditions that exist in the area.
 - 3) Creating a windbreaker on the outside of the building, an effective way to reduce the discharge speed and the wind in the building.
 - 4) Plant barrier, adapted tree species to withstand wind

Metode

The research material was Building G and H Unnes the Western Region which has a primary function as an office. The steps in this research are:

- a. Data collection

The data collected in this study is the direct observation of the building for office space in Building G, H and I Campus Unnes, to obtain primary data relating to spatial planning, equipment rooms, lighting and natural penghawaan. Primary data are: (1) natural Penghawaan: media use direct opening of the window to enter the outdoor air / wind; (2) Natural light: the use of media directly in the form of a window opening to enter the light / reflected light of the sun; (3) Layout space: governance conditions that are directly related furnishings floor surface. While secondary data are: Plan space, room layout and furniture in the space Data.

- b. Data Analysis

- 1) Phase 1: determination of sample office space that has a high activity level.
- 2) Phase 2: exploration samples with variable based on a functional,

spatial, thermal comfort, visual comfort and aesthetics. Exploration conducted in accordance with standard facilities and field conditions. So before carrying out exploration should be prepared checklist being targeted aspects, both physically and users.

- 3) Phase 3: correlate the field data and reference standards / planning that already exist.
 - 4) Phase 4: establish an alternative implementation of spatial and user services according to the principles of green office
- c. Variables of Research

Variables defined in this study include: (1) Functional: Each facility in the office space should be used properly in accordance with the procedures; (2) Comfort Access: Access Leisure relating to conditions of work space layout to support a user's movement in space; (3) Aperture: The availability of openings such as vents related to visual comfort, natural lighting and natural air supply.

Unnes campus located in the city have now split by a road that ran from north to south. Under these conditions, the campus is divided into 2 kawsasan namely western and eastern regions. Western region consists of buildings with office functions, the student and the rest is lectures western region has a strategic value in the region, because it is an area of the rector and key institutions Unnes. Resulting in the development of land use and building a top priority with the basics of conservation. If viewed as a physical or environmental conditions over the western region of cool, comfortable and conducive to support the performance of the employees and students there. The western region is also the main gateway to the region Campus Unnes land layout patterned grid. The grid pattern has the advantages of the proximity of the access between one building to another. It can also classify the buildings that have similar functionality and management. At least for buildings that have office functions, such as the rector and the library / LP2M (Institution of Research and Public Service) clustered into one area that has direct access to one another. Outer space as a buffer filled by a green area which is able to provide ecological support for the buildings that are in it.

Discussion

Description of The Western Region Campus of Unnes

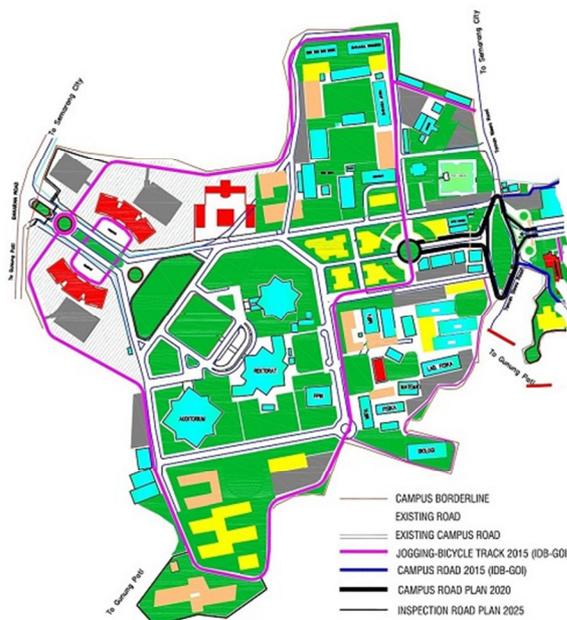


Figure 1. The Western Region Campus of Unnes

Functional Identification of Building G and H

A discussion of the functions associated with the activities of the users in the room on which to base the determination of the functions of space in the building. The determination of this function will affect the layout (spatial) in. Based on its location, Building G and H located adjacent to each other together. Topographically, Building G is located in the lower area. While the H Building located higher on it by topography.



Figure 2. Building Locations

Building G was established in 2000 has a primary function as a university library and additional functions as Lembaga Office of Research and Community Service (LP2M). While the support function is as Space Developer Journal and Exhibition. This building has an area of 6400 m² of total 3 floors.



Figure 3. Functional Spaces of Building G

Building H which was established in 2000 has a primary function as rector and the university administration, the Senate, as well as an additional function as the Office of Education and Professional Development Institute (LP3), the Quality Assurance Agency (BPM), the Project Developer. While the support function is as a space meetings, exhibitions and other administration. This building has an area of 8100 m² of total 4 floors.

Access Identification of Building G and H

In general, the type of means of access to the existing buildings on campus can Unnes tangible doors, stairs and elevators. However, not all buildings have elevators in supporting the movement in it. Building G has a main access that is located symmetrically designed in accordance with the plan. Type of means of access is the main entrance and stairs. On the 1st floor has three means of access: (1) the main door; (2) the main staircase; (3) secondary staircase. This ladder is has a function as a U-shaped staircase existence of alternative means of access to Level 2 and Level 3 is similar to an existing access Floor 1. The difference is only in the first floor which has the means of access such as the main door



Figure 4. Functional Spaces of Building H

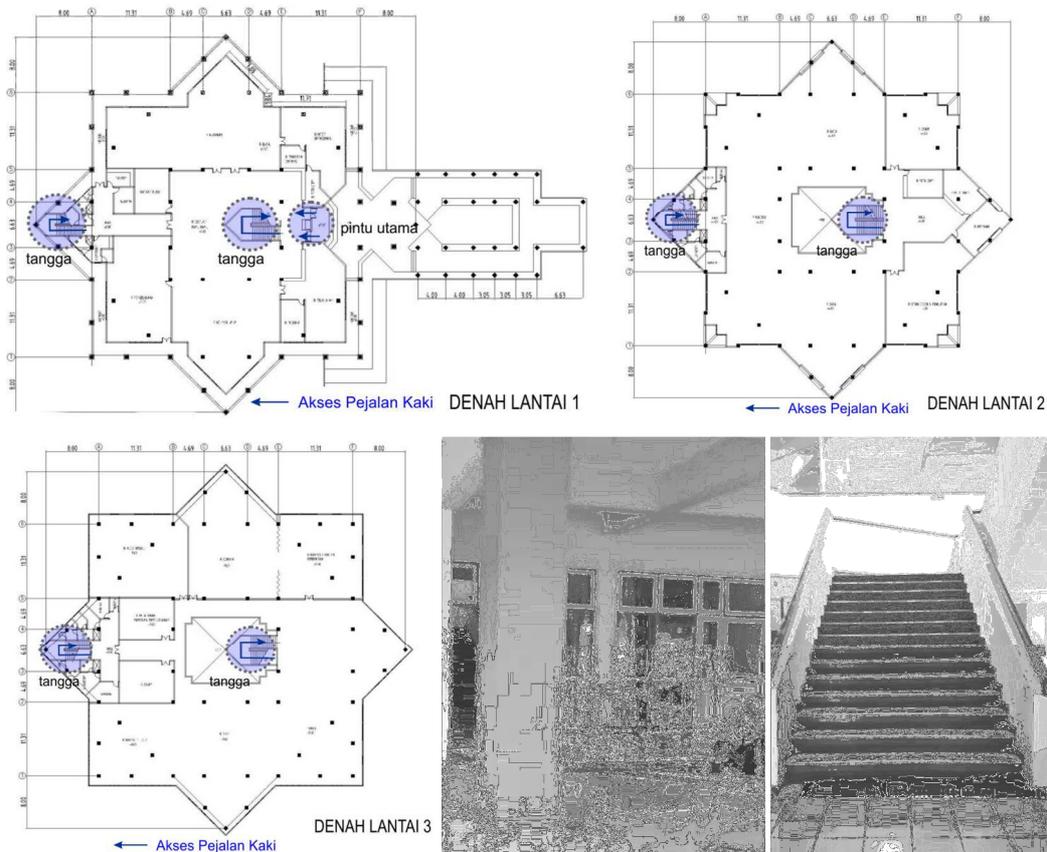


Figure 5. Access Facilities of Building G

Building H has a main access that is located symmetrically designed in accordance with the plan. Type of means of access is the main entrance, stairs and lifts. On the 1st floor has 8 means of access: (1) the main door; (2) secondary door left side; (3) The right side of the secondary door; (4) The main staircase; (5) secondary staircase amid; (6) the main lifts; (7) ladder sekuder left wing; (8) the secondary stairs right wing. On the 2nd floor has 6 means of access: (1) the

main door; (2) the main staircase; (3) secondary staircase amid; (4) the main lifts (5) sekuder ladder left wing; (6) the secondary stairs right wing. At Level 3 has 5 means of access: (1) the main staircase; (2) secondary staircase amid; (3) the main lifts; (4) ladder sekuder left wing; (5) secondary stairs right wing. On the 4th floor has three means of access: (1) the main staircase; (2) secondary staircase amid; (3) the main lifts.

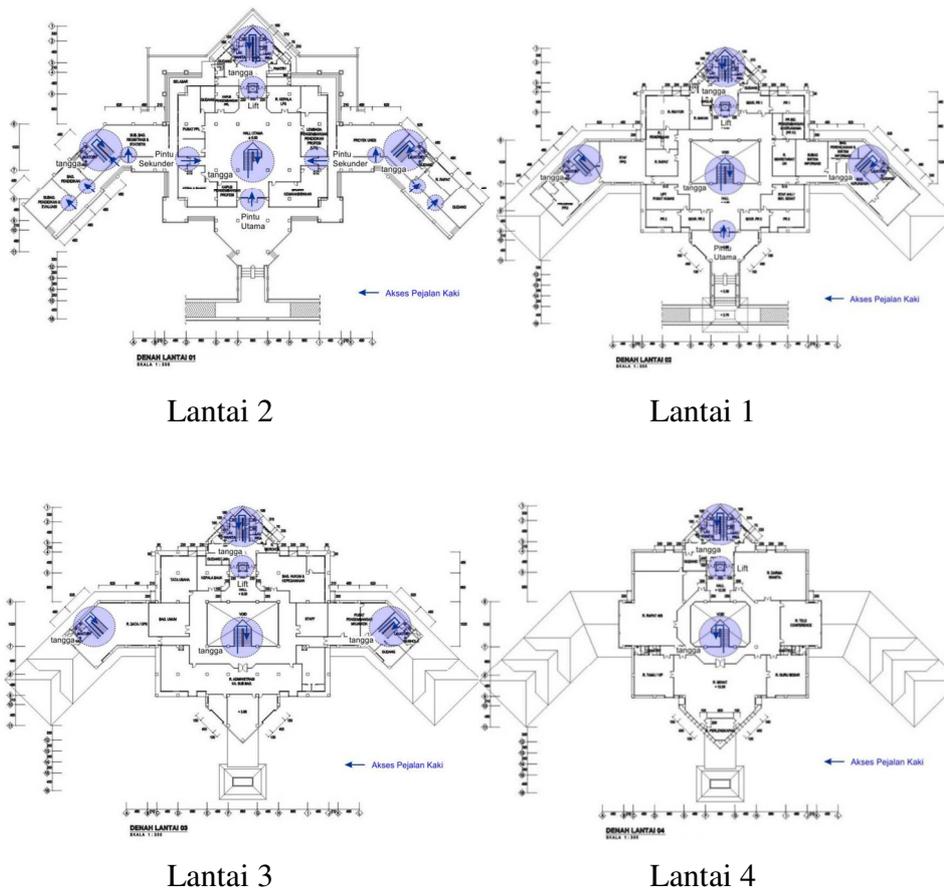


Figure 6. Access Facilities of Building H

Ventilation Identification of Building G and H

One important aspect that must be considered in the construction of the building is the availability of openings. Means of public openings can be doors, windows and bouvenlight. Aperture has an important role in supporting the performance of the building itself. Among others: the lighting function, penghawaan, visual,

aesthetic and emergency. G building is designed with a rich sheath openings. If seen look further, almost all the outer side has a fairly wide window and glass clear. It certainly has the potential entry of natural light freely. But in many operational layout of furniture and screens that do not pay attention to the orientation of the direction of the incoming light. But the existence of roof lighting right in the middle, giving enough space in the supply of light

for much of the opening edge. Similarly, the aspect of natural penghawaan potential because it is cool and shady environment

surrounded many shady trees. Here are the points of the openings in Building G on all floors:

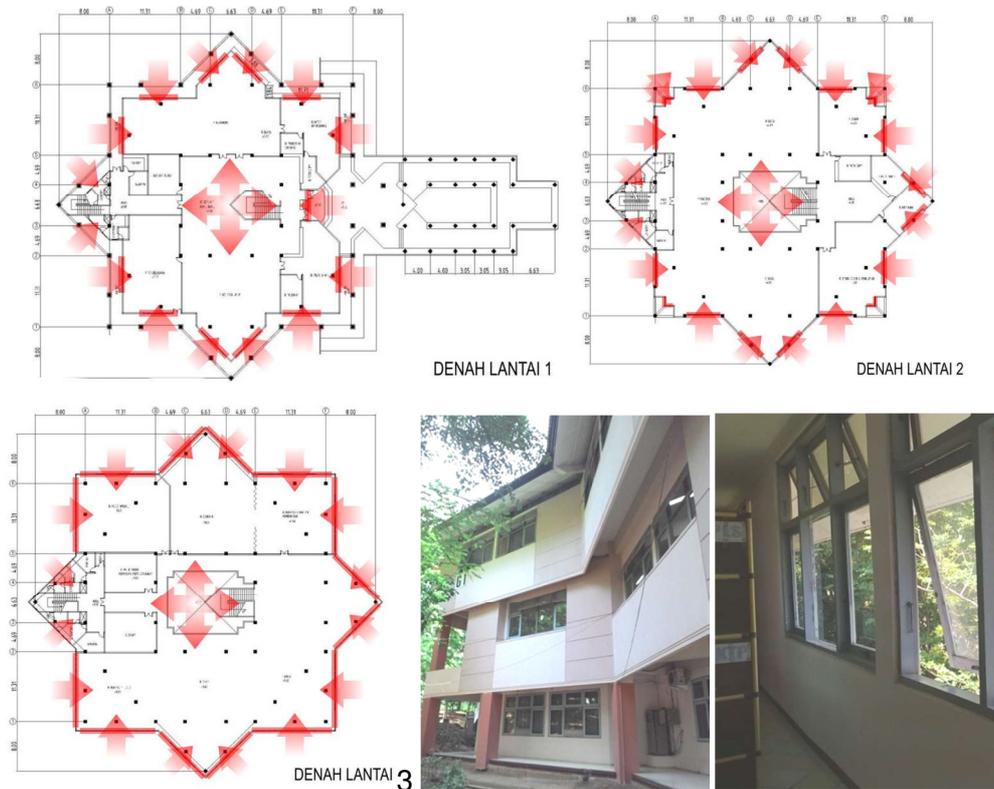


Figure 7. Ventilation Facilities of Building G

Similarly, Building G and H are designed with a rich sheath openings, though not as rich in Building G. When viewed see, almost all the outer side has a fairly wide window and glass clear. Although the openings between the groups given separately spaced wall structures and aesthetic interest. The existence of openings are pretty much certainly has the potential entry of natural light freely. Similarly in Building G, in operation much furniture layout and

bulkhead are not forced to pay attention to the orientation of the direction of the incoming light. This is to support the needs of existing space in the building. But the existence of roof lighting right in the middle, giving enough space in the supply of light for much of the opening edge. Similarly, the aspect of natural penghawaan potential because it is cool and shady environment surrounded many shade trees.

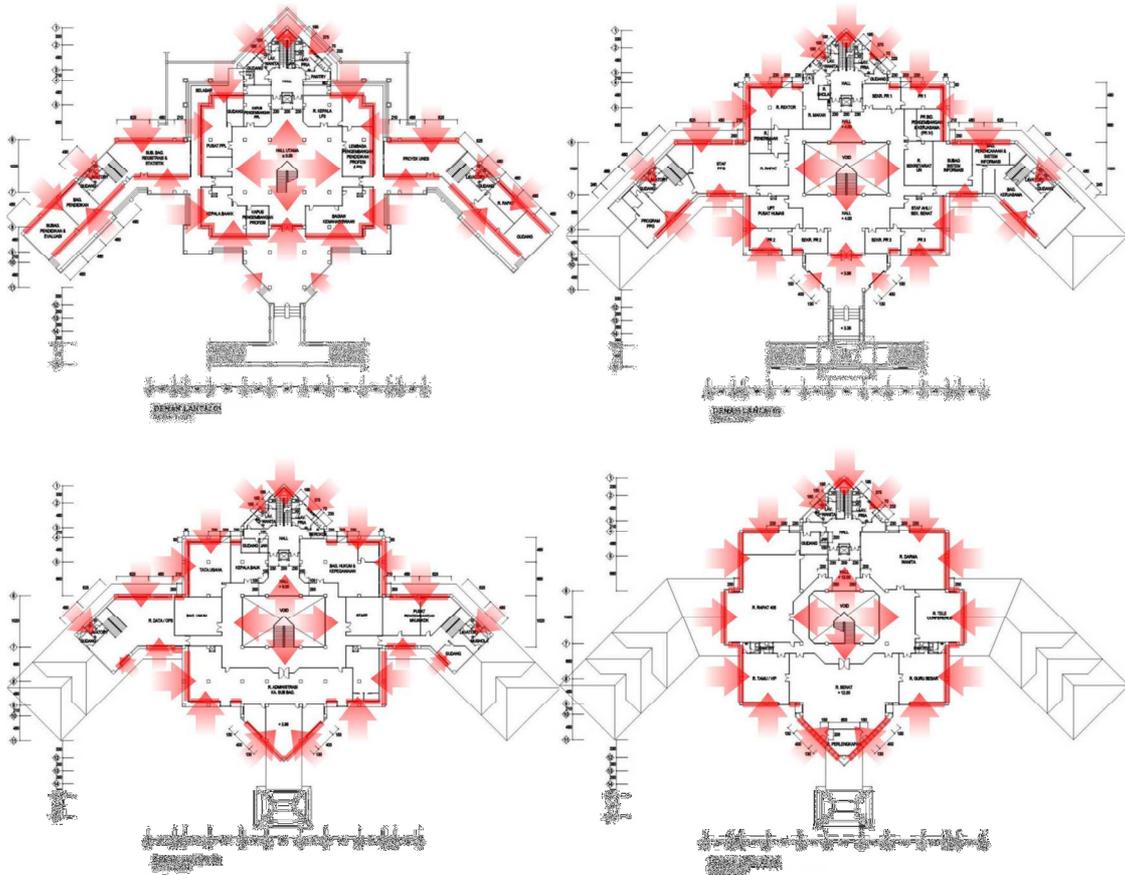


Figure 8. Ventilation Facilities of Building H

Evacuation Route Identification of Building G and H

Circulation is the movement system of the building if in a state of danger or emergency, both between the environment and space within, and between the space inside the building. Tata evacuation route will determine the smoothness of the movement of the user, concerning the safety and comfort. As a building which has a primary

function as an office, it must meet the aspects of security and user convenience.

Building G has a path as well as the evacuation of the main access that is located symmetrically designed in accordance with the plan. On the 1st floor has 2 evacuation means: (1) the main door; (2) a secondary door. At Level 2 and Level 3, each of which has 2 evacuation means: (1) the main staircase; (2) a secondary staircase. This ladder has a function as a ladder is more

alternative / emergency. This ladder-shaped model of U.

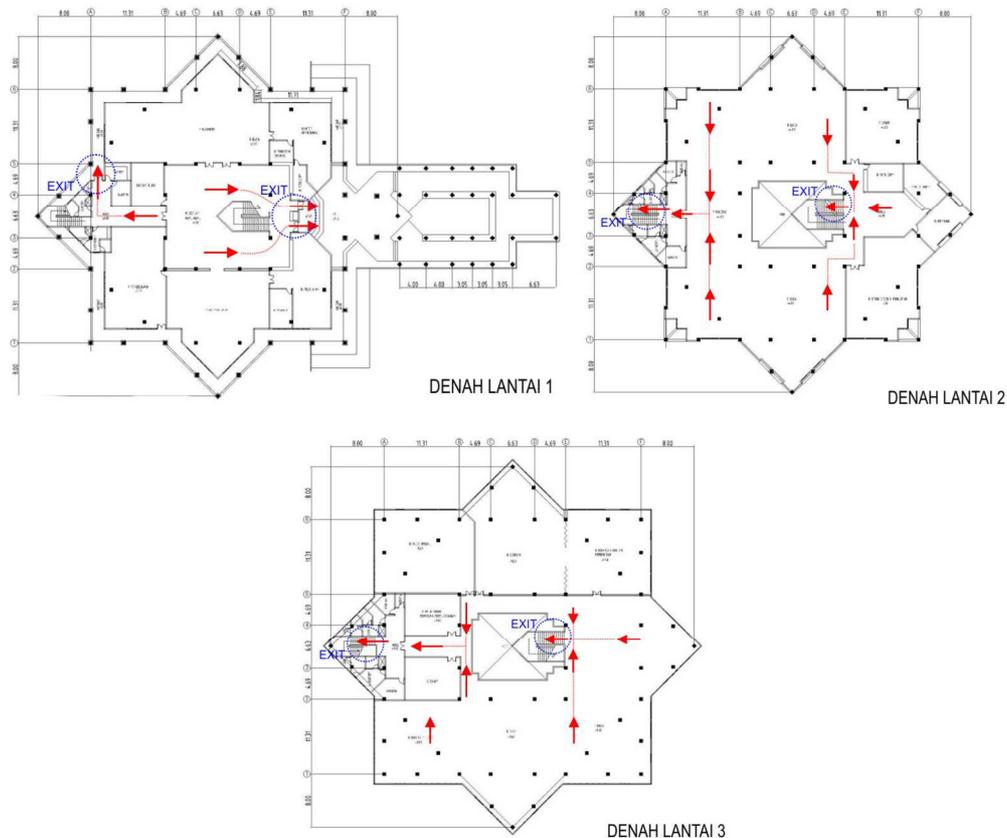


Figure 9. Evacuation Route of Building G

Building H has the means of evacuation lines are located symmetrically designed in accordance with the plan. Type of means of access is the main entrance, stairs and lifts. On the 1st floor has 11 facilities, namely: (1) the main entrance located at the front of the building adjacent to the main terrace of the building. There are 2 doors with each having a width of 120 cm; (2) secondary door left side; (3) The right side of the secondary door; (4) door tertiary left side; (5) tertiary entrance right side (6) six doors, each in the spaces in the right and left wings. On the 2nd floor has 4 lanes means of evacuation: (1) the main entrance located at the front of the building adjacent to the main terrace of the building. There are 2 doors with each having a width of 120 cm; (2) The middle secondary staircase located at the end of the

building with a width of 100 cm; (3) household sekuder left wing; (4) a secondary staircase right wing. At Level 3 has four evacuation route means: (1) The main staircase located between the middle of the hall area and the main entrance to the U model with a width of 150 cm; (2) The middle secondary staircase located at the end of the building with a width of 100 cm; (3) household sekuder left wing; (4) a secondary staircase right wing. On the 4th floor has two means of evacuation lines: (1) The main staircase located between the middle of the hall area and the main entrance to the U model with a width of 150 cm; (2) The middle secondary staircase located at the end of the building with a width of 100 cm with a function as an alternative to the U-shaped staircase.

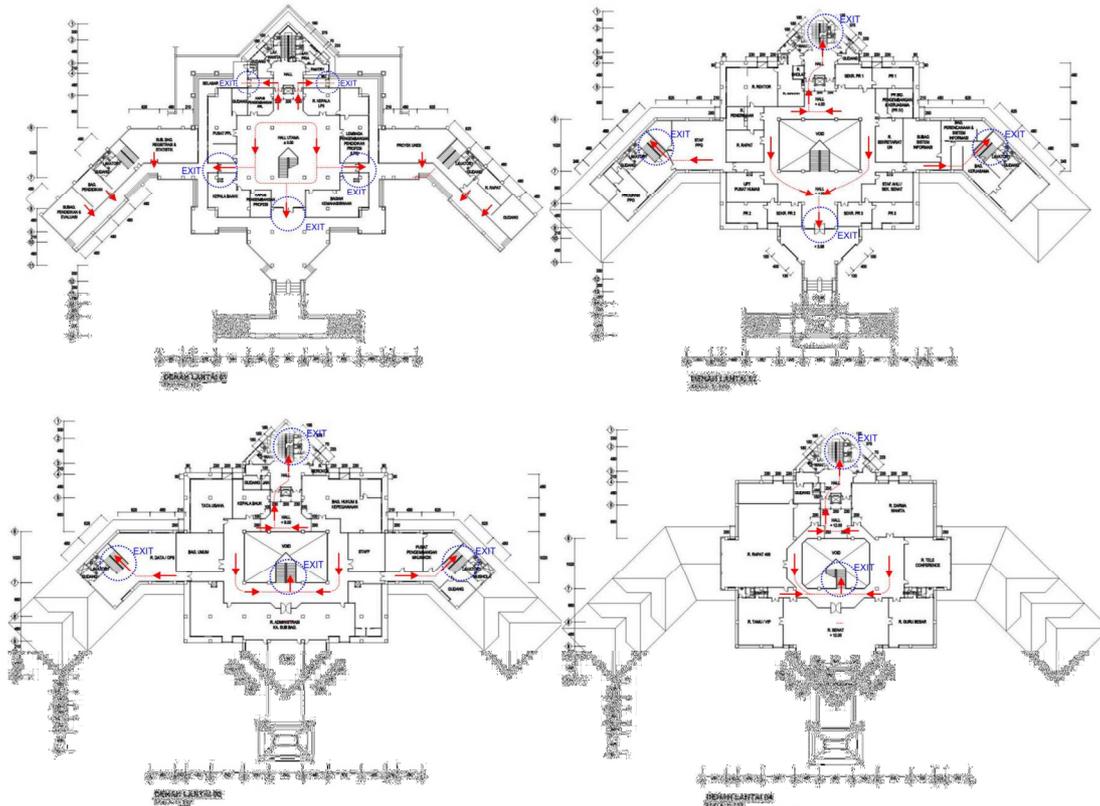


Figure 10. Evacuation Route of Building H

Conclusion

Based on the identification of conditions in the field, based essentially on the design of Building G and H have the potential to support a good ventilation system and pencayaan air supply naturally. Supported by environmental conditions are cool and conducive, certainly have a positive impact on the performance of the building and its users. Based on the identification, operational buildings tend to not pay attention to aspects of the layout which tends to close the existing ventilation with potential air supply and natural lighting. Likewise, the existence of alternative less terdesain ladder to rescue the user in the event of danger. In order to encourage the optimization potential of buildings based on its design, it is necessary to review the

layout of the rooms and the barriers that exist. It also gives clear access and circulation to support its movement in case of emergencies or danger.

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Increasing the Performance of Natural Polymer Modified Mortar with *Gracilaria Sp.* AND *Moringa oleifera* in Aggressive Environment for Green Materials

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ABSTRACT

Green materials can be defined as ‘eco-friendly’ materials. Materials which have less impact for environment, durable, and sustainable, can be categorized as green materials. Natural polymer modified mortar is one innovation that meets the purpose of green materials, because it is more durable and sustainable compared to conventional mortar. Since previous research of natural polymer modified mortar with *Gracilaria Sp.* and *Moringa oleifera* performed very good performance of compressive strength, this research then investigated its performance in aggressive environment that was represented by sea water and brackish water curing. This research wanted to find whether natural polymer modified mortar with *Gracilaria Sp.* and *Moringa oleifera* performed still perform good in aggressive environment or not. Mortar composition is of weight ratio of cement : sand : water = 1 : 1 : 0.6. Natural polymer modified mortar has compressive strength design of $f'_c = 30$ MPa (for mortar cured by plain water). There are 8 categories and 10 compositions for each category, A-H. Natural polymer of *Gracilaria Sp.* powder and grinded raw *Moringa oleifera* were added into mortar mix. The composition of *Gracilaria Sp.* and *Moringa oleifera* based of percentage of cement weight for each mix composition. Each composition was cured by three curing mediums: plain water, sea water, and brackish water. All specimens were tested for compressive strength at ages 7, 14, and 28 days. The result of the compressive strength showed that optimum compressive strength achieved by TK-0.2% - SW - H that consists 50% of *Gracilaria Sp.* and 50% *Moringa oleifera*, compared to control specimens. This research meets conclusion that natural polymer modified mortar consists of *Gracilaria Sp.* and *Moringa oleifera* performs higher compressive strength in aggressive environment compared to the plain mortar.

Keywords – natural polymer modified mortar, *Gracilaria Sp.*, *Moringa oleifera*, aggressive environment

Introduction

Green materials can be defined as ‘eco-friendly’ materials. Materials which have less impact for environment, durable, and sustainable, can be categorized as green materials. Natural polymer modified concrete and mortar are several innovations that meet the purpose of green materials because it is more durable and sustainable compared to conventional mortar. Since previous research of natural polymer modified mortar with *Gracilaria Sp.* and *Moringa oleifera* performed very good performance of compressive strength in plain water curing (Susilorini, et. al., 2014a,b; Susilorini, et. al., 2015a,b). Hence,

this research wants to investigate natural polymer modified mortar with *Gracilaria Sp.* and *Moringa oleifera* performance in aggressive environment that was represented by sea water and brackish water curing. This research wanted to find whether natural polymer modified mortar with *Gracilaria Sp.* and *Moringa oleifera* performed still perform good in aggressive environment or not.

Theoretical Review

Conventional concrete and mortar usually meets problem of durability, especially when exposed to aggressive environment. In last decades, the problem mentioned above

has been covered by innovation of polymer modified concrete and mortar. Polymer modified concrete and polymer modified mortar defined as composites of polymer and cement and also aggregates, depend on the size of granule (Barbuta and Harja, 2008; Islam, et. al., 2011), used in repairing and retrofitting.

It is interesting that some natural polymer may give good performance in bond mechanism and corrosion resistance, in this case, *Gracilaria Sp.* and *Moringa oleifera*. *Gracilaria Sp.* is polysaccharide which has agarose and agarpectin which produce strong gel (Salamah, et. al., 2006), while *Moringa oleifera* has bioactive compound of *rhamnosyloxy-benzil-isothiocyanate* which works as coagulant that absorbs metal ions (Sutanto, et. al., 2007)

Previous research of Susilorini, et. al. (2014a,b; 2015a,b) noted that addition of natural polymer of *Gracilaria Sp.* alone and combined with *Moringa oleifera* has increased the compressive strength of mortar. In this research, compressive strength of natural polymer modified mortar *Gracilaria Sp.* and *Moringa oleifera* will be investigated in aggressive environment that modeled with seawater and brackish water curing

Research Methods

This research conducted experimentally by producing mortar cube specimens. The natural polymers used were *Gracilaria Sp.* and *Moringa oleifera*. This research used *Gracilaria Sp.* powder (Figure 1) and grinded raw *Moringa oleifera* with (Figure 2) and without skin.

Mortar composition is of weight ratio of cement : sand : water = 1 : 1 : 0.6. Natural polymer modified mortar has compressive strength design of $f'_c = 30$ MPa (for mortar cured by plain water).

There are 8 categories of mix design of natural polymer modified mortar with 10

compositions, A-H, of *Gracilaria Sp.* and *Moringa oleifera* (Figure 1) that were added into mortar mix. Mix designs and compositions were based on percentage of cement weight. Percentage of total natural polymer weight for each mix design was identified by specimen code while percentage of *Gracilaria Sp.* and *Moringa oleifera* of total described natural polymer weight by Table 1. For example, for specimen code K-0.1%, has total weight natural polymer of 0.1% of cement weight. Specimen code K-0.1% consists of *Gracilaria Sp.* and *Moringa oleifera* which its compositions identified by A-H as seen in Table 1.



Figure 1. *Gracilaria Sp.* powder



Figure 2. Grinded *Moringa oleifera* with skin

Each composition was cured by three curing mediums: plain water, seawater, and brackish water. The seawater and brackish water curing represented aggressive environment. All specimens were tested for compressive strength at ages 7, 14, and 28 days. The compressive test referred to ASTM C-496.

Table 1. Mix designs and compositions

No	Specimen Code (Category)	Composition					
		Composition Code	G	MS	Composition Code	G	M
1	Control - BW		0%	0%		0%	0%
2	K-0.1% - BW	A	100%	0%	F	100%	0%
		B	75%	25%	G	75%	25%
		C	50%	50%	H	50%	50%
		D	25%	75%	I	25%	75%
		E	0%	100%	J	0%	100%
3	K-0.2% - BW	A	100%	0%	F	100%	0%
		B	75%	25%	G	75%	25%
		C	50%	50%	H	50%	50%
		D	25%	75%	I	25%	75%
		E	0%	100%	J	0%	100%
4	K-0.5% - BW	A	100%	0%	F	100%	0%
		B	75%	25%	G	75%	25%
		C	50%	50%	H	50%	50%
		D	25%	75%	I	25%	75%
		E	0%	100%	J	0%	100%
5	Control - SW		0%	0%		0%	0%
6	TK-0.1% - SW	A	100%	0%	F	100%	0%
		B	75%	25%	G	75%	25%
		C	50%	50%	H	50%	50%
		D	25%	75%	I	25%	75%
		E	0%	100%	J	0%	100%
7	TK-0.2% - SW	A	100%	0%	F	100%	0%
		B	75%	25%	G	75%	25%
		C	50%	50%	H	50%	50%
		D	25%	75%	I	25%	75%
		E	0%	100%	J	0%	100%
8	TK-0.5% - SW	A	100%	0%	F	100%	0%
		B	75%	25%	G	75%	25%
		C	50%	50%	H	50%	50%
		D	25%	75%	I	25%	75%
		E	0%	100%	J	0%	100%

Composition : A-H

G : *Gracilaria Sp.*

MS : *Moringa oleifera* with skin

M : *Moringa oleifera* without skin

BW : brackish water

SW : seawater

Results and Discussion

The results are described by Figure 3, 4, and 5. Compressive strength of specimens was tested at age 7 days (Figure 3), 14 days (Figure 4), and 28 days (Figure 5).

It is interesting that age 7 days (Figure 3), most specimens has lower compressive strength compared to control specimens with neither brackish water curing nor seawater curing. There are only two specimens have higher compressive strength compared to control ones. They are K-0.1% - BW - A (compared to Control - BW) and TK-0.1% - SW - A (compared to Control - SW). It is also found that K-0.1% - BW - B has same value of compressive strength compared to Control - BW.

For age 14 days (Figure 4), some specimens performed higher compressive strength compares to control ones. They are K-0.1% - BW - C (compared to Control - BW), K-0.1% - BW - H (compared to Control - BW), and TK-0.1% - SW - I (compared to Control - SW).

Final result at age 28 days is described by Figure 5. It is noted that at category of TK-0.1% - SW and TK-0.2% - SW, most compositions (A-H, but B) have higher compressive strength compared to control specimen (Control - SW). Other specimens that achieve higher compressive strength compared to control specimen (Control - BW), they are K-0.1% - BW - G and K-0.5% - BW - J.

It is understood that at age 28 days, natural polymer modified mortar which only consists of Gracilaria Sp. or Moringa oleifera tends to perform high compressive strength as categories of TK-0.1% - SW and TK-0.2% - SW with composition A, E, F, J.

For combined natural polymer which consists of both Gracilaria Sp. or Moringa oleifera, categories of TK-0.1% - SW and TK-0.2% - SW with composition of H and I also perform higher compressive strength compared to control specimen.

Hence, it is noted that optimum percentages of natural polymer of cement weight are 0.1% and 0.2%. The value of compressive strength will decrease at percentage of 0.5% because of excessive natural polymer of Gracilaria Sp. that performs as bonding agents. If there is too much bonding agents, strength will be reduced and 'killing setting' of mortar might be happened. The strength will be also reduced if the natural polymer of Moringa oleifera is exceed the optimum dosage, because it will prohibit bonding mechanism.

As shown by Figure 5, natural polymer modified mortar with Gracilaria Sp. and Moringa oleifera, categories of TK-0.1% - SW and TK-0.2% - SW, composition of H and I, shows very good performance. Composition H that consists of 50% Gracilaria Sp. and 50% Moringa oleifera has about same compressive strength (30.64 MPa and 30.72 MPa) with composition I that consists of 25% Gracilaria Sp. and 75% Moringa oleifera (30.56 MPa and 29.28 MPa). Composition H increases 17.48% and 17.79% of the control specimen (26.08 MPa) while composition I increases 17.18% and 12.27% of the control specimen. Therefore, optimum mix design is achieved by TK-0.2% - SW - H. This optimum mix design provides good chemical reaction among mortar, Gracilaria Sp., and Moringa oleifera and optimum bonding mechanism that make the mortar highly compacted and strong.

Compressive Strength (MPa)

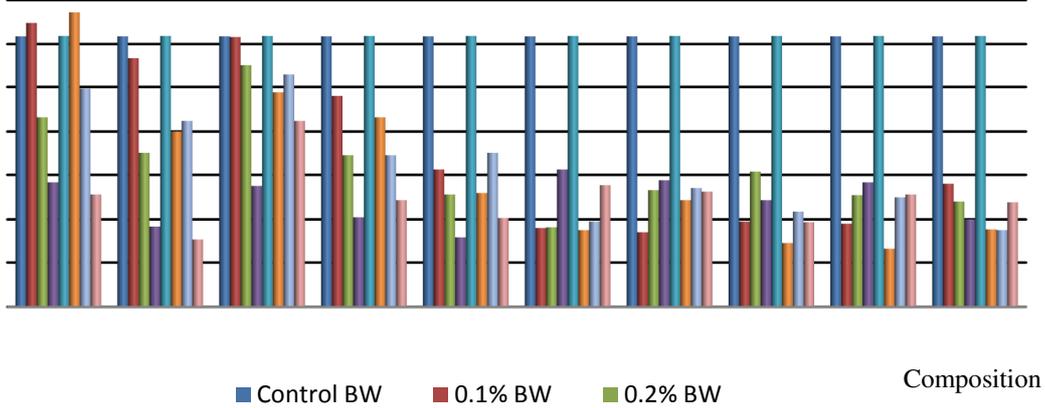


Figure 3. Compressive strength of specimens in various curing media at age 7 days (Modified from Susanto and Kurniawan, 2015; Susilorini, et.al., 2015b)

Compressive Strength (MPa)

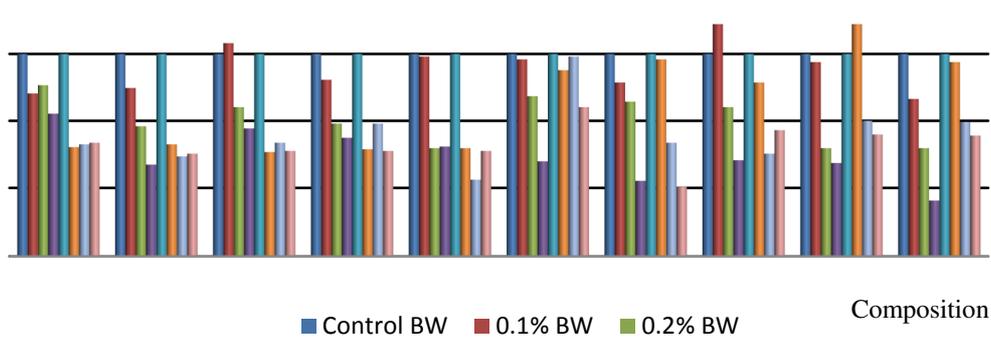


Figure 4. Compressive strength of specimens in various curing media at age 14 days (Modified from Susanto and Kurniawan, 2015; Susilorini, et.al., 2015b)

Compressive Strength (MPa)

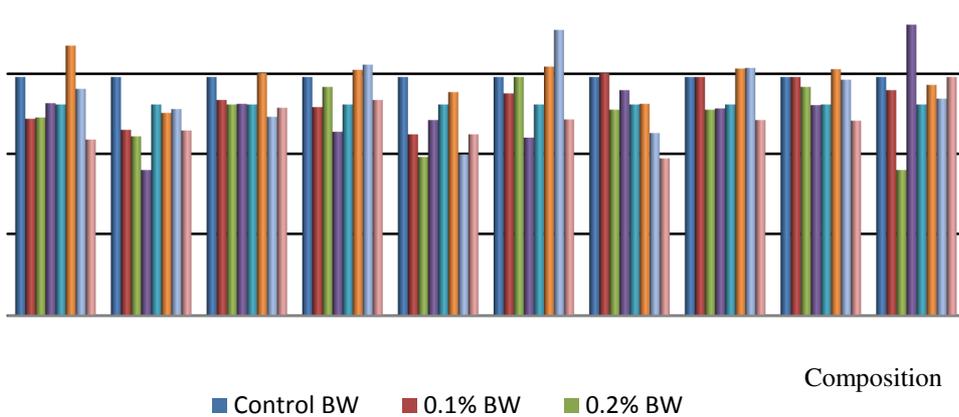


Figure 5. Compressive strength of specimens in various curing media at age 28 days (Modified from Susanto and Kurniawan, 2015; Susilorini, et.al., 2015b)

Conclusions

The result found optimum mix design is achieved by TK-0.2% - SW - H. This optimum mix design provides good chemical reaction among mortar, *Gracilaria Sp.*, and *Moringa oleifera* and optimum bonding mechanism that make the mortar highly compacted and strong. Hence, this research meets conclusion that natural polymer modified mortar consists of *Gracilaria Sp.* and *Moringa oleifera* performs higher compressive strength in aggressive environment compared to the plain mortar.

Acknowledgment

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THE COLOR CHANGE OF SWIFTLET BIRD NEST (*Aerodramus fuciphagus*) IN PAMANUKAN, WEST JAVA

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ABSTRACT

The color change on the swiftlet bird's nest is still unknown.. The objective of this study is to investigate the factors which affect red nest formation. Observation on nest formation were conducted in the swiftlet bird house in Pamanukan from November 2014 to March 2015. Nest formation were observed visually, development of nest and color change was measured by colorimeter. The biomass of swiftlet faeces were collected every week. The results showed that swiftlet nest formation was 18 weeks and formation of red color occurs gradually, start from white, light yellow, dark yellow, orange, red. This phenomenon related with faeces drop. At the beginning of nest formation the amount of swiftlet drop was 0.01 ± 0.02 g/week (first week) and at fourth week was 2.16 ± 0.90 g/week and the color of swiftlet nest was white color. At fourteen weeks, the nest become red and at that time the amount of swiftlet dropping (faeces) was 41.85 ± 4.48 g/week.

Keywords – Swiftlet bird (*Aerodramus fuciphagus*), red nest, faeces drops

Introduction

Swiftlet bird (*Aerodramus fuciphagus*) be resource involves which many met in South-East Asia (Chantler & Driessens, 1995; Ripley, 1997). Edible bird nest of swiftlet which many searched public is having status high economics social, because this nest exploited as special quality food which had been recognized since dynasty Tang (618-907) until dynasty Sung (960-1279) and can increase social status (Koon and Cranbrook, 2002).

Resident Hong-Kong consumes edible nest of swiftlet 100 tons each year closing 60% world supply. Community Tionghoa in North America consumes 30 tons each year while in continent Chinese only 10 tons each year. (Goh et al, 2001 and Quentien, 2004). Out of 24 specieses of this bird was only 4 species can produce edible nest (Koon, 2000).

The biggest edible nest international trade come from white nest (*Aerodramus fuciphagus*) and black nest (*Aerodramus maximus*), only a few coming from red nest (Koon, 2000 and Koon, Cranbrook, 2002). From result of survey field in area Sidayu,

Gresik the year 2007 indicating that number of white nest 98%, and 2 % red one. Red nest international trade has higher level value (C\$ 10000/kg) than white nest (C\$2000/kg). And estimates in the event of addition of produce of red nest, will not influence price because the consumer still be tied by idolizing culture. So they would remain to requires red nest in high level. (Koon and Cranbrook, 2002).

Almost 90% commerce of white nest to Hong-Kong was come from Indonesian. Rest fulfilled by other South-East Asia nations, like Malaysia, Vietnam, Thailand and Philipina (BPS,1995). Up to now market still lacking of supply of edible nest especially red nest. (Mardiastuti, 1998)

Chemical composition of white nest coming from Gresik consisted of carbohydrate 18,307 %, fat 0,089 %, crude fiber 0,289 %, protein 50,757 %, dusty 11,062 %, water content 19,872 % (Mardiastuti, 1996). Chemical composition of Comparison of white nest and red nest for fat (0,14% - 1,28%), ash (2,1% - 2,1%), carbohydrate (25,62%-27,26%) and protein (62%-63%), and it is found that red nest contained ovotransferrin protein (Massimo, 2005).

Kong et al (1987) reports that edible nest contains "cell division inducing hormone" and "epidermal growth factor (EGF)" what can influence growth and differentiation cell, covers growth network, regeneration of cell, and body impenetrability. Besides edible nest applicable to effort for prevention from influenza virus attack (Chao et al, 2006)

Trust in public about red nest known as blood nest (red-blood nest) be produced by swiftlet which is new first time learning makes nest, causing is estimated that red colour effect of blood sweep from swiftlet bird. There is other assumption telling that red nest because of to be specific of mushroom.

Based on observation of person (2007) swiftlet bird is anticipated to has behaviour is compiling nest in teams is separate with group of white nest so that between red nest and white nest there are no in one rooms. Red nest not always found at each bird house of swiftlet, so that data about red nest still have not many known. Research about red nest has not many done especially research about habitat place of having a nest and behaviour of having a nest. This thing happened because red nest very rare found in bird houses of swiftlet.

Until now scientific has not known of the cause of forming to red edible nest of swiftlet bird, and how forming technique red nest building. The objective of this study is Determination amount of faeces produced in the period swiftlet nest formation

Theoretical Review

Forming of red nest still becoming debate does forming cause red colour at edible nest of swiftlet. Patricia (1996) mentions that compiler material and nest colour determined by behaviour of having a nest at swiftlet bird and supported with research Ingolf (2004) indicates that hot temperature from mains swallow (*Hirundo rustica*) during incubation process will disseminate

up to nest with degree of different temperature and indirectly will influence colour, structure, matter and construction nest. So is anticipated mains body temperature during incubation can cause forming to red nest. While Massimo (2005) tells that by using X-ray microanalysis at surface of red nest there is high ferrum content (60 ppm) from at white nest (30 ppm) causing indicates existence of distribution some element into nest. Besides anticipated the entry of environmental elements into nest, Massimo (2005) indicates that existence of difference of protein type between white and red nest, fingerprint between both nests there is difference.

Research Methods

We conducted fieldwork in October 2014 until February 2015 in Pamanukan West Java. We visited nests weekly to determine size nest, laying date, hatching date of the first egg (defined as day 0), colour, which included start of egg laying, clutch size, egg laying interruptions, hatching date, hatching success, fledging success and breeding success. We individually marked nestlings at hatching with non-toxic permanent colour markers at days after hatching.

This research includes Explorative research conducted at the Laboratory of Research and Laboratory Instruments UNESA and the Department of Chemistry at Home swiftlet Pamanukan, West Java. swiftlet bird droppings (*Aerodramus fuciphagus*), digital cameras, colorimetri, flashlights, stationery, plastic container, digital scales.

Ways of working :

- a) Treatment: collect faeces swiftlet
- b) Parameter observations: Heavy faeces deposited in the period of formation of hives.

3 nest determines the red as the research object, every red nest formed plastic laid width of 1 x 1 m at the bottom of the nest. Adjust the position of the plastic so that the

nest right in the middle of plastic so that the faeces will fall right in the middle of the plastic. Faeces will be accommodated in the lower part (plastic) as the swiftlet and juvenil will issue manure in a way out in advance of the hive and remove manure, after completion of the swiftlet and the juvenil will come back to the nest, so the nest will remain clean from faeces (Nguyen , 1994). Measurements of heavy faeces performed every week starting from nest has not been formed until the chicks are ready to fly.

Results and Discussion

Development of forming of nest at white and red one shows existence of equality of development inner measure of forming of nest. This thing proves inexistence of such a great difference between red and white nest though compiled at different room of its

Development of white and red nest shows development of measure which approximately equal either speed solving of nest and also nest measure compiled. Apparition of egg happened when at the same approximant after nest lapped over perfection at week to 12 (5th January 2015). Incubation is done during 2 week, and continued with mothering of child of during

5 week until juvenile really can fly. Manifestly differentiating both types of this nest is the forming of young yellows colour, yellows, orange, and red of which is not happened at white nest.

Faeces swiftlet nests in the early formation showed a very small amount (2.16 g) at week 4 and different in the last weeks where weight gain each week faeces can reach 93.86 g. This is because the existing population in the nest increases, the first week of a population of only 2 per nest swiftlet and different in the last weeks populaasi where the number increased to 4 birds per nest swiftlets. When early rearing chicks (week 14) heavy faeces increased slightly (8.59 g / week) are different at the end of rearing chicks (week 18) heavy faeces rising high (17.35 g / week). This difference is due at the end of rearing chicks bird that has become as big as the parent, but have not been able to fly away from the nest. Any activity chicks still in the nest, including removing impurities. More or less manure produced over a period of swallow chicks nest formation affects the colors on the formative period of bird's nest of red color. At the beginning of the formation of red, white initially swallow nest for 4-5 weeks because of the amount of manure

Table 1 Development of forming of white and red nest

week	Red Nest			White nest		
	length	width	description	Length	width	description
1.	5,60	0,13	white	4,73	0,03	white
2.	6,63	0,30	white	5,80	0,17	white
3.	7,57	0,60	white	6,50	0,27	white
4.	8,67	0,93	white	7,40	0,43	white
5.	9,80	1,63	light yellow	8,73	0,87	white
6.	11,03	2,30	light yellow	9,97	1,40	white
7.	12,07	3,07	yellow	10,90	2,17	white
8.	12,57	3,67	yellow	11,73	3,03	white
9.	12,90	4,23	Orange	12,57	3,90	white
10.	13,37	5,03	Orange	13,03	4,53	white
11.	13,43	4,77	Orange	13,40	5,20	white
12.	13,43	4,77	Orange / egg	13,40	5,23	white/egg
13.	13,60	4,93	Orange / egg	13,52	5,37	white/jouvenile
14.	13,67	5,00	red / jouvenile	13,63	5,47	white/jouvenile
15.	13,80	5,10	red / jouvenile	13,77	5,63	white/jouvenile
16.	13,87	5,23	red / jouvenile	13,93	5,77	white/jouvenile
17.	14,03	5,37	red / jouvenile	14,00	5,83	white/jouvenile
18.	14,03	5,37	red / empty nest	14,00	5,83	white/empty nest

produced swiftlet still slightly red color formation and development will be more rapid in recent weeks of rearing chicks, because the amount of manure produced more (17 , 35 g / week). This research is still necessary to continue to examine the gas contained in the faeces and how the process of chemical reactions that occur in birds nest red.

Table 2 the Addition of Swiftlet Droppings Each Week

Weeks	Faeces Weight (g)				Nest conditions
	Nest 1	Nest 2	Nest 3	average	
1	0,03	0	0	0,01 ±0.02	white
2	0,14	0,12	0,05	0,10 ±0.05	white
3	0,87	0,76	0,24	0,62 ±0.34	white
4	2,97	2,32	1,2	2,16 ±0.90	white
5	5,34	4,65	2,31	4,10 ±1.59	light yellow
6	7,23	6,45	3,98	5,89 ±1.70	light yellow
7	10,27	8,63	5,21	8,04 ±2.58	yellow
8	12,23	10,43	8,54	10,40 ±1.85	yellow
9	14,56	13,42	10,23	12,74 ±2.24	Orange
10	19,21	17,23	13,32	16,59 ±3.00	Orange
11	25,27	24,78	18,35	22,80 ±3.86	Orange
12	32,48	30,25	24,35	29,03 ±4.20	Orange / egg
13	38,54	35,56	30,24	34,78 ±4.20	Orange / egg
14	46,23	42,03	37,28	41,85 ±4.48	red / juvenile
15	55,21	50,45	45,67	50,44 ±4.77	red / juvenile
16	69,43	62,34	55,45	62,41 ±6.99	red / juvenile
17	85,65	77,65	66,23	76,51 ±9.76	red / juvenile
18	105,24	96,45	79,89	93,86 ±12.87	red / empty nest



Figure 1 color change of swiftlet nest white, yellow, orange and red

Conclusions and Recommendations

The formation of bird nest white and red colors there are differences in size , while the color change tends to be influenced by the amount of faeces released by the swiftlet

bird. Bird nest color changes occur gradually from white , yellow , orange and red .

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IN VITRO SHOOT MULTIPLICATION OF *Feronia limonia* (L.) Swingle IN A CO₂ ENRICHMENT AND SUCROSE REDUCTION CULTURE

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ABSTRACT

This present study was conducted to develop a non-conventional method of *Feronia limonia* (L.) Swingle shoots multiplication. The research was carried out experimentally using a completely randomized factorial design with two factors, i.e. sucrose concentrations of culture media (0%, 1%, 2%, and 3%); and CO₂ levels of culture vessel (0.0%, ambient concentration, 0.03%, and 0.30%). Explants used in the research were cotyledonary nodes of sterile seedlings. Some variables observed include number of shoots produced in each explant, shoot height, internode length, and the number of composite leaves generated in each shoot after being cultured for three months. Data were analyzed in two-way Analysis of Variance and Duncan's Multiple Range Test. Results showed that sucrose concentrations, CO₂ levels, and their interaction significantly influence the multiplication of *F. limonia* shoots. Murashige and Skoog medium containing 2% sucrose under 0.03% CO₂ level was the best treatment. It resulted in the highest number of shoots/explant, the tallest shoot, as well as relatively large amount of composite leaf and shoot. CO₂ could replace a part of sucrose in the medium of *F. limonia* culture that used the cotyledonary node explants under red and blue light during the day and a temperature of 26 ± 2 °C.

Keywords - shoot multiplication, *Feronia limonia* (L.) Swingle, sucrose, CO₂-enrichment

Introduction

In vitro plant propagation is aimed to produce pathogen-free and high viable plantlets efficiently when transferred to *ex vitro* environment. The conventional *in vitro* techniques often face obstacles of a highly contaminated culture and low survived plantlets during acclimatization. This condition is believed to be caused by the sugar usage as a carbon source in the culture medium. This phenomenon results in low photosynthetic activity and reduction of plantlet adaptation in the natural environment. In addition, the presence of sugar in culture media also allows fungal and bacterial contamination. The nutritional type, which chlorophyllous tissue uses endogenous and exogenous carbohydrates as a carbon source, is called photo-mixotrophy (Kozai and Kubota, 2005).

In order to overcome this problem, a different condition of nutritional type is required to produce optimally photosynthesizing plantlets. One way to

achieve this condition is by lowering sugar concentration of the culture and replacing the carbon source with a highly concentrated CO₂. The enriching of CO₂ will not only replace the sugar as the carbon source, but also can improve microclimate of the culture media that in turn increases photosynthesis capacity and explant biomass accumulation (Qu et al., 2009). Another advantage of the increasing of CO₂ in the culture is improvement of plantlets produced. The plantlets would be more resistant to microbe contamination and more vigorous with stronger rooting system (Xiao and Kozai, 2006; Xiao et al., 2011). The lowering of sugar and enriching of CO₂ in principle decrease the dependence of culture to exogenous carbohydrates and gradually develop photoautotrophic condition, i.e. the ability of explant to grow without additional exogenous carbohydrates and other organic compound (Kozai and Kubota, 2005).

The present study was aimed to find out a non-conventional shoot multiplication

protocol of *F. limonia* to produce vigorous *in vitro* shoots. The effect of CO₂ level of the culture vessel and sucrose concentration of the media at varying concentration and their interaction were studied. The results may attribute to studies of the physiological mechanism of plant in the *in vitro* culture and development of micropropagation methods of *F. limonia* or other woody plants.

Theoretical Review

Photoautotrophic culture has long been expanding in many countries (Kozai and Kubota, 2005), but there is little interest in Indonesia so far. The optimization of photoautotrophic multiplication method is important for propagating rare species, e.g. *Feronia limonia* (L.) Swingle (Jv. *kawista*). In Indonesia, *F. limonia* has a high economic value for food and medicine. At present, the population of this species tends to decline. In Java, most of *F. limonia* grow in District of Rembang, Central Java. According to Office of Agriculture and Forestry, District of Rembang (2012), plants number in 2009 was 1400 trees, but in 2011, it was reduced to 948 trees. In order to prevent the extinction, this phenomenon should be evaluated. Among some factors of the population reduction, decrease of planting area was the primary factor because of the relatively severe propagation of *F. limonia* (personal communication with the society in Rembang, 2012). The growth of *F. limonia* seedlings is very slow; on the other hand, the vegetative propagation using stem cutting or grafting is not effective. For this reason, to increase the availability of the *F. limonia* seedlings, more efficient propagation should be developed, i.e. through a photoautotrophic tissue culture technique.

There are several ways to increase CO₂ level in culture vessel, namely, 1) using large culture vessel with forced ventilation to supply CO₂ (Zobayed et al, 2005), 2) using chemicals to produce CO₂ in the culture

vessel, such as NaHCO₃ or Na₂CO₃ (Vyas and Purohit, 2006), or 3) using gas-permeable membrane or plastic film as the cover of the culture vessel (Saldanha, 2013). The usage of chemicals to produce CO₂ gas is a relatively inexpensive and simple manner.

Photoautotrophic culture for *F. limonia* has been developed by Vyas and Purohit (2006). They examined an effect of CO₂ enrichment on shoot multiplication grown in sucrose media and free-sucrose media. The research result was difficult to apply, especially in a tissue culture laboratory that doesn't have lighting comparable to sunlight perfectly which leads to un-optimal photosynthesis. It means that CO₂ may not able to replace sucrose as a carbon source entirely. Therefore, the treatment of gradually lower sucrose content under 3% needs to be done. In addition, CO₂ enrichment treatment is carried out by Vyas and Purohit (2006) through adding Na₂CO₃, NaHCO₃, KHCO₃ and K₂CO₃ in various ratios without acid addition, whereas it has widely been known that NaHCO₃ and Na₂CO₃ efficiently produce CO₂ at acidic condition. Therefore, the application of these chemical substances was recommended in acidic condition, for example, by adding HCl. Set up of CO₂ concentrations in culture vessel can be based on the following reaction: $\text{NaHCO}_3 + \text{Na}_2\text{CO}_3 + 3\text{HCl} \rightarrow 3\text{NaCl} + 2\text{H}_2\text{O} + 2\text{CO}_2$. The coefficient ratio of NaHCO₃, Na₂CO₃, and HCl, as well as CO₂ produced by this equation, was 1:1:3:2.

Research Methods

This study was carried out in Plant Tissue Culture Laboratory of Biology Department, Semarang State University from March to October 2014. Explants used in this study were cotyledonary nodes obtained from seedlings with height of approximately 4 cm derived from *in vitro* germination of *F. limonia* seeds.

The experiment was conducted using a completely randomized factorial design with

two factors. There were four concentrations of sucrose (0%, 1%, 2%, and 3%) and four CO₂ levels (0.00 g/m³, ambient concentration, 0.60 g/m³, and 6.00 g/m³) investigated. The CO₂ levels of 0.60 and 6.00 g/m³ were equal to 0.03% and 0.30% respectively (Vyas and Purohit, 2006), while the CO₂ ambient concentration in *in vitro* vessel usually equal to about 400 ppm (0.40 g/m³ or 0,02%). Each experimental unit consisted of two cotyledonary nodes. Five replicates were prepared for each of treatment.

Various CO₂ levels were applied in acrylic boxes; each has a volume of 6,500 cm³ (25cm x 20cm x13cm) with a lid on the upper side (Fig. 1A). To reach the CO₂ concentration of 0 g/m³ in the culture vessel, solution of 10% KOH was placed in the acrylic box. For each CO₂ level treatment (0.03% and 0.30%), a petridish containing mixture solutions of NaHCO₃, Na₂CO₃, and HCl was placed inside the acrylic box with the molarity or concentration ratio based on the ratio of the CO₂ production reaction (Table 1). The solutions were kept in an open petridish inside the acrylic box to provide CO₂ diffusion maximally and changed every 5 days (Vyas and Purohit, 2003). Ambient CO₂ concentration treatment was made by placed the closed culture bottles outside the acrylic boxes in the growth room.

The preparation of MS (Murashige and Skoog, 1962) multiplication media was carried out using a standard method, except

the addition of sucrose was given in accordance with the treatment. The media MS supplemented with 2 μM BA, 0,5 μM IBA dan 0,3 μM GA3 was adjusted to pH 6 and autoclaved for 20 minutes at 121 °C and 15 psi. The cotyledonary nodes as explants were incised from sterile seedlings and planted aseptically on 30 ml media inside 300 cm³ bottles (Fig. 1B). Sub-cultures were conducted every month on fresh media. Four bottles of each sucrose concentration treatment were placed into each of sterile acrylic boxes with controlled CO₂ level in accordance with the CO₂ level treatment, and then the boxes were covered tightly to avoid contact with the atmosphere. The acrylic boxes were placed randomly according to the experimental design in an incubation room with a temperature of approximately 26 ± 2 °C, and illuminated with red and blue tubular lamps (40 W each) placed 40 cm above the culture rack at approximately 800-900 lux with a 12 hour photoperiod.

Various variables observed at month-3 after culturing include the number of shoots resulted in each explant, shoot height, internode length, and the number of composite leaves (CL) resulted in each explant. A shoot was considered be generated when its length at least 1 cm. The CL number was counted based on the number of petiol (usually it had 3 – 5 leaflets) grown from shoot. The data collected were analyzed using two-way Analysis of Variance and Duncan's Multiple Range Test.

Table 1. Ratio of NaHCO₃, Na₂CO₃, and HCl Used to Produce Various CO₂ Levels in the Acrylic Boxes Based on the Reaction of NaHCO₃ + Na₂CO₃ + 3HCl → 3NaCl + 2H₂O + 2CO₂

Compounds ratio (M)				Compounds ratio (g/l)			
NaHCO ₃	Na ₂ CO ₃	HCl	CO ₂	NaHCO ₃	Na ₂ CO ₃	HCl	CO ₂
0,007	0,007	0,021	0,014	0,588	0,742	0,756	0,60
0,068	0,068	0,204	0,136	5,712	7,208	7,344	6,00

* Molecular weight of CO₂, NaHCO₃, Na₂CO₃, and HCl are 44, 84,106, dan 36, respectively

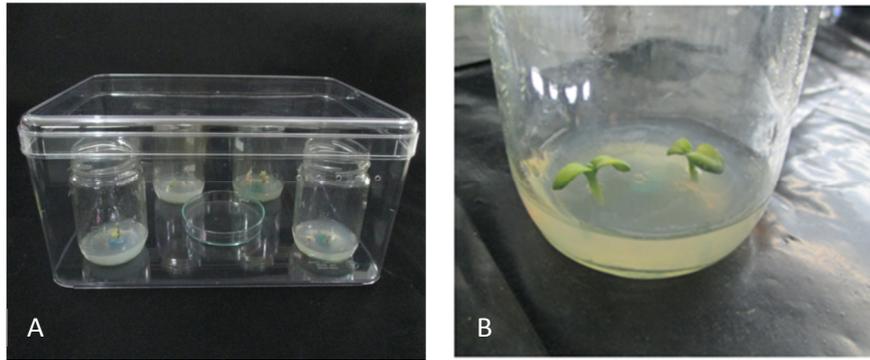


Figure 1. Culture vessels and explants used in the development of photoautotrophic culture. A) Acrylic box for set up treatment of CO₂ level containing four bottles of each sucrose concentration treatment and one petridish containing the mixture of NaHCO₃, Na₂CO₃, and HCl solution. B) Two cotyledonary nodes cultured on multiplication medium.

Results and Discussion

In general, emergence of new shoots from cotyledonary node began at the first month and increased over the time until the third month, except on the explants cultured in sucrose-free media under 0% CO₂ which it began at the second month and then died. The number of shoots/explant generated at month-1 until month-3 in sucrose-free media was fewer than those generated in media containing sucrose, and increasing concentration of sucrose increased growth responses (Fig. 2).

Sucrose concentrations influenced significantly on shoot multiplication of *F. limonia* recorded after three months, especially on the number of shoots/explant, number of CL/explant, and shoot height. Explant cultured in the media containing sucrose developed and grew better than those cultured in the free-sucrose media. These results revealed that sucrose was needed in shoot multiplication mechanism of *F. limonia*.

Sucrose is a type of sugar found in Murashige and Skoog (1962) culture media formulation. Because of the culture condition usually unsuitable for photosynthesis, addition of sugar is essential for optimal growth and development of

explant in *in vitro* condition. Sugar is required as carbon and energy source. The sugar kind and concentration must be determined based on type and age of explant; very young organ needs a relatively high sugar level (Saad and Elshahed, 2012). Among the sugars, sucrose is probably widespread used because it is the most common sugar in phloem sap of many plants (Tayz and Zeiger, 2006), highly soluble in water, and does not inhibit the main of biochemical processes inside cells (Saad and Elshahed, 2012), regulates lateral root formation (MacGregor et al., 2008), and triggers in axillary bud development (Mohammed et al. 2013). This result agrees with those achieved on *Wrightia tomentosa*. Sucrose was still needed in the culture media. Although the increase of CO₂ concentration in culture vessels has been proven to improve the shoot development rate, the unavailability of sucrose has caused browning and mortality of *W. tomentosa* shoots after 30 days (Vyas and Purohit, 2003).

However, there are some weaknesses in usage of sucrose in culture media. Sucrose is rapidly hydrolyzed, and autoclaving may also decrease its concentration because it is broken down into glucose and fructose. Although the broken down is advantageous because allows generating an available

carbon source, but subsequently it enables affect pH fluctuation of media and decreases nutrients absorption by explant when it occurs continuously (Saad and Elshahed, 2012). Additionally, Zobayed (2005) stated that ethylene could be produced and accumulated due to the presence of sucrose in the culture media and disturbs stomata development. As a result plantlets grown in a media containing sucrose have lower photosynthetic capacity than that grown in free-sucrose media. According to Badr (2011), the presence of sugar in the media may redirect amino acids synthesis pathways, decreases intermediate compounds of glycolysis and tricarboxylic acid cycle and then disturbs carbohydrate and nitrogen metabolisms. For those reasons, plantlets were grown in media containing sucrose shows metabolic and physiological imbalances.

The CO₂ level highly significant affected the number of shoots/explant, number of CL/shoot, shoot height, and internode length. Under different levels of CO₂, explants showed various responses. Best response was observed on 0.03% CO₂.

Increase in CO₂ level beyond 0.03% showed the decline in shoots/explant and number of CL/shoot. In addition to its function as a source of carbon, CO₂ has a positive role in the development of *in vitro* leaves. Under high CO₂ environment, leaves develop better than those in the lower CO₂ condition. Yokota et al. (2007) proved that leaves of *Aralia eleta* and *Phellodendron amurens* grown in conventional *in vitro* culture (with low CO₂ concentrations) are thinner and have an undeveloped palisade layer than those greenhouse-grown plants. However, when CO₂ level exceeds the certain point, leaf growth will be reduced. It can be due to an adverse effect of high CO₂ concentration on chlorophyll biosynthesis (Woltering, 1986).

There was a significant interaction between sucrose concentration and CO₂ level. Interaction between the two factors had a significant effect on all of the growth parameters measured (Table 2). The number of shoots/explant increased with increasing sucrose concentration in the same CO₂ level. Explants cultured in the media containing 2% sucrose under 0.3% CO₂ produced

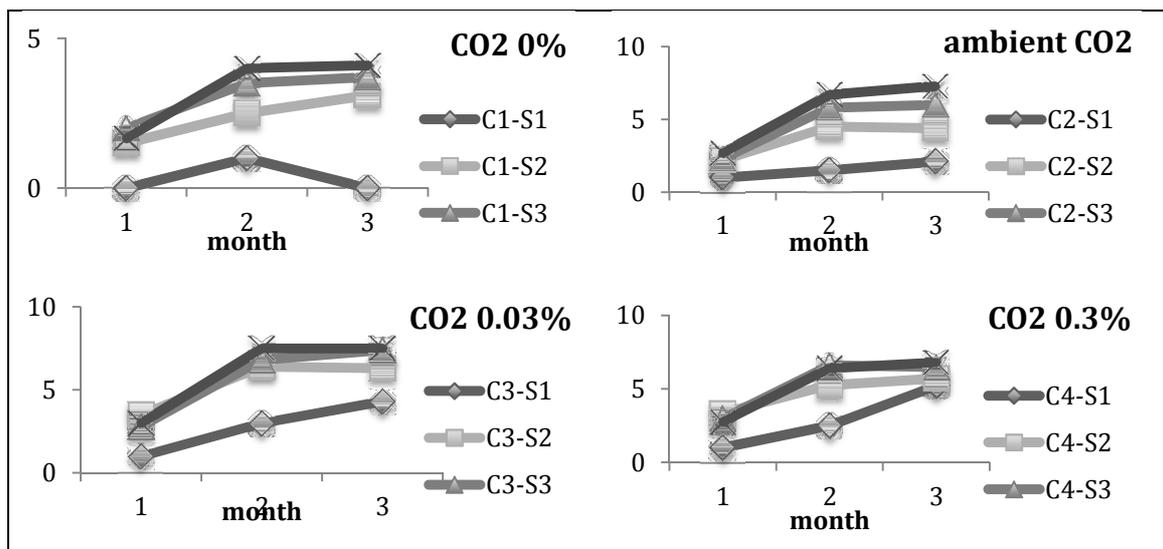


Fig. 2. The increase of the number of shoots/explant every month in various CO₂ levels in the culture vessel and sucrose concentrations in the multiplication media. C1, C2, C3 and C4 were CO₂ level at 0%, ambient, 0.03% and 0.3% respectively. S1, S2, S3 and S4 were concentrations of sucrose at 0%, 1%, 2% and 3% respectively

highest number of shoots (7.5 shoots) and did not significantly differ from those in the media containing 3% sucrose under ambient air. The lowest one was found on free sucrose media under environment without CO₂. In this condition, explant sustained growth for about one month only and subsequently died (Table 2, Fig. 3A).

Explant grown in media containing 2% sucrose under 0.03% CO₂ level resulted in an average of 4.6 CL. It was the most number compared to the other treatments. It was interesting to note that there were a similar number of CL/shoots formed in certain sucrose concentration and CO₂ level with that formed in lower sucrose

concentration and higher CO₂ level. For example, the number of CL/shoot in the media containing 1% sucrose under ambient air (2.8 CL/shoot) similar with those in media without sucrose under CO₂ of 0.03% (2.7 CL/shoot) (Table 2, Fig. 3B, Fig. 3C). Regardless shoot multiplication in the media without sucrose did not well as compared to that occur in the media containing sucrose. It suggested that the *F. limonia* culture using cotyledonary node still required sucrose as a carbon source. Media containing 2% sucrose under 0.03% of CO₂ could be stated as the best treatment because it produced a biggest number of shoots/explant, tallest shoots as well as a relatively large number of CL (Table 2, Fig. 3D).

Table 2. Effect of interaction between CO₂ levels in the culture vessel and sucrose concentrations in the media on shoot development recorded after 3 months

Treatments interaction	Variables of shoot development							
	number of shoots/explant		number of composite leaves (CL)/shoot		shoot height (cm)	internode length (cm)		
S1-C1	0.0	k	0.0	k	0.00	e	0.00	c
S2-C1	3.1	i	1.9	j	2.76	c	0.97	a
S3-C1	3.7	h	3.0	gh	2.42	cd	0.60	a
S4-C1	4.1	gh	3.9	b	2.20	d	0.46	b
S1-C2	2.1	j	2.1	j	3.18	b	1.07	a
S2-C2	4.4	g	2.8	hi	3.02	b	0.79	a
S3-C2	6.0	de	3.5	def	2.72	c	0.61	ab
S4-C2	7.3	a	3.7	bcd	2.52	cd	0.54	b
S1-C3	4.3	g	2.7	i	3.64	a	1.01	a
S2-C3	6.3	cd	3.6	cde	3.74	a	0.82	a
S3-C3	7.4	a	3.8	bc	3.70	a	0.78	a
S4-C3	7.5	a	4.6	a	3.02	b	0.55	b
S1-C4	5.2	f	3.1	gh	3.76	a	0.92	a
S2-C4	5.7	e	3.3	fg	3.18	b	0.74	a
S3-C4	6.5	bc	3.4	ef	3.04	b	0.71	a
S4-C4	6.8	b	3.5	bc	2.72	c	0.61	ab
F value	7.14**		8.37**		11.69**		2.42*	

Remarks:

C1, C2, C3 and C4 were CO₂ level at 0%, ambient air, 0.03% and 0.3% respectively. S1, S2, S3 and S4 were concentrations of sucrose at 0%; 1%, 2% and 3%. The mean followed by different letter in a column showed a significant difference based on DMRT 5%. ** and * represent highly significant and significant, respectively, at 5% level

In contrast to the two growth parameters before, in general, the shoot height and internode length decreased with increasing sucrose concentration. Shoot produced on media without sucrose under CO₂ 0.30 % was highest (3.76 cm) and did not differ significantly from those produced on media containing 0 %, 1% and 2% sucrose under CO₂ level of 0.03%. There was no significant difference of node length between shoots in almost of all of the treatments unless the shoots have grown in media without sucrose or 3% sucrose under 0% CO₂ (Table 2). It is believed because mechanisms of shoot and leaf development differ from shoot and internode growth. The formation of new shoot and leaf primordium require oriented cell divisions which need some organic compounds and energy (reviewed in Malinowski 2013); while the increasing of shoot height and internode length is conducted by cell enlargement which need more water than organic

compound (Reddy et al. 2014). In addition, sucrose in culture media was well capable of a performing optimum growth while glucose and maltose performed well especially in an increasing the nodal number per plantlet (Rahman et al., 2010).

Based on the results, it could be stated that the explants were able to grow well in the media with lower sucrose under CO₂ enrichment. Shoots developed in all levels of CO₂ enrichment were higher than those grown at ambient CO₂ levels. It could be due to several roles of CO₂ in plantlet growth under *in vitro* condition. Relatively high CO₂ concentration may favor some enzymes kinetics, for example, ribulose-1,5-bisphosphate carboxylase. As a consequence, activity of carboxylase increases and oxygenase decreases, leading to carbon assimilation enhancement and photorespiration reduction (Reddy et al. 2010).

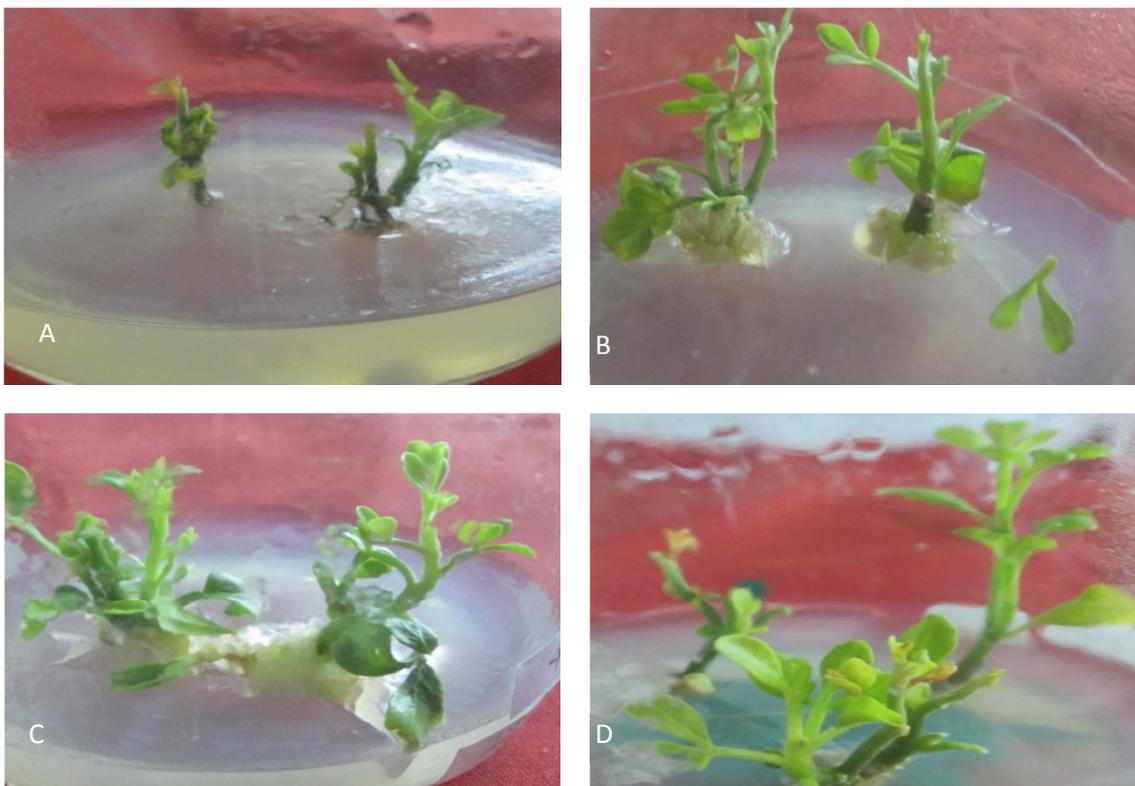


Fig. 3. The appearance of *F. limonia* shoots cultured in the multiplication media. A) in a free sucrose medium under 0% CO₂, B) in a medium containing 1% sucrose under ambient CO₂,

C) in a free sucrose medium under 0.03% CO₂, D. in a medium containing 2% sucrose under 0.03% CO₂

Moreover, the CO₂ enrichment increases total chlorophyll content, thick and development of leaf tissues, such as xylem, upper epidermis, palisade parenchyma and spongy cells (Mohamed and Alsadon, 2010), enhances photosynthetic rate (Supaibulwattana et al. 2011), reduces stomatal density which lead to a lower relative water loss from leaves and increases photosynthetic pigment, net photosynthesis and growth (Saldanha, 2013).

However, CO₂ is not the only determining factor for photosynthesis. The photosynthesis also requires several other factors such as chlorophyll content, light, and temperature. Light is used as an energy source and was harvested by chlorophyll to synthesize glucose from CO₂. The temperature facilitates enzyme activity in order to optimize the photosynthesis process (Taiz and Zeiger, 2006). As a result, the use of CO₂ in culture is only effective when the explants have optimum levels of chlorophyll and grow in a culture room equipped with adequate light and temperature for photosynthesis. This was proven by culture of Asiatic hybrid lilies; CO₂ enrichment accompanied by an increase in photons of light can enhance leaf area, root and bulblet production higher than that induced by CO₂ enrichment only (Mei-Lan et al. 2003).

Our results revealed that CO₂ enrichment up to the certain concentration positively impacted on shoot growth and development. This result was consistent with the findings of other previous reports. The addition of CO₂ concentration in the culture vessel increases the growth of *Ipoemoa batatas* in liquid media without hormone and sucrose (Yulan and Toyoki, 2006), the active compound production of *Artemisia annua* L. (Supaibulwattana et al., 2011), and many others.

The number of shoot/explant produced in the present research was lower compared to

that of Vyas dan Purohit (2006). The difference might be because of the explant used. Because more efficient, the explant used in this research was cotyledonary nodes that have not yet ready to perform photosynthesis and generate a shoot primordium, whereas Vyas dan Purohit (2006) used shoot clump that has been actively formed new shoot. According to Kozai dan Kubota (2005), theoretically, the initiation stage of the culture still need heterotrophic conditions where pathogen free cultures are established by culturing meristematic tissues. Once the chlorophyllous organs able to conduct photosynthesis are developed, the cultures are ready to move on to photoautotrophic micropropagation conditions.

Acclimatization step, where the plantlet resulted from *in vitro* culture grown in nature environment condition, is a critical factor in the success of *in vitro* propagation of plant. There are accumulating evidence that the CO₂-enriched cultures may help acclimatization success because of 1) reducing the physiological changes which required for plantlet growth upon transfer to nature environment (Zobayed et al. 2005), 2) a higher density of stomata of *in vitro* leaves as a major factor related to desiccation control at the beginning of acclimatization (Hazarika 2006), and 3) a higher capability of photosynthesis of leaves similar to the leaves of plants grown in greenhouse (Saldanha, 2013). According to Mills (2009), leaves of plantlet are highly significant affected due to conditions of *in vitro* culture. Probably the stem is also affected; it has a smaller effect on the plantlet survival at acclimatization phase. For this reason, the *F. limonia* shoots produced in this research need further examine to check the survivability during the acclimatization process.

In the present study, we verified that by employing Na₂CO₃ and NaHCO₃ in the

growth vessel could successfully induce photo-mixotrophic culture resulting in healthy plantlets of *F. limonia*. The using of the chemical compounds in an acidic condition produced saturating CO₂ and probably prevents the CO₂ depletion inside the vessel during the light period. Thus, the photosynthesis optimally occurred resulting in the obtained growth. The most important characteristic of this technique is simple that reduces laboratory cost. Although an enriched CO₂ culture may significantly aid in the growth of plant tissue cultures, a number of cultural factors (i.e. lighting) also contribute towards the growth observed.

Conclusion and Recommendations

Sucrose concentration, CO₂ level, and the interaction significantly influenced the multiplication of *F. limonia* shoots. MS media containing sucrose of 2% under CO₂ level of 0.03% was the best treatment. In the *F. limonia* culture using cotyledonary explant under red and blue light during the day and a temperature of 26 ± 2 °C; CO₂ could replace a part of sucrose but not at all. It is necessary to explore the shoots capability to perform root and then grow the plantlet in acclimatization media before the final recommendation on a wide scale.

Acknowledgment

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The Utilization of Basil and Acid Lime as an Innovative-Hair Shampoo to Apply the Value of Biodiversity Conservation

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ABSTRACT

Acid lime is known as dandruff-basher as well. The acid in lime scrubs-out the dead cells, it also helps relieve itching on the scalp. Basil is known as stimulates hair follicles, increases scalp circulation and promotes hair growth. The magnesium in Basil helps protect hair from breakage, and its anti-inflammatory properties help soothe the roots. The aims of this research was to utilize the biodiversity herbs (Basil and Acid lime) around us, besides to recognize the benefit of them as an innovative-hair shampoo. This shampoo used a combination of special ingredients to control dandruff and hair-fall. This research has five type of test to determine the expediency of the shampoo. From the physical-test, it showed its stability in colour (light brown), and has an aromatic of Lime and Basil. The pH of shampoo changed from pH=4 (week 2) to pH=5 (week 4). It also produced smooth-foam, easy to wash-off. Based on the acceptability test, the researcher was disseminate the quosioner to respondens (to 5 curly-hair and 5 straight people). From those, it was obtained that the average of quosioner was 8,72 (accepted by consumers).

Keywords – *Citrus aurantiifolia*, *Ocimum basilicum*, Shampoo, Conservation

Introduction

Healthy hair condition is a reflection of a person's health, water intake, and adequate relaxation. Hair has two main functions, keeping the head skin from dangerous sun exposure and keep the scalp of various friction and collisions (Hull, 2009).

Dandruff is a condition of the scalp that causes flakes of skin to appear (Elewski, 2002). Dandruff is a common condition, which is marked by itching. In some cases it can be embarrassing and not easy to treat (Nowicki, 2006). Fortunately, dandruff can be controlled. In mild cases, the person need only find a suitable shampoo which contains a gentle cleanser. When the dandruff is severe, a medicated shampoo will be required.

Dandruff is more common in men than in women, and in people with oily skin (Martoss, 2008). Dandruff can have several causes, including dry skin, seborrheic dermatitis, shampooing too often, psoriasis, eczema, sensitivity to hair care products, or a yeast-like fungus (Ashbee, 2002). Dry skin is the most common cause of flaking dandruff.

Lime (*Citrus aurantifolia*) is a natural asset that could be used for health because it contains high vitamin C, and lemon is also beneficial for the health of our hair, for example to prevent hair loss, eradicate dandruff and oily hair care (Sharma, 2006).

Basil (*Ocimum basilicum*) is one of the family Lamiaceae. There are many varieties of *Ocimum basilicum*, as well as several related species or species hybrids also called basil. Basil has been known and grown since ancient times. According to Gerard in his Herbal published in England in the 1600s, the smell of basil was “good for the heart and for the head.”

Basil is commonly used fresh in cooked recipes. In general, it is added at the last moment, as cooking quickly destroys the flavor (DeAngelis, 2005). The fresh herb can be kept for a short time in plastic bags in the refrigerator, or for a longer period in the freezer, after being blanched quickly in boiling water. The dried herb also loses most of its flavor, and what little flavor remains tastes very different, with a weak coumarin flavor, like hay.

Research Methods

Design of this study was experiment method. The subject of this research were the effectivity of basil and acid lime. This research was hold in the laboratory of organic chemistry, Semarang state university. The tools that used for this research include buckets, mixers, knives, blender, bottle shampoo, plastic, filter, hoses, gloves, masks, lab-coats, filter-paper, beaker, pipette, pipette volume, ball pipette, measuring cups, spatulas, analytical balance, universal indicator, rubber, rack and test tubes.

Substances used for research include aquadest, basil (*Ocinum basilicum*), lime (*C. aurantifolia*), cocamoide, glycol distearate (stearate), *polyquaternium*, essens, nipagin (preservative).

The stage implementation includes processing and testing. The making process of the shampoo with basil (*O.basilicum*) and lime (*C. aurantifolia*) with working steps: 1) wash basil leaves and lime well, 2) wash the bath and the stirrer and sterilizing other equipments, 3) remove lime peel and press it, 4) poured the lime extract into bucket, 5) pounded the basil until smooth and like a mucus, then filter it, 6) concentrate with way mixing TEA, stearate, quaternium, nipagin - with a little water to the solvent in another bucket, 7) providing a bigger bucket that for mixing the lime juice and the filtrate leaves, 8) add concentrate that has been created by always stir in any additions, 9) heat, stirred until thickens, 10) silence for an hour to pretty cold, 11) added orange essens, 12) packaged in a bottle.

The testing phase, carried out by five straight hair-people and five curly hair ones. Those test include:

Physical Stability Test

It was done by identifying the volume, its color, and color stability visually. Besides, stability deodorizer observed using the sense

of smell, to make sure the shampoo did not experience changes.

pH test

It was done by universal indicator.

Dirt Dispersion Test

Test dispersion of dirt performed by mixing 2 drops of shampoo with 10 ml of distilled water, then the measuring cup, add red ink, then performed shaking for 10 times.

Foam and Stability Test Ability

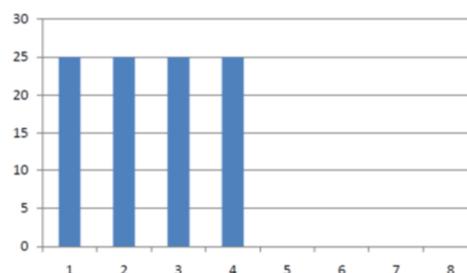
It was done by 50 ml of solution shampoo 1% is put on the glasses, then covered with a glass-lid and shaken 10 times. Foam total volume measured every 1 minute, for 4 minutes.

Results and Discussion

This shampoo consists of the main ingredients and additives. The main use is filtrate from basil and lime juice. While the additional were distilled-water as a solvent, *polyquaternium* as softener, nipagin as a preservative, orange-essens as an aroma-enhancer, glycerin for smoothed, cellosize as a thickener and texapon as surfactants. After shampoo made, there were some testing such as following :

Physical stability test shampoo

Physical stability test shampoo during 1 month. This observation carried out once a week, and the results showed that shampoo no-shrinking volume until the end of observation (30 days).



Picture 1. Volume shrinkage graph

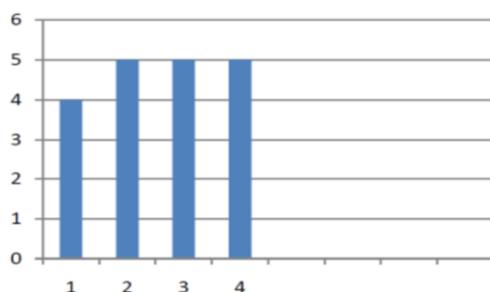
Observation in 30 days show that aroma of shampoo like a combination of lime and basil. Observation result also shows the color stability during 30 day, which is visible russet clear.



Picture 2. The color of shampoo

pH test

This shampoo's pH changes from week 2 (pH = 4) to week 5 (pH = 4). According to Ravichandran (2004), for a normal hair pH is 4.5 – 5.5 for all hair type. Shampoos and conditioner with a pH above 5.5 can be cause hair damage.



Picture 3. pH changes graph

Dirt disperse test, Foam stability capability

Consumer generally judge a shampoo through the foam produced. That matter the background to why evaluation the ability of the dispersion of dirt and ability to produce foam shampoo important to do.

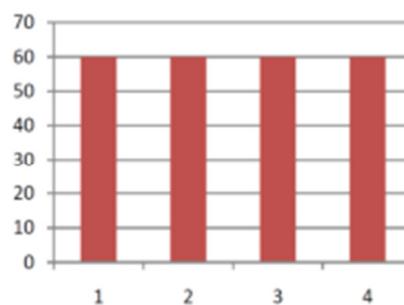
Dispersion Test

It showed that shampoo have good quality. The quality shampoo evidenced by red colored ink which dispersed in shampoo's solution. So, the water is red, whereas the foam is white.



Picture 4. Dispersion Test

Shampoo produce smooth-foam and its volume shows a constant value from minute 1 to 2.



Picture 4. Foam stability graph

It concluded that the ability to produce foam shampoo Occitan 60 ml is optimal, because has a foam volume of more than 100% (100% is 50 ml volume of solution shampoo).

Evaluation of acceptability shampoo

To know this shampoo-acceptance by the consumer, it was used by the way filling the questionnaire to the respondent (5 straight hair and 5 curly hair). From filling the questionnaire results, the data was processed and accumulated, and obtained the average value of the questionnaire 8.72, it is showed that shampoo received by consumers (managed). With details of the hair changes consumers as follows: 4 increased, 4 people remain, and 2 decreased.

Conclusions and Recommendations

Conclusions

1. This shampoo has fulfill recommended-criteria; pH = 5 (near the scalp pH), has the ability disperse dirt (easily rinsed with water), as well as produce foam optimum and gentle.
2. This shampoo accepted by consumers with an average scale value 8.72 of 10 (research succeeded)
3. This shampoo is able to reduce dandruff and hair loss, also do not has negative impact for consumers.

Recommendations

There should be more study (especially on protein) and microorganisms-test (to determine the presence of fungus or bacteria) in this shampoo.

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PASSIVE THERMAL COMFORT OF WOODEN HOUSE AND STONE HOUSE IN MOUNTAINOUS, INDONESIA

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ABSTRACT

Local houses in mountainous areas comprise of two types namely wooden-wall house and unplastered-river-stone-wall house. Thermal comfort is needed to ease the occupants to do their activities. Passive thermal comfort is a kind of thermal comfort based on the physical condition of the building. The aim of this research is to analyze passive thermal comfort in mountainous areas local houses. This is a quantitative research done by measuring the temperature and humidity using a thermal device. This is carried out in one whole day by jotting down the results of measurement every hour. The result shows that the temperature of the inside of wooden-wall houses and river-stone-wall houses is lower than the temperature of the outside of wooden-wall houses and river-stone-wall houses. Wooden-wall houses lower the temperature by 1.62o C, meanwhile river-stone-wall houses lower the temperature by 1.95o C. Considering the location of houses in mountainous areas, in which houses are required to protect people from cold, it is revealed that wooden-wall houses have better thermal performance than river-stone-wall houses.

Keywords – passive thermal comfort, mountainous areas, wooden-wall house, river-stone-wall house

Introduction

Designing an eco-friendly room needs the involvement of thermal comfort analysis, so there would be a design process that does not need equipment to achieve the thermal comfort. The equipment used to meet the thermal comfort often leads to energy wasting; therefore the room will not become environmental friendly.

Universally, thermal comfort is divided into two; passive thermal comfort and active thermal comfort. Today, there is development of adaptive thermal comfort that becomes part of active thermal comfort. Active thermal comfort is a study of thermal comfort based on the analysis on occupants, while the passive thermal comfort is a study of thermal comfort based on the building physical condition.

Passive thermal comfort is related to the ability of a building in comforting its occupants both in reducing the temperature in warm area and increasing the temperature in cool area. Research on houses in tropical

area is often concerned only on how a house can reduce the overly high external temperature. This condition is inapt to the fact since the tropical areas have more than overly high external temperature. On the other hand, several places in Indonesia are overly cold in their external temperature, for example the mountainous areas. Among the tropical mountainous areas are Dieng Plateau and Mount Sindoro located in Wonosobo Regency in Central Java.

Houses in Dieng Plateau and Mount Sindoro have several variations according to the building material of the wall such as wooden-wall houses, plastered-bricked-wall houses, plastered-river-stone-wall houses, exposed-river-stone wall, and wood-brick wall. From those variations, this research takes wooden-wall houses and exposed-stone-river houses as samples. This sampling is based on how the materials are collected. Both wood and river stone are environmentally friendly material.

Viewing this phenomenon, the research on how the difference between houses with

eco-friendly material (wooden-wall and exposed-river-stone wall houses) can cause the interior thermal variable more comfortable than the external thermal variable.

The objective of this research is to analyze the difference of thermal comfort attainment between wooden-wall houses and exposed-river-stone houses by analyzing the difference between exterior thermal variable and interior thermal variable for every type of house. The benefit of the study is to give input for designers about the house planning that include the wooden wall and exposed-river-stone wall in achieving the thermal comfort.

Theoretical Review

The basis of thermal comfort, according to Manurung (2009) is when sunlight shines on a building and the light directly shines into the interior room. The heat of the sunlight is then trapped in the room and the occupants inside it can feel the heat. Therefore, ventilation is made to let the air flows into the room and to release the heat. This condition occurs in houses located in warm tropical areas, whereas in houses in cold tropical areas (mountainous) may lead to different result. In cold tropical areas, sunlight doesn't shine sufficiently; it means that sunlight shines the building only in particular hours. Without the sunlight, the cold temperature can remain in the room longer. The light and heat produced by the sun can be managed by reduction, reflection, direction, or by applying other approaches.

According to Lipsmeier (1994), the micro climate in a room can be improved in order to create comfort for its occupants by concentrating on the orientation of building, cross ventilation, sun guard, humidity, heat absorption and isolation, and vegetation. Meanwhile, Givoni (1994) stated that passive thermal control concerns on the shape and layout of the building, the orientation of size, location, and window details, window shadowing, the painting

color of external building (roof and wall), and the surrounding vegetation. Furthermore, Olgyay (1994) explained that the orientation of a building, which is the compromise between sunlight and wind direction for humid tropical area, is the mass stretched out East-West with angle of 25° towards the South. In addition, Frick et al (1998) argued that the precise and advantageous orientation of building direction towards the sunlight is between the location of the building which is East-West and perpendicular toward the wind direction. Those are analyzed based on the location which is the warm tropical area.

The cold tropical areas (mountainous) have low temperature. Thus, the higher the land results in the lower the temperature. Lakitan (1994) mentioned that the variation of climate in Indonesia is influenced by the height of particular place (altitude) and it is divided into three; highland (mountainous areas), lowland, and coastal areas (beaches). According to Houbolt as quoted by Mangunwijaya, the correlation between temperature and height of location from sea level (altitude) shows that the maximum climate in Indonesia decreases $0,57^{\circ}\text{C}$ for every elevation of 100m in the areas under 60°C latitude (Samodra dan Santosa, 2006).

The passive thermal comfort presently has become the object of research by many researchers, among them is Kristianto, et al (2014) who studied traditional buildings by applying CFD (Computational Fluid Dynamic). This research is studying the floor elevating which is associated to the wind movement so that it creates the thermal comfort in warm tropical areas.

Bodacha, et al (2014) studied the traditional building in Nepal, specifically the vernacular and architectural building. This research takes vernacular architecture as sample because this type of establishment is often considered successful in attaining the thermal comfort, compared to the modern building that often leaves the aspect of

climate analysis in the process. This research is studying the element analysis in Nepal by applying qualitative approach.

Barbosa and Kenneth (2014) studied the Double Skin Façade/DSF. This study is a review of theory and included into the passive thermal comfort. This review discussed about the parameter in DSF Technology on natural-ventilation building. The discussed parameters are wind behavior, heat absorption, glazing material, façade height, and open areas.

The method of research with simulation about wind flow on natural ventilation was also applied by other researchers. The result obtained is the occurrence of passive cooling which can save energy to 90% (Perez, et, al, 2014). Through this passive cooling, the energy saving without cooling equipment will be realized (Prianto, 2007). The shapes of ventilation also give influence toward the wind flow, therefore the shape of ventilation need to be taken into account when planning a house design.

The passive thermal comfort is not like active thermal comfort. Active thermal comfort based on occupants, but passive thermal comfort is a studied based on the researcher's consideration that is occupants are illogical and irrational individuals (O'Brien and Gunay, 2014). The passive thermal comfort is achieved by considering the elements of the building in attaining the thermal comfort. This research is a study on passive thermal comfort that observes the difference on the building material that build the wall (wood and exposed-river-stone).

Research Methods

Research paradigm is qualitative based on theories about the material to build the wall which will influence the passive thermal comfort. This research is conducted by measuring the thermal variable in exterior and interior room during one day starts 07.00 am to 18.00 pm. The samples are 5 wooden-wall houses and 5 exposed-river-

stone-wall houses. The studied houses are located in highland with 1500m of height above sea level. The data of thermal variable measurement include the air temperature and air humidity. Rooms under research are exterior rooms and interior rooms (living rooms, kitchens, guest rooms, and bedroom).

Data recapitulation method applies graphics and tables. Analysis is conducted by comparing the graphics resulted from studying both types of houses. Graphics produced are exterior room graphics and interior room graphics on several rooms. The first analysis is to compare between exterior room graphics and interior room graphics on every type of the house. The next analysis is to compare the graphics between wooden-wall house and river-stone-wall houses. Finally, the last analysis observes the thermal variable of each room that is close to the occupants' temperature comfort. It is based on Mom&Weisborn (temperature comfort of 24°C) since this research was conducted in Bandung which its thermal condition is similar to Wonosobo.

Results and Discussion

The result of measurement produces data of the building physical condition as well as air temperature and the humidity. The rooms in each house are almost similar including living room, kitchen, bedrooms, bathroom and warehouse. However, there are some houses that do not have bathroom, and some bedrooms are not allowed to be studied. Thus, some rooms are not involved in the comparative analysis in this research.

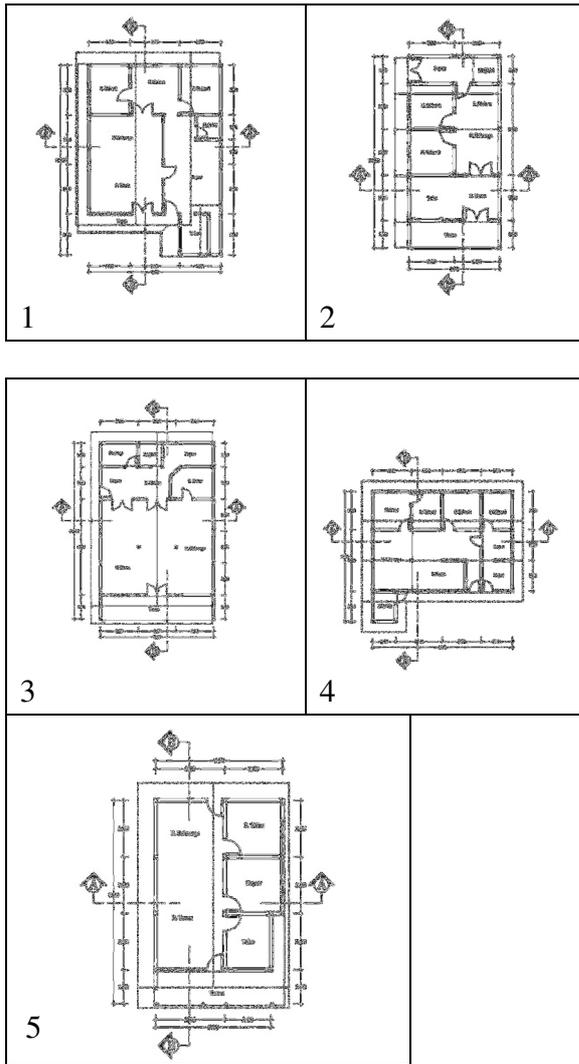


Figure 1. Floor plan of Wooden-Wall House (Sample 1-5)

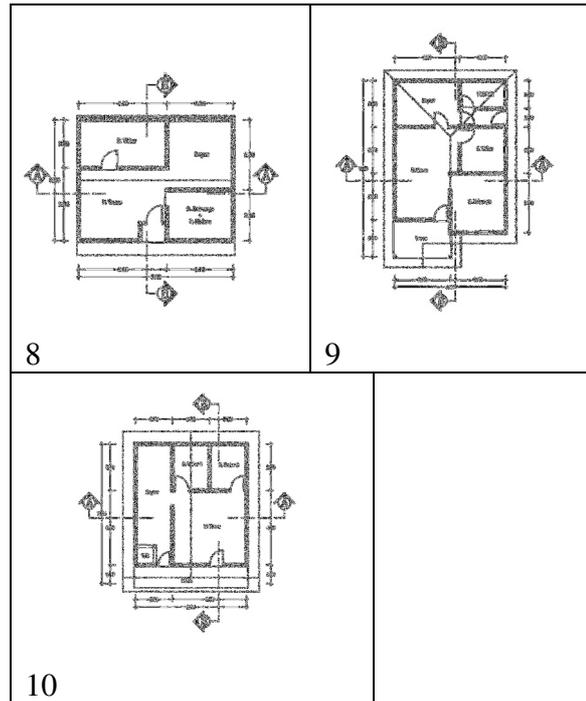
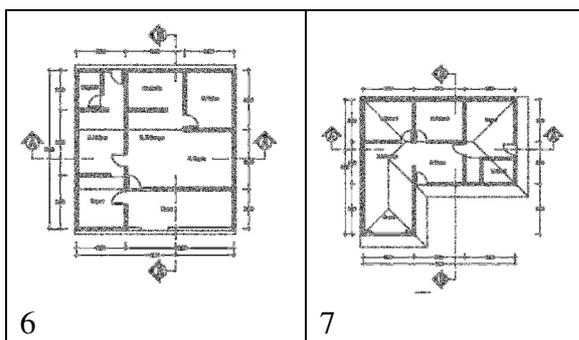


Figure 2. Floor plan of River Stone-Wall House (Sample 6-10)

Data of living room can be seen in figure 3. Based on the measurement, it is revealed that the minimum temperature of guest room is 21.3°C obtained at house 3 at 07.00 a.m. Apparently, this colder temperature is due to the fact that house 3 is only little furnished and has plaster floor without rug. The maximum temperature reaches 26.0°C obtained at house 4 at 13.00 p.m. This hotter temperature is caused by partly ceiled room's condition so that in sunny days its temperature rises higher than the others. The average temperature is 23.4°C .

It can be seen from the graphic that the minimum humidity, which is 59.6%, occurs in house 4 at 07.00 a.m. This room has earthen floor that enables air from outside to flow in and makes the air temperature, circulation and humidity well-run. The building faces to east which eases the sunlight to infiltrate the rooms. The highest humidity is 77.8% which occurs in fully-furnished house 2 at 16.00 p.m. when it was cloudy.

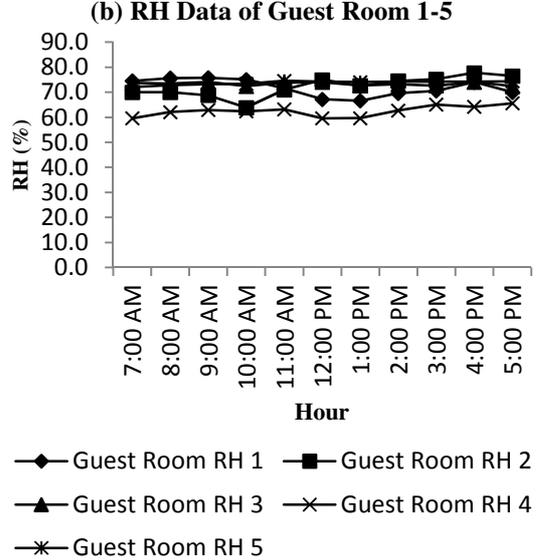
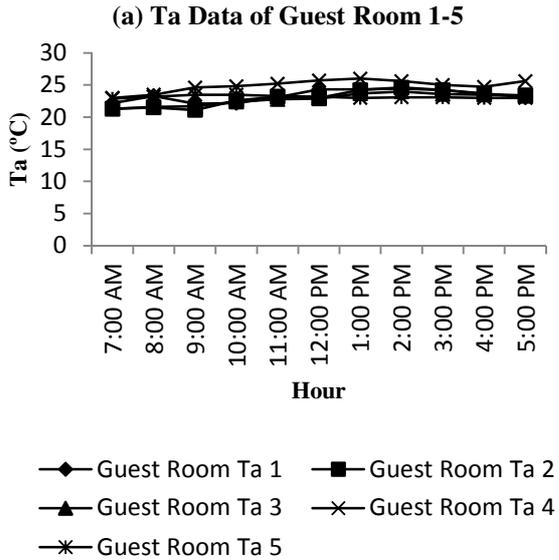


Figure 3. Guest Room Data in Wood Wall Residential (a) Guest Room Ta (b) Guest Room RH

In the guest room of exposed-river-stone house 9, minimum temperature obtained is 21.4° C at 07.00 a.m. This house is only little furnished and has plaster floor without rug that makes colder temperature. The maximum temperature reaches 26.8° C at 12.00 p.m. at house 10. The average temperature is 22.7° C.

It can be seen from the graphic that the minimum humidity occurs in house 8 at 14.00 p.m. which reaches 65.6%. That state

enables more temperature, air circulation, and humidity in the room. The highest humidity is in house 6 that reaches 78.4% at 14.00 p.m.

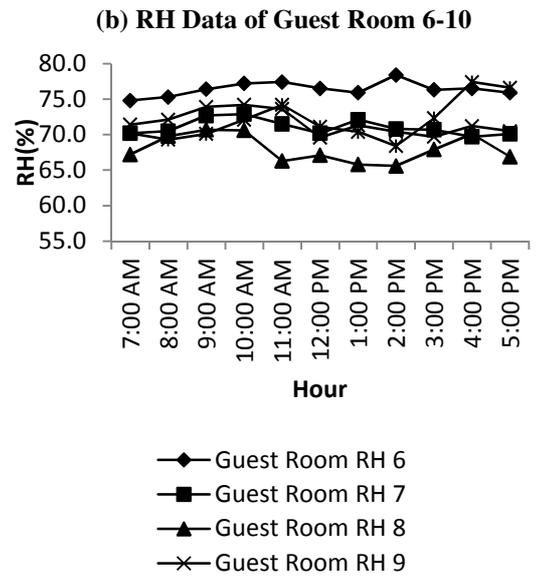
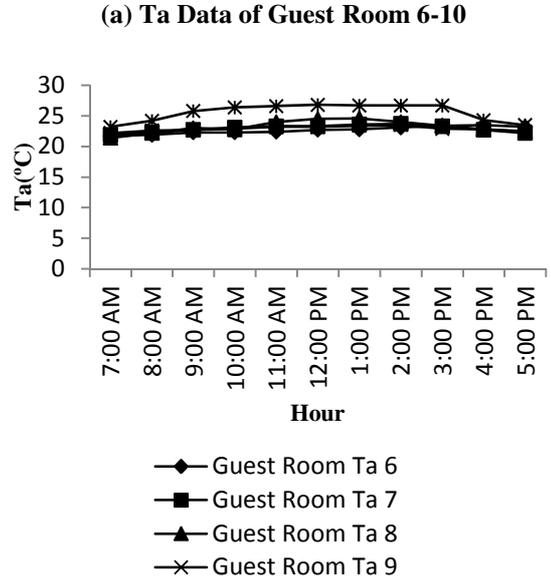


Figure 4. Guest Room Data in Stone Wall Residential (a) Guest Room Ta (b) Guest Room RH

The data shows that minimum temperature is 20.3° C in house 2 at 09.00 a.m. There is seldom activity in this middle situated with windows guest room. The maximum temperature is 25.5° C in house 4. This house does not have direct ventilation with lower roof and utilized wooden plank floor

covered by rug. The average temperature reaches 22.6° C.

Data of minimum humidity is 67.0% in house 4 at 14.00 p.m. There are cracks in this room’s wall that enable outside air to flow in. Maximum humidity is 80.5% in house 2. This room is situated in the middle of the house with wooden shutter and glass windows. The average humidity in all the houses is 73.8%

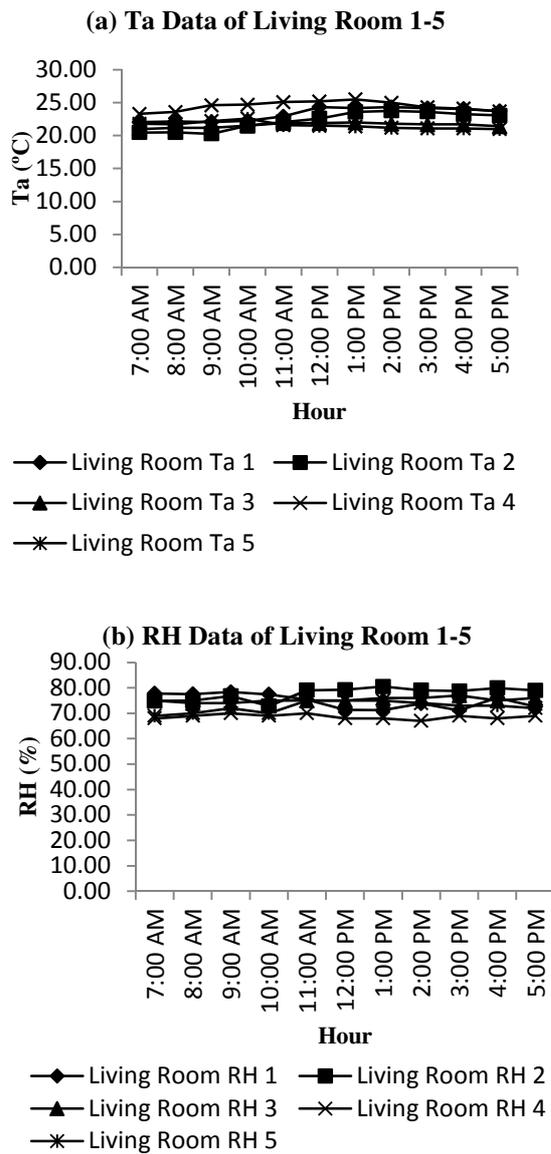


Figure 5. Living Room Data in Wood Wall Residential (a) Living Room Ta (b) Living Room RH

Minimum temperature is 21.5 °C in house 6 at 07.00 a.m. Meanwhile the maximum temperature is 25.9 °C in house 8. The average temperature reaches 22.6 °C. Minimum humidity is 69.1% in house 8 at 14.00 p.m. The maximum humidity is 79.0% in house 6. The average humidity in all of the houses is 73.8%.

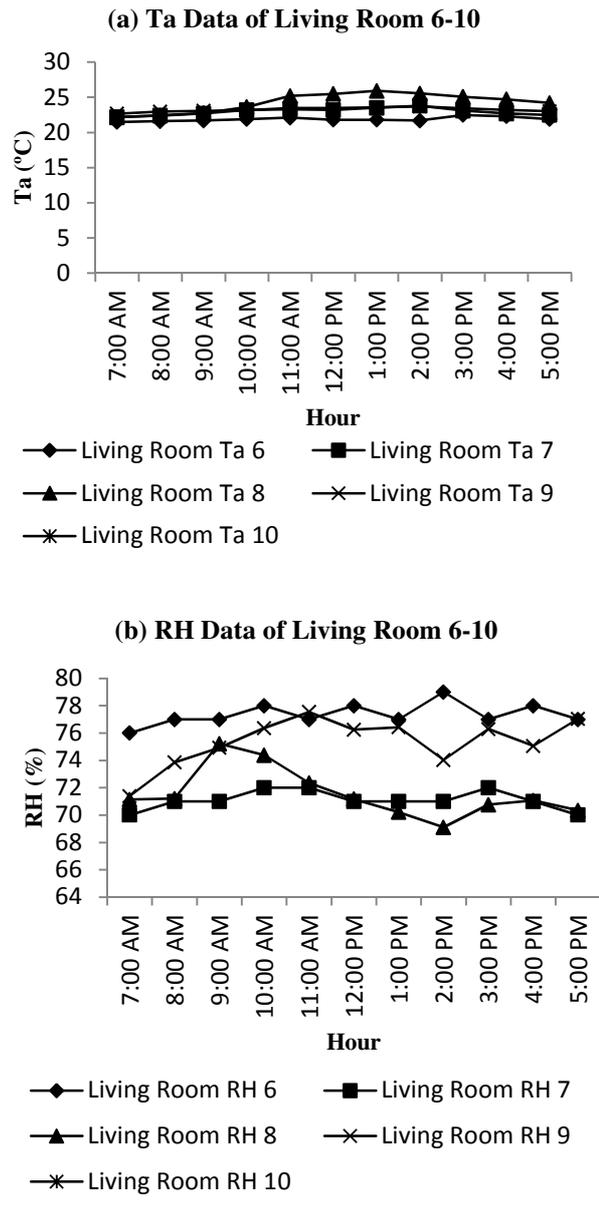


Figure 6. Living Room Data in Stone Wall Residential (a) Living Room Ta (b) Living Room RH

Minimum temperature at the front porch of house 1 at 10.00 a.m. is 21.4° C. This room

lies in the eastern part of the house, while the building is orientated to the east. It was cloudy when the measurement was taken. The maximum temperature is 27.9° C in house 2 at 13.00 p.m. It was clearer at that hour on the day of the measurement so that the temperature rises. The average temperature in all the front porches is 24.3° C.

Minimum humidity in front porch is 45.3% in house 2 at 10.00 a.m. At that hour, the air circulation and sunlight flows more freely. Maximum humidity is 79.2% in house 1 at 09.00 a.m. There were crops (vegetables, tubers, etc) in this porch and it was cloudy during the measurement. The average humidity is 66.9%.

Figure 7. Outside Data in Wood Wall Residential (a) Outside Ta (b) Outside RH

Minimum temperature of the front porch is 22.9° C in house 9 at 07.00 a.m. This room is situated in eastern part of the house that faces east. The maximum temperature is 29.4° C in house 10 at 15.00 p.m. It was clear outside during the measurement. The average temperature of all front porches is 25.1° C.

Minimum humidity of the front porch is 58.5% in house 10 at 15.00 p.m. The maximum humidity reaches 75.0% in house 8 at 10.00 a.m. The average humidity is 67.3%

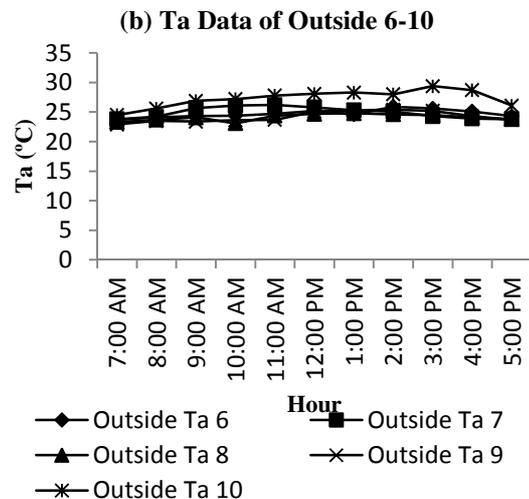
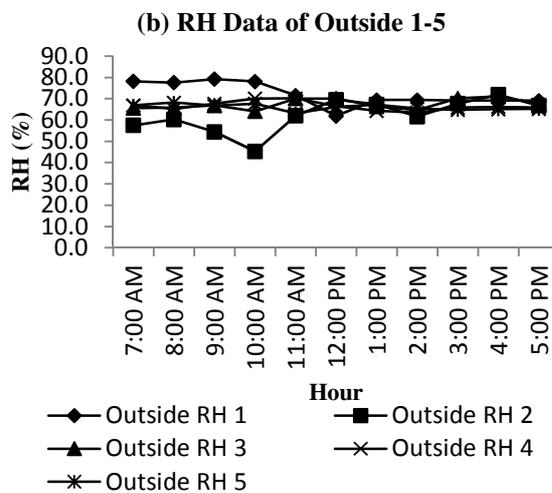
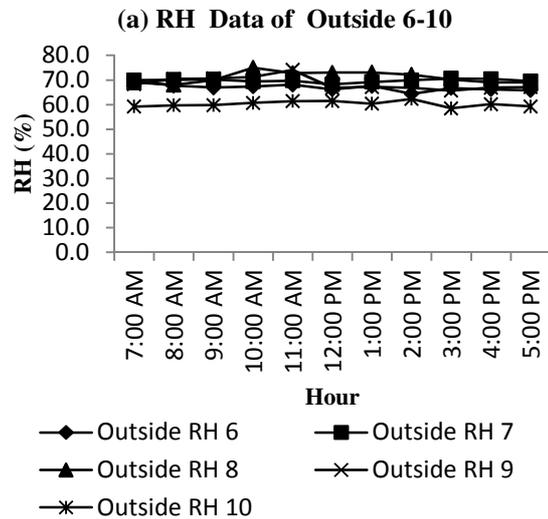
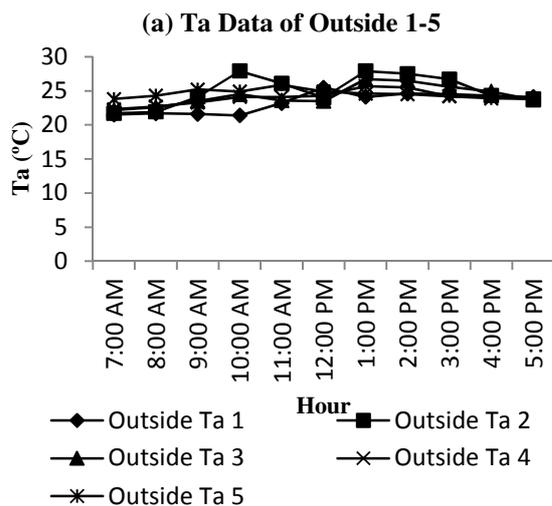


Figure 8. Living Room Data in Stone Wall Residential (a) Living Room Ta (b) Living Room RH

Table 1. Comparison of Temperature

Ta Ruang Tamu Rumah Kayu	Ta Ruang Tamu Rumah Batu	Ta Ruang Keluarga Kayu	Ta Ruang Keluarga Batu	Ta Ruang Luar Rumah Kayu	Ta Ruang Luar Rumah Batu
23.4	23.4	22.63	23.10	24.25	25.05

The average temperature in the room in the wooden-wall house (presented by Guest Room and Living Room) is lower than the stone-wall house. In wooden-wall house the temperature is 22.63°C, whereas in stone-wall house is 23.1°C. Thus, the temperature difference reaches 0.47°C. The average of temperature change between interior and exterior room is almost the same; the wooden-wall house decreases the temperature to 1.62°C, while the stone-wall decreases the temperature to 1.95°C. The result of this research is almost the same with the prior research which was conducted in local residence in coastal area. The previous research concluded that wooden-wall house is more comfortable than the exposed-stone-wall house in coastal area according to the occupants' perception (Hermawan,et,al, 2015). As an eco-friendly material, wood comforts the occupants. At the present time, there are some researches on recycled building material such as Styrofoam waste (Setyowati, 2014). The passive thermal comfort is also associated to the house design from both the physical building and the elements that construct it. The building façade also makes the building to be environmentally friendly (Prianto, 2012). Therefore, the processing of building element whether the material or the building structure needs to be well-maintained. An appropriate process saves energy to 70% (Prianto, 2007).

Conclusions and Recommendations

Passive thermal comfort can be viewed as the thermal work valuation of a house. Although the adaptive thermal comfort that

values thermal work based on occupant's perspective is now developing, the passive thermal comfort is still needed in order to physically compare the function of the building toward its thermal comfort.

The result of this research is that the thermal work of wooden-wall houses is better than the river-stone-wall house by evaluating the comparison of the measurement result between interior temperature and exterior temperature. In addition, wood as building material for the wall is environmentally friendly, therefore its development needs to be improved.

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EFFECTIVITY OF PBL LEARNING SETS VISION ASSISTED ACEBOOK COLLOID SYSTEM MAN MODEL GORONTALO

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ABSTRACT

This study aims to understand the effectiveness of facebook assisted PBL learning that feature SETS vision on the learning outcomes of students in achieving competencies related to the colloidal system, in Gorontalo Model of MAN. The population of the study comprised all students registered in grade XI semester 2014/2015 academic year. The nonequivalent control group design was applied in the study. The research samples were taken purposively from two classes. The first one was treated as an experiment class applied facebook-assisted PBL learning that feature SETS vision. The second class was treated as a control group, applied PBL learning that feature SETS vision without facebook. Both classes comprise of 27 students. On the analysis, result of post test showed the average value 81 on the experimental class, classical mastery 25 from 27 students reached KKM. The average result of its counterpart was 78, classical mastery 23 from 27 students reached KKM. the average of total scores of affective aspect was 17 in both experimental and control group. While the average total scores on psychomotor aspect (Practical) of experimental and control groups was 20. Based on this study, it can be concluded that the facebook assisted PBL learning that feature SETS vision effectively support the cognitive learning in the Gorontalo Model of MAN.

Keywords - Learning that Features SETS Vision, PBL, Colloidal Systems, Facebook, Learning Outcomes.

Introduction

Chemistry is the science that is seeking answers to the questions of what, why, and how natural phenomena in the environment associated with the composition, structure and properties, changes, dynamics and energetics substances. Therefore, subjects learn everything about the chemical substances that involves skill and reasoning. One chemical learning approaches that are considered to have the characteristics of scientific learning is Problem Based Learning / Problem Based Learning (PBL). Chemical linking of learning science and technology in everyday life is a visionary learning SETS (Science, Environment, Technology and Society) in general it can be said education with science teaching SETS meaning associated with other elements, namely the environment, technology and society. In the context of SETS (Science, Environment, Technology and Society), the development of science considered to be influenced by changes in the environment,

technology, as well as the interests and expectations of society. At the same time it should be understood that the development of science it also has an influence on the development of technology, society and the environment (Binadja, 1999a: 173). Thus, the evolution of technology push on the location and time of learning. Learning is no longer only take place at school and in the classroom, learning can take place anywhere as long as there are teaching materials and media which support the students feel comfortable with the situation. One way to encourage the achievement of effective learning, is used learning aids, or commonly called learning media. Facebook as a medium of learning can help students interact and communicate outside class hours. Many benefits can be obtained by joining the social networking sites like facebook. Which can connect with friends, whether it is new or old friends or family, without being obstructed by the distance. facebook has great potential to be used in education and learning, especially for the

chemistry in order to overcome the limitations of the number of hours of lessons.

Methodology

The population in this study is a class XI student EXCELLENT, XI IPA 1, XI IPA 2, XI IPA 3, XI IPA 4, MAN Model Gorontalo school year 2014/2015. The sample in this research is class XI IPA 1 as an experimental class and class XI IPA 2 as the control class.

This type of research is an experimental research design with pelitian used in this study is the nonequivalent control group. The design can be described as follows:

Table 1 Design Research *the nonequivalent control group design*.

KE	O ₁	X	O ₂
KK	O ₁		O ₂

Keterangan:

KE : *Experiment class*

KK : *Control class*

X : *Different treatment*

O₁ : *Pre test*

O₂ : *Post test*

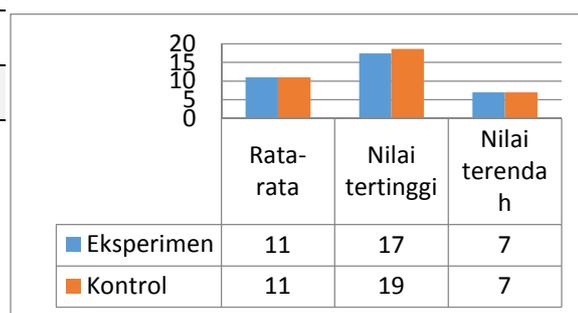
Table 2 Design Research

Group	Early	Treatment	And
Experiment Class	<i>Pre test</i>	PBL Learning SETS vision assisted facebook	<i>Post test</i>
Control Class	<i>Pre test</i>	PBL Learning SETS vision without assisted facebook	<i>Post test</i>

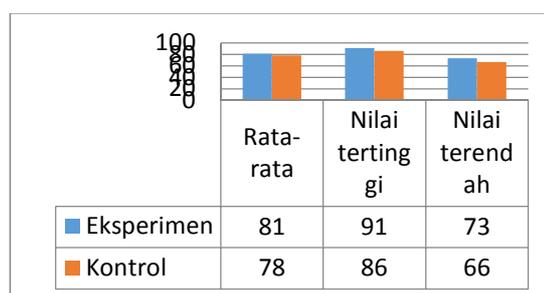
Results and Discussion

Result

Analysis of the data based on the results obtained from the research using three main devices namely 1) tilapia pre test and post test mastery of the concept of the colloidal system, 2) student activity observation sheet, 3) questionnaire responses of students towards learning. Based on data collection on research that has been done in MAN Model Gorontalo, on the competence of the colloidal system obtained the following data: The data used is data result of learning the mastery test instruments at the colloidal system concept, ie the pre-test and post-test. Figure 1 and Figure 2 is an experimental class learning outcome data and control classes.



Picture 1 Data value pretest experimental class and control class



Picture 2 Data value of post test experimental class and control class

Discussion

This study was conducted on June 6 until May 26, 2014 at MAN Model Gorontalo. This study aims to determine keefektifan

learning Problem Based Learning (PBL) SETS assisted facebook vision on learning outcomes in the competence of the colloidal system. Learning implemented in eight meetings. Learning begins with pre test the experimental class and control class at the 1st meeting, to determine the initial state before the second class was given a different treatment. At a meeting of the 3rd and 6th performed in the laboratory to pass practicum. While at the meeting of the 2nd, 4th, 5th and 7th done teaching and learning in the classroom. 8th meeting held post test to measure the success of teaching after second grade were given a different treatment.

In the experimental group and the control group was given the same learning is learning vision SETS learning model PBL (Problem Based Learning). Learning begins by giving the problem at every meeting. Students are required to solve the problem by working in their respective groups. The difference in the experimental class learning SETS assisted facebook vision while using a learning model PBL (Problem Based Learning). Unlike the case with the control class, learning vision SETS without facebook assisted by still using the model PBL (Problem Based Learning). Learning is always associated with aspects of science, environment, technology and society as a whole that influence each other reciprocally. Learning PBL (Problem Based Learning) SETS vision on the competence of colloidal aided facebook expected to motivate students and affect learning outcomes. Winkel (1996: 58) motivation to learn is the overall driving force of psychic within the students that lead to learning activities, ensure continuity of learning activities and provide guidance on the learning activities in order to achieve the goal. Motivation to learn can determine learning outcomes achieved by students. Learning outcomes can be defined as the level of the actual capabilities that are measured in the form of mastery of knowledge, skills, and attitudes that achieved by students of what is learned.

Learning using PBL (Problem Based Learning) vision SETS done pembagiaannya groups randomly. The group is permanent during the study, it aims to facilitate classroom management in the learning process takes place. Learning to control classroom learning by applying PBL (Problem Based Learning) vision-aided SETS without facebook. Learning The same is done by using model PBL (Problem Based Learning) SETS vision, the division of the same group during the study. Learning outcomes of the second class compared to determine whether the experimental class learning effective than learning in classroom control. Based on the initial stage of the analysis, obtained results which indicate that the data value of pre-test experimental class and control class normal distribution has a variance that is no different, and having an average value is almost the same. This means that both classes departs from state / the same initial conditions.

Has found the analysis of the final stage, the average value of post test between the experimental class with the control class. Student learning outcomes-assisted learning with facebook better than students without pembelajaranya assisted facebook. This is evident from the analysis of the parties the right, which shows the learning PBL (Problem Based Learning) vision SETS assisted facebook the experimental class learning outcomes better towards learning PBL (Problem Based Learning) vision SETS without assisted facebook the control class. Binadja (2002: 72) states that learning vision SETS membentuk positive impression in students and positive impression arising from visionary learning SETS positive effect on student learning outcomes. Similar Akinoglu et al., (2006: 80) states that the application of problem-based learning model affect students' conceptual development positively. As well as on the results of descriptive analysis shows that learning outcomes affective (character) and psychomotor (practical) through observation sheet activities of students who were

learning PBL (Problem Based Learning) vision SETS assisted facebook lebih well against students who were learning PBL (Problem Based Learning) vision-aided SETS without facebook.

The learning process after being given the different treatment, obtained an average value of post test experimental class of cognitive learning outcomes at 81 and 78. In the control class is a test post test data normality using the Kolmogorov-Smirnov assisted SPSS 22, both normal bedistribusi class. Expressed with a significance value (Asymp. Sig. 2-tailed) > 0.05 , ie the value of the experimental class and control class 0.083 0.131. In the test the average difference of the right hand, acquired $t = 2.141$, while $t_{table} = 1.675$, because $t_{count} > t_{table}$ then H_0 is rejected, which means that the hypothesis is accepted. So it can be drawn the conclusion that the results of experimental class learning better than the control class, in other words, learning PBL (Problem Based Learning) vision SETS assisted facebook competence colloid provide good learning outcomes of the learning PBL (Problem Based Learning) vision SETS without assisted facebook on colloidal competence.

Seen from the average results of experimental class learning and control classes already reached the limit of minimum mastery. With a population of 25 experimental class of 27 students reached KKM, more than the control group at 23 of the 27 students reached KKM. In addition the average value of post test grade students experiment better than the control class. Mulyasa (2006: 99) the success of the class can be seen from at least $\frac{3}{4}$ of the amount that is in a class of individuals that have achieved mastery. Based on the criteria of effectiveness of learning, it can be concluded that learning PBL (Problem Based Learning) SETS vision-aided learning facebook and PBL (Problem Based Learning) SETS vision without facebook

assisted effectively used to help students achieve mastery limits.

The average score value gain experimental class learning outcomes by 70 while the control class is 67. In the second class of the sample, there is a significant increase in learning outcomes. Experimental class and control class, learning outcome categorized as high but has a different gain value. In the experimental group the average value gain of 0.78 is not much different from the control class 0.75. Although the increase in both classes in the same category, but the experimental class has a higher gain value. It can be concluded learning PBL (Problem Based Learning) SETS aided facebook vision can help improve learning outcomes, especially in colloidal competence. But generally speaking, facebook assisted learning has not been optimally contribute to the affective and psychomotor learning outcomes of students. This is because the rocky learning students only focus on facebook facebook account, resulting in less attention to aspects afektf (character) and psychomotor (practicum). Students are actively engaged in discussions with the group through facebook account group (virtual classroom), through the stages orientasi problems encountered, then conduct scientific investigations, develop and present through the presentation. The next step is to analyze and evaluate the results of students' presentation, so students get their own knowledge of the problem solving process. However, the vision of SETS in learning has helped students achieve minimum competency affective and psychomotor.

The use of the learning model PBL (Problem Based Learning) assessed in accordance with the vision of learning SETS. According to Koh et al., (2008: 54) PBL in student-centered learning process, students learn independently, and its main purpose to improve problem-solving skills in students. Luo, (2014: 127) states that PBL can be a solution if the students do not innovate and

provoke students' motivation. Giving the problem at a meeting at the beginning of the learning, aims to foster the curiosity of students to instructional material and the way of solving the problem through the four elements SETS. Binadja (2005a) states that for a discussion on SETS, can be started from any direction and the starting point. Performance learning process students are not only given the knowledge of the science of colloidal material only, but students are taught about the use of colloids in everyday life. McCare (2011: 130) states that stimulate student learning will be more active when used as a stimulus issues.

Problem-based learning invites students to better understand the issues that are evolving in the environment, is able to interpret environmental problems and solutions. Because students are required to solve problems and find alternative solutions. Problem-based learning stimulate students to think critically in any solve existing problems, both in the context of the colloidal material as well as in everyday life.

Descriptive analysis of the activity of students in the learning process, grouped by affective assessment (character). Obtained average scores for each aspect of the character aspects. Based on the average value of the character / morality of students in the experimental class and control class both have a good rating, which is keeluruhan scores tototal on apektif aspect (character) experimental class and control class together 17 (of the score range 04-20) , The average value of the indicator of cooperation, discipline, curiosity, and communicative have an average score almost the same, ie the same category with a score of 3 (good). But the visible aspects of honesty experimental class is higher than the control class in succession 4 (very good) and 3 (good). Students in the experimental class in character honest with indicators of assessment in the form of (a) do not cheat, (b) do not commit plagiarism, (c) express things as they are, (d) reporting of data or

information is in accordance observations and (e) admit fault or disadvantages that are likely to obtain a score of 4 (very good) .. It shows messages displayed character education has not been effective in improving students' character. Education requires habituation and exemplary character so it takes a long time. This is in accordance with the opinion of Agboola (2012: 165) does not function as a character education improvement students' deviant behavior that goes fast, because there are other factors that influence their behavior such as family, social and cultural.

Activity can be seen in the control class, search and troubleshooting information on the group woke up. Aspects of cooperation and discipline in receiving advice or input in the group is needed. By contrast, the experimental class seem less cooperation and discipline were awakened. Look busy with the hardware (hadware) used. This is because the experimental class students accustomed to conduct its activities through facebook to find information and solving problems independently. So that students are less cooperation in group.

Learning that connects the material studied by students around the event or phenomenon, it makes students more easily understand the material presented as topics in the learning environment of students themselves. Learning The same is done by using model PBL (Problem Based Learning) SETS vision, but there is a difference between the experimental class with the control class. Students in the experimental class tend to be silent or indifferent, they are busy with activities on facebook. Students in the control group were active in learning. This is due to discussions with learning model PBL (Problem Based Learning) could lead to active students in cooperation. So that the students' ability to analyze and solve problems very well. When learning takes place in the experimental class many students do not ask questions. It is not assure you that the students have grasped the

material but be a sign of more active student with a social media facebook the experimental class.

The learning process does not only take place in the classroom with the help of facebook, but also made the learning process in the lab to perform the lab. Purpose does the lab aims to apply the theory and basic concepts acquired during the learning in the classroom and then adjusted colloidal material, as a topic of study. Assessment process should be implemented practicum either systemically and transparent, ranging from the practical to produce. Assessment process lab in question is the activities undertaken by the students associated with the lab. While the final assessment is practical product assessment in accordance with the expected outcomes.

Based on data from students in practical activities that dirty water purification and manufacture of colloids of maize by producing yoghurt. Data obtained from the analysis of the results of peer assessment. In the experimental group and control group total score obtained both 20 (of about a score of 06-24), the total score results obtained in the experimental class and control class that is a good category. The total scores showed no difference in psychomotor learning outcomes of both classes.

The descriptive analysis of student activity on the facebook account during the learning takes place through seven aspects are observed, such as 1) Students read course materials via facebook, 2) Students are given like the material presented via facebook, 3) Students comment on the material presented via facebook, 4) Students answer exercises through facebook, 5) Students are asking questions through facebook, and 6) Students conduct discussions through facebook, 7) Students provide advice with regard to things that must be added in learning through facebook. Most conduct its activities on facebook. Just seen that the

observed aspects that students give suggestions regarding the things that had been added in learning through facebook has never categories. The absence of the advice of students in the learning process, proving that learning PBL (Problem Based Learning) vision SETS with facebook assisted to good use. It just looks that facebook is not optimal role in the assessment of affective and psychomotor. Facebook assisted learning, giving freedom to the students to always access the information related to the problems and find solutions to problems that occur in the neighborhood.

Analysis of responses expressed the majority of students strongly agree with pembelajaran PBL (Problem Based Learning) SETS vision-aided facebook. Most of the students stated strongly agree and agree. This means that students are interested in and easily understand the learning material with PBL (Problem Based Learning) SETS vision-aided facebook. Learning PBL (Problem Based Learning) vision SETS open the horizons of students about the phenomenon in everyday life that relate to the concept of colloidal they learned. Student response data showed that students' interest towards learning PBL (Problem Based Learning) vision SETS average facebook aided both categories. Thus it can be said that the application of learning PBL (Problem Based Learning) vision-aided facebook SETS can encourage students' interest in learning. (Nur, 2001: 39), aroused the interest of students is important to reassure students and pull the material to be covered to make sure students how knowledge will be useful for students to solve problems that exist in the surrounding environment.

Thus the application of learning PBL (Problem Based Learning) SETS aided facebook vision can motivate students to learn. Conformity with the opinion (Nur, 2001: 43), motivation is one of the most important elements of effective teaching or teaching works. Further according to (Woolfolk, 2009: 167) suggested to involve

the students in group work as group work to create the conditions for learning motivation, even in a group there are members of groups that contribute very little.

Conclusion and Suggestion

Conclusion

Learning PBL (Problem Based Learning) SETS assisted facebook vision effectively to the learning outcomes on achieving competency colloid. This is indicated by an average value of 81 in the class of cognitive experiments and the average value of cognitive control class is 78. The total score affective (character) experimental class and control class equally 17. The total score on the psychomotor aspect (Practical) experimental class and control class equally 20. evidenced by the value of N-gain experimental class and control class respectively at 0.78 and 0.75 are included in the high category.

Suggestion

Need to do more research on learning PBL (Problem Based Learning) SETS vision-aided facebook with some modifications by adding some variables eg scientific literacy and critical thinking.

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MIND MAPPING TECHNIQUE AS AN ALTERNATIVE WAY TO EXPLORE FELICITY CONDITION OF SPEECH ACTS IN SPEAKING

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ABSTRACT

This research concerns to exploration of felicity condition of speech acts for speaking. Felicity condition is proper condition of interaction to get meaningful and communicative interaction. In this research, the researcher categorizes some areas of finding which are felicity condition itself according to Yule's concept in 2003, speech acts intonation, and hands-body language. In the felicity condition theories, the researcher elaborates all aspects according to Yule's concept which consists of general condition, content condition, preparatory condition, sincerity condition, and essential condition. This article is divided into two sessions. The first session is the research conducted on 2012 to AKI university students which the researcher is Agung as a single researcher. It is exploration to develop felicity condition without any kind of method or media as assistance. The second session research was conducted by Agung as the leader and Tatik as the member of researcher team. It was conducted to build felicity condition by using Mind Mapping Technique. Both first and second session research has its own strengths and weaknesses. The second session research was run on 2015 to 7A class of STKIP PGRI Pacitan of academic year 2014-2015.

Keywords - Mind Mapping Technique, Felicity Condition, Speech Acts, Speaking

Introduction

Communication can be divided into two main forms. It is verbal and non-verbal communication. Some kinds of verbal communication are speech, talk, conversation, monologue, epilogue, prolog, etc. On the other hand, some kinds of non-verbal communication are written form, signal, code, morse, etc. Verbal form means the action of communication that use and produce sounds. Nonverbal communication means any form of communication that does not use and produce sounds.

The use of appropriate verbal actions will also make very communicative and effective interaction. It's because verbal communication requires certain actions. Via verbal utterances, the verbal action is used to deliver meaning, passion, intention, information, knowledge, etc. In fact, certain verbal actions are appropriate for certain conditions. People can't use apologize utterances when they did not make any mistake. Someone also can't use order

utterance to his superior figure such as parents. On the other hand, people can't use high intonation when praying. There are many other forms of appropriate usage of verbal actions.

Pragmatics as one of language especially English science branches serves the speech acts as the verbal actions. Speech acts provides rules in delivering utterances as Austin (1962) defines "Speech acts as the action performed in saying something". It is about the action in verbal context. Speech acts contains some aspects in usage. It is related with meaning, ethics, social range, etc. The usage of speech acts also requires appropriate situation. According to universal language context, the usage of speech acts is also related with other area such as discourse studies. In this context, pragmatics is still able to back up the usage of speech acts.

Previous speech acts researches which researcher take two of them prove the important of speech acts in real communication. Pamela (1996) finds the

importance of value and function in speech acts theory. She finds illocutionary is an interpretive category produced by the receiver or the target of the communication. In this context, the speech act helps the speaker to build the illocutionary meaning. The speech acts help to avoid misunderstanding between the speaker and the hearer. The second previous research belongs to Sbisá (2002) finds some findings of speech acts research. Her first finding is felicity condition. She finds that felicity condition must be hold before the speech act. It should also be sufficient. Her second finding is about context. She agrees with Austin (1962) that the context of the speech acts is limited. Her last finding is about objectivity. She finds that a context has an objective nature in sense relevant.

Felicity condition is the ideal condition for a communicative, interactive, meaningful, and success of speech acts. The appropriate usage of speech acts determines the meaningfulness of the interactions. The appropriate usage of speech acts not only depends on the semantic meaning, but also it depends on the pragmatics meaning.

The researcher explores the felicity condition in this research. The researcher considers felicity condition is one of the key for the ideal speech acts. The research is a field research. The researcher finds a research problem; *“How are excellent strategies of pre-condition to build felicity condition to get effective and effecient communication and interaction?”*.

The researcher chooses AKI University as the field of the research. It is a private university. It is located at Semarang city, central Java province, Indonesia. The subjects are the fourth semester students of English department, faculty of letters of AKI University. This is the first research session on 2012.

Researcher made a team of research which consists of Agung as the leader and Tatik as

the member. The team continued the first session research above on 2015 in the STKIP PGRI Pacitan. This second session research explores Mind Mapping Technique in building felicity condition. The problem is almost similar with the first research session that is *“How the extent of mind mapping technique improve felicity condition of speech act of speaking?”*. Mind mapping technique looks like drawing material of learning technique.

Review of Related Literatures

In order to carry out the research, the researcher hangs on some theories of speech acts. The theories presented by the researcher includes the general concept of speech acts, the action of speech act, classification of speech acts, felicity condition, and a short of speech event. Although the focus of this research is the felicity condition, other branches of speech acts theories is included and utilized. The researcher applied the theories to analyze and develop the findings.

The Concept of Speech Acts

Speech acts is one of pragmatics branches of which verbal usage area. In order to produce meaningful spoken utterances, it needs certain verbs used in proper situation. Yule (2003:47) argues “actions performed via utterances are generally called speech acts and, in English, are commonly given more specific labels, such as apology, complain, compliment, promise, or request”. In this term, speech acts is divided into some specific actions. One certainty is about verbal form. Speech act is solely found in verbal communication. People have to recognize what kind of speech act item need to use.

Speech acts is action of which meaning in real world interaction. It's not about philosophy of language or a concept of language learning. It's about language in real use. Mey (1993:110) presents an

opinion that the language use in speech acts is a combination of “sound and meaning”. It’s clear enough that every speech act is meaningful language use in real world interaction. We can also conclude that every usage of speech acts must be meaningful. The tendency of speech acts is the real use. In this context, the speaker has authority to use and develop the speech acts.

The action of speech acts

There are some steps of usage speech acts until the result can be got. Austin in Levinson (1983:236) isolates three basic senses in which saying something is doing something, and hence three kinds of acts that are simultaneously performed:

- Locutionary act: the utterance of a sentence which determine sense and reference
- Illocutionary act: the making of a statement, offer, promise, etc. in uttering a sentence, by virtue of the conventional force associated with it (or with its explicit performative paraphrase)
- Perlocutionary act: the bringing about of effects on the audience by means of uttering the sentence, such effects being special to the circumstances of utterance.

Locutionary act is the utterance itself which contains the speech acts. Illocutionary acts is the step of building meanings. Perlocutionary acts is the effect of the uttering the sentence. Here is the illustration of the process of locutionary acts, illocutionary acts, and perlocutionary acts. When a speaker says “*It’s hot here*” in a closed room where there are some other people. The utterance of “It’s hot here” is the locutionary acts. The illocutionary acts is the meaning of “I’m really getting hot here. I need fresh air. I need someone to open the window”. The perlocutionary acts as the effect is that “Someone opens the window for the speaker”.

Classification of Speech Acts

Speech acts has its main categories. Searle (1977:34) establishes five categories of speech acts. They are representatives, directives, commissives, expressive, and declarations. Mey (1993:163-168) and Yule (2003:53-54) explore the classification of speech acts;

- a. Representatives (assertive): Assertive speech acts is the expression of giving information. It represents the fact that the speaker wants to convey something.
- b. Directives: Directives express speaker’s passion to make other people or someone do something.
- c. Commissives: Commissives is a commitment of a speaker to do something by his or her self or group. Commissives is almost similar with directives. The difference between them is the target of the speech acts. The target of the directives is other people. Meanwhile the target of commissives is the speakers themselves alone. The speaker can act commissives for his or her own self or for his or her group when they represent to their groups.
- d. Expressives: Representatives are expressions of feelings or mood. It expresses the mood condition of the speaker.
- e. Declarations: In simple understanding, declaration is the utterance that express speaker’s statement.

Felicity Condition

Every speech occasion requires proper context to make it becomes success. Every type of speech acts also requires proper condition to get meaningful and communicative interaction. Austin (1962) in Levinson (1983:229) describes the felicity condition into three categories; (i) There must be a conventional procedure having a conventional effect; (ii) The circumstances and persons must be appropriate, as specified in the procedure

The procedure must be executed (i) correctly and (ii) completely

Often, (i) the persons must have the requisite thoughts, feelings and intentions, as specified in the procedure, and (iii) if consequent conduct is specified, then the relevant parties must so do

Felicity condition must be developed in order to get interactive, effective, and meaningful communication. Yule (2003:50) states “There are certain expected or appropriate circumstances, technically known as felicity condition, for the performance of a speech act to be recognized as intended”. Felicity condition is the circumstances of speech acts. It is one of the keys of successful speech acts application. On the other hand, Yule (2003:50-51) elaborates the felicity condition as pre-condition of speech acts which includes:

- a) General condition; “There are general conditions on the participants, for example, that they can understand the language being used and that they are not play-acting or being nonsensical”.

The speaker must recognize the context of situation first before engaging in a verbal communication. They have to recognize and decide the appropriate of language style in verbal interaction. They also have to recognize the appropriate body act generally according to their interlocutor.

- b) Content condition; “for example, for both a promise and a warning, the content of the utterance must be about a future event. A further content condition for a promise requires that the future event will be a future act of the speaker”.

The content of the speech must be logic. It must be related with what kind of utterance is. A promise must occur in the future.

- c) Preparatory condition; “The preparatory conditions for promise are significantly different from those for a warning. When I promise to do something, there are two preparatory condition; first, the event will not happen by itself, second, the event will have a beneficial effect. When I utter a warning, there are the following preparatory conditions; it isn’t clear that the hearer knows the event will occur, the speaker does think the event will occur, and the event will not have a beneficial effect”.

In preparatory condition, the speaker must prepare the condition before delivering their statement orally. The speaker must be able to serve some certain and appropriate condition that support their ideas or statements. Their verbal statement must have a foundation. It can’t be just an unfounded supposition.

- d) Sincerity condition; “The sincerity condition that, for a promise, the speaker genuinely intends to carry out the future action, and, for a warning, the speaker genuinely believes that the future event will not have a beneficial effect”.

It is about the suggestion built by the speaker. The speaker must be able to suggest to the interlocutors that he/she has good passion and intention for their statement. One example is that when a speaker gives a promise, she/he must be able to show and ensure his/her interlocutor that he/she will do the promise.

- e) Essential condition; “The essential condition, which cover the fact that by the act of uttering a promise, I thereby intend to create an obligation to carry out the action as promised. In other words, the utterance changes my state from non-obligation to obligation. Similarly, with a warning, under the

essential condition, the utterance changes my state from non-informing of a bad future event to informing. This essential condition thus combines with a specification of what must be in the utterance content, the context, and the speaker's intentions, in order for a specific speech act to be appropriately (felicitously) performed".

It can be said that essential condition is the final condition of felicity. It is the combination of appropriate content, context, speaker's verbal and non-verbal acts, etc. It is a complex system.

Mind Mapping Technique

Michalco (2010: 5) in Kundariyati's thesis (2012: 23) define that, "Mind Mapping is the route map for memory to compiling the fact so the brain works naturally from early". Besides, Mind Mapping is creative note taking method, which eases us to remember much information (De porter at all, 1999: 175 in Indah's thesis: 8). Mind Mapping Technique involve the students' idea to find out new word that eases them to remember the words which they found. Mind Mapping has central idea that can appear new hidden idea. It helps the students to organize information that was found by themselves.

According to Buzan (2005: 4), "Mind Map is line least resistance for placing information into the brain and taking information to out from the brain. Mind Map is a way of noting creative, effective, and literal to check our minds. Mind Map also very modestly".

According to Windura (2008: 77-86) in Fatmaningrum's thesis (2012: 18) "There are some parts of Mind Mapping, namely (1) central image, (2) key word, (3) basic ordering ideas, (4) branches, (5) color and (6) picture".

Method

This research was done into 2 sessions. The first session is on 2012 at AKI University. The second session was done on 2015 at STKIP PGRI Pacitan. The first session research is the research of exploring felicity condition of speech acts of speaking without Mind Mapping Technique. The first session research is conducted by Agung Budi Kurniawan as the single researcher. The second session research is the research of exploring felicity condition of speech acts of speaking by using Mind Mapping Technique. The second session research was conducted by a team which consists of Agung as the head and Tatik as the member.



Figure 1. One example of mind mapping technique

In the first session research, the researcher chose AKI University as the place where the research was done. The subjects are the fourth semester students of English letter faculty in the academic year 2012/2013. The researcher got the subject by technique of simple random sampling. The researcher attended some meetings at speaking class. The researcher observed the usage of speech act in the class. Then, it is described based on the fact. The last thing done is to explore the pre-condition of felicity condition based on the result of observation and the theories of speech acts. This research applies qualitative method because there is no numeric data used. It similar as Sandelowski (2000) describes “Qualitative descriptive designs are typically an eclectic but reasonable and well-considered combination of sampling, and data collection, analysis, and re-presentational techniques. In the following sections, I describe typical design features”.

In the second session, the researcher chose and used seventh grade students of STKIP PGRI Pacitan in the academic on 2015. It is 7A class which consists of 32 students. The researchers conducted one shoot case study experiment. Researcher explained the concept of felicity condition and mind mapping technique. Then, researcher asked students ask students one by one to the performance speaking activity in front of class individually. Every student was given 10 minutes. The researchers gave mind mapping and determined one topic inside it. It looks like spontaneous material given to students. Everyone must express anything of their ideas born in their mind related with the topic got. Then, researcher observed their performance. The observation categories or a criterion is similar with the first research session on 2012. It is not really difficult for researchers to make observation for their performance because researchers had got simulation of findings according to the first research session.

In the analysis, the researcher compared the findings between using and not using mind mapping technique to explore felicity condition of speech acts for speaking performance. The researchers have no intention and purpose to judge which one is better, but it is to find the strengths of every session between using and not using mind mapping technique.

Findings and Discussions

After doing the research, the reseracher finds some findings. The researcher categorizes the findings according to the theories applied in this paper. The researcher and team research separate the findings into the felicity condition according to Yule (2003:50-51), speech acts intonation, and body langauge management.

Speech acts intonation without Using Mind Mapping Technique

Intonation is one important aspect in speech acts. Intonation also gives the meaning of an interaction. An utterance can have different meaning beacuse of different intonation applied. Intonation can also be assumed as the reflection of someone’s thought and feelling condition. Intonation also determines the context of situation whether it is serious, relax, etc. The usage of intonation can happen consiusly and uncounsiously.

The researcher finds how intonation can help communication. They are:

- 1) Intonation helps and enables us to express our emotion and attitudes. It can be said intonation is the representation of our emotions, feeling, attitude, thought, etc. Someone who is getting angry, annoyed, happy, etc can be recognized by the usage of intonation. On the other hand, intonation also determines the meaning of verbal language. An utterance can have different meaning in different usage of intonation;

- 2) Intonation helps us to produce effects of communication. This is almost similar with the first point above of intonation function. Intonation can give effect of communication because it determines the meaning of an utterance. The meaning of an utterance gives, even determines the effects of communication. An utterance can offend one's feeling or not also depends on the usage of intonation;
- 3) Intonation helps us to repair the mistake of grammar usage. The appropriate usage of intonation can also help us to repair the mistake of grammar usage. It could occur in verbal interaction. The misunderstanding because of inappropriate usage of grammar can be avoided by the appropriate usage of intonation. One example is when a speaker produces verbal question, but he/she makes a mistakes on the grammar usage. People may still be able to recognize it as a question by identifying the intonation usage;
- 4) Intonation helps us to identify the interlocutor's meaning. This is also similar with the previous discussion. The previous discussion elaborates our meaning when using different form of intonation. It also occurs toward interlocutor. We can identify our interlocutor's meaning through his/her usage of intonation. We can identify his/her thought, feeling, implicit meaning, etc by identifying the intonation usage;
- 5) Intonation gives information of turn-taking in interaction. This is one function of intonation. Intonation can give signal when one has to start or stop talking. This gives advantage in very formal situation. Sometimes, in formal situation it is impolite to say directly when one has to start or stop talking. On the other hand, the usage of intonation to give information of turn-taking can be used when we face someone who is superior than us.

Speech Acts Intonation by Using Mind Mapping Technique

In the second session of this research, the researcher find intonation aspects of speaking practice by using mind mapping technique among:

- 1) Intonation is influenced by the topic of speech: Some students get more time and change to prepare their intonation style after getting their topic of speech. Some students feel very easy to deliver their message through well prepared intonation. Sometimes, it seems to be suggestion for them.
- 2) Students tried to determine their intonation to attract their audiences: It is almost similar with the first finding and discussion. Students who have been relax because they have got topic of speech first get more time to develop their technique of arranging intonation. Some of them tried to attract audiences as good as they could do.
- 3) Intonation which is not natural gives more damage rather than benefits to speaking performance: Some students who tried to use artificial intonation got failure. Some of them were not ready to use prepared and artificial intonation. This is one aspect of failure found in this research. Based on the observation, researchers conclude that the failure is caused by unconfident and having no general knowledge related with the topic.
- 4) Mind mapping technique is effective to help students become more relax in setting their speech intonation: It happens to some students who are really interested and impressed by mind mapping technique first before giving speaking performance. It seems giving them extra confidence and spirit. Some of them were impatient to get their turn-taking of giving speech or description of the topic.
- 5) Students who got topic which not according to their expectation get a little nervous: This is one of lack of mind

mapping technique found in this research. Some students got expectation to get their favorite topic. Some of them who do not get their expected topic get a little nervous. A little time of giving understanding of mind mapping technique topic gives negative impact. Some students whose that condition cannot set their psychological condition. Meanwhile, some students whose similar condition can overcome their psychological condition.

- 6) Mind mapping technique helps students to deliver their message more comprehensible because their intonation is better set up: Some students really learn from mind mapping technique about how to set up their intonation. It happens especially to students who can learn from their previous friends' performance. They can identify how to determine different intonation for different topic.
- 7) Some students still use Indonesia and Javanese intonation when giving speech: This happens to students who have low competence of speaking. The use of mind mapping technique is not really able to be identified.
- 8) Mind mapping technique encourage students to be creative thinker: It encourages students to build new ideas when speaking: Mind mapping technique is effective to encourage students to prepare their ideas step by step when speaking. The main power is the attractive side of mind mapping media.
- 9) Mind mapping technique encourages students to be critical thinker: Some students are encouraged to give critic to the topic of the mind mapping technique. Sometimes, some students were encouraged to give critic to social and recent phenomena of which similar topic with their topic.

Body Language Management without Using Mind Mapping Technique

Body language is a kind of non-verbal communication which gives influence to felicity condition. Sometimes, body language also determines implicit meaning delivered in communication. An utterance can get different meaning through the different body language usage. A kind of utterance should be supported by appropriate body language. Actually, it also depends on the context of situation. Different interlocutor can get different meaning although they face same body language, intonation, and utterance. Body language is also influenced by culture. A body language can give different meaning interpreted by different culture.

In this research, the researcher finds some aspects of body language that give influence to felicity condition. They are among:

1. Face and eyes expression and movement. Face and eyes expression and movement gives the biggest influence to felicity condition. Face and face expression and movement express one's actual meaning. It is a universal concept that one's thought and feeling can be read or interpreted from his/her face and eyes expression and movement. Even, some people assume that eyes expression is a reflexion of the honesty. If one wants to get good felicity condition, he/she must adjust his/her face and eyes expression and movement. One example of this is when one wants to give a command to his inferior, he/she must make firm face and eyes expression and movement. The first thing for a speaker to do before adjusting face and eyes expression and movement is identifying the context of situation and the interlocutor. The speaker must recognize the situation and kind of speech that he/she will deliver whether a question, command, statement, etc. He/she also must recognize who the interlocutor is,

- whether superior or inferior than him/her;
2. Breathing and perspiration. Breathing and perspiration give influences toward the speaker his/herself. It is related with the technical of speaking. Good management of breathing and perspiration gives calmness in speaking. It needs simple training for a speaker to manage breathing such as long and short breathing when speaking. Perspiration also gives influence for calmness in speaking. A speaker can get nervous when getting to much perspiration. A simple suggestion is to avoid drinking to much water before speaking especially in public area such as giving presentation in front of many people;
 3. The position of our body. The position of our body reflects our intention to speak with our interlocutor. Good body position is to face directly toward our interlocutor. If we face directly toward our interlocutor, it means we appreciate him/her. It also means we have good intention in conversation. Position of our body also reflects how far our politeness is. The politeness can be read from one's body position when speaking. It also depends of the context of situation and culture;
 4. The space between the speaker and the interlocutor. The space between the speaker and the interlocutor also give influences toward felicity condition. Generally, interlocutor feels comfortable with suitable space when engaging in conversation. When the space is very close, it gives assumption that the speaker pushes the interlocutor. When the space is very long, it gives assumption that the speaker gives no respect toward the interlocutor;
 5. Gesture of hands-body language. In this point, the researcher emphasizes the hands-body language. Generally, hands-body language sends more signals than any part of the body except our face and eyes. Hands-body language is also

influenced by culture. One's hands-body language can give different meaning in different culture. The researcher finds common hands-body language purposes are:

- emphasizing such as pointing, jabbing, chopping action, etc
- giving illustration such as drawing, shaping, pointing, etc
- Greeting and leaving taking
- Specific signals such OK., very good, bad, etc
- Other expression such as openness, doubt, defence, confused, happy, etc

Body Language Management by Using Mind Mapping Technique

In this finding and discussion of second research session, the researchers give similar categories with the first research session. Here are the findings and discussion:

- 1 Face and eyes expression and movement: Mind mapping tries most students to animate their role in the speaking performance. They realize more that face and eyes movement really reflect their meaning. They could try to more focus by setting their face and eyes expression. They can learn to be more mature by setting their face and eyes expression.
- 2 Breathing and perspiration: Mind mapping technique was not really successful to train students to set their breathing and perspiration technique. It is because mind mapping technique is more focus to train information delivery process and result. This is also one of weaknesses that could be solved by the further researchers.
- 3 Body position: Mind mapping technique give impacts to speaker's body position arrangement. The speakers are forced to explain their topic to audiences. It makes speakers train to set their body position to support them being more communicative.

- 4 The space between the speaker and the interlocutor: This aspect is improved in this research. The speaker is to be as close as possible with the interlocutor. It really helps them to be more communicative because they can get interlocutors' more attention.
- 5 Gesture of hand-body language: Mind mapping technique helps students to be more skillful in speaking. It is because they have to explain their topic as clear as possible.

Conclusions and Suggestions

Felicity condition is one key feature of successful in building communicative interaction. The main point of felicity is the preparation of an interaction. Before engaging in an interaction or communication, a speaker is suggested to prepare every aspect very well. On the other hand, the effectiveness of prepared felicity condition is also influenced by context of situation and culture. A good felicity condition is not guaranteed that it will be accepted by all kind of interlocutors. With or without using Mind Mapping Technique has its own strengths and weaknesses. It could support to each other.

Researchers suggests to language teachers especially English teachers always improve their method and material of teaching learning verbal language. The real skill of language application for foreign language learner is a must.

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PROBLEM SOLVING AND MATHEMATICAL DISPOSITION BASED ON LEVEL OF GEOMETRY THINKING BY PBL VAN HIELE APPROACHES

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ABSTRACT

The purpose of this study was to analyze effectiveness of PBL model with Van Hiele approaches and to describe problem solving ability and mathematical disposition for each level of geometry thinking by PBL model with Van Hiele approaches. This study was a combination of qualitative and quantitative research. Model combination of this research was type of concurrent triangulation, which it was merging qualitative and quantitative methods in a balanced manner. Quantitative research sampling technique was simple random sampling which in this study taken a class experiment by PBL model with Van Hiele approaches and a control class by expository learning. Qualitative research subject selection techniques, was non-probability sampling, whereas the subjects based on levels of geometry thinking Van Hiele. PBL model with Van Hiele approaches effectived to problem solving ability and mathematical disposition. Problem solving ability and mathematical disposition for each level of geometry thinking Van Hiele were varies. Student on level 0 (visualization) can't understand problem well. Students on level 1 (analysis) can understand problem but can't plan well completion. Students on level 2 (deduction informal) can understand problem, execute plan well but can't check results. Students on level 3 (deduction) can understand problem, implement plan well, and check results properly. Overall mathematical disposition each level of geometry thinking by PBL model with Van Hiele approaches included in the high category.

Keywords - level of geometry thinking, mathematical disposition, problem based learning (PBL), problem solving ability, Van Hiele approaches.

Introduction

Geometry was a branch of mathematics that it was very important learned because of applied in everyday life. Geometry had a better opportunity to be understood by the learner rather than the other branches of mathematics as it was containing geometric ideas which found in the neighborhood. However, problem solving ability of geometry between students can be different even though they were on same level of education. Van Hiele stated that increase the level one to the next level more depend on learning than aging (Usiskin, 1982).

According to Nur quoted by Sadiq (2009) stated that mathematics education Indonesia in general was still in conventional mathematical education where teachers taught mathematics to prove arguments directly. Students was less given opportunity

to initiate a solution settlement itself, but only faced with the question of how to solve problems rather than to why such settlement. It was'nt in line with learning process in the educational unit based on SNP PP RI No. 19 (2005) which held in an interactiving, inspiring, funning, challenging, motivating students to participate actively and to provide enough space for innovative, creative, and independent in according to their talents, interests, physical, and psychological development of students. One of learning model's in according to these principles was problem based learning (PBL). Meanwhile, differences levels of geometry thinking among studentss was needed Van Hiele approaches in learning geometry.

According Muhassanah and Riyadi, (2014) for each level of geometry thinking have different characteristics in solving geometry

problems. Therefore, analysis of problem-solving ability and mathematical disposition was needed for each level of geometry thinking Van Hiele by PBL models with Van Hiele approach. Based on description, the purpose of this study was to analyze effectiveness of the PBL models with Van Hiele approaches and describe problem solving ability and mathematical disposition for each level of geometry thinking by PBL model with Van Hiele approaches.

Theoretical Review

Geometry as a branch of mathematics which according to Usiskin (1987: 26-27) was (1) branch of mathematics that studied the visual patterns; (2) a branch of mathematics that connected mathematics to the physical world or the real world; (3) a way of presenting a phenomenon that didnt look or didnt physical; and (4) an example of a mathematical system. Level of geometry thinking according to Van Hiele theory (Crowley, 1987: 1) was level 0 (visualization), level 1 (analysis), level 2 (deduction informal), level 3 (deduction), and level 4 (rigor). PBL model with Van Hile approaches was expected to address the differences in the level of geometry thinking.

Learning geometry by PBL model with Van Hiele approaches was expected to develop cognitive and affective students. One of cognitive domain was problem solving ability, while including affective domain was mathematical disposition. Problem solving ability by Anderson (2009) was a skill that involved the process of analyzing, interpreting, reasoning, predicting, evaluating, and reflecting. Steps to solve problem by Polya (1973) consisted of: understanding problem, planning solution, implementing plan, and examining process and results. While mathematically disposition according to NCTM (1989) was a tendency to think and act in a positive way in the learning mathematics.

Problem solving ability of students were taught by PBL model with Van Hiele approaches that was expected 75% of students to reach a minimum completeness criteria (KKM). Problem solving ability and mathematical disposition of students taught PBL model with Van Hiele approaches were also expected to be higher than the student whom are taught expository learning. According to Hudojo (2001: 21) that the affective domain can affect cognitive domains. Therefore, it was expected to positively influence mathematical disposition to problem solving ability of students whom taught PBL model with Van Hiele approaches.

Research Methods

This research was a combination of qualitative and quantitative research. The model in this study was a combination of concurrent triangulation. Concurrent triangulation is incorporating qualitative and quantitative research methods with balanced (Sugiyono: 2013: 499). The population was students of class X SMA N 9 Semarang academic year 2014/2015. Subject selection techniques of qualitative research was purposive sampling, whereas the subject was based on levels of geometry thinking Van Hiele. The sampling technique of quantitative research was simple random sampling, where sampling was done randomly. The research sample consisted of one experimental class and one control class. Students in the experimental class were taught by PBL models with Van Hiele approaches, while students in the control class were taught by expository learning.

Data collection techniques in this study consisted of: observation, test, scale psychology, and interview. Types of tests was used in this study, namely the Van Hiele geometry test (TGVH) and problem solving ability test (TKPM). TGVH performed twice: before and after the students made the learning process of geometry material in the experimental class, because according to

Usiskin (1982) increase in the level of thinking geometry from one level to the next level more dependent on learning than aging. TKPM only be done only once a time after the learning process in the experimental class and the control class. TKPM material in this study was a matter of geometry class X with problems in the form of a description. Psychology scale was used to measure mathematical disposition of students. The interview was designed to explore characteristics of problem solving ability and mathematical disposition students for each level of geometry thinking Van Hiele.

Data analysis was performed before until during in the field. Analysis done before in the field were validation of tools and instrument learning. Analysis during in the field was preparing systematically of quantitative and qualitative data obtained from observation, TGVH, TKPM, scale mathematical disposition, and interviews. Analysis of the quantitative data obtained from the result TKPM and scale mathematical disposition determined effectiveness of PBL model with Van Hiele approaches. Analysis of quantitative data used a test of completeness with z test, the average difference test with t test and regression analysis to determine the effect on the mathematical disposition to problem solving abilities. While analysis of qualitative data was done by reducing the data, presenting data, and drawing conclusions from the data collected and verifying this conclusion.

Results and Discussion

Based on the calculation results with the experimental class learning completeness t test right parties was gained $z_{count} = 1,854$ and $\alpha = 5\%$ was obtained $z_{0,45} = 1.64$. Because $z_{count} > z_{0,45}$ so H_0 was rejected. Based on the results of this study was concluded that the problem solving ability of students were taught by PBL model with Van Hiele approaches that has reached a

minimum completeness criteria of 70 to more than 75%. Based on the results of the calculation of the average difference TKPM by t test was obtained $t_{test} = 2.879$, while 5% of significance level and $dk = 68$ was obtained $t_{table} = 1.669$, because $t_{test} > t_{table}$ then H_0 was rejected. Therefore, it can be concluded that the problem solving ability of students were taught by PBL model with Van Hiele approach higher than students were taught by expository learning. Based on the results of the calculation of the average difference scores mathematical disposition by t test was obtained $t_{test} = 2.738$, $df = 68$, while the 5% of significant level was obtained $t_{table} = 1.669$, because $t_{test} > t_{table}$ then H_0 was rejected. Therefore, it can be concluded that the score mathematical disposition of students were taught by PBL model with Van Hiele approaches higher than students were taught by expository learning. Based on the results of linearity test with SPSS significance value was $0\% < 5\%$ so that H_0 is rejected. This shows that the problem-solving ability (Y) can be predicted by mathematical disposition (variable X). Simple linear regression model between X and Y of student who are taught by PBL model with Van Hiele approaches was $Y = 39.782 + 0,457X$. Mathematical disposition positive affecting on problem-solving ability in students whom were being taught by PBL model with Van Hiele approaches reached 33.6%.

PBL model with Van Hiele approaches effective was applied mathematic learning in particular geometry material. There were because (1) the presentation of student whom were taught by PBL model with Van Hiele approaches already achieved more than 75%; (2) the average test score of problem-solving ability and mathematical disposition of student were taught by PBL model with Van Hiele approaches were higher than students whom were taught by expository learning; and (3) the mathematical disposition positive effect on problem-solving ability, so it was in line with the opinion of Mahmudi (2010) which

stated that the mathematical disposition to support the development of problem solving ability. Some experts also stated that PBL model effectived in mathematics. Mariani, et al (2014) stated that the problem-based learning Mathematic Pop Up Book aided effectively to learning geometry. Padmavathy and Mareesh (2013) also stated that effective problem-based learning applied to the study of mathematics. Fatade (2012) also stated that the problem-based learning effectively applied to the study of mathematics. Abu and Abidin (2012) stated that learning geometry by applied Van Hiele theory effectively increase the students level of thinking Van Hiele. There were consistent with the results of Abdullah and Zakaria (2013) researches which stated that a significant increased students level of geometry thinking in the learning geometry.

In this study, TGVH was held twice in the experimental class. TVGH carried out before and after students of experiment class learned geometry materials. Figure 1 below was a grouping levels of geometry thinking Van Hiele based on the pretest and posttest in the experimental class.

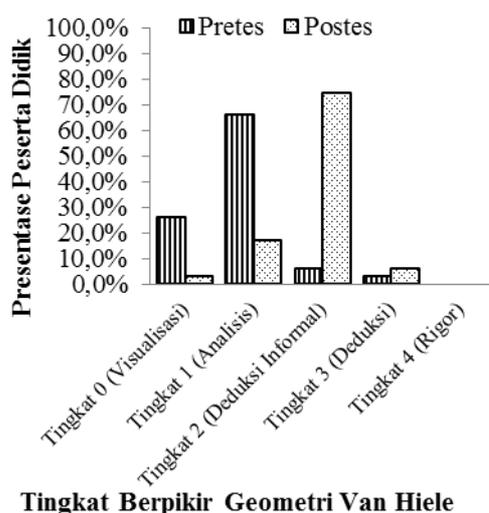


Figure 1 Result of Geomtry Van Hiele Test

Based on Figure 1, there were several students who changed levels of geometry thinking Van Hiele. Students on level 0

(visualization) decreased from the originally amounted to 25.7%, after learning down to 2.9%. Student on level 1 (analysis) also decreased from the initial 65.7% after learning down to 17.1%. Student onlevel 2 (deduction informal) increased from the initial 5.7% after learning up to 74.3%. Student on level 3 (deduction) also increased from the initial 2.9% after learning up to 5.7%. Nobody were level 4 (rigor) before and after studying.

Levels of geometry thinking Van Hiele lowest of student senior high school in grade X was level 0 (visualization). While levels of geometry thinking Van Hiele highest was level 3 (deduction). Burger and Shaughnessy (1986) also stated that level of geometry thinking for junior high students were level 2 (deduction informal) and most of students were level 0 (visualization). The statement was also supported by the opinion of Walle (1994) which stated that the majority of junior high school students were level 0 (visualization) to level 2 (deduction informal). Khoiriyah et al. (2013) stated that the results of research on the level of thinking geometry high school students based consists of level 0 (visualization), level 1 (analysis), and level 2 (deduction informal). It was consistenting with this study that student whom were at level 4 (rigor) to X-class senior high school has not been found.

Steps to solve problem by Polya consist of understanding problems, planning of problem solving, implementing plan of problem solving, and checking results. Problem solving ability of students were taught by PBL model with Van Hiele approaches at every level of thinking geometry have different characteristics. There were description for each level of geometry thinking to problem solving ability by PBL model with Van Hiele approaches.

- (1) Students on level 0 (visualization) can identify elements that are known, but cannot mention the element in question.

Students on level 0 (visualization) cannot construct a mathematical model, it is seen from the inability to make a sketch based on the elements that are already known. The results are consistent with the opinion of Crowley (1987) which stated that students on level 0 (visualization) to make the shapes of geometry based on physical appearance as a whole. Therefore students of level 0 (visualization) cannot sketch geometry based solely on the description of the matter. In step plan, the students of level 0 (visualization) cannot plan properly to solve problems. Students on level 0 (visualization) cannot cite the formulas used to solve problems. This is because according to Fuys et al. (1988), students on level 0 (visualization) ability just identifying awake by its whole appearance, so that students of level 0 (visualization) cannot determine the settlement formula geometry problems

(2) Students on level 1 (analysis) can identify the elements that are known and asked. Students on level 1 (analysis) also can develop mathematical models though not yet complete, it is seen from students on level 1 (analysis) ability to sketch geometry but not equipped with elements that are known. There were in line with the opinion of Crowley (1987) which stated that students on level 1 (analysis) can identify and draw waking given verbally or writing. Muhassanah and Riyadi (2014) also stated that students on level 1 (analysis) has been able to construct an image in accordance to characteristics given. In step plan, the students on level 1 (analysis) cannot plan solving problems properly. Students on level 1 (analysis) cannot cite the formulas used to resolve the problems appropriately. This is because according to Crowley (1987), the ability of students on level 0 (visualization) are still a class describing a structure in accordance to its properties and comparing based on the characteristics of its properties. In step implement plan, students on level 1

(analysis) cannot answer the question correctly as it cannot devise a plan to correct the problem solving. Therefore, students on level 1 (analysis) cannot write the final conclusions of problems solving. Students on level 1 (analysis) also cannot check the results.

(3) Students on level 2 (deduction informal) can identify the elements that are known and asked. Students on level 2 (deduction informal) also has to be able to construct a mathematical model completely, it is seen from the ability of students on level 2 (deduction informal) to sketch geometry that is equipped with elements that are known. In step implement the plan, the students level 2 (deduction informal) can answer problems correctly as it can devise a plan problem solving correctly. Therefore, students on level 2 (deduction informal) can write the final conclusions of solving problems. This is consistent with the opinion of Fuys et al. (1988) that student on level 2 (deduction informal) can give an informal argument that describe a conclusion, give conclusions using appropriate logic. However, student on level 2 (deduction informal) cannot check the result settlement of geometry problems. In step understand the problem, students on level 3 (deduction) can identify the elements that are known and asked. Students on level 3 (deduction) also has to be able to construct a mathematical model completely, it is seen from the ability of students on level 3 (deduction) sketch geometry that is equipped with elements that are known.

(4) Students on level 3 (deduction) have been able to plan problem solving properly and systematically. Students on level 3 (deduction) can also mention the formulas used to resolve the problems appropriately. In step implement the plan, students on level 3 (deduction) can answer problems correctly as it can devise a plan problem solving correctly. Therefore, students on level 3 (deduction) can write final conclusions of

problems solving. In step to check the results, students on level 3 (deduction) can check results. It was because Fuys et al. (1988) stated that students on level 3 (deduction) can prove relationship between theorem.

Mathematical disposition of students who are taught by PBL model with Van Hiele approaches including in the high category. There are description mathematical disposition of students based on the level of geometry thinking Van Hiele who are taught by PBL model with Van Hiele approaches.

- (1) Mathematical disposition of students on level 0 (visualization) included in the high category. All aspects of mathematical disposition exception aspect of self-confidence in learning mathematics and aspects of flexible in exploring mathematical ideas included in the high category. Confidence students of level 0 (visualization) in mathematics are including in medium category. While flexibility exploring mathematical ideas students of level 0 (visualization) are included in the low category. This may be caused by the geometry ability students of level 0 (visualization) are still low. Crowley (1987), Walle (1994), and Fuys et al. (1988) stated that students of level 0 (visualization) can only identify based on whole appearance.
- (2) Mathematical Disposition of students on level 1 (analysis) included in the high category. All aspects of mathematical disposition exception aspect of self-confidence in learning mathematics and aspects of flexible in exploring mathematical ideas included in the high category. Confidence in mathematics of students on level 1 (analysis), including in medium category. While the flexibility in exploring mathematical ideas of students on level 1 (analysis) included in the low category. This may be caused by the geometry ability of students on level 1 (analysis) are still low. Crowley (1987), Walle (1994), and Fuys et al. (1988) stated that learners level 1

(analysis) can only classify geometry based on its properties

- (3) Mathematical disposition of students on level 2 (deduction informal) included in the high category. All aspects of mathematical disposition exception aspects of flexible in exploring mathematical ideas included in the high category. Flexibility in exploring mathematical ideas of students on level 2 (deduction informal) included in the category. Fuys et al. (1988) stated that learners level 2 (deduction informal) has been able to identify, use strategies and give a meaningful reason to solve problems
- (4) Mathematical disposition of students on level 3 (deduction) included in the high category. All aspects of mathematical disposition exception aspects 7 to appreciate the role of mathematics included in the high category. Students of level 3 (deduction) has a very high desired to appreciate the role of mathematics. This can be due to already be at level 3 (deduction) have high capability of geometry. Fuys et al. (1988) stated that students on level 3 (deduction) was able to evidence creation and collection of simple axioms

Conclusions and Recommendations

PBL models with Van Hiele approaches effectived to mathematic learning. Problem solving ability and mathematical disposition for each level of thinking geometry Van Hiele were varies. Students on level 0 (visualization) cannot understand problem well. Students on level 1 (analysis) can understand problem but cannot plan completion well. Students on level 2 (deduction informal) can understand problem, execute plan well but cannot check results. Student on level 3 (deduction) can understand problem, implement plan, and check results properly. Mathematical disposition of student were taught by PBL model with Van Hiele approaches overall for each level of geometry thinking including in the high category.

Application of Van Hiele approach needs to be applied to the study of geometry because it can increase the level of thinking geometry students. Students are grouped by level of thinking geometry with Van Hiele approaches. The limited ability of teachers to face the different levels of thinking geometry students are needed for development of instructional media that were able to develop students independence in learning geometry in accordance with the level of thinking. No one Student of senior high school secondary school has reached level 4 (rigor) therefore needed more research on higher education in order to find it level.

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BUILDING THE INDEPENDENCE STUDENT CHARACTER ON THE MATHEMATICAL REASONING ABILITY IN DISCOVERY LEARNING MODEL WITH SCAFFOLDING STRATEGY ON TRIGONOMETRY MATERIAL

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ABSTRACT

One of the main character in mathematics is the independence character of students as set out in the educational value of the nation's character. The independence character of students can be integrated in the learning of mathematics on discovery learning through scaffolding strategy on trigonometry material by learning where the students are given the opportunity to discuss among friends, teachers who involved in the discussions if the student deadlock situation. The process of independence is required to bear mathematical reasoning abilities. The research objective is establishing an independent character of students and determining the influence of students' independence character of the mathematical reasoning abilities. The research was mixed method. The population in this study were students of class X of SMAN 1 Kadugede by taking a sample of five student's choices. Data collection by observed, interviewed and tested. The data analysis used descriptive analysis and regression test. Based on the observations from the first meeting until fifth meetings, students learned mathematics which integrated with the formation of character through group discussions and question and answer that brings students formed the character and support process of reasoning to solve problems. As evidenced by the increasing in the average student independence first choice, second choice students, students' third choice, fourth choice students, and students of the fifth choice. The independence of the overall increase in visiting and giving effect to the mathematical reasoning abilities by learning above.

Keywords - Discovery Learning, Character Independent, Mathematical Reasoning, Scaffolding.

Introduction

Mathematics formed as a result of human thought related ideas, processes, and reasoning. Therefore, mathematics courses should be offered to all students on the basis of improving the ability of logical thinking, analytical, systematic, critical and the ability to work (Depdiknas, 2006). Realizing the importance of mathematics, the mathematics is necessary to be understood and controlled by all levels of society, especially students of elementary school through college.

Reasoning ability (reasoning) is one component of a standard process in Principles and Standards for School Mathematics in addition to problem-solving ability, representation, communication and connection. Mathematical reasoning (mathematical reasoning) (NCTM, 2009: 6)

is a thought process that is done in a way to draw conclusions. Mathematical reasoning is important to know and do math. Mathematical reasoning skills students are lacking, consequently students are not enthusiastic to learn, do not do tasks according to their own abilities, cannot begin to undertake strategies to solve problems. This shows that the self-contained character in students is very low.

One subject matter of mathematics is still problematic is a matter of trigonometry in class X. From the facts that there is also that the interpretation of the students' learning SMAN 1 Kadugede on trigonometry material in 2013/2014 was recorded in the tenth grade lower. Students received grades below the minimum completeness criteria (KKM).

Based on the above, to determine pemasalahan anything related to mathematical reasoning and independent character of students, conducted a preliminary study in SMAN 1 Kadugede. Interviews with teachers of mathematics class X of SMAN 1 Kadugede also done to obtain secondary data in the preliminary study. Interviews showed that mathematics teachers have implemented several models of learning in the classroom, but still dominated in expository. Based on observations of researchers, many students are not enthusiastic in welcoming the questions provided by the teacher, not trying to the maximum to complete the task, cannot begin execution strategy. This suggests that the independent character of students is low.

The importance of character education in schools launched by the Ministry of National Education, requires teachers to prepare lesson plans, by requiring the addition of the character development of students in the syllabus and lesson plans. Character education is a system of value investment behavior to the school community which includes knowledge, awareness or willingness and action for implementing the values, both to the Almighty God, ourselves, others, the environment, as well as the nation. The characters are developed in mathematics, among others: logical thinking, critical, honest, hardworking, curious, independent and confident.

The fact as mentioned above encourage researchers to examine more deeply the mathematical reasoning abilities of students of class X of SMAN 1 Kadugede. The first stage of this research will be conducted with qualitative methods. The goal is to determine the initial conditions of mathematical reasoning and independent character of the student before getting learning by discovery learning model of scaffolding strategies. Identification of initial conditions is important because it can

provide information for teachers to plan lessons accordingly.

Based on the background and the identification of the problems mentioned above, the purpose of this research, which is to form the independent character of the students and determine the influence of students' independence character of the mathematical reasoning abilities. This study is expected to provide benefits for students to develop independent character of the mathematical reasoning ability on the model of discovery learning with scaffolding strategy.

Theoretical Review

According Sumahamijaya, et al (2003: 19) independent character would arise because of the following indicators.

- a. Initiative (initiative),
- b. Creativity (creativity),
- c. Innovation (new discovery),
- d. Improvisation (development),
- e. Pro-active (unyielding in the search for and find solutions to various problems encountered),

Self-reliance is the character which is needed when the students solve the problems of trigonometry material. By training students' independence, is expected to encourage students to create mathematical reasoning abilities.

Mathematical Reasoning that include the ability to think logically and systematically is a mathematical cognitive highest. Mathematical reasoning can be summed up as the ability of a person's thinking process of understanding the patterns and properties, perform mathematical manipulation in making generalizations, compile evidence, or explain ideas and mathematical statements as a process in problem solving.

NCTM (2009: 9) gives reasoning habits that need to be developed to improve the students' reasoning ability. Reasoning habits is a productive way of thinking in the

process of invention and rationalization of mathematics. Indicators of mathematical reasoning abilities in this study refers to the reasoning habits in NCTM as follows.

1. Ability to analyze problems.
2. Ability to apply the strategy execution
3. The ability to search for and use of the domain mathematical relationships, contexts, and different representations, including:
4. Ability to interpret a solution and a way to answer the problem.

Research Methods

This research uses research method mix (a mix of quantitative and qualitative). The design used in this study is embedded concurrent design, the method of research that combines qualitative and quantitative research methods by mixing these methods are not balanced (Sugiyono, 2013: 537).

The first phase of the research done by taking 5 X.9 grade students of SMAN 1 Kadugede. Qualitative research aims to analyze the increase in independent characters pa da student learning discovery learning with scaffolding strategy. Qualitative research begins with the collection of data through TKPM, independent character observation of students and followed up with interviews.

Quantitative research aims to look at the effect of an independent character and determine completeness of the mathematical reasoning abilities that get learning strategy discovery learning with scaffolding. Test enhancement is done by an independent test of the character of the student gain at each meeting, reinforced by a qualitative analysis of the increase observed in five students choices, each two of the above, one of the middle group, and two of the bottom. Test the effect of an independent character of the mathematical reasoning skills students performed with the regression test, and test completeness referred to in this research is to test the completeness of the individual,

the learning is said to be completed if the average results of students' mathematical reasoning abilities exceed minimum completeness criteria individual is 70.

Results and Discussion

Observations were confirmed through interviews indicate where an increase independent character of the students after learning applied learning strategy discovery learning with scaffolding. Here are excerpts of interviews with one of the students choice.

Q : "Do you enthusiasm for a given task?"

SP-1 : "Yes, I am enthusiastic to tasks given because I like math"

Q : "What is sought with the maximum in completing the task?"

SP-1 : "I think not maximized, because the allotted time is still lacking".

Q : "If you do the work, whether you work in accordance with its own capabilities?"

SP-1 : "Yes, I do it as much as I do."

Q : "Do you dare to show, that what you do is the result of your own?"

SP-1 : "Yes, I dare show"

Q : "Do you dare to communicate with your friends to solve the problem?"

SP-1 : "If there is a little problem, I was discussing with a friend"

Results of an independent character interview the students showed that students strive to develop the characters independently.

Table 1. Independent Character Gain

SP	1&2	2&3	3&4	4&5	5&1
SP-1	0,10	0,38	0,44	0,44	0,83
SP-2	0,37	0,18	0,29	0,15	0,69
SP-3	0,03	0,13	0,25	0,19	0,48
SP-4	0,08	0,14	0,26	0,21	0,54
SP-5	0,13	0,16	0,18	0,19	0,52

Researchers observed five subjects research of 3 levels of different cognitive, namely SP-1 as a student with cognitive ability are high, SP-2 as a student at the position quartile 1 (Q1), SP-3 as a student in the position of the median (Q2) , SP-4 as a student with cognitive ability in kuartil 3rd position (Q3), and SP-5 with low cognitive abilities.

Having seen an increase in student self-contained character, then look at the effects on students' mathematical reasoning abilities. The independent variable is the independent character (X) and the dependent variable was the mathematical reasoning ability (Y). Data on the independent character of the students is taken from observations in observation sheet independent character of students.

While the data capabilities of mathematical reasoning abilities are taken through TKPM held at the end of the meeting. Results of the analysis of the influence of the independent character of the students' mathematical reasoning ability by using SPSS values obtained thus rejected, meaning that the linear regression equation so that there is a significant influence on the independent character of mathematical reasoning skills students acquired. Further to the regression equation $Y = 8.862 + 1,102X$ means each additional variable Independent character of the unit, it will increase the value of mathematical reasoning ability tests. The amount of influence independent character of students to mathematical reasoning abilities demonstrated the value of R square of or. That is the character of the student independently affect students' mathematical reasoning ability by or are there other variables that affect the ability of mathematical reasoning.

Regression Test Table

M	Sum of Squares	Df	Mean Square	F	Sig.
Regresi	1316.451	1	1264.5	264.28	.000b
Residual	152.264	30	5.001		
Total	1468.715	31			

The characters are embedded in the learning process a positive impact in mathematical reasoning. The indicators are applied as the implementation of an independent character value can be realized so that the independent character of the student is well established as a supporter of the establishment of mathematical reasoning abilities. Aside from the student's character, was able to external factors affecting student achievement.

Based on the completeness of test, the result of calculation of the value. With significance level of 5% was obtained = 1.687. Because the value of the rejected. It can be concluded that the average mathematical reasoning skills students are taught using a model of discovery learning with scaffolding strategy beyond the KKM (70).

The application of the model learning device discovery learning with scaffolding strategies may shape the character of the students choice of SMA Negeri 1 Kadugede research by obtaining independent attitude to the development of values or indicators membudayanya independent in solving mathematical problems.

Conclusions and Recommendations

Based on qualitative analysis, found that an increase in the independent character of the students. After the lesson, the students in all three groups showed improvements in all indicators of an independent character. Increased self-contained character is shown with a gain of meetings 1 and 5 for the fifth student option. Analysis of the results of quantitative research shows that there is a positive influence between the independent character of the mathematical reasoning skills students acquire learning strategy model of discovery learning with scaffolding material trigonometry class X of the equation 84,5%, based on testing individual completeness $Y = 8,862 + 1,102X$, the average ability students obtain discovery learning model learning strategies

trigonometry exceeded KKM scaffolding material (70).

Based on the conclusions obtained, then there are some things that researchers suggest that such teachers should provide learning innovations that focus on the objectives to be achieved. In this study, the learning model of discovery learning with scaffolding strategy can be used as a reference for teachers in stimulating learning trigonometry material or other material to enhance the students' independence and mathematical reasoning abilities. The need for further research as to the level of development of different classes so that this study can be thoroughly applied to the field of study of mathematics.

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ANALYSIS OF STUDENT'S CRITICAL THINKING THROUGH COGNITIVE CONFLICT STRATEGY WITH WINGEOM LEARNING IN GEOMETRY

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ABSTRACT

Critical thinking skills is effective means to improve the performance of students that math and understanding the concept of able to think critically. But only a few school that develop the critical thinking ability, so the students did not have capability for solving problems well. This study applied cognitive conflict strategy with Wingeom (CCSW) learning in geometry grade 10th. This learning gives opportunity for students to increase the critical thinking skill in asking opinion, and solve problems through group discussions. The purpose of this study was to analysis the increase of selected student's (SS) critical thinking skill in this learning, the effects in their critical thinking ability, and the completeness result. This study used combination design which started with qualitative to determine the increase of SS's critical thinking skill, followed by quantitative to test the influence and completeness on student's critical thinking ability. Result shows that the implementation of the CCSW learning can be increased the SS's critical thinking skill by the gain value: SS-1 (0,85), SS-2 (0,48), SS-3 (0,67), SS-4 (0,67), and SS-5 (0,69). Viewed as a whole, critical thinking skill have significant positive effect on critical thinking ability with the equation $Y = 1.793X + 0,981$ about 80.2%. Eventually be implemented final test of critical thinking ability and obtained average of 78,46 exceed the minimal completeness criteria 70. This result shows that CCSW learning is suitable for increase the critical thinking ability.

Keywords – Analysis, Cognitive conflict strategy, Wingeom, Critical thinking

Introduction

A big problem education in indonesia is limited student's critical thinking ability. Low critical thinking ability unfold the Fachrurazi (2011) research, that math learning in school there has not yet many give opportunity students to develop the critical thinking ability. The survey IMSTEP-JICA (Fachrurazi, 2011) find a series of activities considered tough by to learn that students and teachers to teach them, among other solutions proof that requires reasoning mathematical, found, a generalization or conjecture and found the relationship between data or fact given. Such activities are the activities who demands the critical thinking ability. Students have trouble when faced with problems that requires the think ability, while high critical thinking is the capital to control almost all lessons. Critical thinking is a components used in daily life to solve problem, because critical thinking involving reasoning logical,

interpret, analyze and evaluate information in valid decision making. Critical thinking skill an effective means to improve understanding the mathematical conception students. Hence, critical thinking skill recommended for teaching mathematics high school, and must implanted in education curriculum teachers to improve student performance in mathematics (Chukwuyenum, 2013). That reason show learning designed to improve critical thinking skill would be more important than with learning that only designed to increase knowledge.

Preliminary research conducted in SMK Diponegoro 3 Kedungbanteng Purwokerto grade 10th to know problems associated with student's critical thinking skill in solve the problem. Interviews shows that teachers still learning conventional do not emphasis on of student's critical thinking skills. Observations indicate that there are many students who do not skilled at analyze,

evaluate and determine proper procedures to solve the problem. This indicates that student's critical thinking skill in learning mathematics is still low.

Problems on student's critical thinking skill and ability in this research be solved by applying learning use cognitive conflict strategy with Wingeom (CCSW) where students are required express conception early and given questions. CCSW also created conflict conceptual to stimulate critical thinking skill in asking opinion, analyze and evaluate problems, and seek the cognitive accommodation by the provision of scaffolding, so that students always tried to resolve the problems and invented the concept of own (Osborne, 1992).

Pertaining to background and identification matter that has been described, so the purpose in this research, which is to develop student's critical thinking skill in order to give a positive influence and completeness on ability to think critically in resolving problems the geometry material. Research is expected able to provide benefits for a student to can develop critical thinking skill in the face of the problem in every learning, and for teachers to can provide innovation empower students engaged in finish various problems.

Theoretical Review

Critical thinking skill is a skill learned that requires instruction and practice. Math teacher at junior high school and senior high school can improved the student's critical thinking skill with: (i) use instructional strategy involving liveliness students in learning process than dependent in the lessons and records memorization, (ii) focus to instructions in the learning process not only to the contents, and (iii) used technique which provide an assessment, with the challenge intellectual than remember memory (Peter, 2012). Critical thinking skill as an effective means to improve their performance and

understanding a mathematical conception of students that skilled in analyze and evaluate information and capable of think critically in valid decision making (Chukwuyenum, 2013).

Student's critical thinking skill and ability analysis reference on the steps critical thinking according to Fisher (2009), that is identify the case elements thought (reason and conclusions), identify and evaluate assumptions; clarify and interpreting statements and ideas; judging the acceptability (credibility and claim); evaluate various argument; analyze, evaluate and produce clear proofs; analyze, evaluate and make the conclusions; draw the inferences; and produce the arguments. Old assessment research also showing that the adoption of cognitive conflict strategy in learning can improve the student's critical thinking ability.

Cognitive conflict strategy with Wingeom learning (CCSW) is learning strategy that can reveal conception early students by giving questions, created conflict conceptual to stimulate critical thinking skill in asking opinion, analyze and evaluate problems, and seek the cognitive accommodation by the provision of scaffolding, so that students always tried to resolve the problems and invented the concept of own (Osborn, 1992). Learning stage with CCSW begins with homework given and review it that enables the student to practice resolve the issue and can reveal conception originally. Besides in learning it also contains the scaffolding by teachers and friends adapted to the student needs to continue solve the problems and found concept that can train critical thinking skill. The formerly theory to base researchers belief that learning with CCSW can improved the student's critical thinking skill with habituation given, so that would have an impact on increased in critical thinking ability.

Research Methods

The research is combination concurrent embedded research, namely the methodology that combines between the qualitative and quantitative methods (Sugiyono, 2013). The first study conducted by taking 5 selected students of class X AK 2 in SMK Diponegoro 3 Kedungbanteng. The qualitative study aims to analyze the increase student's critical thinking skill on learning with CCSW. The qualitative study begins with data collection through critical thinking ability test, critical thinking skill observation and acted upon by interviews. Test results, observation and interview analyzed based on indicator reference critical thinking steps (Fisher, 2009).

Quantitative research aims to see the effect of critical thinking skill and know completeness on student's critical thinking ability who received learning with CCSW. The increased done by gain test to student's critical thinking skill at each meeting, reinforced by qualitative analysis of the increase observed in five selected students, each of two from the upper group, one from the middle, and two from the bottom. The effect test of critical thinking skill on student's critical thinking ability done with regression test, and the completeness test referred to in this research is individual completeness test, learning is said to be completed if the average results of student's critical thinking ability exceed the individual minimum completeness criteria is 70.

Result and Discussion

The results of observation confirmed through the interview activities shows that been an increase in student's critical thinking skill afterwards applied learning with CCSW mainly in making sketch picture, consider the possibility answer based on facts obtained, analyze and make the conclusions. Following footage interviewing one of the selected students.

Researcher : "What are you doing in group discussion activities?"

Student : "I actively participate discuss settled with group members, trying to find information in internet and another book, and asked with my friends or theacer if find it difficult".

Researcher : "What steps did you do to solve the critical thinking test?"

Student : "I wrote elements that are known and who asked first, then describe the sketch. After that, i draw the possibility of the answer, find the best solution, and get it done".

Researcher : "What do you do if gained a poor grade in doing tests?"

Student : "I match my work with book to know the guilty, then ask friends, and trying to do again at home".

The results of the student's critical thinking skill interview shows that students try to get the various problems, and asked with friends and teacher if difficulties. Steps the case of student's critical thinking test was also is in conformity with the steps of critical thinking indicators (Fisher, 2009), as identify and interpreting the problems, analyze, evaluate, and draw conclusions proper procedures in completing problems. The results of this increase can be seen based on selected students got in Table 1.

Table 1. Gain of Critical Thinking Skill.

Subjek	Gain Tiap Pertemuan				
	1 & 2	2 & 3	3 & 4	4 & 5	1 & 5
SP-1	0,12	0,26	0,29	0,67	0,85
SP-2	0,15	0,09	0,10	0,25	0,48
SP-3	0,39	0,09	0,17	0,40	0,67
SP-4	0,08	0,21	0,38	0,31	0,69
SP-5	0,21	0,21	0,13	0,11	0,70
	Rata-rata				0,68

From table 1, it appears that five selected student's critical thinking skill increased at each meeting. Overall the five selected students has increased significantly with average is 0.68. This is because learning with SSCW enables the student given questions to lodge opinions concerning the initial concept of present, actively involved in group discussions to finish various problem together, with scaffolding from teachers and friend that students keep trying to sharpening his critical thinking skill in resolving problems that he faced. After seeing an increase in student's critical thinking skill, next we see their effect for the student's critical thinking ability. Independent variable in this research is student's critical thinking skill (X), and dependent variable is the student's critical thinking ability (Y). Data on student's critical thinking skill taken from observation in student's critical thinking skill observation sheets, data on the student's critical thinking ability been taken by critical thinking ability test that was held in the last meeting. The results of the efect analysis between critical thinking skill on student's critical thinking ability by using SPSS obtained sig value of $0,000 < 5\%$ so H_0 rejected, it means the regression equation is linear, so that there is a positive effect critical thinking skill on student's critical thinking ability. In addition, obtained r square value is 80,2 %, which means critical thinking skill variable effect on critical thinking ability variable of 80,2 %, and the rest 19.8 % influenced by another factor with the regression equation $Y = 1.793x + 0,981$. How major critical thinking skill on student's critical thinking ability presented in Table 2.

Table 2. Regression Test Result

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate

1	.896 ^a	.802	.795	3.918
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Predictors: (Constant), KBK

After seeing that critical thinking skill have had a positive effect for student's critical thinking ability, next see whether the effect made the average of student's critical thinking ability whether less or more than the minimum completeness criteria which is 70. Calculation of t_{count} in this study on the SPSS from the one sample t-test analysis. Table 3 show results SPSS for individual completeness test.

Table 3. Individual Completeness Test.

One-Sample Test						
Test Value = 70						
95% Confidence Interval of the Difference						
	T	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Post_E						
ksperi men	5.182	27	.000	8.464	5.11	11.82

Of the output SPSS on Table 3, one-sample test on t column it can be seen that t_{count} value of 5,182 with $df = 27$. With significant level of 5% obtained $t_{table} = 1,687$. Because the result is $t_{count} > t_{table}$ then H_0 rejected. We can conclude that the average of student's critical thinking ability who were taught CCSW exceed the individual minimum completeness criteria is 70.

Manifesting learning can develop student's critical thinking skill not be easy. Hence referred several theories and the results of the old study on which to base the implementation of a learning that can really improved the student's critical thinking skill. Peter (2012) mentioned that there are three strategy that can be done teachers to improve critical thinking skill in learning.

The first strategy is use instructional strategy involving liveliness students in learning process, so can increase the critical thinking ability in solve the problem.

Research now applied learning with CCSW who in their activities stage is the homework given and acted upon by review it. Tasks given to students in a variety of senses presented in the students covering the concept construction task, link to the issue of daily and apply the concept of on the real given. At first students were still confused and objections to task given, but having habituation given each meeting, students became come accustomed and trained to do their tasks structured. Activities review the task carried out by the questions provision related to the tasks, so that student's early conception can look.

Next phase in learning with CCSW is given to contextual problems associated with matter to discuss in the group. Problems deliberately made to create conceptual conflict, so that students will fire and try to consider the initial concept of it owned with facts obtained to solve the problem. Besides group discussions could also help students who weak to give scaffolding from friends or teachers. Scaffolding will lead students to find the concept and solutions problems meaningful for students.

The last phase is trying to the occurrence of cognitive accommodation. At this stage, teachers and students have a discussion of the discussion group results with the help of Wingeom media making it easier to visualize students in studying geometry material. Cognitive accommodation convince students that concept construction during the discussion group activities right and crack the initial concept of students who was still wrong.

Conclusions And Recommendations

Based on qualitative analysis, obtained that increase in student's critical thinking skill.

After learning, students on three groups shown increase in all critical thinking skill indicators especially on analyze, evaluate and make the conclusions indicators, while for draw the inferences and produce the arguments skill indicators must continue to developed by habituation-conditioning tasks were varied and contextual learning. Increased critical thinking skill indicated by gain of 1 and 5 meetings to the five selected students (SS), where: SS-1 (0,85), SS-2 (0,48), SS-3 (0,67), SS-4 (0,67), and SS-5 (0,69). Quantitative research analysis shows that there is a positive effect between critical thinking skill on student's critical thinking ability who obtain lessons learned with CCSW to the geometry matter grade 10th of 80,2 % with equation $y = 1.793x + 0,981$. Based on the individual completeness, the average student's ability who obtain lessons learned with CCSW to the geometry matter grade 10th exceed minimum completeness criteria is 70. Based on a conclusion that obtained there is a number of things researchers suggest of them for teachers should give innovation learning that focuses on the objective who want to achieved. In this study of learning with CCSW can be used as reference for teachers in stimulating learning geometry or other material that is stressing improved student's critical thinking skill and ability. Then for students, critical thinking skill and ability that had been formed for learning geometry have to keep developed in everyday life and can be used as a basis for studies for learning other material.

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ANALYSIS OF MATHEMATICAL CREATIVE THINKING AND SELF-DIRECTED USING MMP MODEL BASED ON INFORMATION PROCESSING THEORY

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ABSTRACT

The lack of self-directed of students in learning mathematics leads to lower student achievement. To solve these problems, mathematics applied by using a model of MMP based on the theory of information processing in which students are invited to review the lesson as the basic of importance of prior knowledge. On the development an exercise controlled, students observe the examples of students' books and group work related to the register sensing and short-term memory. In long-term activities, students are given a self-test and evaluation together. This research was made in order to know the early self-directed condition and the ability of students' mathematical creative-thinking and find out this learning more effective. Variable in this research is self-directed (X1), skill of mathematical creative thinking (X2) as the dependent variable, the ability of mathematical creative thinking (Y) as independent variable. That is why from the result of preceding analysis, it can be concluded that the early condition of students is still low based on the proficient indicator of giving the various way. The Model of learning called effective by showing 1) the instrument of learning is valid with average-syllabus 4,0; RPP 4,07; LKS 4,04; students book 4,07; and AMCT 4,02; 2) the ability of mathematical creative-thinking 76 reach up total criteria more than 70 and classically 86,84% fulfill the criteria more than 70%; 3) there is positive influence that is significant between X1 and X2 toward Y with the regression similarity $\hat{Y} = 31,833 + 0,279X_1 + 1,062X_2$; and 4) there is raising of level of self-directed character as 0,05; 0,08; 0,06; 0,10; and 0,26.

Keywords - MMP , Creative-Thinking, Self-Directed, Effective

Introduction

Education basically takes an important part of producing high-quality human resource. Education is related to the learning process and the development of students. Education is the process of interaction which consist of activity involved teachers or educators who take part as preceptor of students.

Geometry in VIII grade includes identifying, make cube nets, and measure the surface area and the volume of cubes, blocks, prism and pyramid. According to Suwaji (2008) in his book which published showed that VIII grade students in junior high school lack of geometry, especially when comprehend space and form. For example, sometimes students cannot identify the shape of square pyramid just because the presentation of the square must as be parallelogram. This

problem should get an attention for a teacher. From initial studies were done, the students still have difficulty in giving answer by using one or more ways. Self-directed of the students is also lack because students are less likely to do homework and group work while there are still students who just come without participate so they rely on their friend only.

Skill of creative-thinking is cognitive skill to bring out and develop new ideas. New ideas as the development of ideas that have been published earlier and skill to solve problems differently (from different angles) (Santosa, 2012: 454). The exercise of creative thinking skills can improve students' ability to think creatively because it is done by habituation in each meetings. Skills provide relevant answers for example, will allow students to solve problems with relevant answers. The

aspects that are used to measure students' creative thinking Munandar (in Azhari, 2013: 4) is fluency, flexibility, originality, and elaboration.

Character education needs to be prioritized in the moral formation of students. Monks (1999: 279) says that an independent person will show exploratory behavior, capable of taking decisions, confident and creative. Lack of self-directed in adolescents will produce a wide range of behavioral problems, such as low self-esteem, shy, no motivation in school, poor in study habits, feelings of insecurity and anxiety. This matters is appropriate to research conducted by Prasetyaningsih (2012) if the self-directed of learning is high so the learning outcomes are also high, and on the contrary if the learning self-directed is low, so the study results also low. According to Song and Hill (2007: 32) stated that the self-directed includes three aspects: 1) Personal Attributes, 2) Processes, and 3) Learning Context.

One of model learning that can be used to improve the character of self-directed and mathematical creative-thinking is a model of learning MMP (Missouri Mathematics Project). This learning model is designed to help teachers in terms of effectiveness of the use of exercises so that students achieve a high increase. MMP models used in the study are based on information processing theory which aspects of this theory are 1) the importance of prior knowledge, 2) Register sensing, 3) short-term memory, and 4) long-term memory.

The problem formulation in this study were: 1) what extent to the initial conditions of ability of Mathematical Creative-Thinking and self-directed of eighth grade students of SMN 2 Pecangaan?; 2) Is mathematics learning with MMP models based on the theory of information processing in the material of geometry is effective in improving the creative thinking and self-

directed of VIII grade students of SMPN 2 Pecangaan?

The purpose of this research were: 1) to describe the extent of the initial conditions of ability of mathematical creative-thinking and self-directed of eighth grade students of SMPN 2 Pecangaan; 2) Learning mathematics with MMP models based on the information processing theory of material of geometry is effective in improving the creative thinking and self-directed of eighth grade students of SMPN 2 Pecangaan.

Theoretical Review

Creative thinking is a skill that is very important to be noticed by the teacher of mathematics. Definition of creativity in mathematics is the ability to think creatively in solving mathematical problems. Furthermore Munandar (in Azhari, 2013: 4) states that creative thinking can be defined as the ability reflected to aspects of fluency, flexibility, originality, and elaboration. Through these aspects, the achievement of creative thinking can be measured by identifying an open question. The solution of not optimal and lack of thinking creatively lead the students difficult in solving mathematical problems.

In addition of creative thinking, lacking in self-directed of character of the students is also a matter that must be considered for the educator. Mustari (2014: 77) self-directed is attitude and behavior that is not easy to depend on others to complete tasks. While Tahar and hyacinth (2006) argues that independent learning is a learning activity that carried out by someone with the freedom to determine and manage their own teaching materials, time, place, and take advantage of learning resources they need. The importance of self-directed for the students to learn mathematics is due to the demands of the curriculum so that students may face problems in the classroom and outside the classroom that is more complex

and reduce the dependence of students with others in everyday life. This is related to the opinion of Darr and Fisher (2004) who obtained the results that self-directed gives a valuable perspective on the instructions and it is helpful to improve the existing rules in class that will support the learning and development of students. Aspects of self-directed according to Song and Hill (2007: 32) that are personal attributes, processes, and learning context.

After seeing the problems, it is necessary to provide the appropriate learning for the students that is associated with the lower creative thinking and independent learning. The designed learning is a learning that students is able to construct thoughts in an effort to understand the mathematical ideas so that students could express their ideas and encourage students to learn independently. One of model that is applied in learning is Missouri Mathematics Project. MMP model is a structural learning model as well as the structure of the teaching of mathematics. MMP model is designed to assist teachers in terms of the effectiveness of the use of exercises so that students achieve maximum improvement. MMP model is a structural learning model as well as the structure of the teaching of mathematics. The research was done by Kurniasari (2014) showed that the skill of students' creative thinking acquire the better learning of Missouri Mathematics Project than the ability of creative thinking of students who obtain an expository learning.

According to Widhiarto (2004: 28) the steps of model learning of Missouri Mathematics Project consists of review, development, controlled exercise, self-employment (seat work), and assignment. The advantages of the model MMP is saving time and there are lots of practice so that the student accustomed easily with a variety of questions that will train their creative thinking. The learning model that is applied also based on the theory of information processing. The theory of Information

processing explains the processing, storage, and called as transformations of input information (stimulus) to the output (response). According to Arends (in Trianto, 2009: 33) model of information processing consists of the importance of prior knowledge, register sensing, short-term memory and long term memory. Therefore, the presence of MMP model based on the theory of information processing is a character of self-directed and creative thinking of students that will increase optimally so that the abilities of creative thinking ability of students also increase.

Research Methods

This is Method Mix research. The combination design used in this study is the Concurrent Embedded type. The research instrument used in this observation organized as self-directed of character observationsheet (affective), observation sheets mathematical creative thinking skills (psychomotor aspects), and ability test of Mathematical of Creative Thinking (cognitive).

Portrait of early conditions in analyzing the ability of mathematical creative thinking and self-directed of students in learning of mathematics will be analyzed qualitatively to describe the beginning at study location. While the testing of effectiveness consist of completeness test, the effect test, and the raising test will be analyzed quantitatively. Then the results obtained will be analyzed descriptively.

The subjects of this study were VIIB grade of SMP Negeri 2 Pecangaan in 2014/2015. Based on fore going tests which have been done in class VIIB, 6 selection students were selected in the category of student group on which the code S-11 and S-23, the code of middle student groups S-01 and S-17, and a group of students under the code S-29 and S-38. Selecting of the six student was conducted to explore the more information about the character of self-

directed and skill of mathematical creative thinking of students. The sampling technique used here was purposive sampling where as the members of the sample of the population carried out with consideration and specific purposes.

The instruments used in data collection in this study consisted of, observation sheets, questionnaires, interview guides, and the ability of mathematical creative thinking test (AMCT). Analysis of the trial about AMCT can be seen by the analysis of test items. Analysis items is necessary because, (1) to determine the strengths and weaknesses of test items, so selection can be possible, (2) to provide information on the specifications of items completely so it will easier to draw up the questions that will complete of the test in the field and a certain degree. In this study, the analysis items of AMCT is validity, reliability, level of difficulty and different effort. In this study validity and reliability known as the self-directed questionnaire of analysis items.

Individual mastery test is based on the results / grades obtained by students, whether less or more than MCC from see the value of the ability of mathematical creative thinking. Minimum completeness criteria (MCC) is 70. The hypothesis are:

$H_0 : \mu \leq 70$, the average mathematical of creative thinking ability does not exceed 70.

$H_1 : \mu > 70$, the average mathematical of creative thinking ability exceed 70.

Criteria: H_0 acceptable if $t_{hitung} \leq t(n-1, \alpha)$ with

$t(n-1, \alpha)$ obtained from t distribution list. H_0 receipt by comparing t count with $t(n-1, \alpha)$. If $t_{hitung} > t_{tabel}$ mean H_0 rejected.

It means H_1 is acceptable in which the average of AMCT of the students is not equal to 70. To see the completeness of student learning classically as one of criteria

for the effectiveness of learning, the two proportions is tested by using the formula:

$$z = \frac{\frac{x}{n} - \pi_0}{\sqrt{\frac{\pi_0(1-\pi_0)}{n}}}$$

Hypotheses used as follows:

$H_0 : \pi \leq 70\%$ (the students' proportion in learning of mathematics with the information processing theory reach individual completion has not reached 70%)

$H_1 : \pi > 70\%$ (the students' proportion in learning of mathematics with information processing theory that reach individual completion reach 70%)

The testing criteria is H_0 is rejected if $z_{hitung} < z_{0,5-\alpha}$ with the significant level used is 5% (Sudjana, 2005: 235).

Regression analysis was used to test the influence of the character of self-directed and creative thinking skills to the ability of mathematical creative-thinking using multiple regression test with linear models $\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$ in which the hypothesis is:

$H_0 : \beta = 0$ (there is no linear effect between the character of self-directed and creative thinking skills to the ability to think mathematical creatively)

$H_1 : \beta \neq 0$ (there is linear effect between the character of self-directed and creative-thinking skills to the ability to think mathematical creatively)

By means of,

$$\beta = \begin{pmatrix} \beta_1 \\ \beta_2 \end{pmatrix}$$

The test criteria H_0 is rejected if the significant score less than 5%. Then to know magnitude of variable X_1 and X_2 to Y it can be seen from the value R^2 (R square) in the output Model Summary. While the equation of regression can be known also from the

output table Coefficients (Sukestiyarno, 2010: 83-85).

An increase test in selection students is used to determine the increase of affective variables that is self-directed (X1), psychomotor variables that creative thinking abilities (X2) of 6 selection students. Selection of the six students were obtained by using coupling technique based on preliminary tests / initial tests that have been grouped. To see an increase in the affective variable and psychomotor, here used Normality Gain formula (g) (Hake, 1999). The formula is as follows:

$$(g) = \frac{\text{final score} - \text{initial score}}{\text{max score} - \text{initial score}}$$

Results And Discussion

The aim of this study is to see how far the initial condition of creative mathematical thinking skills and character of the self-directed and effective learning. Initial conditions mathematical creative thinking abilities of students in class VIII B of SMP Negeri 2 Pecangaan still relatively low. Through initial tests of mathematical creative thinking abilities given to students, only 7.89% of students who reach MCC while students who did not complete the MCC amounted to 92.11%. For example, when asked to solve problems like the pieces of Figure 1.

Gambarkanlah 2 jaring-jaring balok ABCD.EFGH yang memiliki ukuran panjang 6 cm, lebar 4 cm, dan tinggi 3 cm!

Figure 1. Piece Problem of AMCT Introduction Number 3

In the top group of students (STG) seem more able to present a variety of block. STG also detail in describing the block nets. On each side, the STG write a description of the size of the block in the question without forgetting to write the unit. This shows that it is able to elaborate the idea of a way or its own. In addition it shows that at the stage of initial knowledge and registers sensing, STG has been able to capture well. The ability to answer the question relevantly has also been

very good on the STG. It could be argued that STG has been able to write the step of completion well. In the middle group of students (SMG) in providing diverse ideas, it writes the alternative answers only. The block nets picture drawn was not given a description of the size. In giving relevant answers and details the answer, SMG is still fairly lacking. This means that the beginning of received knowledge SMG is less. In addition to sensing the register stages of observing carefully, SMG has not been quite able to do so. However, SMG is already trying to produce an answer in his own way. For a group which is low (SKR) the ability of creative thinking is still lack. This means the beginning of received knowledge SMG is still lack. In addition to sensing register stages of observing and look about mathematics, SMG has not been able to do well. For example, a variety answer of students in group, middle group and bottom group can be seen in the following figure.

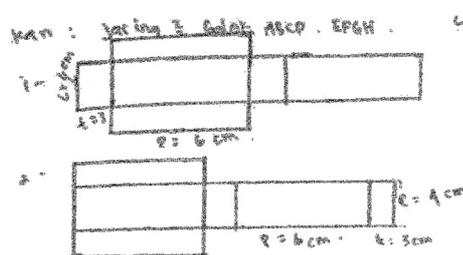


Figure 2 The answer of students in Top Group

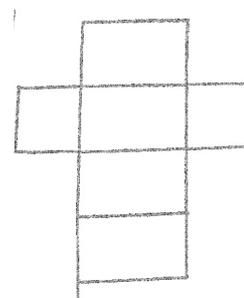


Figure 3 The answer of students in Middle Group

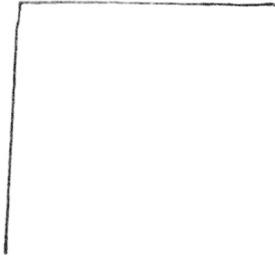


Figure 4 The answer of students in Bottom Group

The early condition of students' independent character obtained information that STG had attempt in completing mathematical tasks without delay in doing it. STG also tends to do the questions based on the self-initiative and bolder in delivering opinion if there is problems that difficult to be understood. In addition, confidence in the capabilities known as the main asset in STG without relying on friends' answer if they are notable to work it. This means that students in the top group have high self-directed in learning, especially in learning mathematics.

As like as with SMG. Character of self-directed is visible from the group which is still lack of effort in solving mathematical tasks, and sometimes procrastinate in doing it and done if remember only. Initiative in doing the task was not entirely based on the initiative themselves. In delivering opinion, SMG is occasionally in asking about the material that has not been understood. However, confidence in the capabilities is already emerged in themselves. It shows that SMG character of self-directed is still low.

For SBG, the character of self-directed is not much different from the students in middle group. The level of effort in solving math problems is relatively small. SBG also always procrastinate in doing task. The initiative is not a pure emerging from yourself also. It means that parents is still involved in learning activities at home.

In the case of asking to the teacher about the unclear material, this change doesn't use in proper and students miss this change

although there is material that difficult to be understood. However, confidence in the ability is still lack or still undecided. It shows that SBG character of self-directed is still very small and below from the top group and the middle group.

Mathematics learning is declared effective because the effectiveness criteria are complete:

1. AMCT have achieved completeness of both individual and classical based on MCC 70 is gained by 33 completed students and 5 students who did not complete. Based on the calculations, the value is obtained $z_{hitung} = 2,266$. By level 5% therefore $z_{tabel} = z_{(0,5 -0,05)} = Z_{0,45} = 1,64$. since $Z_{hitung} > Z_{0,5-0,05}$ therefore H_1 is acceptable. Therefore, it can be concluded that mathematics learning with MMP model based on the information processing theory that fulfill the criteria of learning minimum 70 reach up to 70%
2. There is significant positive influence between the character of self-directed and mathematical creative thinking skills toward AMCT. The most influence of the character of self-directed to AMCT shows the value of R square of 0.339 or 33.9% means that the self-directed affect students' mathematical creative-thinking ability by 33.9% or 66.1% can be expressed that there are other variables affect the ability of mathematical creative thinking. The most influence of mathematical creative thinking skills to AMCT shows the value of R square of 0.510 or 51%. It means that the creative thinking skills affect students' mathematical creative thinking abilities by 51% or 49% variables can affect the ability of mathematical creative thinking. Amount of influence the character of self-directed and mathematical creative thinking skills toward AMCT shows the value of R square of 0.518 or 51, 8%. It means that 51.8% mathematical creative thinking abilities of students are influenced by the character of self-

directed and mathematical creative thinking skills in solving exercises (together) and 48.2% are influenced by other factors.

3. There is the existence of increase character skills of self-directed and mathematical creative thinking From the observation during 5 meetings toward 6 selection students, the increase of self-directed of character that is calculated by n-gain test is happened as described in the following table :

Table 1 The Recapitulation of self-directed Character Gain Test of 6 Selection Students

No	Subyek	Meeting					Average
		I	II	III	IV	V	
1	S-11	0,07	0,08	0,13	0,30	0,48	0,21
2	S-23	0,18	0,09	0,14	0,33	0,57	0,26
3	S-01	0,05	0,03	0,17	0,07	0,28	0,12
4	S-17	0,10	0,11	0,10	0,11	0,36	0,16
5	S-29	0,05	0,02	0,05	0,08	0,19	0,08
6	S-38	0,07	0,05	0,05	0,06	0,21	0,09
Average		0,09	0,06	0,11	0,16	0,35	
SUM Average		0,15					

Table 1 above shows clearly that the increase of independent character of the six selection students during the long study. The difference between the final score and premier score shows the amount of increase of self-directed character of each student. The following Table 2 presents the data of problem-solving skills gain test based on the subject of study options.

Table 2 The Recapitulation of Mathematical Creative Thinking Ability Gain Test of 6 Selection Students

No	Subect	Meeting					Average
		I	II	III	IV	V	
1	S-11	0,07	0,11	0,08	0,13	0,33	0,14
2	S-23	0,04	0,15	0,09	0,14	0,36	0,15
3	S-01	0,04	0,02	0,09	0,19	0,31	0,13
4	S-17	0,05	0,08	0,06	0,06	0,24	0,10
5	S-29	0,05	0,06	0,04	0,02	0,16	0,07
6	S-38	0,04	0,08	0,02	0,02	0,15	0,06
Average		0,05	0,08	0,06	0,10	0,26	
SUM Average		0,11					

Table 2 above shows clearly the improvement of the mathematical creative thinking skills of the six selection students during the study. The difference between the final score and premier score shows the amount of increase mathematical creative thinking skills of each selection student.

Conclusions And Suggestions

Based on the analysis of the initial conditions, it can be concluded that the initial conditions of mathematical creative thinking abilities (AMCT) of class VIII B of SMP Negeri 2 Pecangaan is still very low. Through initial tests of mathematical creative thinking abilities given to students, only 7.89% of students who reach MCC while students who did not complete the MCC amounted to 92.11%. Description of the initial conditions of mathematical creative thinking abilities STG shows that STG has been able to demonstrate the stage of completion well. On SMG's ability to stage of elaborating the idea and provide relevant answers are still in lacking. While in the SBG it is still very lack in giving the stage in detail idea and provide relevant answers because it is not able to present relevant answers. In initial conditions of STG independent character it is very high because of the confidence of having capabilities known as the main assets in the STG. In the SMG confidence toward their own capabilities is already emerged from themselves even it is not high enough. While inthe ability of SBG confidence it is still lack or still undecided. The material of Geometry mathematics learning using MMP models based on information processing theory is declared effective, it is seen from the results of the analysis showed: 1) the ability of mathematical creative thinking achieve mastery, both individually and classical. Individual mastery is obtained with an average students' AMCT were treated more than the MCC and achieve classical completeness of which more than 70% of students who had reached MCC (70); (2) the character of self-directed and

mathematical creative thinking skills give positive effect on the ability of mathematical creative thinking; (3) there is an increase in the character of self-directed and mathematical creative thinking skills in selection students .

Based on the research that has been done, the researchers gave suggestions as follows.

1. MMP learning model based on the theory of information processing can be used as an alternative in the process of learning of geometry and it can be applied to other materials.
2. In lessons teachers it should pay attention to the application of the self-directed character and mathematical creative thinking skills in learning so that teachers will be able to take a better alternatives steps in order to improve the students' ability in solving problems.
3. The open-ended question is recommended as one of the way to improve the ability of mathematical creative thinking in order to be accustomed so that students are able to explore the answer creatively.

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ANALYSIS OF MATHEMATICAL REPRESENTATION AND SELF-EFFICACY AT EXPERIENTIAL LEARNING MODEL BASED ON CARL- ROGERS THEORY

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ABSTRACT

Lack of opportunities for students to use their own representation in solving problems cause no appearance of students' representation and made low of self-efficacy because students are less confident of their own abilities. To overcome these condition were applied a mathematics learning model known as "experiential learning" based on Carl Rogers theory in which students learn to use more their thoughts and experiences through the learning phase of concrete experience, reflective observation, abstract conceptualisation and active experimentation. This study aims to identify the initial conditions of mathematical representation capability also self-efficacy of students in the mathematics learning at geometry material and the effectiveness of mathematics learning using that model. The results showed that the students are dominant in source of psychological index where they still have low toughness in dealing with mathematical problem so they anxious in solving the problem; the students not accustomed to use visual representations in modelling and interpreting problem solving. Mathematics learning using that model is effective which is demonstrated with valid devices (syllabus: 4,41; lesson plan: 4,45; student book: 4,23; worksheet: 4,44; and test: 4,18 out of 5 scale); the average of mathematical representation capability is 70 met the criteria more than 64 and whole class reach 87 % met the criteria more than 70%; self-efficacy and mathematical representation skill effect significantly 78,4% toward mathematical representation capability; an increase in self-efficacy of lesson 1 to 5 respectively: 0.13; 0.14; 0.10; 0.28; 0.50 and an increase of mathematical representation skills : 0,14; 0,08; 0,25; 0,16; 0,49.

Keywords – mathematical representation, self-efficacy, experiential learning, Carl Rogers theory

Introduction

Mathematics learning patterns that drill formulas and give the questions without sufficient understanding how to the formula is formed, commonly have impact that student unable to absorb comprehensive understanding that the teacher conveyed. When students are faced with a mathematical problems in the classroom, they should try to understand the problem and solve it in ways that they know. Ways were highly correlated with previously existing knowledge relating to the problems presented. One part of the effort that students can do is to create a model or representation of the problem. Models or representations are made can vary depend on the ability of each individual to interpret the existing problems (Sabirin: 2014). Graders VB Kanisius Kurmosari Semarang primary

school on the initial conditions are still not familiar in using representations to solve the problem when work on the problems of geometry material. This can happen either because the students never or rarely given the opportunity to present their own representation or this tendency caused by imitating the teacher step in solving a problem. As a result, students' mathematical representation capability are not developed. Though mathematical representation is one of important tools in mathematics, both for students and for teachers. Perhaps this is due to limited knowledge about the mathematical representation and its role in the mathematics learning within the teachers (Kartini, 2009). Mathematics learning in the classroom should provide ample opportunities for students to be able to train and develop mathematical representation as an important part of problem solving. The

mathematical representation capability is one of essential thing in order to improve concept and thinking mathematically and relatively completely understanding within students. Not only good for student understanding, representations also help students to communicate their thinking.

In mathematics, many students are not sufficient enough in their abilities. Often found once in classroom, though they have ability to explain his thinking or idea in solving a problem but they have no courage to present it. Based on interviews with the class teacher, this behaviour is tend to lack confidence in their ability to solve mathematics problems, especially the word problems. Students still need to be guided by teacher while working on word problems even though the teacher had taught this kind of mathematic problems previously. This phenomena also shown up when examination, students feel anxiety, doubt and fear whether able to pass the test or not. This insufficient self confident actually hinders students ability to work on math problems in class.

Self-efficacy is someone's appraisal his/her own ability to perform a particular behavior or achieve certain goals (Ormrod, 2008: 20), in other words, self-efficacy is a belief that students need to have in order to be successful in the learning process. Therefore, self-efficacy must be developed in students in order to make mathematisc lesson meaningful in daily life. Successes and failures experienced by students can be viewed as a learning experience. This learning experience will produce the self-efficacy of students in problems solving that would increase learning ability, a positive self-efficacy required in learning so that students can achieve their learning goals and achieve qualified learning. Self-efficacy is sourced from four issues of mastery experience, others experience, the social approach or verbal and psychological indices (in Somakin Bandura, 2012). Based on questionnaires that explore the source of

student self-efficacy discovered that almost all the students are psychologically experiencing anxiety or fear when faced a math problem. Many students feel fear when asked to come forward to do math, students also afraid to make a mistake when do the math, and sometimes try to see the answers of friends when did a math test. Thus it can be said that self-efficacy graders VB SD Kanisius Kurmosari Semarang primary school is still quite low.

According to Rogers (1983) the most important principal in the learning process are: being human means having a reasonable strength to learn. Organizing the material means to organize lesson material and new ideas as part of meaningful lesson for students. Meaningful learning in modern society means learning about the process. Based on the observations made in the preliminary study of mathematics learning process in the classroom, the teacher is still seeking the optimal organization of learning in accordance with the theory of Carl Rogers. Students have not been sufficiently pursued to develop itself so do not have the ability to learn on their own initiative and be creative. It is important to make a meaningful learning and personalized experience by encouraging students to use their minds rather than just receive information (Rogers, 1983: 113). One of the way is through experiential learning developed by David Kolb that later becomes a learning model and the model will be used in the organization of learning in this study. Through four stages of learning, namely concrete experience, reflective observation, abstract conceptualisation and active experimentation (Kolb & Kolb, 2005) this model is used as an alternative to solve the problems on the initial conditions.

The research questions are 1) how are mathematical representation and self-efficacy of students on geometry material of the initial conditions? 2) Is mathematics learning with experiential learning models

based on the Carl Rogers theory on the material geometry effective?

The aims of this study were 1) to identify students' mathematical representation and self efficacy in mathematics learning on the geometry material 2) Examine the effectiveness of mathematics learning with experiential learning models based on Carl Rogers theory on the geometry material

Theoretical Review

Mathematics tend to abstract and difficult to understand by students was caused student difficulties to solve problems using the appropriate mathematical representation and diverse. Mathematical representation is one of the standard processes in mathematics according to the National Council of Teachers of Mathematic or NCTM (2000) are the mathematical ideas can be represented in a variety of ways: images, materials concrete, tables, charts, numbers and symbols, and so on. Representation as a form of interpretation of students' thinking on an issue used as a tool to find a solution of the problem (Sabirin, 2014). The aim is to facilitate solving mathematical problems that are abstract becomes more concrete for students but usually a representation learned and taught only as a supplement in solving mathematical problems. Supposedly as an essential component of learning, the capability of students' mathematical representation should always be trained during the process of learning mathematics in school. Standard representation (NCTM), determines that the learning programs from pre-kindergarten through grade 12 should enable students to: 1) create and use representations to organize, record and communicate mathematical ideas; 2) select, implement and translate the mathematical representations to solve problems; 3) use representations to model and interpret physical phenomena, social, and mathematical phenomena. In this study, the representation capability uses the

appropriate indicators of the NCTM standards.

Bandura in Turgut (2013) defines self-efficacy as the belief in a person's ability to organize and execute actions required to achieve the desired results. A person with high self-efficacy will be more focused on the requirements of the task and are not easily distracted by anxiety and cognition off-task. Four sources of self-efficacy (Ormrod, 2008) is the mastery experiences (direct experience), the level of arousal when facing tasks, vicarious experiences (achievement exemplified by others) and social persuasion (pep talk) or specific performance feedback. The perception of self-efficacy can be established by interpreting information from four sources (Bandura in Somakin, 2012) as follows. a) Mastery experiences (direct experience), is the most influential source, because the failure/ success of past experience would decrease / increase someone self-efficacy who would like to experience. In particular the failure that occurred in the early action can not be attributed to a lack of effort or external environmental influences. b) Vicarious Experience (experience of others), which refers to the success / failure of others, one can gather the necessary information to make a judgment about the ability itself. Model of experience of others is very influential when he got a similar situation and poor experience in the similar experience. c) social or verbal approach, the approach taken by a person believes that he has the ability to do something. It should be noted, that the negative statements about competence in a particular area is very bad for those who have lost of confidence, for example, the statement that women are not fit to study mathematics, will lead women to believe that they are not competent in math. d) Psychological Index, in which the physical and emotional state will affect a person's ability. High emotions, such as anxiety towards mathematics will change one's confidence about his ability.

In her study, Lusby (2012) surveyed the level of self-efficacy math students by using the indicators of Bandura and formulated as an indicator of the observations in this study as follows. I can do math well (endurance); I feel confident in my ability to solve mathematical problems (reliable / resourceful); In math class, a person who understands the material being taught teachers (curious); I can do the work without the help of others (self-reliant).

Learning mathematics that is part of the implementation of education in schools should be also developed to organize a humanist learning and character. Currently, the learning of mathematics tend to focus on cognitive aspects and less to accommodate the humanistic in learning. Humanistic learning theory of Carl Rogers (1983) identify that the best learning is to obtain and master an environment that free from threats. The learning process is enhanced when students can examine their own abilities, try new experiences, even make mistakes without feeling hurt by criticism and censure. Learning will be the most significant and pervasive when it learned it on his own initiative because it teaches students to be independent and confident. Students have the opportunity to make judgments, selection and assessment. Experiential Learning is one of the principles of Rogers is the most useful learning is to learn about the process of learning. Experiential learning is a learning process, a changing process of change to use the experience as a medium of learning or teaching. Experiential learning is learning undertaken through reflection and also through a process of making meaning from direct experience. (Kolb, 1984). According to Rogers, it is important to make the learning experience as meaningful and personal by encourage students to use their minds rather than just receive information (Rogers, 1983: 113). The experiential learning model consists of four phases, namely concrete experience, reflective observation, abstract conceptualisation and

active experimentation (Kolb & Kolb, 2005). Can be interpreted according to this theory, learning as a process by which knowledge is created through the transformation of experience.

The experiential learning model is very relevant applied to develop the understanding of the concept. Real experience and observation phase of reflection can develop the ability to interpret, give examples, classify, suspect, and compare. Conceptualization stage can develop the ability to summarize and explain (Kolb & Kolb, 2005). Hopefully, through this learning model can improve representation and self-efficacy of students as previous research by Rahmawati, Hidayah, and Darmo (2013) also by Azizi, Susanto, and testifying (2013).

Research Methods

The design of this research is combination or mixture of qualitative and quantitative methods are also known as mixed methods. The strategy used is "embedded concurrent strategy" that implement the data collection phase of quantitative and qualitative in one time (Cresswell, 2014: 321). Research procedures run three stages of research are the initial conditions phase, the learning implementation and data analysis stage.

Phase analysis of initial conditions includes observation of learning activities based on Carl Rogers theory, fill in the self-efficacy questionnaire, Mathematical Representation Capability Test (TKRM) preliminary, arrange and validation of learning tools and TKRM. The implementation stage of mathematics learning on geometry material with experiential learning models based on Carl Rogers theory, TKRM finalon solid figure material and interviews with six students choice. Stages of data analysis includes qualitative analysis to describe self-efficacy and mathematical representation capability well as quantitative analysis to identify the effectiveness of learning include

the validity of the device, mastery learning, testing and the effect of the increase.

In this study the random sampling defined the sample used is grader VB Kanisius Kurmosari Semarang academic year 2014/2015 While the research variables are self-efficacy (X1) and skill mathematical representation (X2) as the independent variable, while the dependent variable is the capability of a mathematical representation (Y). The instrument used to collect data in this study are learning device validation sheets, observation sheets, student questionnaire, and test the capability of a mathematical representation (TKRM).

Results and Discussion

Student's self-efficacy in the initial conditions is known from the questionnaire about the source of self-efficacy. Questionnaire compiled based on four sources of self-efficacy (Ormrod, 2008) that is mastery experiences, vicarious experience or the others experience which is in this questionnaire is the experience of peers and adults around the students, persuasion social or performance feedback that is specific, and levels of arousal when facing a task or psychological indices when faced with the task. Recapitulation of filling the questionnaire showed that students upper group (SKA) is low in sourcing peers experience and psychological indices when faced with the task. It happen because SKA has a high self-efficacy tend to be uninfluenced by other people's experiences which are peers, but they still have anxiety when faced with the task of mathematics. Also for students in middle group (SKT), the lowest is in the source index of psychological students when faced with the task so they are still feel anxiety or low of confidence when working on math problems. For lower group (SKB) had similar results with SKT with the lowest is a source of psychological indices in the group. From the above information it can be seen that almost all students in both the groups of

upper, middle and lower have a same result that from the source of self-efficacy they were low in psychological indices. It means that students still have low confidence or toughness in dealing with mathematical problems that tend to be anxious.

Data of mathematical representation capability is obtained from the value of mathematical representation capabilities test (TKRM) introduction. The capability of students in the initial conditions are generally low in the first aspect that is creating and using representations to organize, record and communicate mathematical ideas. The second and third aspects also indirectly low because they are interrelated and support each other.

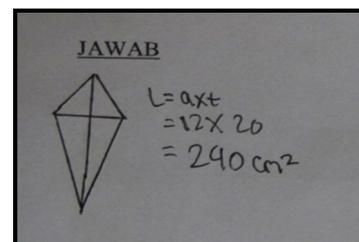


Figure 1.Example of student's work

Specifically low capability of students can be seen from the way they represent mathematical ideas back both written and visual from the question into the "known" form. In other words, when they are difficult to cultivate their internal representation and turn into external they will have difficulty in solving mathematical problems. Within the domain of mathematics, representations may be thought of as internal-abstractions of mathematical ideas or cognitive schemata that are developed by a learner through experience (Pape & Tchosanov, 2001: 119). Students' skills in using the forms of representation especially a visual representation is still very low. Students create a visual representation regardless of the details that are actually beneficial to them in solving problems. In accordance with the results of Cai & Lester (2005: 235) that students must learn to use conventional representations but, perhaps more important,

they must learn to choose representations that fit the situation and, when appropriate, teachers must engage students in discussions of why their representations are satisfactory and whether those representations would be useful for other related problems.

Quantitatively showed that the mathematics learning of geometry material with experiential learning models based on Carl Rogers theory is effective. It is said to be effective because it meets the effectiveness test with the results as follows. Valid learning devices with an average score of syllabus: 4.41; lesson plan: 4.45; student book: 4.23; worksheet: 4.44; and test: 4.18 out of 5 scale. Based on the calculations, the value of $z = 1.992$. With the 5% level so $z_{table} = z(0.5 - 0.05) = Z_{0,45} = 1.64$. Because $Z > Z(0.5 \text{ to } 0.05)$, H_0 is rejected. It can be concluded that the students in a class that has reached passing grade (KKM) of the mathematical representation capability is 87% met the criteria of $>70\%$. The analyzes using One Sample T-test in SPSS 16.0 is obtained results of the value of $t = 5.879$, and the degrees of freedom ($df = 30 - 1 = 29$), while 5% error level obtained $t_{table} = 1.699$. Turns $t > t_{table}$ or $5.879 > 1.699$ which means that H_0 rejected and H_1 accepted. It can be concluded that the average capability of mathematical representation of graders VB has exceeded $KKM = 64$ at 70.

Regression test is done to see how the influence of self-efficacy (X1) and skill mathematical representation (X2) on the capability of mathematical representation simultaneously. To determine the influence of self-efficacy and mathematical representation skill toward the capability of mathematical representation can be seen in Table 1

Table 1. Regression Test Result

Model Summary ^b				
Model	R	Adjusted R Square	Std. Error of the Estimate	
1	.886 ^a	.784	.768	2.86949

From the table above were obtained value of $R \text{ Square} = 0.784 = 78.4\%$. This means that 78.4% of students mathematical representation capability is influenced by self-efficacy and skills mathematical representation simultaneously while 21.6% are influenced by other. The regression equation is $\hat{Y} = 25,190 + 0,215X_1 + 0,999X_2$.

Observation of the students' self-efficacy is based on four aspects according to the theory developed from research Lusby (2012). Enhancement can be seen from scores of two consecutive meetings and was calculated using the formula Gain normality. Increased of self-efficacy of chosen students can be seen in Table 2.

Observation of the students' skills of mathematical representation is based on three aspects of the standards NCTM (2000). Enhancement can be identified from scores of two consecutive meetings and was calculated using the formula Gain normality. Increasing of mathematical representation skill of chosen students can be seen in Table 3.

Table 2. Increasing of Self-Efficacy

STUDENT INISIAL	GAIN SCORE OF MEETINGS				
	1&2	2&3	3&4	4&5	1&5
SS-07	0,26	0,18	0,29	0,40	0,74
SS-30	0,28	0,17	0,00	0,40	0,64
SS-20	0,04	0,23	0,00	0,29	0,48
SS-01	0,04	0,15	0,09	0,33	0,50
SS-27	0,06	0,03	0,10	0,11	0,26
SS-08	0,10	0,11	0,15	0,14	0,40
AVERAGE	0,13	0,14	0,10	0,28	0,50

Table 3. Increasing of Mathematical Representation Skill

STUDENT INISIAL	GAIN SCORE OF MEETINGS				
	1&2	2&3	3&4	4&5	1&5
SS-07	0,26	0,04	0,32	0,20	0,61
SS-30	0,05	0,07	0,21	0,03	0,32
SS-20	0,19	0,08	0,29	0,24	0,59
SS-01	0,13	0,05	0,30	0,23	0,56
SS-27	0,09	0,20	0,15	0,14	0,47
SS-08	0,10	0,07	0,23	0,10	0,42
AVERAGE	0,14	0,08	0,25	0,16	0,49

One of the results of Pape & Tchoshanov (2001) research on the implications of a mathematical representation in the class is closely related to the representation of social activity. Students come to understand both the process and product of representation through social activities. At least, the results can strengthen the relationship between the representation capability with the representation skill and social activity that closely related with students self-efficacy. Generally, these achievements are accordance with the theory that developed from previous studies as expressed by Fast, et. al (2010) that the mathematics self-efficacy appears to play an important role in the achievement of mathematics and as a mediating influence of the environment-oriented class expertise in mathematics achievement (the capability of mathematical representation). Beliefs in one's efficacy can vary across academic subjects (e.g. reading vs. writing) and self-efficacy for mathematics has received close attention. Students with higher math self-efficacy persist longer on difficult math problems and are more accurate in math computations than those lower in math self-efficacy (Collind, 1982; Hoffman & Schraw, 2009; Fast, et. al., 2010)

Learning models in this research has an important role as well as a media delivering during the learning process of geometry material in VB SD Kanisius Kurmosari Semarang. As the name implies, the experiential learning model is done through reflection and through a process of direct experience meaningful (Kolb, 1984). Steps of this model are: 1) Concrete experience in which the student using concrete objects in the group to solve the problem that it receives. At this stage one of the activities is the students create visual representations of solid figure of the concrete objects that they have; 2) Reflective observation in which students discuss with their peers and reflect on the activities that has been done. At this stage, for example, is when students should

discuss drawing nets corresponding solid figure he has; 3) Abstract conceptualisation in which students discuss problem solving based on experience in stage 1. Here the students together with the group working on solving the problem, and 4) Active experimentation in which students apply the results of his experience to work on individual tasks that teacher prepared. Finally students were given individual tasks either orally via a question and answer before the lesson finish. From effectiveness test results, experiential learning models is eligible to be effective in this study was supported by the results of previous studies of Rahmawati, Hidayah, and Darmo (2013), which examines effectiveness model of experiential learning with REACT strategy towards mathematical and communication skills result that the model is able to deliver experimental class achieve minimal passing grade assigned. Similarly, the results of Azizi, Susanto, and Pambudi (2013) research which showed an increase in passing grade for the implementation of experiential learning in circle material so it can be concluded that the model is quite effective in its implementation.

According to Rogers (1983: 113) it is important to make the learning experience as meaningful and personal to encourage students to use their minds rather than just receive information. Experiential learning is one of the principles of humanistic learning developed by Carl Rogers in which meaningful learning is to learn about the process of learning. At this time the existing knowledge of science and technology is developing rapidly, what is learned in the past is not enough for the investment in the future. What is needed now is an individual who is able to learn in different environments. Learning happens in daily life, the experience of learning have their own meaning and personal relevance. Implementation of the humanistic approach in learning is important to start soon. In addition to character education to students it is important as a teacher to be a humanist

facilitator so that students can learn to acquire the learning objectives. During the lesson, little things can be done to provide humanistic learning environment needs to be applied. Suppose that in classroom discussions, the teacher must respond to any expression came up and received both intellectual content with a good feeling and in appropriate way both for individuals and groups. Teacher as a facilitator helped take participation in the group, but the feelings and thoughts should not be demanding and pushy, but as a personal contribution which may be accepted or rejected students (Zimring, 1999).

Conclusions and Recommendations

Grader VB Kanisius Kurmosari Semarang primary school on the initial conditions are generally low in self-efficacy sources "psychological indices" in which a personal self-efficacy is based on the interpretation of the emotional and physical condition in preparing a task or a performance. In other words, students still have low of confidence or toughness in dealing with mathematical problems so feel anxious. While the mathematical representation capability of student in general is low in creating and using representations to organize, record and communicate mathematical ideas especially visual representation. After implementation experiential learning students are able to use representations to organize, record and communicate mathematical ideas. Specifically for student in upper and middle groups are quite able to select, implement and interpret mathematical representation to solve problems. Upper group students has begun to use representations to modelling physical phenomena, social, and mathematical. Whereas upper group's self-efficacy high on *self-reliant* aspects that represent personal ability to do the work without the others help, for the middle group dominant aspect is *endurance* that represents a person can do math well with an emphasis on the sense that he is more likely to survive and challenged in facing difficulties. The

lower group has strongest self-efficacy aspect is curious which is the aspect describes a person who always willing to understand the material being taught by teachers.

Mathematics learning with experiential learning model based on Carl Rogers theory in geometry material is effective which is demonstrated with valid devices (syllabus: 4,41; lesson plan: 4,45; student book: 4,23; worksheet: 4,44; and test: 4,18 out of 5 scale); the average of mathematical representation capability is 70 met the criteria more than 64 and whole class reach 87 % met the criteria more than 70% of whole class achieve the passing grade; self-efficacy and mathematical representation skill effect significantly 78,4% toward mathematical representation capability with the regression equation is $\hat{Y} = 25,190 + 0,215X_1 + 0,999X_2$; an increase in self-efficacy of lesson 1 to 5 respectively: 0.13; 0.14; 0.10; 0.28; 0.50 and an increase of mathematical representation skills : 0,14; 0.08; 0.25; 0.16; 0.49.

This study has recommendation for the teachers are deepen more about humanistic learning which design the lesson as student-centered. It can be started with the simple actions like minimize treatment tends to dictate the student to do what we want, giving trust, prizing and acceptance them as valuable person, unique individual and respect both their feeling and opinion. Give them opportunity to choose and use appropriate representation to solve mathematics problem. By creating humanistic learning indirectly teachers help to increase positive student's self-efficacy because the students effort being supported and get the reinforcement to achieve their goals. For the students, this study suggest to increase their self-efficacy by never give up even being challenged in facing the learning difficulties to get the solution. Practice more in using representation to model and interpret the mathematics problems so they can get the best appropriate solution

especially for solving contextual problems. For next researcher, they have many chance to make advanced research in collective self-efficacy for example remembering the limited study that discuss about this. Collective self-efficacy one alternate way to increase personal self-efficacy. Futhermore, the research about representation still open widely for advanced study example for another treatmen, material and so on.

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THE SOUTHERN CROSS LANE (JLS) OF JAVA AND ITS IMPLICATIONS TOWARD THE ECONOMIC AND SOCIAL COMMUNITY

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ABSTRACT

The lane is a vital facility and becomes a primary need for the community. Various research shows that the existing lane has implications for socio-economic development of society. This research aimed at viewing the social and economic impacts arising from the presence of the southern cross lane (JLS) which crosses the district of Pacitan. Results of this research shows that the presence of the southern cross lane in Pacitan provides significant socio-economic impact on society. However, the impact of the stretching economic development must be accompanied by education of the communities around JLS.

Keywords - Southern Cross Lane (JLS), Java island, social, and economy.

Introduction

The southern cross lane, especially in East Java is one of the strategic programs of the central government as well as the provinces through eight districts. Those are Pacitan, Trenggalek, Tulungagung, Blitar, Malang, Lumajang, Jember and Banyuwangi. The development is motivated by per capita income gap between northern, central, and southern island of Java.

Ease of lane access will trigger the economic passions of agriculture, fisherie, transportation, communication sector and even tourism. The society is motored to do activities in the non-agricultural sectors. The so-called the establishment of a food stall, grocery, hospitality, rental services, car rental, and the like.

A similar research had ever been carried out by Hardi Utomo and M. Roziqin Herianto (2012) entitled "The impact of Salatiga southern ring road construction to the development of small and medium businesses throughout the southern ring road of Salatiga" which concluded that the existence of the southern ring road was reducing congestion on arterial roads, breaking up the concentration of economic

activities, opening up isolated areas, utilizing land, creating jobs in the services sector, improving the economy and environmental infrastructure as well as social facilities which can be utilized for the public interest.

Moreover, the existence of the JLS improve the psychology community to foster a business climate in society. The ring road easily makes a mode of transportation connect one region to another region. The existence of the southern ring road can create jobs, improve people's income, increase revenues of Salatiga. The slow development of small and medium enterprises of southern ring road in Salatiga was caused by weak capital and access toward sources of capitalization, limited ability in technology mastery, weak organizational and business management, and intense busniess competition.

In that context, this reserach aims at revealing the response of the people in Pacitan against the construction of the southern cross lane, revealing micro and macro impact of the construction toward social and economic conditions of Pacitan society, and also formulating policy

recommendations that can be used to prevent negative impacts for people in Pacitan. Finally this study can be the foundation in formulating policies to optimize utilization and minimize the negative impact of the southern cross lane existence.

Theoretical Review

Construction is the whole activities which are simultaneously running. It covers plan, implementation, and evaluation in order to achieve the goal of welfare changes towards a better society. Such activities are supported by construction policies, so as to guide the representative in increasing the added value in achieving these changes. Construction is a process of change that includes the entire social system; such as politics, economy, infrastructure, defense, education and technology, institution, and culture (Alexander; 1994).

Meanwhile, the construction is tightly related with infrastructure, including access to the roadway. The road is a land transportation infrastructure of which covers all parts of the road, including complementary buildings and equipment intended for traffic, which is at ground, above ground, below ground and/or water, and above the water surface, excluding railroad train, lorries road and railroad.

In UU/Constitution No. 38 year of 2004 was stipulated that the implementations of the road are the following activities: 1) road regulation, which is the formulation of a common planning policy and drafting road statutory regulations; 2) guidance, which is drafting guidelines and technical standards, service, empowerment of human resources, and research and development of the road; 3) road construction, namely programming and budgeting, technical planning, construction execution, operation and maintenance of roads; 4) road supervision, is the activities undertaken to realize the

orderly arrangement, guidance and construction of roads.

Furthermore, the purpose of the southern cross lane construction of the Java island is to meet the public facilities or interest. Public interest is broadly termed as interest including personal or group interests, or in other words, the public interest is an interest that covers most people (Mudakir Iskandar Syah: 13).

Besides, the classification of public interest according to Presidential Regulation No. 65 year of 2006 as described in Chapter 5 is as follows: 1) public roads, highways, railroads (above ground, in the space above the ground, or in the basement), drinking water channels or clean water, sewer and sanitation; 2) reservoirs, dams, weirs, irrigation, and other irrigation buildings; 3) ports, airports, railway stations and terminals; 4) public safety facilities such as date of flood hazard countermeasure, lava, and other disasters; 5) landfills; 6) natural reservation and cultural heritage; 7) generator, transmission, distribution of electricity.

Research Methods

This research is kind of qualitative descriptive approach with case study method. Qualitative descriptive approach is chosen because this research aims at understanding and describing the phenomenon of what is experienced by research subjects holistically, and by way of description in the form of word and language, in a natural specific context by utilizing a variety of natural methods, which is carried out on a "unified system" (Moloeng 2006; Sukmadinata, 2010).

Data collection from respondents was conducted in four sub-districts in Pacitan, Those were Pacitan, Kebonagung, Ngadirojo, and Sudimoro. Respondents were taken using purposive and snowball sampling techniques. Purposive sampling

was used to select a few key informants such as village officials, police, and also official related institutions. The people around the JLS snowball sampling was also selected to be the respondents.

Referring to the form of qualitative research approaches and used data sources, then the used data collection techniques were documentation, questionnaire, interview, and focus Group Discussion (FGD). The used data analysis technique was descriptive narrative by using the Miles and Huberman model.

Results and Discussions

Pacitan is one area that is mostly in hills and mountains, cliffs, and includes part of a thousand mountains that stretches along the Java island. Pacitan Regency is one of regencies in East Java province, located in the Southwest and directly adjacent to the Central Java Province. The north side borders Ponorogo (East Java) and Wonogiri District (Central Java), the east side borders Trenggalek (East Java), the west side borders Wonogiri District (Central Java), and the south side borders Indonesian ocean. Geographically, Pacitan is located between 7,920 southern latitude up to 8,290 southern latitude, and between 110,900 eastern longitude to 111,430 eastern longitude.

Pacitan regency has an area of 1389.87 km², which consists of a wetland area of 130.15 km, equivalent to 9.36% and the dry land area of 1259.72 km², equivalent to 90.64%. Administratively, the region is divided into 12 sub-districts. The most wide area is sub-district Tulakan, namely 161.61 km² and sub-district Tegalombo 149.25 km². On the contrary, the smallest area is sub-district Sudimoro, within 71.86 km². From the 12 available sub-districts, those have number of 171 villages which consists of 5 kelurahan (has less autonomy than village) and 166 villages, where 19 of them have the status of city and 152 remainings have status of the

countryside, which are divided into 1,745 RW (hamlet) and 4,970 RT (neighborhood).

Viewed from topographical perspective, Pacitan consists of coastal areas, lowlands and hills. The topographic conditions can be broken down as follows: 1) flatsoil (slope class 0-5%) within area of 55.59 km², equivalent to 4% from Pacitan regency area; 2) wavy (slope class 6-10%) within area of 138.99 km², equivalent to 10% from Pacitan regency area; 3) corrugating (11-30% slope class) within area of 333.57 km², equivalent to 24% from Pacitan regency area; 4) Hilly (slope class 31-50%) within area of 722.73 km², equivalent to 52% from Pacitan regency area; 5) mountainous (slope class >52%) within an area of 138.99 km², equivalent to 10% from Pacitan regency area (Mukodi, 2014).

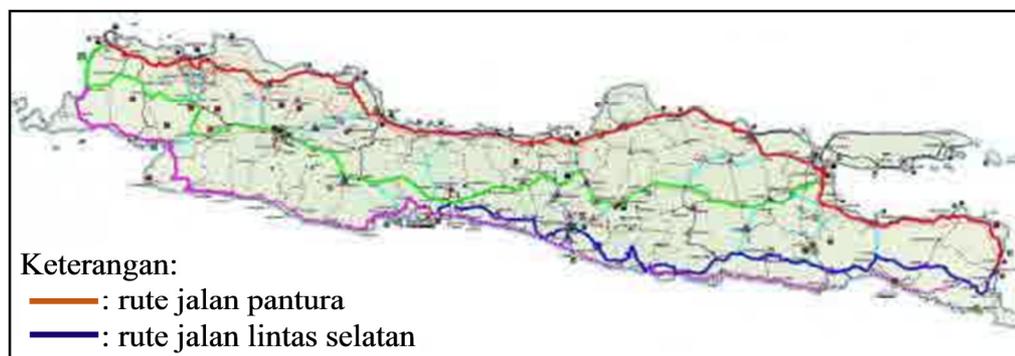
Geography and topography condition of Pacitan largely determine the access to transportation between villages and between sub-districts. The farthest distance between those districts is between sub-district Donorojo and sub-district Bandar as far as 107 km, while the shortest distance between those districts is between sub-district Donorojo and sub-district Punung or sub-district Punung and sub-district Pringuku which is 6 km. The farthest distance to the closed sub-districts is the distance between sub-district Bandar and sub-district Tegalombo as far as 86 km.

In terms of population, according to the Population Census of 2010 (SP2010), the total population of Pacitan inhabitants is 540 881. The composition of the population viewed from sex consists of men who is 264 112 people (48.83%) and women who is 276 769 people (51.17%). While based on the Population Register in 2013, the population of Pacitan is 599 939 people, consisting of men who is 298 053 people (49.63%) and women who is 301 886 people (50.32%) within the sex ratio 98.73% (Balitbantik, 2014).

The Program of Southern Cross Lane

One of effort to balance growth and also face the challenge of population density in the northern coast of Java and southern coast of Java is the development of infrastructure. One of the infrastructure to be built is in the

form of roads and bridges, as both is an infrastructure that can be the lifeblood of the region as well as developing a shaper of space structure of region. Regarding to this state of affairs, the government's efforts is the development and improvement of road infrastructure across the southern island of Java (Taufik Widjojono, 2008).



Gambar 1 Ilustrasi Jalur Lintas Pulau Jawa

Figure 1 Illustration of Cross Lane in Java Island

The existence of the southern cross lane is expected to be part of the road network across Java and became the main access instead of northern cross lane. Likewise with the construction of the southern cross lane in the province of East Java, which is intended to develop the eight regencies in the south, namely Pacitan, Trenggalek, Tulung District Court, Blitar, Malang, Lumajang, Jember and Banyuwangi.

South highway construction is done in stages in accordance with the ability of central and local government budgets. Especially in Pacitan, the construction of the southern cross lane is divided into several roads, namely road Glonggong-Pacitan (36.5 Km), road Ploso-Pacitan/Ringroad Pacitan (4.8 Km), road Pacitan-Sidumulyo-Hadiwarno Pacitan (30, 91 Km) and the Hadiwarno-Trenggalek boundary (15 Km).

Up to now, it is just road Pacitan-Sidumulyo-Hadiwarno which has been inaugurated by the Minister of Public Works, Djoko Kirmanto, on August 22, 2013. The road construction of Pacitan-Sidumulyo-Hadiwarno is also equipped with 9 bridges within total length 510 meters, which comprises Bridge Gawang I, Bridge Gawang II, Overpass Gayam, Bridge Kakap, Bridge Wora Wori, Bridge Padi Dangkal, Bridge Balang, Bridge Soge I, and Bridge Soge II.

Southern cross lane construction is certainly not away from existing various obstacles, among other physical conditions or hard southern contour of Java island, limited funds, land acquisition, and also annual contracts issues. Therefore, up to now JLS has not been able to connect the entire region on the southern island of Java, of course with various obstacles respectively.

The existence of a new facility would not be separated from pros and cons in the community, including the case with the presence of the JLS. However, the general construction of the JLS has been mostly

supported by people. Results of this study showed that for many reasons, all respondents agreed with the construction of the JLS. Likewise the issue of determining the location of the JLS, which is not disputed by the public. Society has assumed that the government has considered it carefully related to the determination of the JLS.

Nevertheless, it is not necessarily the construction of the JLS can run smoothly without any obstacles. The preparation process of development, particularly in terms of land acquisition, become a real problem. The absence of land price agreements between the public and government results the delay of the JLS construction for several months. On the one hand, the government proposed a budget in accordance with a predetermined ceiling, but on the other hand, people want their land compensation used as the southern cross lane (JLS) to be increased.

These constraints even make the Minister of Public Works (PU) Djoko Kirmanto-at that time - to intervene directly to help the process of land acquisition (Spatial, 2013). Soils that should be freed reach 742 hectares by the release of funds Rp36 billion coming from APBN (state budget) and APBD (regional budget). Finally in mid-2013, an agreement was occurred between the people of Hamlet Godeg, Jetak Village, Sub-district Tulakan and the government. After that, the construction of JLS was continued, and the route Pacitan-Sidumulyo-Hadiwarno had been completed and inaugurated on August 22, 2013.

The existence of the JLS is a great scenario, to evenly distribute the development between the North Zone of Java island and South Zone of Java island. The JLS is projected as a liaison between the regions and cities that are in the South Region of Java, so it will still have an impact on the economic growth of each region. But until now, the JLS has not really been able to

connect the southern region of the island of Java.

Social and Economic Impact

The existence of JLS even make transportation access easier. The implication is such increasing road users from different regions and from different backgrounds. These conditions resulted in a slight shift in lifestyle in some communities, especially in performance and intercommunication. It's frequently founded that young couples are alone together along the way, particularly in tourist areas, either day or night. Likewise with the recognition of a public figure that says that one of the favorite locations of young people, is used as a place to alcoholic drink. Even so, there are no criminals data being police records related to it.

The construction of a public facility is projected to have a positive impact on the quality of community service. Likewise with the construction of the JLS-through-Pacitan also provides real impact that can be felt by the people, including indigenous people around, people in Pacitan in general, and the people of other regencies/towns.

First, increasing the selling price of the property, primarily in the form of land. The perceived increase in land prices is significant, ranging from 1000% to 2000%. Originally, the land which has a selling price of Rp. 20,000.00 per square meter, is now appreciated to Rp. 200,000.00 per square meter, even for certain places it reaches Rp. 500,000.00 per square meter. Similarly to the value of land, lots of land previously unused because of the barren, is now able to rent and can even be used to set up shop.

Second, the rising price of properties rental, either in the form of land, houses, and shop. As one respondent stated above, the land that was originally neglected and not utilized, now it becomes the productive land to be rented, or setting up shop to be rented out other parties.

Third, the rising of the shop enterprise (grocery stores, sellers of fuel, mobile phone stores and pulses). After nearly two years of its inauguration, shops throughout the village began to appear that is passed by the JLS.

Fourth, the growing world food sector businesses (restaurants and food stalls). Along with the increasing JLS users, have an impact on the increasing need for food along the JLS. Many food stalls and restaurants, ranging from the simplest (angkringan, huts and stalls), to a more representative such as a restaurant.

Fifth, increasing of production business sector, such as in the field of furniture, building stones, and various processed cement. There are two new central location of furniture, which produces a variety of wood crafts, such as tables, chairs, and cabinets. Similarly, with the sale of sand and stone building materials which are displayed along the JLS in the village Hadiwarno Ngadirojo. While various processed cement such as concrete blocks, paving, pillars, and others are also found in the village of Hadiwarno Ngadirojo.

Sixth, the increase in the services business sector, such as workshops, electronic service and mobile phones, as well as the services of a haircut. Almost the motorcycle services are appeared entire village along the JLS, ranging from tire workshop until a complete bike shop. While electronic service and mobile phones are in the village of the sub-district Worawari Kebonagung, hair cut services are in the village Sidomulyo Ngadirojo.

Seventh, the increasing development of tourism, namely Soge Beach, Taman Beach, and Pidan Beach, and others. Initially, only the Taman Beach (Village Hadiwarno Ngadirojo) which has been opened to the public commercially. Even though it is still very modest and has not been able to attract many visitors. Likewise with Soge Beach

(Village Sidomulyo Ngadirojo) and Pidakan Beach (Village Jetak Sub-district of Tulakan) which are previously not utilized, both are now to be a commercial attraction and the new favorite recreation spot. Moreover, the support of facilities in the form of the entrance location to the beach, makes the beach accessibility easier. The implication is that the tourism object in those three locations is increasing.



Figure 2. Beach Soge

Conclusions and Recommendations

The existence of the JLS in Pacitan as part of the way across the southern island of Java gets a very good response in the community. The existing condition of the JLS is stretching the impact of macro economic growth of local communities, particularly in the area of Pacitan.

Road construction across the southern island of Java should be accompanied by education on society, in order to minimize the negative impacts that can be generated, as well as optimize utilization well. Educating the public related to the domino effect of road construction should be done to avoid the exploitation of excessive natural resources.

In addition, the need for training and assistance for productive family, to exploit the potential of existing local as well as possible.

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CHARACTERISTICS OF GEOMETRIC THINKING THROUGH VAN HIELE'S PHASE-BASED LEARNING USING GEOMETERS SKETCHPAD

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ABSTRACT

The purpose of this study was to describe the characteristics of VII grade students geometric thinking. This research was a descriptive qualitative research. The subject of this research was nine students of VII grade at SMP N 2 Rembang consist of three students from each level 1 (visualization), level 2 (analysis), and level 3 (informal deduction). Data in this research was the characteristics of geometric thinking obtained from test and interview. (1) Students of level 1 can define transformation based on the appearance; grouping the pictures; but can't understand properties of each transformation or related to another; (2) students of level 2 can define, grouping transformation based on the appearance, and explain properties but can't related to another; (3) students of level 3 define, grouping transformation, understand properties of each transformation, also admit relation from any kinds of transformation, but can't locate vector translation or center of rotation, also can't decompose transformation. These study suggest teacher to design instruction that encourage students' thinking processes with Van Hiele's Phase-Based Instruction using the Geometer's Sketchpad (GSP) concern to their characteristics.

Keywords – Characteristics of geometric thinking | Geometers Sketchpad | Van Hiele's phase-based learning

Introduction

Geometry is one of the important branch in mathematics. Geometry should be learned by students from primary school until university level in almost every country in the world. The study of learning geometry as an essential skill to learn other topics in mathematics was stressed by (Hwang et al, 2009; Idris, 2009; Al-Shehri et al, 2011; Alex & Mammen, 2012; Meng & Idris, 2012; Nurhasanah et al, 2013; Sunzuma et al, 2013; Kutluca, 2013; Aydoğdu, 2014; Bal, 2014; Tieng & Eu, 2014).

Although geometry provide numerous benefits, but in fact the performance of Indonesian secondary students in geometry was still unsatisfactory as highlighted in a number of reports on international assessment studies. Specifically, in the Third International Mathematics and Science Study (TIMSS) 2011 report that the average geometry achievement of Indonesian at 8th

grade (377) less than the international score average achievement (500).

According to Idris (2009), the failure in learning geometry cause of individual's cognitive development, instructional practices and materials and the mathematical system. Another factor is inappropriate instruction that does not encourage students' thinking processes. It focuses only on recognising and naming geometric shapes and learning to write symbols for simple geometrical concepts (Abdullah & Zakaria, 2013). TIMSS reported that half or more of the lessons are spent memorising formulas and procedures (Mullis et al., 2000, 2004, 2008; Dogan & Icel, 2011) and didn't concern student's geometric thinking (Safrina et al, 2014). This because many teacher do not know the characteristics of their geometric thinking (Muhassanah, 2014). The best model in teaching and learning geometry and can enhance in

geometric thinking is phase based Van Hiele model (Crowley, 1987).

Usage of technology tools also have great influence in the teaching and learning process. Student could learn collaboratively and constructively through social interaction and self exploration (Shadaan & Eu, 2013). Several study had reported the effectiveness geometers sketchpad in enhancing student's Van Hiele's level of geometric thinking and found that its help the students to gain better understanding and increase their motivation of learning mathematics in class (Dogan & Icel, 2011; Meng & Idris, 2012; Meng & Sam, 2013; Abdullah & Zakaria, 2013). Therefore in this study, the researcher attempted to investigate students characteristics of geometric thinking through phased based van hiele learning using geometers sketchpad. Specifically, this study aimed to answer the research question: how is the students characteristics of geometric thinking through phased based van hiele learning using geometers sketchpad?

Theoretical Review

Dina and Pierre van Hiele, two Dutch educators in their doctoral study developed a model that may reflect how children learn geometry. The five levels of geometric thinking that also stated by Guven (2012) as follow.

Level 1: Visualization/Recognition, the student recognises geometric figures by their global appearance, identifies names of figures, but does not explicitly identify their properties.

Level 2: Analysis, the student analyses figures in terms of their components and properties, discovers properties and rules of a class of shapes empirically, but does not explicitly interrelate figures or properties.

Level 3: Informal deduction, the student logically interrelates previously discovered properties and rules by giving or following informal arguments.

Level 4: Deduction, the student proves theorems deductively, develops sequences of statements to deduce one statement from another, but does not yet recognise the need for rigour.

Level 5: Rigour, the student establishes theorems in different axiomatic systems and analyses and compares these systems. But in this study, researcher only focused on the first three levels. This also state on several study that most research also concentrated on lower levels since majority of high school geometry courses are taught at level 3 (Usiskin, 1982; (Burger & Shaughnessy, 1986; Crowley, 1987; Guven, 2012).

According to the van Hieles, the learner, assisted by appropriate instructional experiences, passes through the following five levels, each of which depends on successful achievement of the previous levels (Crowley, 1987). The five phases of learning (phase-based instruction) that also stated by Meng & Idris (2012) as follow.

Phase 1: Information. The teacher engages students in conversations about the topic to be studied, evaluates their responses, and provides them with some awareness of why they are studying the topic so as to set the stage for further study.

Phase 2: Guided orientation. Students actively explore the topic of study by performing simple tasks designed to elicit specific responses so as to become acquainted with the objects from which geometric ideas are abstracted.

Phase 3: Explicitation. Students learn to express their opinions about the structures observed during discussions in class. The teacher leads students' discussion of the objects of study using their own words until a consensus is achieved so that they become explicitly aware of the objects of study. Then, the teacher introduces the relevant vocabulary.

Phase 4: Free orientation. Students are

challenged with more complex tasks that can be completed in different ways (Crowley, 1987). The teacher encourages students to solve and elaborate on these problems and their solution strategies, and to introduce relevant problem-solving processes as needed.

Phase 5: Integration. Students summarize what they have learned about the objects of study with the goal of forming an overview of the topic.

Crowley (1987) described the characteristics of the five levels of van Hiele model as follows: (1) The model is sequential in that a learner cannot function at a higher level without first progressing through the thought processes of all previous levels; (2) progress from one level to the next is not through biological development but rather depends on instruction; (3) the linguistic symbols of each level are unique, that is, each level is regarded as having its own language, and learners on different levels cannot understand one another; (4) the intrinsic characteristics of one level become the extrinsic objects of study of the next; and (5) the mismatch between the level of instruction and the level at which a student is functioning may restrict the desired progress.

Research Methods

This paper reports on the characteristics of students geometric thinking through phased based Van Hiele learning using GSP. Based on the aims of this research to describe the characteristics of students geometric thinking through phased based Van Hiele learning using GSP, this research can be considered as descriptive qualitative research (Cresw (Creswell, 2008)ell, 2008). The research involves 7th grade students in SMP N 2 Rembang consisting of 32 students, but only 9 students who are assigned as the subject of this research. These students were selected based on their achievement, performance, their

communication skills, and the result of the test. First, those 32 students of VII-4 was given Van Hiele Geometry Test (VHGT) which was developed by the Cognitive Development and Achievement in Secondary School Geometry (CDASSG) group from the University of Chicago (Usiskin, 1982) and then the researcher analyse and grouping based on their geometric thinking. Then the students was taught with phased based Van Hiele learning using GSP and do test. From the result of the test then researcher choose nine students consisted of 3 students of level 1 (visualization), 3 students of level 2 (analysis), and 3 students of level 3 (informal deduction. The data were collected using observation, test, and interview. The observations were conducted in the class during learning process of transformation, assisted by GSP. During this process all students' activities were observed and videotaped. In this class, the teacher used phased based van Hiele model using GSP. The observation was held by using a camera, particularly when the students explore the material using GSP and solved problems on transformation. The test was constructed in order to identify characteristics their geometric thinking. Then, the data from observation and test were analysed to determine the subject of this research and also to determine which students should be interviewed. Deep interview were conducted to nine student from each level for the sake of triangulation.

Results and Discussion

Based on VHGT result show that from 32 students at SMP N 2 Rembang only 4 students can achieve level 3 (informal deduction), 12 students at level 2 (analysis), and 16 students at level 1 (visualization/recognition). From those result also see that none of students can achieve level 4 or level 5. This also similarly with several study such as (Usiskin, 1982; Burger & Shaughnessy, 1986; Walle, 2001; Guven, 2012; Abdullah & Zakaria, 2013)

which state that most of geometric thinking achievement at secondary school is until level 3 (informal deduction).

From this study also can see that there are differences in characteristics of students geometric thinking. Its also state by (Budiarto & Sofyana, 2011) there are different characteristics of geometry skill based on Van Hiele levels and students need those geometry skill to solve problem in geometry.

Based on analysis of test and interview from 9 subjects, the characteristics of students geometric thinking from this study can describe as follow:

1. The characteristics of students geometric thinking at subject level 1 (visualization/recognition):

The subject at this level show that they can identifies transformation by the changes in the figure, subject at this level also can grouping the figure given based on the transformation occurred, but when they asked to explain the properties of the kind of transformation they still have some difficulties or does not explicitly identify their properties. The subject at this level also haven't been able to differentiate between kinds of transformation each other based on the properties of its image. The subject of level 1 haven't been able relates between kinds of transformation or able formulate the sentence which show the relationship.

2. The characteristics of students geometric thinking at subject level 2 (analysis):

The subject at this level have be able identify and grouping kinds of transformation by the changes in the figure or by the properties of given transformation. The subject at this level also can state or explain the properties of given transformation explicitly. Specificly can say changing form, length measurement, angle measurement but can't explain or interrelate kind of transformation to another.

3. The characteristics of students geometric thinking at subject level 1 (visualization/recognition):

The subject at this level have be able to identify and grouping kinds of transformation by the changes in the figure or by the properties of given transformation. The subject at this level also can state or explain the properties of given transformation explicitly. Specificly can say changing form, length measurement, angle measurement. This subject have been able interrelate the properties changes to a figure resulting from transformation. They also can performs composition of simple transformations. But they can't decompose or recombine a transformation as a composition of simple transformations.

The findings of this study are consistent with conclusions reached by Muhassanah (2014), who found that every level of geometric thinking skill have different characteristics. From the third result of the test also show that there are improvement understanding level on several students from level 1 (visualization) to level 2 (analysis), and from level 2 (analysis) to level 3 (informal deduction). From the score of the test show that there are 11 students who can achieve level 1, 15 students can achieve level 2, and 6 students can achieve level 3. This also can observe from the progress of the students in explore geometers sketchpad while learning concept and construct their knowledge about the concept learned.

There are several possible explanations for the students progress. First the use of instructional activities based on the van Hiele theory. This is consistent with the findings of previous studies on Van Hiele phase-based instruction using geometers sketchpad (Idris, 2009; Abdullah & Zakaria, 2013; Meng & Sam, 2013; Tieng & Eu, 2014). During Learning Period, in Information Phase students named transformation. They identified the properties of transformation using the manipulatives GSP in Guided Orientation.

Next, they presented the properties to the class using their own words and then learned the standard vocabulary for describing them in Explicitation. In Free Orientation, they solved problems involving properties of transformation and using the manipulatives. Finally, in Integration, they summarized the properties.

Second, the use of the manipulatives GSP based on the van Hiele theory provided the students with opportunities to first investigate visually the kinds of transformation, then analyze their properties, and finally develop arguments about relations among their properties. This also consistent with the findings of previous study which stated that Technology in mathematics classrooms must be an effective tool to enhance this interaction between students and the teacher by allowing them to investigate their conjectures (Koh & Sook, 2000). In addition, the opportunity to observe dynamically the features of geometric transformations in an exploratory environment increased students' understanding of these features (Guvén, 2012).

Third, scaffolding and guidance from the teacher also have contribute to the students' progress. During Information, the teacher engaged the students in conversations to learn what they already knew. During Guided Orientation, teacher carefully sequenced the instructional activities for the students to investigate. During Explicitation, he encouraged the students to share their findings using their own words and introduced relevant vocabulary when appropriate. During Free Orientation, teacher chose open ended problems or problem-solving for the students to solve and elaborate solution strategies. Finally, teacher guided the students in summarizing the properties and relationship among properties of transformation in Integration.

This findings also consistent with previous study (Amiripou et al, 2012) which stated that scaffolding method can motivate to problem solving procedure for student, promote current level of student's capacities and social relations, increase self-confidence of student in difficult mathematical problem solving.

Conclusions and Recommendations

The conclusion of this study are; (1) the Van Hiele phased based learning using geometers sketchpad has positive effect to enhance the students levels geometric thinking; (2) the characteristics of geometric thinking at students level 1 (visualization) are can identifies transformation by the change in the figure, grouping transformation based on the figure, students level 2 (analysis) can discover and state the properties of transformation, uses the properties of changes to draw the pre-image or image of a given transformation, students level 3 (informal deduction) can describe changes to states image or pre image after composite transformation, performs composition of simple transformation, represents transformation using coordinates, interrelates the properties of changes to a figure resulting from transformation. In light of the findings of this study, the following recommendations can be suggested for geometry teaching: (1) the geometry understanding level of students can be improved with the help of computer assisted (GSP) so geometry course at secondary school should be design so its supportive and appropriate to van hiele geometric thinking level, (2) every students at the class have different level of geometric thinking so teacher can give appropriate task for students based on their characteristics such as: for students at level 1 (visualization) teacher should be give task not only focus on visual but also that emphasise on analysis; for students at level 2 (analysis) teacher should be giving task that help students to improve their verbal skill and develop their inductive reasoning; for

students at level 3 (informal deduction) teacher should be give task that enable students to make conjecture and develop to deductive reasoning.

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DEVELOPMENT OF ATONG BASED REFERENCE MODULE FOR SCHOOL GEOMETRY SUBJECT AND ANALYSIS OF MATHEMATICAL CREATIVE THINKING SKILLS

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ABSTRACT

This research aims to develop a ATONG based reference module for school geometry subject that meets the criteria of a valid and practical. ATONG approach is learning by exploration, elaboration, and confirmation. Students are always taken on the atmosphere of observing, questioning, analyzing, associating, and expressing (scientific). Geometry subject presented in the module are triangle, the Pythagorean theorem, and rectangular. Mathematical skills of creative thinking can be seen from four aspects: fluency, flexibility, originality and elaboration. Research procedures in the development of reference module using a strategy of research and development described by Borg and Gall (1983), which is limited to the sixth stage is main field testing. The focus of this research is to develop a reference module that is valid, practical and able to increase the mathematical creative thinking skills of students. The testing is limited to three teachers, nine students and two mathematic readers using purposive sampling technique. The data validity, practicality, and creative thinking skills upgrading collected through questionnaires, observations, and interviews and analyzed with a valid test, practical test, gain test and qualitative descriptive. The results were obtained (1) the validity of the module = 4.52, which is $4.20 \leq Vm < 5.00$ are included in the category of very valid; (2) the results of the questionnaire responses of teachers = 4.53, which is $4.20 \leq Rg < 5.00$ are included in the category of very good; (3) the results of the questionnaire responses of students = 3.13, which is $2.80 \leq Rpd < 3.40$ are included in the category of good with an average percentage of 78%; and (4) increasing skills of creative thinking mathematically nine students through the test of the gain is included in the high and medium category. The conclusions in this research are the generated ATONG based reference module for school geometry subject is valid and practical.

Keywords – Development of Reference Module, ATONG Approach, Geometry, Creative Thinking

Introduction

Education has an important role for the development of each individual. With education, the potential possessed by every individual can be developed optimally into a person who is independent, responsible, active, and skilled in solving various problems. In addition, education also has an important role for the progress of a nation. With education, a nation can form the young generations who are qualified and strong to build the nation.

In the sphere of education, mathematics is one of the subjects which are considered to have a very important role, because mathematics can improve the knowledge of a student to think logically, rationally,

critically, accurately, effectively and efficiently. In addition, mathematics also has an important role in developing education. Mathematics is seen as a basic science for the development of other disciplines. The importance of mathematics make mathematics is taught at every level of education in Indonesia. It is started from elementary school into high school with the allocation of considerable time. Besides, mathematics is still regarded as a scourge for students. They assume that mathematics is difficult and abstract. But in fact mathematics is very close to our daily lives.

Based on Law No. 20 of 2003 Chapter II Section 3 of the National Education System, it is mentioned that one of the goals national education is to develop the ability, character,

and creative potential. Therefore, the ability and creative thinking skills must be owned also by every student in the mathematics learning. Mathematics requires logical thinking, efficient, ideas and creative patterns and amazing. Therefore, mathematics is often called as the art of creative thinking (Fathani, 2009). Creativity is the ability to think about things in a new way and unusual and produce a unique solution on a problem (Santrock, 2008). Creativity can be measured by four criteria, namely; (1) fluency; (2) flexibility; (3) originality; and (4) elaboration (Munandar, 2009).

There are some learning subjects that the students get often the difficulties to understand or teachers are difficult to explain. The difficulties are happened because the subjects are abstract, complicated, or unfamiliar. To resolve these difficulties, it is necessary to develop a book or appropriate teaching materials (Depdiknas, 2008). One of the mathematics subjects' which is considered as difficult and abstract by students is geometry. The results of the national exam (UN) in 2012 shows that the average absorption students junior high school in Central Java for the material geometry, especially the Pythagorean theorem, flat figure, and the triangle is still below the average of the national absorption capacity. This is supported by observations and interviews of researchers in some schools in Semarang city. Based on observations and interview, researchers obtain the fact that there are still many problems in the learning mathematics. This problem can be seen from four aspects: subjects, students, teachers and learning resources.

In terms of subject, geometry indeed is one of the subjects which are difficult to be mastered by students. Students of elementary schools, junior high schools, and high School generally get difficulties in the flat geometry of subject and the geometry of space subject. Most of them are difficult to

imagine things that are abstract despite using props.

In terms of students, most students still have a low level of mastering the subjects and a low level of learning seriously. Most of the students are also difficult in working on different sample questions given by the teacher when in fact the same concept used. This indicates that the level of creative thinking of students is still low.

In terms of teacher, most teachers are still glued with the learning time. So sometimes the students do not really understand the subject which is taught, but teachers should continue to the next subject. So that, teachers can not follow the learning speed of each student.

In terms of learning resources, existing textbooks are still feels boring, unattractive and difficult to be understood by students.

The facts, as mentioned above encourage authors to do research development reference module that can be used not only in the classroom but also can be used anytime and anywhere as a reference study. This reference module can also customize the speed of comprehension each student. The module is a book written with the purpose make the students can learn independently (Depdiknas, 2008). Reference is derived from English that refer to which means to turn, to far aid, or information. According to Indonesian dictionary, reference means a reference source, reference, or instructions. So the reference module is a module which the content and the presentation could be used to obtain information about the science deeply and extensively. This module can also be used by anyone students who need it. Learning by using module enables a student who has high speed in learning to be more quickly complete the module compared to other students (Depdiknas, 2008). The advantage of using module as a reference, among others, is to facilitate students in learning,

the existence of many and immediate feedback, mastery of the subject more complete and students more independent and motivate to complete the module itself within its capabilities (Nasution, 2009).

Mathematics subject that will be presented in a reference module is geometry subjects in school namely (1) triangle, (2) the Pythagorean theorem, and (3) rectangle. The use of this reference module will facilitate the students more interested in learning geometry and increase the mathematical creative thinking skills of students.

Reference module that was developed in this study is ATONG based reference module. ATONG approach is learning by exploration, elaboration, and confirmation. Students are always taken on the atmosphere of A(Amati = observing), T(Tanya = questioning), O(Olah = analyzing), N(Nalar = associating), and G(Gagas = expressing). Amati = observing, means not only see but also read the questions or issues to explore the whole concept to be learned. Tanya = questioning, means asking questions about information that is not understood from what was observed (exploration) or asking a question to increase the flexibility of information. Olah = analyzing, means doing experiments, processing information from the results of observing and questioning activities. Nalar = associating, means to examine, to associate data with other data to make a conclusion of the analyze activities. Gagas = expressing, means communicating ideas has compiled to get new ideas.

The development of this module is done to obtain ATONG based on reference module for geometry subject in school which is valid and practical. The components of educational products is said to be valid when based on state-of-the-art knowledge or strong theoretical rationale (content validity) and all components must be associated consistently with each other (construct validity). While the components of educational products said to be practical if

the teacher can consider tools or subject that can be used and easier for teachers and students to use (Nieveen, 1999).

Module is one form of teaching materials packaged fully and systematically, it is contained a set of learning experiences inside which are planned and designed to help students to take control specific learning goals (Daryanto, 2013). Module is a complete unit that stands alone and consists of a series of learning activities which is structured to help students achieve a number of goals that are formulated specifically and clearly (Nasution, 2009).

To develop a reference module, it needs to pay attention to the characteristics of the modules include; (1) self-instruction; (2) self contained; (3) stand alone; (4) adaptive; and (5) user friendly (Daryanto, 2013). Self instruction means enable someone learn to be independent and does not depend on the other hand. Self contained means all the necessary learning materials contained in modules so that learners can learn thoroughly. Stand alone means not dependent on teaching materials / other media or should not be used together with teaching materials / other media. Adaptive means if the module is able to adjust the development of science and technology, as well as flexible use in a wide range of hardware. User friendly means instruction and explanation of information in the module helpful and friendly to the wearer.

According to Regiero (Johnson, 2007), thinks is all mental activities that help to formulate or solve problems, make decisions, fulfilling the desire to understand, search for answers, and achievement of meaning. According to Krulik and Rudnick (1995), think categorized consists of basic thinking, critical thinking, and creative thinking. According Saefudin (2012), creative thinking is a single unit or a combination of logical thinking and divergent thinking to generate something new. Something new is one indication of

creative thinking in mathematics, while the other indications related to logical thinking and divergent thinking. Munandar (2009) suggests that creativity can be measured by four criteria, namely; (1) fluency; (2) flexibility; (3) originality; and (4) elaboration. Fluency means fluent in expressing his ideas. Flexibility means to solve the problem with a variety of different ways. Originality means creating an innovation with their thoughts. Elaboration means the detail steps to resolve the issue. Mathematical skills of creative thinking can be seen from psychomotor students through observation and interviews before and after using the reference module.

This reference module development is related to Skinner, Piaget, Brunner, Van Hiele, Constructivism and Ausubel learning theory. In Skinner learning theory, Skinner argued that learning is the stimulus and response (Purwanto, 1997). A reference module given to students is stimulus and will be responded by students to understand the facts, principles and concepts of mathematics and problem-solving procedure which is the result of learning. Therefore, learning to use a reference module should be meaningful. According to the theory of learning Ausubel (Rifa'i, 2011), learning will be meaningful if it meets the four principles of learning namely hook framework, progressive differentiation, integrative adjustment and learn the superordinate. Learning to use a reference module begins by studying general things towards things that are more specialized.

Because the module is being developed is a reference module, the reference module development must consider the cognitive development of learners at every level of education. According to the theory of learning Piaget (Rifa'i, 2011), cognitive development divided into four stages: sensorimotorik stage (0-2 years), preoperational stage (2-7 years), concrete operational stage (7-11 years), and the formal operational stage (11-15 years and

over). The elementary school students generally have been able to operate a variety of logic but still a concrete situation. While the students of junior high school and senior high school have begun to think abstractly, devise a plan to solve the problem systematically, test solution, and make conclusions. Development of a reference module is trying to balance it with the provision of images in our daily lives and use simple language.

Learning geometry using the module is also associated with Brunner and Van Hiele learning theory. According to Brunner (Rifa'i, 2011), there are three stages of learning progress are enactive, iconic and symbolic. Learning geometry using a reference module, according to Brunner's theory, learning is begun by linking the abstract geometry of subject with concrete objects that exist around the learner. Then the students are invited to visualize it in the form of images. Then the last, students can use mathematical symbols to solve the problems of geometry.

According to the theory of Van Hiele (Prabowo, 2011), someone will go through five stages of development thinking in learning geometry. The fifth stage of development thinking Van Hiele: stage 0 (visualization), stage 1 (analysis), stage 2 (deduction informal), stage 3 (deduction), and stage 4 (rigor). Stage 0, students are able to identify, giving the name, compare, and operate the drawings geometry. Stage 1, students can mention the properties owned by a wake. Stage 2, students are able to understand the relationship between the characteristic one another at a wake. Stages 3, students already understand the role notions, definitions, axioms and theorems in geometry. Stage 4, students are able to do formal reasoning without requiring concrete models as a reference.

Furthermore, according to the theory of constructivism (Rifa'i, 2011), learning is an active process of learners in constructing

meaning, discourse, dialogue, physical experience in the learning process to a process of assimilation and connecting experiences or information that has been learned. This is in line with the stage ATONG used in modules developed. Stages ATONG teaches learners construct their own learning experiences through the stages of amati = observing, tanya = questioning, olah = analyzing, nalar = associating, and gagasan = expressing. Through this ATONG stage learners will be more active in learning to use the module independently.

Research Methods

This type of research is a kind of research and development, namely development of ATONG based reference module for school geometry subject. Development procedure used is research and development strategy described by Borg and Gall (1983), which includes 10 steps, namely; (1) research and information collecting; (2) planning; (3) develop preliminary form of product; (4) preliminary field testing; (5) main product revision; (6) main field testing; (7) operational product revision; (8) operational field testing; (9) final product revision; and (10) dissemination and implementation. Research module development is limited to six main stages field testing because of time and cost.

Stage 1: research and information collecting, analyzing problems in learning mathematics, analyzing the characteristics of students (creative thinking mathematically students), analyzing geometry subjects, analyzing difficulty in learning geometry, literature reference module development, literature ATONG approach, and literature creative thinking mathematically.

Stage 2: planning, conducted targeting reference module, determination subjects, determination the purpose of learning using a reference module, the selection of the reference module format, and determination components of the reference module.

Stage 3: develop preliminary form of product, done the preparation module (draft 1) and instruments of research.

Stage 4: preliminary field testing, validation module (draft 1) and instruments of research. Validation module is carried out by three-person team of experts that are supervisor 1, supervisor 2, and a Lecturer department of mathematics Unnes while the instrument validation study carried out by supervisor 1 and supervisor 2.

Stage 5: main product revision, revised module (draft 1) into module (draft 2) and all the instruments that have been made based on advice from experts. This revision continues to obtain the module (draft 2) and valid instrument.

Stage 6: main field testing, conducted testing limited to 3 teachers, 9 students, and 2 mathematic readers to determine the practicality of the reference module. At this stage used instruments are questionnaire responses of teachers, questionnaire responses of students, and interview guide (for teachers, students, and mathematic readers). At this stage also made observations of creative mathematical thinking skills of students before and after using the reference module.

The samples in this research are 3 teachers, 9 students, and 2 mathematic readers taken with purposive sampling technique. The first is to determine the validity of the reference module using instrument module validation. The second is to determine the practicality of the reference modules using instruments questionnaire responses of teachers, questionnaire responses of students, and interview guide (for teachers, students, and mathematic readers). Meanwhile, to determine the increase of mathematical creative thinking skills, guidelines observation skills are used.

On average validation module reference calculated by add an average score of each

aspect divided by the number of aspects, or formulated as follows (Hobri, 2010).

$$V_m = \frac{\sum_{i=1}^n A_i}{n}$$

V_m is the value of the reference module validation, A_i is the average aspect to- i , and n is the number of aspects.

The average response of teachers and students is calculated in the same manner with the above formula Hobri (2010). R_g is the average response of the teacher and R_{pd} is the average response of students.

Skills upgrading is calculated by using gain normalized by the following formula.

$$g = \frac{\text{After Scores} - \text{Before Scores}}{\text{SMI} - \text{Before Scores}}$$

g are normalized gain, SMI are maximum score index. Criteria gain according to Hake (Fachrurazi 2011) presented in Table 1.

Table 1. Criteria Gain Index

Gain Index	Criteria
$g \geq 0.7$	High
$0.3 \leq g < 0.7$	Medium
$g < 0.3$	Low

Results

Research and Information Collecting

This stage obtained information and theories relating to the development of ATONG based reference module for school geometry subject. These theories include the theory of the reference module and its characteristics, ATONG approach, school geometry subject (triangle, the Pythagorean theorem, rectangle), research and development strategy Borg & Gall, and mathematical creative thinking skills.

These theories will help researchers to plan the development of a valid and practical

reference module and able to increase mathematical creative thinking skills.

Planning

This stage do planning of development of reference module which includes determining the subjects, determination of learning objectives using a reference module, election format, and determination components of the reference module.

ATONG based reference module consists of three sub-modules: module 1 triangle, module 2 Pythagorean theorem, and module 3 rectangle. The purpose of learning using a reference module is to understand the material and improve the skills of creative thinking mathematically. Format reference module use ATONG approach (Amati, Tanya, Olah, Nalar, Gagas). ATONG approach will help students learn from observing, questioning, analyzing, associating, and expressing. Through a series of stages this ATONG, students will also be able to increase the mathematical skills of creative thinking with fluence thinking, flexible thinking, original thinking, and elaboration thinking. The questions presented in the modules also have an important role in improving mathematical creative thinking skills. The questions presented in the module are problem-solving questions and problems of creative thinking mathematically. These questions will help learners improve mathematical creative thinking skills gradually.

Through the stages of Borg & Gall, it is also obtained ATONG-based reference module for School geometry subjects are valid and practical. The validity of this reference module is obtained through the stages of preliminary field testing and main product revision. On stage preliminary field testing obtained validation expert and the reference module improvement suggestions from the experts. Based on the reference module improvement suggestions from the experts, the reference module was revised repeatedly

to obtain valid module. The validation process and repeated revisions will ensure that the reference modules developed valid and can be used on main field testing.

Main field testing was conducted to determine the practicality, usability, and legibility of module in the field. Data practicality reference module is obtained based on the response of teachers, students, and mathematic readers in the field. The design components of ATONG based reference module for School geometry subjects as follows.

1. The initial part consists of a cover “Modul Geometri Sekolah Berbasis ATONG”, preface, guide the use of modules, table of contents, apperception, and map of the module concept.
2. The contents consist of the subjects presented in the module reference. The components of each sub module reference include.
 - a. The initial part sub module reference, it consists of:
 - (1) Title of sub module.
 - (2) The opening image material, such as photographs or preliminary description of the material to be studied.
 - (3) The purpose of the module
 - (4) The term is important, containing important words are the key to the discussion in each sub module.
 - (5) Advance Organizer, introductory lesson to motivate students to learn the material that will be presented..
 - b. Part of the contents of a reference sub modules, it consists of:
 - (1) Map of sub module concept, contains the concepts of the subject to be learned from each sub module and the relationship between the concepts presented.
 - (2) InfoMath, in the form of information about the figures of mathematics, history of

mathematics and other information related to mathematics.

- (3) Description of the subject, which is presented with a simple sentence.
- (4) Example question, in the form of questions that accompanied the steps in the answer.
- (5) You can do it, in the form of questions that test the ingenuity of students in solving a mathematical problem.
- (6) Summary, containing the main points of discussion in the sub modules that have been completed studied.
- c. The final part of sub modules, it consists of:
 - (1) Exercise matter, contains questions to test the ability of students to understand the material they have learned.
 - (2) Test formative, contains questions to measure the subject understanding of specific sub-modules.
 - (3) References.
 - (4) Efforts to follow up, is used to determine the level of mastery learners after taking the test formative.
 - (5) Key answers formative tests, such as formative test answers.

Develop Preliminary Form of Product

At this stage of the preparation of the reference module (draft 1) and instruments of research which includes ; (1) sheet of module validation; (2) questionnaire responses of teachers; (3) questionnaire responses of students; (4) guidance teacher interviews; (5) guidance student interviews; (6) guidance mathematic readers interviews; (7) the scoring guidelines mathematical creative thinking skills; and (8) sheet of instrument validation.

At this stage, the reference module has been through the validation and repeated revisions

based on suggestions from the supervisor. Revisions were made several times to obtain the appropriate module expectations. At this stage, the revisions are additional explanations ATONG approach in the early part of the module and the selection module format to ATONG approach visible.

Preliminary Field Testing

At this stage, these are validation module reference (draft 1) and instruments of research. Results of the validation module obtained an average assessment module by an expert third validator included in the category of very valid, namely $V_m = 4.52$ (maximum score 5). So that ATONG based reference module for school geometry subject was said to be valid. Results of the validation module can be seen in Table 2 below.

Table 2. Results of Validation Module

The Validity of Module	Validator Value		
	I	II	III
Validity Criteria V_m	4.10	4.65	4.80
Criteria V_m	Valid	Very Valid	Very Valid
		4.52	
		Very Valid	

Based on Table 2 above shows that the value of each successive expert validator is 4.10; 4.65; and 4.80 with valid, very valid and very valid criteria. This suggests that each validator experts stated that the ATONG based reference module for school geometry subject is valid and may increase mathematical creative thinking skills. Based on the results of expert validation, the results obtained recommendation that the module can be used with minor revisions. This revision is done based on the comments and suggestions given by the experts.

The instruments are also validated by the supervisor 1 and 2 to obtain a valid instrument and ready for use in research. Here are the results of the instrument validation by the supervisor 1 and 2.

Table 3. Results Validation Instrument

Instrument	The Average Results of Validation	Criteria
Teacher Questionnaire Response	4.50	Very Valid
Student Questionnaire Response	4.42	Very Valid
Teacher Interview Guidelines	4.50	Very Valid
Student Interview Guidelines	4.50	Very Valid
Mathematic Reader Interview Guidelines	4.50	Very Valid
Guidelines Observation Skills	4.17	Valid

Based on the validation results, it is obtained recommendation that the instrument can be used with minor revisions. This revision is done based on the comments and suggestions given by the supervisor.

Main Product Revision

At this stage, it is revised the reference module (draft 1) into the module (draft 2) and all the instruments that have been made based on advice from experts. Revisions have been conducted by researchers to repair modules, namely (1) the addition of questions to think creatively and questions olympics; (2) the improvement of grammar especially preposition adjusted EYD; and (3) improvement of charts and Venn diagrams relations between waking on page 175. After the module was revised and declared valid, the module can be used in a practical test.

Main Field Testing

At this stage conducted testing limited to 3 teachers, 9 students, and 2 mathematic readers to determine the practicality of the module. Three teachers consisted of

Elementary School (G-1), Junior High School (G-2), and High School (G-3). Nine students consists of 3 elementary school (PD-1, PD-2 and PD-3), 3 junior high school (PD-4, PD-5, PD-6), and 3 high school (PD-7, PD-8 and PD-9). The last is two mathematic readers (M-1 and M-2).

Based on the results of teachers' questionnaire responses, obtained average yield response of teachers = $R_g = 4.53$ (maximum score 5) and is included in the excellent category. Results of the teacher's response to the reference module can be seen in Table 4 below.

Table 4. The teacher's response to the Module

Response	Validator Value		
	I	II	III
Teacher's Response	4.41	4.56	4.63
Criteria	Very Good	Very Good	Very Good
R_g	4.53		
Criteria R_g	Very Good		

Based on Table 4 above, it indicates that the three teachers gave a very positive response to the module.

Based on the questionnaire responses of students, it is obtained average yield response of students = $R_{pd} = 3.13$ (maximum score 5) and including in good category. The results of student response to the reference module can be seen in Table 5

Table 5. Response of Students

Students	Response	Criteria	Percentage Response	Average
PD-1	3.69	Very Good	92%	$R_{pd} = 3,13$ (Good)
PD-2	2.80	Good	70%	
PD-3	2.80	Good	70%	
PD-4	3.44	Very Good	86%	Percentage Response = 78%
PD-5	3.36	Good	84%	
PD-6	2.82	Good	71%	
PD-7	3.09	Good	77%	
PD-8	3.00	Good	75%	
PD-9	3.16	Good	79%	

Based on Table 5 above, it shows that the majority of students responded positively to the ATONG based reference module for school geometry subject and only a small fraction that showed a negative response to the module.

There are some suggestions and feedback from the three teachers, ninth students, and both mathematic readers.

The third teacher gives suggestions: (1) language and writing system used in reference modules adapted to EYD; (2) the modules can be equipped with teaching VCD; (3) problems in the modules should be of a level is easy, rather easy, and difficult; (4) the language used in the module fixed to be simpler so easily understood by students; and (5) can be added SMA subject so it can be used as a companion book high school students.

Ninth students advise that (1) exercises should also be added the answer key; (2) module is communicated to a wider students; (3) on the material triangle added about trigonometry subjects and special corners of the table; and (4) the words of motivation can be added.

Both mathematic readers advise that (1) it would be better if the module is separated among elementary schools, junior high schools and high school, so that elementary school students are not confused, and (2) a mathematics problem more varied so that children grow accustomed to a lot of practice and creative thinking.

The average yield total score indicator mathematical creative thinking skills on the ninth students before and after using the atong based on reference module for school geometry subject show an increase. Calculation test value gain of nine students presented in Table 6.

Table 6. Test Gain Mathematic Creative Thinking Skills Before and After Using Modules

Interviewees	The test results gain	Criteria
PD-1	0.76	High
PD-2	0.77	High
PD-3	0.72	High
PD-4	0.71	High
PD-5	0.53	Medium
PD-6	0.75	High
PD-7	0.77	High
PD-8	0.73	High
PD-9	0.50	Medium

Discussion

The research showed that through the stages Borg and Gall (1983) obtained a ATONG based reference module for school geometry subject are valid, practical, and capable of improving the skills of creative thinking mathematically. Mathematical creative thinking skills improvement is due to the ATONG approach (Sukestiyarno, 2013) and the questions contained in the ATONG based reference module. ATONG approach is used in the module, in addition to constructing the way students learn from observing, questioning, analyzing, associating, and expressing, also able to encourage students improve mathematical skills of creative thinking. The questions contained in the reference module is also a problem solving questions and problems of creative thinking mathematically arranged starting from easy to difficult level. This problems solving proved that it increases mathematical creative thinking skills students. This is according with what is stated Siswono (Azhari, 2013) which mentions that the forms of matter and matter that can foster creative thinking is a form of mathematical problem solving, filing problems or a combination of both.

Increasing creative thinking mathematically through ATONG approach and problem solving is consistent with what was raised by Rothenberg (1996) and the results Mustakim (2015). Rothenberg (1996) argues that

scientific discoveries demonstrate the significant role to enhance creative thinking in science by prioritizing the investigation. While the research results Mustakim (2015) states that learning scientific approach to solving the problem with organized can improve the mathematical skills of creative thinking and learning outcomes of students..

Increasing mathematical and creative thinking skills of students can be observed through the activities students when working on covering observations aspects of fluency, flexibility, originality, and elaboration (Munandar, 2009).

Conclusions

To obtain a reference module that can be used independently and able to enhance the creative and mathematic thinking, it needs learning stages which is able to bring students improvement. The stage used in this reference module is ATONG stage. ATONG stages are proven to bring students to observing, questioning, analyzing, associating, and expressing and able to enhance creative and mathematic thinking skills of students.

Based on the results of research and discussion are concluded that the ATONG based reference module for school geometry subject is valid with an average validity module, $V_m = 4.52$ (maximum score 5) and are included in the category of very valid and ATONG based reference module for school geometry subject practical with an average response of teachers, $R_g = 4.53$ (maximum score 5) , including in the excellent category and the average response of students = $R_{pd} = 3.13$ (maximum score of 4) were included in both categories with a response percentage students $PR_{pd} = 78\% = 75\%$.

Recommendations

Suggestions in this research is ATONG based reference module for school geometry subject can be used as reference material

both teachers and students. To increase creative and mathematic thinking, students should not rely only on textbooks alone. They need also reference as the supporting media.

For developing a reference module that able to carry other students improve thinking skills, it need stages of learning that is able to bring students construct knowledge by their own way of learning so that students can learn independently and improve their skills according to what is desired.

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THE DEVELOPMENT OF MATHEMATICS MODULE MULTI LEVEL BASE ON SOCIAL ARITHMETIC SCHOOL MATERIALS TO ENHANCE THE MENTAL OF ENTREPRENEURSHIP

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ABSTRACT

Through social arithmetic mathematics learning materials, students are expected to associate mathematical concepts with daily life, particularly in economic activity. The concept of multi-level business is strategic to be applied in teaching mathematics. With multi-level stages, joining a study group (list), learning materials, training materials, learning entrepreneurial skills and entrepreneurial skills training, receiving the award, the students form a learning network of mathematics as well as to enhance the entrepreneurial spirit. The above activities are packed in reference module development. The stage development model Borg and Gall (1983), the module is designed to load problem-solving exercises of the concept of social arithmetic integrating with the formation of entrepreneurial spirit. The objective of this research is to obtain valid module according to mathematicians and limited practical trials which is represented by the student and an elementary school teacher, junior high school / equivalent, as well as mathematics reader. The results showed that the modules assessment of expert people about the concept of social arithmetic material, the concept of multi-level, the establishment of entrepreneurial spirit, and the performance and readability of each 80% show in a good conditions and valid criteria. Limited testing by users of the indicators: the display module, the multi-level construction, the establishment of entrepreneurial spirit, and the use of modules are respectively 88.64%; 87.41%; 87.87%; and 89.78%; they fulfill the practical criteria. All students from elementary to high school / equivalent can utilize this module. The change in behavior on the indicators of the entrepreneurial spirit, which is independent, creative, oriented in action, risk-taking, leadership, hard work and skill before reading the module and the afterwards with the average increased from 58.25% (currently) to 80, 73% (very high). So the module is feasible to become reference for studying social arithmetic integrated with spirit of entrepreneurship.

Keywords - Module, Multi Level, Spirit of Entrepreneurship

Introduction

Law No. 20 of 2003 on National Education System Section 3, states that the national education serves to develop the ability and character development as well as the civilization of dignity in the context of the intellectual life of the nation, aims to develop students' potentials to become a man of faith and fear of God Almighty, noble, healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens.

Functions and objectives above, shows that education in each educational unit should be conducted systematically in order to achieve these objectives. Qualitative indicators are

also very important in order to achieve that objective, qualitative indicators include: faith and fear of God Almighty, noble, healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens. The qualitative indicators related to the character formation of students and associated with the formation of attitudes and skills / entrepreneurship skills of students so that they can compete, ethical, moral, good manners, have the attitude and skills / skill entrepreneurship (Mulyani, 2010: 1).

However, according to Hendrowo (2010: 47) teaching materials on entrepreneurship in schools or universities are still relatively

few. Therefore we need a teaching material on entrepreneurship.

Meanwhile, nowadays it is hard to get a job which graduate from SMA / SMK, as well as a diploma, even bachelor is just hard to get a job. No wonder the unemployment rate in Indonesia is still high. According to the Central Bureau of Statistics, Unemployment Rate in Indonesia in February 2014 reached 5.70 percent. And in August 2014, the total of unemployment increased by 97 836 inhabitants of February 2014.

According Suwarsono (2011: 1), mathematics education as part of the world for education, has various potential that can be developed to promote the development of entrepreneurship in Indonesia. As we have seen that aspect of entrepreneurship in the social arithmetic material is strong.

Based on the result of national exam data in 2012/2013 from the Research Kemdikbud, one of the understanding ability to solve problems is still low, that is in social arithmetic subject. In Central Java the understanding rate reached 68.31%, still low compared to the national rate, which reached 77.54%. According to the observations and interviews, it can happen because mathematics is often not meaningful because the mathematics learning process is a text book oriented, so we need an innovation that can make math learning becomes meaningful. One of them by compiling a module that can enhance the entrepreneurial spirit of students.

On the other hand, Multi-level marketing (MLM) is a business that is emerging in Indonesia. The rate of MLM development in Indonesia is quite rapid (Santoso, 2006: 1). MLM is often also referred to as Network Marketing or business network. According to Jamil Azzaini (2013: 139), networking is a useful and advantageous relationship. If it is applied in learning, the students can also make a useful and advantageous learning networks. By using the formed network,

students can exchange ideas, help each other, and share the knowledge that has been gained to the other students. According to Erman Suherman (2003: 277), the support of peer learning can eliminate the awkwardness. And there is no reluctance, low self-esteem, shame, and so on to ask questions or ask for help with the peers.

According Warsita (2011: 2), education is a necessity and the right for every citizen, regardless of class, gender, age, social status, or residence. However, based on observations and interviews to several schools in Kudus, many teachers and students felt that the learning and teaching time of mathematics is decreased because there are various difficulties in learning mathematics that have not been fully resolved when learning mathematics in school. In addition, if there is a school activity, the students are required to study independently. Meanwhile, some students are still difficult in doing self study without a teacher. To overcome it, the learning process can be carried out by using learning media.

From the interaction and learning process, the the students' entrepreneurship mentality will be formed or increased. Therefore, the researcher will develop a module-based multi-level social arithmetic school materials to enhance the entrepreneurial spirit of students.

The purposes of this study were (1) Getting the development of module-based multi-level mathematics in social arithmetic school material in order to enhance the validity of entrepreneurial spirit; (2) Test the practicality of modules based on multi-level mathematics in social arithmetic school material in order to enhance the entrepreneurial spirit; (3) Improving the the students' entrepreneurship mentality after reading the math module-based multi-level social arithmetic school material.

Theoretical Review

The modules are printed teaching materials that are designed to be studied independently by students and it is also called as media to study independently because it has been equipped with instructions for self-study (Surya Dharma, 2008: 3).

According to Surya Dharma (2008: 3-5) stated that modules can be considered good if it has the following characteristics.

a. Self Instructional

Learners are able to self study and not depend to others; it is called Self Instructional. In complying the self-instructional character then the modules must : (1) contain clearly formulated goals; (2) contains material that is packed into small units; (3) specifically to facilitate learning thoroughly; (4) provide examples and illustrations that support the clarity of presentation of learning materials; (5) displays tasks questions, assignments, etc. which allows the user to respond and measure the level of mastery; (6) contextual material that is presented associated with the condition or the context of the task and its environment; (7) use simple and communicative language; (8) there is a summary of the learning material; (9) there is an assessment instrument/assessment, which allows the use of training do the self-assessment; (10) there are instruments that can be used to measure or evaluate the level of mastery of the material; (11) there is a feedback on the assessment, so that the users know the level of mastery of the material; and (12) provided information about the referral / enrichment / references that support the intended learning materials (Surya Dharma, 2008)

b. Self Contained

Self Contained, is all learning materials from a competence or sub-competencies that is learned contained in the module as a whole (Chomsin and Jasmadi, 2008:

51). The aim of this concept is to give opportunities to the students to study the learning materials thoroughly, because the material is packed into one unified whole. If the material from one unit competence is divided or separated, it must be done carefully and notice to the scope of competencies that need to be mastered.

c. Stand Alone

The use of module should not be used together but can be used individually and also does not depend on other media. Because if the students still depend on other media, so it can be said that the module is not eligible.

d. Adaptive

In module development should follow the development of science and technology, flexible use, as well as the material can be used to a certain time.

e. User Friendly

User Friendly is characteristic of the module that should be friendly to the user. One of them is the use of language that is simple and easy to understand.

Multi level marketing system is adopted from Multi Level Marketing to be applied in education field, in this case the module. Riva'i (2012: 298) said that the Multi Level Marketing (MLM) is a sale system by Zain Ahmad An-Najah, utilizing the power of distributor consumers as directly as well as consumers. This sales system uses multiple levels (tiers) in marketing his wares.

Module-based multi-level in this study is a module that includes a multi-level stages, those are: joining the study group (list), learning materials, training materials, learn entrepreneurship, entrepreneurship training, invite friends, and received the award.

According to Mulyani, et al (2010), the value which was developed in entrepreneurship education are considered the most basic and suitable with the level of development of students as much as 17 value, which is independent, creative, risk-

taking, action-oriented, leadership, hard work, honesty, discipline, innovative, responsibility, cooperation, unyielding, commitment, realistic, curious, communicative, a strong motivation to succeed.

Those values are developed gradually. The first stage is developed the 6 (six) values, those are independent, creative, risk-taking, action-oriented, leadership, and hard work. After that, the next values are newly developed (Arifin, 2012: 66-67).

Table 1. Value Spirit of Entrepreneurship

Value	Indicators
Independent	Attitudes and behavior that is not easily depend on others.
Creative	Think and do something to produce different ways or results of the products / services that already exist.
Risk-taking	The ability of someone to love a challenging job, brave, and be able to take the risk of working.
Oriented in action	Take the initiative to act and not to wait, before an unwanted incident occurs.
Leadership	Attitudes and behavior of someone who is always open to suggestions and criticism, sociable, cooperate, and directing others.
Hard work	Behaviors that indicate an earnest effort in completing tasks and overcome various obstacles.

According Hendrowo (2010: 45) material or method that will be done to establish the students' entrepreneurial spirit is learning by doing. Children will be able to understand things that we instil if they do so. Moreover, if we also do so they will get the closest example to observe and emulate. In addition, according to Arifin (2012: 67) by learning entrepreneurship will not be effective if it is dominated by the teacher (teacher centered). Participants must be activated by the teacher, the keywords that can be done by learners are thinking activities (minds-on) and doing (hands-on).

In addition, to prepare potential entrepreneurs are also required to invest the value of money to the children. It can be done by getting students to experience in buying, saving, managing pocket money, save money by fulfilling their own needs, as well as make money for themselves. It is also necessary to train the creativity of children with various games. Games often contain the elements of social education and overcome the shyness in society. Among the games that are written in the module is a monopoly game. By using the monopoly game students will learn a lot about entrepreneurship (Hendrowo, 2010: 51-60).

According Hendrowo (2010: 68) to form the the students' entrepreneurship mentality can use the learning method from the others' success. A story that contains a moral message would be very good for the formation of children's mental.

Creating propaganda in the form of dream board also become important in making the entrepreneurial spirit of students. Because of a clear dream will be able to bring the clearer and focused thinking. Hendrowo (2010: 13) said that the goal has been described clearly by the brain's memory will be stored in the subconscious, then he will move the body and conscious mind to realize these goals.

Based on experiments that have been carried out by Thorndike in Rifa'I (2011: 166-167) finally put forward three kinds of learnings' rule, those are: (a) the rule of readiness; (b) the rule of exercise; and (c) the legal effect.

- a. The rule of readiness
For learning to achieve good results, we need the readiness of individuals in learning.
- b. The rule of exercises
Relationship or connection between stimulus and response will be strong when the exercise is frequently done. In other words, the relationship between the stimulus and the response will be better if it is practiced. Therefore the

rule of exercises requires learning exercises while working (learning by doing).

c. The rule of effect

If something gives pleasant or satisfactory results, the relationship between between stimulus and response will be stronger. In other words, if the stimulus cause a response that brings the gift (reward), the relationship of stimulus and response will be strong, and vice versa.

This theory is appropriate with the award that will be given to students after doing the module. These awards are found in the content of social arithmetic modules on multi-level base, which in each chapter is always given the award so that the students feel happy and satisfied with the result of their assignments.

In determining the quality of the research and development results, according to Nieveen (1999), the components of educational products are valid when it is based on the state of the art knowledge rational theoretical is strong (content validity) and all components must be associated consistently with each other (the construct validity) while the components of educational products are practical if the teacher can consider the tools that can be used and it is easier for teachers and students to use.

Research Methods

This research was conducted by using the type of research and development (research and development), that is the research which resulted the development products in the form of mathematics modules based on the materials multilevel social arithmetic schools to improve the entrepreneurial spirit which fulfill a valid and practical criteria.

According to Borg and Gall (1983: 775-776) there are ten steps to implement the strategy of research and development, those are: (1)

research and information collecting; (2) planning; (3) develop preliminary form of product; (4) preliminary field testing; (5) main product revision; (6) main field testing; (7) operational product revision; (8) operational field testing; (9) final product revision; (10) dissemination and implementation. However, in this research of development is limited until the sixth step ecause of time and cost of research.

Stage 1 : research and information collection, identification and collection of data regarding: (1) problems in the learning of mathematics; (2) the characteristics of the students (entrepreneurship); (3) the material social arithmetic; (4) difficulties in learning social arithmetic; (5) literature study module development; and (6) multi-level literature.

Stage 2 : planning, aimed to design a module that will be developed which includes; (1) determining the learning objectives by using the module; (2) the determination of the material; (3) The targeting module; (4) the selection of formats; and (5) the determination of the components of the module.

Stage 3 : develop preliminary form of product, aimed to produce the first draft of the modules and instruments are subsequently validated by experts.

Stage 4 : preliminary field testing, aimed to validate the module and all the instruments that have been made. Validation was carried out by three experts, including 2 professors in mathematics. Expert validation results as a benchmark for revising the first draft of the module into module II draft and all the instruments that have been made.

Stage 5 : main product revision, aimed to obtain a valid modules and instruments. Results of expert validation is used as a benchmark for revising the first draft of the module into module II draft and all of the instruments that have been made. This

revision continues to acquire draft module II and valid instrument.

Stage 6 : main field testing, conducted trials limited to 3 teachers, nine students and three parents of students to determine the practicality of the module. At this stage, the students used a questionnaire instrument readability, the questionnaire responses of students, teachers' questionnaire responses, the questionnaire responses mathematical observer, interview students, teachers interview guide and interview guides observers mathematics. The module is practical if the results of the questionnaire of legibility students, the questionnaire responses of students, teachers' questionnaire responses, the questionnaire responses of parents are practical.

In this study, the source of data is determined by using purposive sampling technique. Purposive sampling is a sampling technique with particular consideration of the data sources. It can be seen that the technique provide the data maximally. Researchers took samples of 9 equals from each 3 students. Three teachers consists of primary school, junior high, and high school teachers. Students, three teachers, and two observers of mathematics. Nine students consists of the students of elementary, junior high, and high school which are at this stage also made observations on the entrepreneurial spirit of students. To determine the improvement of the students' entrepreneurship mentality before and after reading the module is by using observation sheets and questionnaires entrepreneurship in order to determine the improvement percentage of the students' entrepreneurial spirit before and after the reading module reading module.

The average of assessment validation module by experts formulated as follows (Hobri, 2010).

$$V_m = \frac{\sum_{i=1}^n A_i}{n}$$

V_m is the average assessment expert validation, A_i is the average aspect to i , and n the number of aspects.

And the percentage of expert validation assessment formulated as follows.

$$P = \frac{\text{total score of each aspect}}{\text{the maximum score}} \times 100\%$$

The average response of students, teachers, and mathematics readers is also calculated in the same manner as above.

Improved skills is calculated by using normalized gain with the following formula.

$$g = \frac{\text{scores after} - \text{scores before}}{\text{SMI} - \text{scores before}}$$

g is the normalized gain, SMI is the maximum score index.

Criteria gain according to Hake (Fachrurrazi 2011) presented in Table 2.

Gain Index	Criteria
$g \geq 0,7$	High
$0,3 \leq g < 0,7$	Currently
$g < 0,3$	Low

Results

Research and information collection

At this stage, identification and collection of data regarding: (1) problems in mathematics, such as the mathematics learning time is decreased because of many difficulties which is experienced by the students, the learning process is still using text book oriented that is meaningless, and the teaching materials about enterpreunership have not been available yet; (2) the the students' entrepreneurship mentalityis still invisible; (3) information and theories about the module and its characteristics, multi-level, and material of social arithmetic.

These theories will help the researchers to plan the development of a valid and practical

modules and be able to enhance the entrepreneurial spirit of students.

Planning

At this stage is performed about the planning of the target of the module that can be used as a reference elementary, junior and senior high schools students in independent study. The material will be presented in this module is a social arithmetic material which is divided into five chapters, those are: (1) the value of the goods; (2) the purchase price, selling price, profit and loss; (3) the percentage of profit and loss; (4) rebates (discounts), gross, tare, net; (5) interest and tax savings. The components of social arithmetic modules based on multi-level is as follows.

- a. The initial part consisting of a cover social arithmetic modules based on multi-level, Preface, mascot modules, guides the use of modules, apperception, a map of the module concept, and the table of contents.
- b. Content section consists of the materials presented in the module. Social arithmetic modules based on multi-level consists of five chapters, namely: (1) the value of the goods; (2) the purchase price, selling price, profit and loss; (3) the percentage of profit and loss; (4) rebates (discounts), gross, tare, net; (5) interest and tax savings. The components of each chapter on modules include :

1. The first chapter : (a) title of the topic; (b) opening image material, such as photographs or preliminary description of the material that will be studied; (c) the introduction of the study to motivate students to learn the material that will be presented; (d) the purpose of study; (e) the definition of term which contains of the words that became the key discussions in each chapter.
2. The content chapter : (a) description of the material, which is presented with a simple sentence; (b)

examples of Problems in the form of questions accompanied by the steps to answer; (c) exercises, contains questions to test the students' ability to understand the material they have learned; (d) the lessons of entrepreneurship, which can be studied by the students to shape their entrepreneurial spirit; (e) exercise of entrepreneurship, which is useful to train the students' entrepreneurial spirit; (f) a summary which contains about the main points of discussion in the chapter that has been completed studied.

3. The end of the chapter : (a) Test formative which contains of questions to measure the understanding of the material in each chapter that have been studied; (b) the instructions of the award which contains steps that students received awards for their efforts in studying the chapter.
- c. The conclusion section, which consists of a bibliography and an answer key and scoring guidelines of formative tests in all chapters.

The development of preliminary product

This stage is performed the preparation of social arithmetic modules based on multi-level to improve the the students' entrepreneurship mentality which appropriate with the planning. The modules which are produced in this stage is called the first draft modules and the instruments of the research which are used in this study such as: (1) sheet validator assessment of the module; (2) questionnaire legibility students; (3) The students questionnaire responses; (4) the questionnaire responses of teachers; (5) the questionnaire responses of students; (6) the questionnaire responses of parents; (7) the interview guide students; (8) the interviews guide teachers; (9) the interview guide parents; (10) the observation sheet of students' entrepreneurial spirit; (11) questionnaire of students' entrepreneurial

spirit; (12) validation questionnaire legibility students sheet; (13) student response questionnaire validation sheet; (14) validation sheet of the questionnaire responses of teachers; (15) student response questionnaire validation sheet; (16) validation sheet of the questionnaire responses of parents; (17) validation interview guides students sheet; (18) validation guidelines teacher interviews sheet; (19) validation sheet of interview guide parents; (20) validation sheet of observation the students' entrepreneurship mentality sheet; (21) validation sheet of the students' questionnaire entrepreneurship mentality.

Preliminary field testing

This stage is performed the validation module (draft 1) and research instruments. The results showed that the assessment of the modules from the expert about the concept of social arithmetic matter, the concept of multi-level, the establishment of entrepreneurial spirit, and the appearance and readability is 80% categorized in good conditions and valid, that is $V_m = 4.0$ (maximum score 5).

It shows that each of the experts stated that the mathematical module-based multi-level social arithmetic material is valid and can enhance the entrepreneurial spirit of students.

Based on the validation by the experts obtained that module can be used but there is a little improvement in it. The improvement was made based on the comments and suggestions by the experts.

The instruments are also validated by the supervisor 1 and 2 to obtain a valid instrument and ready to use. Here are the results of the instrument validation by the supervisor 1 and 2.

Table 4. Results of the validation instrument

Instrument	Average	Criteria
Questionnaire of legibility students	4,10	Valid
The students questionnaire responses	4,05	Valid
The questionnaire responses of teachers	4,05	Valid
questionnaire responses of mathematics readers	4,00	Valid
The students' interview guide	4,00	Valid
The teachers' interviews guide	4,05	Valid
The Mathematics Readers' interview guide	4,05	Valid
The observation sheet of students' entrepreneurship mentality	4,05	Valid
The questionnaire of students' entrepreneurship mentality	4,05	Valid

Based on the validation results, obtained a recommendation that the instrument can be used with minor revisions. This revision is done based on the comments and suggestions given by the supervisor.

Main Product Revision

This stage is performed the revision of social arithmetic modules multi-level base and the instruments which will be used based on the comments and suggestions for the improvement by the validator.

The revisions which have been made by the researchers to repair the modules such as (1) the language to be more easily understood by students; (2) multi-level stages in module already apparent; (3) the image which has been suitable with the contents of the material; (4) the inclusion of the image sources; (5) the used of letter type is more elegant; (6) the addition of various questions.

Main Field Testing

Based on limited testing by users, 9 students, 3 teachers and 2 mathematics readers obtained the following results.

In order to obtain the average user ratings as follows.

Table 5. Result of the response by users

Indicator	V _m	P
The display module	4,43	88,64
The multi level construction	4,37	87,41
The establishment of entrepreneurial spirit	4,39	87,87
The use of module	4,49	89,78

Based on the results of normalized gain test obtained that the students' entrepreneurial spirit is increased with average criteria. It can be seen in the following table.

Table 6. Gain Test Results

Interviewees	g	Criteria
S-1	0,56	Currently
S-2	0,60	Currently
S-3	0,62	Currently
S-4	0,71	High
S-5	0,80	High
S-6	0,63	Currently
S-7	0,68	Currently
S-8	0,58	Currently
S-9	0,62	Currently

The changing of behavior on the entrepreneurial spirit indicators are independent creative, oriented in action, risk-taking, leadership, hard work and the skill before and after reading the module is increased from 58.25% (currently) to 80, 73% (very high).

Discussion

Multi-level concept which is contained on the module is appropriate with the theory of Thorndike that is combined with cooperative learning. According to Thorndike in Rifa'I (2011: 116-117), there are three kinds of learning rules, those are: (1) readiness rules; (b) legal practice; and (c) the legal effect. It can be described as follows.

1. The readiness rule

To make the learning process achieves good results, so it needs the individual readiness in learning. If the individual can do something suitably with the readiness, so he will get satisfaction. On the other hand, if someone force to do something that is undesirable, so it disposed to make disappointment and even frustration.

Students expressed the readiness in learning through social arithmetic modules multi-level base by filling identity at the stage list. And to obtain a student's readiness, it can be done by using the attractive module. Hence the interesting module is a stimulus for students so there will be a response from the students. It is also suitable with the Skinner's theory which stated that the Respondent response (reflexive response) is generated as a reflex response to certain stimuli.

2. The exercises rule

The relationship or connection between stimulus and response will be strong when doing the exercise frequently. In other words, the relationship between the stimulus and the response will get better if it is trained. Conversely, when there is no practice, the relationship between stimulus and response will be weakened. Therefore this exercises rule requires the learning by doing.

By using the multi-level stages of learning materials, training materials, entrepreneurship learning, and entrepreneurship training, so the students will learn by doing. Thus, the relationship between the module and the results of students' responses will also be stronger.

3. The rule of effect

If something gives pleasant or unpleasant results, so the relationship between stimulus and response will be strong. In other words, if the stimulus cause a response that brings to the gift (reward), the relationship of stimulus and response will be strong and vice versa.

With the multi-level stages in the form of receiving reward, the students will be more pleasant and satisfying. It is also suitable with the Skinner's theory which stated that the operant response (instrumental response) which is arising and developing responses followed by specific stimuli. It is called reinforcing stimuli or reinforce, as stimulants that strengthen the response made by the organism.

In addition, the stage to invite friends in a multi-level concept is also consistent with the cooperative learning theory. By inviting friends, students can solve a problem together; they may share a common task, and build the confidence of students. Inviting friends to study the social arithmetic modules multi-level base means that the student has spread the kindness to his friends and form a learning network. Thus it can help students increase positive attitudes of the students in mathematics. It is suitable with the statement of Suherman (2003: 259-260) that the cooperative learning in math will help students enhance the positive attitude of students in mathematics. The students individually build confidence in his ability to solve mathematical problems, so it will reduce and even eliminate anxiety towards mathematics that experienced by many students.

By using the concept of multi-level which is used in the modules, it is capable to make the students joining a learning group (list), learning the materials, training the materials, learning the skills of entrepreneurship and practicing the skills of entrepreneurship, and receiving the award.

By using the materials and the entrepreneurship training, the students learn by doing. Lessons and entrepreneurial training includes how to invest the value of money to the children (buying, saving, managing pocket money, saving money, making money by themselves), the games, the success stories of others, and propaganda (create a dream board) can enhance the

students' entrepreneurial spirit. So the students become more independent, creative, risk-taking, action-oriented, leadership, hard work, and having entrepreneurial skills.

Based on the results of the students response indicated that nine students gave very positive responses to the developed modules of social arithmetic school materials multi-level base. They stated that the developed modules of arithmetic material multi level base are good and interesting. The use of language is easy to understand and the instructions are clear, so the students can use these modules as a reference for students in self study. Although for the elementary students sometimes still need assistance to use the module-based multi-level social arithmetic school material.

Conclusion

To obtain a module that can be used by students in self study and enhance the entrepreneurial spirit of students, it takes some stages of learning. The stages of learning are used in mathematics modules social arithmetic material multi level base is multi-level stages. The stages are proved to lead the students to join a learning group, learning materials, training materials, learning entrepreneurship, entrepreneurship training, inviting friends, and receiving the award. Thus, the entrepreneurial spirit of the students can be increased.

Based on the research results, obtained conclusions that the mathematics modules social arithmetic school materials multi-level base to enhance the entrepreneurial spirit is valid with the average value $V_m = 4.0$ (valid) and the percentage of assessment experts are good with the percentage is 80% on the concept of social arithmetic, multi-level construction, the establishment of entrepreneurial spirit, and the appearance and readability. Limited testing by users of the indicators: the display module, the multi-level construction, the establishment of entrepreneurial spirit, and the use of

modules are respectively 88.64%; 87.41%; 87.87%; and 89.78%; they fulfill the practical criteria. All students from elementary to high school can utilize this module. The changing of the entrepreneurial spirit behavior indicators, such as independent, creative, oriented in action, risk-taking, leadership, hard work and skill before and after reading the module are increased from 58.25% (currently) to 80, 73% (very high). So the module is feasible to become reference for studying social arithmetic integrated with spirit of entrepreneurship.

Recommendation

This module can be recommended in order to increase the the students' entrepreneurship mentality and obtained the learning experiences which apply the mathematics lessons in the entrepreneurship scope. Thus, it can produce students who are able to apply math in everyday life.

This module can be used as a new paradigm in self-study, so the students do not feel tired and they will be easier to understand the material. This module is useful as learning materials and learning resources in order to make the students can associate the mathematic materials in everyday life, especially in entrepreneurship activity. This module can also be used as a collection of mathematics books which is interesting and can educate the students' entrepreneurial spirit in the module. The multi-level base modules can be used as reference material for teachers in mathematics materials that can enhance the students' enterpreuneship mentality.

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STUDENTS ERROR ANALYSIS IN SOLVING MATH WORD PROBLEMS OF SOCIAL ARITHMETIC MATERIAL FOR 7TH GRADE BASED ON NEWMAN PROCEDURE

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ABSTRACT

In order to know the students errors in solving word problem is used Newman errors analysis procedure. The purpose of this study is to determine what the types and the causes of error students error in solving Social Arithmetics word problem based on Newman procedure. This is a qualitative research. The subject of research consists of 6 students from 30 students in grade 7th E of Buluspesantren Kebumen State Junior High School, with respectively two students from the top, middle, and bottom. Data was collected by tests and interviews. Test the validity of the data was done by using triangulation. Data was analysed by reduction data, display data, and verification. Newman in Parakipitong and Nakamura (2006) suggest to analysing errors by 5 kinds of error (reading, comprehension, transformation, process skill, and encoding). Clements in Jha (2012) also adds error carelessness analysis later. The errors that are made by the top subject group are: comprehension, transformation, and process skill; the middle group errors are: comprehension, transformation, process skills, and carelessness; and the bottom group errors are: reading and comprehension. Deepening with interview is known that the causes of each errors are “reading errors” means that students cannot interpret keywords or mathematical terms although they have could read it well; “comprehension errors” means that students cannot explain correctly the parts of something that is known; “transformation errors” means that students do not understand well the formulas that used to solve problem; “process skill errors” means that students do not understand mathematical operation concept well; “encoding errors” means that students can’t give appropriate conclusion because there is an error in calculation result; and “carelessness errors” means that students are not careful when doing calculation but can repair it immediately without guidance from researcher. Based on the these result, the researchers recommend to: 1) increase understanding the formulas, students should be better to understand the formulas and not to memorize it; 2) increase students ability for interpret the keyword in Social Arithmetic, the matter should be better related to daily life problems so that easy to understand and remember; and 3) increase student ability in doing calculation operation procedures, students should be better doing more exercise and re-check the answer sheet before they submit it.

Keywords – Error analysis, word problem, Newman

Introduction

Laws No. 20 of 2003 on the National Education System, chapter 1 verse 1 states that education is the a plan efforts to create learning atmosphere and learning process consciously, in order to make students actively developing their potential in spirituality, self-control, personality, intelligence, noble character, and skills that are needed for their self, society, nation, and state. One of the efforts to develop the potential is by way of mathematics learning. According to Permendiknas No. 22 of 2006,

mathematics should be given for all elementary school students to give them the ability of logical, analytical, systematical, critical, creative, and cooperative thinking. Then, one of the purposes of mathematics lesson is make students have appreciative attitude to mathematics utility in life, they will be curious, attentive, and interested in learning mathematics, ald also persevering and confident attitude in problem solving.

Mathematics problems in daily life usually indicate word problems. Math word problems give a real life problem. I can

introduce students some benefits of mathematics in daily life activity. Moreover, it can increase students' enthusiasm to learn mathematics, because they have realized the importance of mathematics in daily life.

Tabel 1 The percentage of understanding National Examination SJHS question in solving problems about Banks or Cooperation in Simple Social Arithmetic

Year School	Regency Level	Province Level	National Level
2011/2012	58,83%	68,31%	77,54%
2012/2013	47,36%	48,43%	60,27%

Kebumen Regency, Central Java Province

Sumber: The Report of National Exam by Education Center, Research and Development Agency, Ministry of National Education (2011-2013)

To determine the causes of student learning outcomes reduction is by doing student errors analysis. In this research, student learning outcomes that will be analyzed is the answer sheet of 7th grade students in solving Social Arithmetic word problems. By analyzing student errors, teachers are expected to know the type and cause of student errors in solving Social Arithmetic word problems. If the cause is known, then the students are expected to avoid the same mistakes. The analytical method that is used in this research is Newman Error Analysis (NEA) Method. NEA was begin introduced in 1977 by Anne Newman, an Australian mathematics teacher. In this method, she suggested the five specific activities that very crucial to find the type and cause of student errors in solving word problems, there are: (1) reading, (2) comprehension, (3) transformation, (4) process skills, and (5) encoding. Clements in Jha (2012) also adds carelessness errors analysis later.

The problems in this research are: (1) what are the kinds of student errors in solving Social Arithmetic word problems based on Newman procedure, and (2) What the causes

of the student errors in solving Social Arithmetic word problems based on Newman procedure. Therefore, the purposes of this study are: (1) to determine the kinds of student errors in Social Arithmetic word problems solving based on Newman procedure, and (2) to determine the causes of student errors in solving Social Arithmetic word problems based on Newman procedure. The benefits of this research are to improve the students ability to learn mathematics, especially to solve mathematical word problems.

Theoretical Review

According to Gagne that was quoted by Suherman et al. (2003: 33), in learning mathematics, there are two objects that can be obtained by students, that are the direct object and indirect object. Indirect object is the investigating and problem solving ability, self-learning, positive attitudes toward mathematics, and know how to learn properly. While the direct object is facts, skills, concepts, and rules.

In Indonesian Dictionary (2008:60), "*analisis adalah penyelidikan suatu peristiwa (karangan, perbuatan dan sebagainya) untuk mengetahui apa sebab-sebabnya, bagaimana duduk perkaranya, dan sebagainya*". It means that analysis is the investigation of an event (essay, action, etc.) to find out what causes, how it happens, and so on. Meanwhile, based on Indonesian Dictionary (2008:1247), "*kesalahan adalah kekeliruan, perbuatan yang salah (melanggar hukum dan sebagainya)*". It means that error is mistake, wrong action (illegal and so on. So, error analysis is an investigation effort of a deviation case to find out what cause of a case can be happened.

Math word problems are mathematical problems expressed in story sentences that need to be translated into mathematics sentences or mathematical equations. Word problems are usually expressed in issues or

problems sentences that are finished by numerical skill. (Budiyono, 2008: 8).

The fifth activities in NEA method is listed in NEA method interview (White, 2009:102), that are 1) Please read the question to me. If you don't know a word, leave it out; 2) Tell me what the question is asking you to do; 3) Tell me how answer you are going to find; 4) Show me what to do to get. "Talk aloud" as you do it, so that I can understand how you are thinking; and 5) Now write down your answer to the question.

According to Jha (2012) and Singh (2010:1) reading error is an error that is caused students cannot: a) recognize/read symbols on question, b) understand the meaning of the symbols on the question, or c) interpret the keywords in the question; 2) comprehension error is an error that is caused students are not able to: a) understand the overall meaning of question; b) write down and explain what is known of the question; or c) write down and explain what is asked of the question; 3) transformation error is an error that is caused students are not able to: a) determine the formula that is used to solve the problem; b) determine a mathematical operation or set of operations to solve problems in the question appropriately ; or c) to identify the operation or a set of operations; 4) process skill error is an error that is caused students cannot: a) know the process/algorithm to solve a problem although can determine the appropriate formula; and b) perform the procedures correctly despite being able to specify the mathematical operations used appropriately; and 5) encoding error student is an error that is caused students cannot : a) write down the answers appropriately that changes the meaning of the answers; b) reveal the solution of the problem in written acceptable form; or c) write the appropriate answer conclusion. Carelessness error is an error that is caused students cannot give the correct answer in second trial without guidance.

Social Arithmetic material is related to social life, especially the money using. In this research, Social Arithmetic material including buying, selling, gross, net, tare, profit, loss, profit percentage, loss percentage, interest, discount, and tax.

Research Method

The method used is qualitative research methods. According to the data, the purpose and benefit of this research, this research used a qualitative research approach. A qualitative approach chosen with the purpose to expose student errors in solving the word problems more closely. Moreover, with a qualitative research, we can communicate directly with respondents to identify the student errors in solving word problems. This type of research that will be conducted is a case of study.

The research was conducted in Buluspesantren Kebumen SJHS. Subjects were taken from 6 students of 30 students VII E grade 2014/2015 school year, that each consists of two students from the top, middle, and bottom group. Group based on student test result ranks, then selected two students that were solving word problems based on Newman procedure and have diverse possible errors.

Data was collected using tests and interviews. Tests with word problems in descriptive form and interview instruction have been validated. The word problem trial results was also counted the validity, reliability, level of difficulty, and the distinguishability. From 6 questions that were tested, we selected four questions to be a question research. Each of the subjects were interviewed related his answer sheet on four Social Arithmetic word problems. The validity test of the data was done by using triangulation. Then, students answer sheets were analyzed according to Miles and Huberman was quoted by Sugiyono (2011: 247), that are data reduction, display data, and verification.

Result And Discussion

Social Arithmetic is one of algebra aspects. In this material, question is usually given in word problem form because it closely related with daily life problem about money buying-selling. In solving Social Arithmetic word problem is chosen procedure Newman that can make students easier to solve it. Step-by-step procedure to solve problems by using the Newman can be seen in the solving problems instructions that are given. The instruction is 1) read carefully the questions given (reading), 2) write down what is known and ask about the given problem (comprehension), 3) write down the formula that is used (transformation), 4) write down the answer with detailed, clearly, and correctly steps (process skill), 5) write

the conclusion of the calculation result (encoding), and 6) check back your answer sheet before being collected to supervisor.

Analysis is conducted (1) if the student made reading errors, it means the analysis in the later step comprehension until encoding cannot be done; (2) if the student made comprehension errors, it means that error analysis cannot be continued in transformation until encoding as well as on the transformation and process skill steps, and (3) if student have answered without error until the encoding, the analysis was conducted on all category. Examples interviews to know the types and causes of errors based on Newman procedure is as follows.

Diket: Gaji per bulan Rp 5.500.000,00
Pajak penghasilan 15%
Ditanya: besar gaji yang diterima dalam 1 tahun
Jawab: ~~Besar pajak~~

$$\begin{aligned} \text{Besar pajak} &= \text{persentase pajak} \times \text{besar gaji} \\ &= \frac{15}{100} \times 5.500.000,00 / \text{bulan} \\ &= \text{Rp } 825.000 \times 12 = 9.900.000 \end{aligned}$$
$$\begin{aligned} \text{Besar gaji dalam 1 tahun} &= 5.500.000 \times 12 \\ &= 66.000.000 \end{aligned}$$
$$\begin{aligned} \text{Gaji yang diterima} &= \text{Besar gaji} - \text{Besar pajak} \\ &= 66.000.000 - 9.900.000 \\ &= \text{Rp } 56.100.000,00 \end{aligned}$$

Jawab: besar gaji yang diterima karyawan tersebut dalam 1 tahun adalah Rp. 56.100.000,00.

Figure 1. Subjects error location.

P : *Apa saja kata kunci dan simbol yang terdapat pada soal tersebut?*
 S : *Besar gaji, pajak penghasilan.*
 P : *Apakah hanya itu saja? Masihkah ada yang lainnya?*
 S : *Tidak ada Bu.*
 P : *Bagaimana dengan simbol matematika yang ada pada soal tersebut?*
 S : *Iya ada Bu, simbol persen.*
 P : *Apakah yang dimaksud dengan simbol persen?*
 S : *Simbol persen berarti per seratus Bu.*
 P : *Coba sebutkan apa saja yang diketahui dan ditanya dari soal tersebut?*
 S : *Diketahui besar gaji Rp5.500.000,00 dan besar pajak penghasilan 15% dan ditanya besar gaji yang diterima dalam satu tahun.*
 P : *Apakah kamu sudah yakin?*
 S : *Iya Bu, sudah yakin.*

P : *Coba baca kembali soal nomor 1 dengan teliti. Apakah menurutmu besar penghasilan tidak kena pajak tidak termasuk dalam hal yang diketahui?*
 S : *Saya tidak tahu Bu.*
 P : *Kenapa saat itu kamu tidak menuliskan penghasilan tidak kena pajak untuk hal yang diketahui?*
 S : *Karena saya kira tidak diperlukan Bu.*

From interviews, we can find the cause of the error is the subject did not understand the whole question well because he considered non-taxable income is not required or ignored. Therefore, the error including comprehension errors. Table description of the error cause made by subject are presented in Table 2 below.

Table 2 Description of subjects errors cause

Cause of Errors	Type of errors
Subjects are not able to interpret the key words in question. Subjects cannot understand vocabularies/key terms in Social Arithmetic material.	Reading errors
Subjects cannot determine the known thing in detail. Subjects not identify what is known precisely, that is causing misinterpretation. Subjects not read the questions carefully so that there is missing information. Subjects are less of various exercises so that cannot directly solving a different problems. Subjects not understand the whole problems properly so that inconsistent in identifying what is known. Subjects unable to explain the information in problems appropriately.	Comprehension errors
Subjects cannot plan the solution to solving the problems. Subjects cannot determine the formula. Subjects have not more exercises. Subjects cannot determine the mathematical operations used.	Transformation errors

Subjects not aware of making mistake in summation operation. Subjects cannot operate simplifying fractions correctly.	Process skills errors
Subjects cannot give appropriate conclusion because there is an error in calculation result.	Encoding errors
Subjects not careful in doing the calculations. Subjects not check back before the exam answers collected. Subjects not carefully reading what is known.	Careless errors

Analysis results of the student errors in solving Social Arithmetic word problem shows that in reading step, there is no one subject who doing reading errors in question number 1. In question number 2, 3, and 4, two subject from bottom group doing reading errors. It is caused the subjects are not able to interpret the keywords in the problem and less of vocabulary/key term in Social Arithmetic. This is same with the research conducted by Newman (1977) in Clements and Ellerton (1996) "thirty-five percent of all errors made by low-achieving students happened in Reading and Comprehension categories while the rest of errors were content-knowledge in nature ". There are many terms or keywords in Social Arithmetic i.e gross, net, tare, profit, loss, profit percentage, percentage of loss, interest, discounts, sales tax, income tax, and percent symbol (%). All of them are related to daily life problems, especially buying and selling. According to Turmudi as quoted by Suherman (2003:152) states that students like mathematics with given learning approach that is with different study method from generally, challenging question, addition question that expanding knowledge, and easy to learn because related daily life problem. Something that is closed to daily life problem will be more memorable and meaningful. Therefore, it would be better if the matter is not only taught to students but also related with daily life problems so that it will be easier to learn.

Subjects who are doing comprehension errors in question number 1: four subjects,

number 2: one subject, number 3: two subjects, and number 4: no one subject. The errors are caused subject cannot mention what is known completely, subjects not identify what is known precisely that is causing misinterpretation, subjects not read the questions carefully so that there is missing information, subjects is less of various exercises so that cannot directly solving a different problems, subjects not understand the whole problems properly so that inconsistent in identifying which is known, and subjects unable to explain the information in problems appropriately.

Subjects who are doing transformation errors in question number 1: one subject, number 2: three subjects, number 3: two subjects, and number 4: one subject. The errors are caused by subjects that cannot plan the solution to solving the problems, subjects cannot determine the formula, subjects have not more exercises, and subjects cannot determine the mathematical operations used. Transformation errors are happened at every number. This is shows that subjects are not understanding formulas well. It because students are still memories the formulas without understanding it. According to Ausubel, as quoted Suherman (2003: 32) states that "Pada belajar menghafal, siswa menghafalkan materi yang sudah diperolehnya, tetapi pada belajar bermakna materi yang telah diperoleh itu dikembangkan dengan keadaan lain sehingga belajarnya lebih dimengerti". Therefore, it should be better to use meaningful learning with related to facts and

concepts that have been known by students so that the formulas will be easy to understand.

Process skill errors occur in number 2 and 3, it was doing by one subject respectively. In number 2 and 4, there was no one subjects who was doing process skill errors. The errors were caused subjects not aware of making mistake in summation operation and subjects cannot operate simplifying fractions correctly. Therefore, it is needed to understand calculation operation procedures again and doing more exercise. It is as stated by Suherman (2003: 207) that “latihan diperlukan agar siswa terampil menyelesaikan soal-soal yang pengertian dan prosedur penyelesaiannya sudah dipahami”.

Encoding errors occur if subjects is doing error in written what she/he means in answer sheet. Based on result of research, there was no one subject who doing error until encoding errors. Nevertheless, because subjects were doing errors in previous step i.e reading errors, comprehension errors, transformation errors, or encoding errors, so they were also doing encoding errors for its number. Therefore, the encoding errors was caused subjects made a mistake in concluding because error calculation.

Carelessness error was done by 2 subjects in question number 2. The errors was caused subjects were not careful in calculations, subjects were not check again the answer sheet before being collected, and subjects were not careful at reading what is known. Because of that, it is very needed to be careful and re-check the answer sheet before being collected to avoid the carelessness error.

Conclusion and Recommendation

Based on result and discussion, the type of student errors in solving Social Arithmetic word problem based on Newman procedure were: 1) reading errors: 2 subjects; 2)

comprehension errors: 5 subjects; 3) transformation errors: 4 subjects; 4) process skills: 2 subjects; 5) encoding errors: no subject; and 6) careless errors: 2 subjects. The most errors that was doing by subjects was transformation errors. The errors that were done by the top subject group were: comprehension, transformation, and process skill; the middle group were: comprehension, transformation, process skills, and carelessness; and the bottom group were: reading and comprehension.

The causes of the student errors in solving Social Arithmetic word problems i.e 1) subjects are not able to interpret the key words in question and cannot understand of vocabulary/key term in Social Arithmetic material; 2) Subjects cannot determine the known thing in detail, not identify what is known precisely that is causing misinterpretation, not read the questions carefully so that there is missing information, less of various exercises so that cannot directly solving a different problems, not understand the whole problems properly so that inconsistent in identifying what is known, and unable to explain the information in problems appropriately; 3) Subjects cannot plan the solution to solving the problems, cannot determine the formula, have not more exercises, and cannot determine the mathematical operations used; 4) Subjects not aware of making mistake in summation operation and cannot operate simplifying fractions correctly; 5) Subjects cannot give appropriate conclusion because there is an error in calculation result; and 6) Subjects not careful in doing the calculations, not checking back before the exam answers collected and not carefully reading what is known.

Based on the above conclusions, the researchers recommend to: 1) increase understanding the formulas, students should be better to understand the formulas and not to memorize it; 2) increase students ability for interpret the keyword in Social Arithmetic, the matter should be better

related to daily life problems so that easy to understand and remember; and 3) increase student ability in doing calculation operation procedures, students should be better doing more exercise and re-check the answer sheet before they submit it.

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CONSERVATION POLICY (BASED ON ENVIRONMENTAL COST ACCOUNTING)

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ABSTRACT

The purpose of this research is to examine the advantage and disadvantage of conservation policy based on environmental cost accounting. This research focus on one of conservation pillar is conservation, ethic, and culture. Since Semarang State University declared as the Conservation University, it gives some effect for community. The research method is a qualitative method that collecting data by interview with local people. The result shows that conservation policy determined environmental changes and environmental cost accounting. Conservation policy gives support the implementation of the social cost which social responsibility to the community is something that absolutely must be done considering the existence of Unnes. Besides, impact of environmental change is very powerful. Potential environmental costs that are passed in decision making (regulatory, disclosure, operational overhead, future, uncertainty, and the picture of relations costs).

Keywords - conservation, environment, advantages and disadvantages based on Environmental Cost Accounting

Introduction

Semarang State University or UNNES is a conservation university which have a commitment for establish good environment. The University has a policy to conserve in all fields. This commitment appears due to concerns UNNES in the condition of the surrounding community. There are 68 villages and 44 villages has a flood problem (Unnes' Team, 2009). Hence, as Conservation University has responsibility to solve the problem.

Kusmuriyanto (2011) argue that there are various kind of conservation like reforestation, organic waste and non-organic and conduct conservation education. Those could be solve the problem of environment. In order to create the good atmosphere, people should care about their surrounding. There are many people who do not realize it. Damage was widespread and disastrous consequences continue to come. Furthermore, the emergence of large companies have led to a new damage anyway. Not only the company, entity begins to develop any real impact for

environmental damage. For example perkemabngan UNNES growing rapidly from year to year has made the environment around UNNES be changed drastically.

UNNES existence has changed the condition of the natural surroundings. There are two sides of a coin that significance here. On one side of the territory that was originally barren now become fertile. However, other condition, UNNES rapid development has given rise to new effects, namely the expansion of housing and size of settlements. This of course gives the consequence that green land on the wane. Hence, environment problems began to emerge among the flooding in the rainy season, the difficulty of water during the drought and the high levels of pollution. Hence, this study will examine the determination of conservation policy. Which is more focus on cost environmental accounting.

Literature Review

Conservation Policy

There are many types of conservation policy that published by companies, institutions and

so on. One of the policy is published by UNNES. The university has a special role in order to create good environment especially to achieve conservation in all fields. The university has seven pillars for conservation implementation such as :

- a. Biodiversity conservation.
- b. Green architecture and the internal transport system.
- c. Waste management.
- d. Paperless policy.
- e. Clean energy.
- f. Conservation, ethics, art, and culture.
- g. Conservation regeneration.

(State University Rector Regulation No. 27 Year 2012 on Governance Campus-Based Conservation in Semarang State University)

Thus, give a real guidance for UNNES management to achieve their vision perfectly. Biodiversity conservation means that university will keep all biodiversity. Green architecture and the internal transport system, that the transport system in UNNES priority based on minimal pollution and more public transport rather than individual transport in order to reduce pollution and energy waste. Waste management, efficient waste management is able to create a more useful goods. Paperless policy, the university system uses advanced technology for the sake of reduction in paper use. Furthermore, Clean energy, that energy use is environmentally friendly and does not have negative effects for the surrounding community. Furthermore, Conservation, ethics, art, and culture, that the university always preserve the culture and ethics of the noble nation. Conservation regeneration, that the university teaches students to always go forward without changing the cultural identity of the nation.

However, the policy is not a simply things to do. It needs a huge resources like man, money, and methods. In order to achieve the mission, UNNES will face some problem like the lack of society awareness, the pollution and low quality of water. These

problem have to solve with some method and resources. Hence from the entity perspectives UNNES needs to allocation some funds in order to fulfill all cost that arises from their policy. Generally, in a company this cost usually calls environmental costs.

Environmental Costs

Definition

According to Hansen (2007; 72) expenditures for environmental costs are costs that occur because of poor environmental quality or because of poor environmental quality may occur. Hansen classify environmental costs into four categories, namely:

1. Prevention costs
 - a) Evaluate and select suppliers
 - b) Evaluating and selecting a tool for controlling pollution
 - c) Designing products
 - d) Carry out environmental studies
 - e) Auditing environmental risk
 - f) Developing an environmental management system
 - g) Recycling products
 - h) Obtaining ISO 14001 certification
2. Cost Detection
 - a) Auditing of environmental activities
 - b) Check the products and processes
 - c) Developing environmental performance measures
 - d) Testing of pollution
 - e) Verify the environmental performance of suppliers
 - f) Measure the level of pollution
3. Internal failure costs
 - a) Operate pollution control equipment
 - b) Process and dispose of toxic waste
 - c) Maintaining pollution equipment
 - d) Obtaining the license to produce waste facility
 - e) recycling the remaining ingredients
4. External failure costs
 - a) Cleaning polluted lake

- b) Clean spilled oil
- c) Cleaning contaminated soil
- d) Completing personal injury claims (relating to the environment)
- e) Restoring the land to the state of nature
- f) loss of sales due to poor environmental reputation
- g) Use of raw materials and electricity inefficiently
- h) Receiving medical treatment because of air pollution
- i) The loss of jobs due to contamination
- j) The loss of the benefits of the lake as a place of recreation
- k) Damage to the ecosystem due to the disposal of solid waste

of environmental costs and expenditures for the purpose of management control, budgeting and report capital and operational decision making (Gale, Robert JP and Peter K. Stokoe (2001)). The Canadian Institute of Chartered Accountants (CICA 1993) Applies the term "environmental losses" to the category of environmental cost of expenditures for the which there are no returns or benefits. According to CICA environmental losses are damages that have to be paid to others as a result of damage to the environment that resulted in bodily injury to humans, damage to the property of others, the economic damage to others, or damage to natural resources (CICA 1993). CICA also explain the other categories of expenditure lingkungan such as environmental measurements. The fee is used for prevention, and environmental destruction or to the cost of conservation of resources (CICA 1993; see also, Judd 1996).

Environmental Cost Accounting Components

Environmental cost accounting components are in the environment. Environmental accounting is the assessment and allocation

The following table is based on the environmental costs (CICA 1993; see also, Judd 1996):

External Environmental Costs	
Examples: Depletion of natural resources Noise and aesthetic impacts Residual air and water emissions Long-term waste disposal Uncompensated health effects Change in local quality of life	
Internal Environmental Costs	
Direct or Indirect Environmental Costs <i>Examples:</i> <ul style="list-style-type: none"> · Waste management · Remediation costs or obligations · Compliance costs · Permit fees · Environmental training · Environmentally driven R&D · Environmentally related maintenance · Legal costs and fines 	Contingent or Intangible Environmental Costs <i>Examples:</i> <ul style="list-style-type: none"> · Uncertain future remediation or compensation costs · Risk posed by future regulatory changes · Product quality · Employee health and satisfaction · Environmental knowledge

<ul style="list-style-type: none"> · Environmental assurance bonds · Environmental certification/labeling · Natural resource inputs · Record keeping and reporting 	<ul style="list-style-type: none"> assets · Sustainability of raw material inputs · Risk of impaired assets · Public/customer perception
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Methodology

The method of this research were phenomenology. It is an approach that examines a particular phenomenon in the participant’s condition. Source of data in this study were local resident by using purposive sampling. Purposive sampling is a method in choose population as sampling by consider some factors like gender, job and location. Therefore, data analysis in this study used qualitative techniques which is give a board of explanation that could give good understanding (Miles and Huberman, 2009)

Result and Discussion

Advantage and Disadvantage of Conservasion Policy (Based on Cost Environmental Accounting)

Implementation of conservation policies determine the quality of the environment and society on Unnes. If their correlation with one of the pillars of conservation, namely Conservation, ethics, art, and culture it takes a huge cost to get to a sustainable environment. Examples are plant maintenance costs needed to ensure the plants thrive, road maintenance costs, costs of environmental hygiene campus and around the campus, social costs, and other so there is no activity of internal and external failure. Examples of internal failure activity is the operation of equipment to reduce or eliminate pollution, treatment and disposal of toxic wastes, pollution equipment maintenance, facility license to manufacture recycled waste and residual materials. Examples of external failure costs realized was the cleaning of the lake is polluted,

cleaning the oil spill, cleanup of contaminated groundwater, the use of raw materials and energy inefficiently, settlement of personal injury claims of work practices that are not environmentally friendly, settlement of claims for property damage, renewal of land to a natural state, and the loss of sales due to a bad reputation. Examples include the social costs of medical care because of the polluted air (individual welfare), loss of use of funds as a place of recreation because of pollution (degradation), the loss of jobs due to contamination (individual welfare), and the destruction of ecosystems due to the disposal of solid waste (degradation).

According Arfan Ikhsan (2009) social costs often called unexpected costs or expenses. Though social costs are not always unpredictable. There are a lot of research in the concept of social cost, but generally explain the meaning placed on the costs associated with the public as a result of the environmental impact of specific company or other organization, or an entity that is not specified. Perhaps there is a social cost as “sumbangan” that are totally unexpected. To deal with these kinds of social costs like this, managers can estimate how many restrictions are about to be issued by an agency on environmental conservation activities. The principle is still able to make an estimate.

Therefore, Unnes must prepare a solid team to carry out the seven pillars of conservation so that conservation goals can be achieved. To support the implementation of the social cost of the program would require the cost items in the budget. UNNES social responsibility to the community is

something that absolutely must be done considering the existence UNNES impact of environmental change is very powerful. Potential environmental costs that are passed in decision making (regulatory, disclosure, operational overhead, future, uncertainty, and the picture of relations costs).

Conclusion

Conservation policy determine environmental changes and environmental cost accounting. Conservation policy gives support for the implementation of the social cost which social responsibility to the community is something that absolutely must be done considering the existence of Unnes. Besides, impact of environmental change is very powerful. Potential environmental costs that are passed in decision making (regulatory, disclosure, operational overhead, future, uncertainty, and the picture of relations costs). For further reseacher should be examine the correlation conservation policy on social economic, the condition of environment, and calculated the environemtal cost accounting on conservation.

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Piagam dari International Council of
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Paper Subtitle as needed

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line 2-name of organization, acronyms acceptable

line 3-City, Country

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Abstract

The abstract is the provision of no more than 250 words. Times New Roman font size 10, single spaced, indented 1 cm from the left and right margins. The abstract should be clear, descriptive, and gives a brief overview of the problem under study. Followed by a statement of the methodology and a brief summary of the results. Abstracts must end with a brief conclusion. **CRITICAL: Do Not Use Symbols, Special Characters, or Math in Paper Title or Abstract.*

Keywords – consist of 3-6 words or phrases (font size 10 Bold)

Introduction

The introduction presented in an integrated way in the form of paragraphs as much as 10-15% of the length of the article, single space, Times New Roman font size 12 pt. Contain minimal background of the problem, research questions, the purpose and benefits of the research.

Theoretical Review

This section describes the theories relating to the research, previous research, underlying conceptual models of the research, and hypothesis if any. Written as much as 10-15% of the length of the article, single space, with Times New Roman font size 12 pt.

Research Methods

This section describes the design of the study, the subject of research, data collection procedures, instruments, data analysis techniques, and procedure of the research. Written as much as 10-20% of the length of the article, written by a space 1, with Times New Roman font size 12 pt.

Results and Discussion

Results and discussion presented as much as 35-60% of the length of the article, written by a space 1, Times New Roman with font size 12 pt. The mayor part of the results contain the data analysis and hypothesis testing. Discussion is an important part of the overall content of a scientific article, load response research problem, penafsiraan findings, integration of findings from research into the existing body of knowledge, the preparation of a new theory or modifying existing theories.

Conclusions and Recommendations

Presented as much as 10-15% of the length of the article, written in single space, with Times New Roman font size 12 pt. Conclusion is a brief statement of the results and findings obtained. Suggestions refers to the results and discussion (not suggesting

further research. Written in the form of a paragraph without numbering.

USING THE TEMPLATE

Figure. To clarify the results of verbal data can be presented in the form of tables or images (graphs categorized as an image). The title is written at the bottom of the image. Numbering sequence image and each image referenced in the passage. The image can be referenced in the paragraph before and after images appear with the number of images which are referenced. Example of figure as in Figure 1.



Figure 1. The figure high measuring not more than 5 cm, lies in the middle of the paper. Index images using font 10 pt Times New Roman.

Represent Table. Title laid in the top of the table. The table consists of three main horizontal line, with no vertical lines. The table can be referenced in the paragraph before or after the table appears, listing the number where the referenced table.

Example of table as follows.

Table 1. Data of Color Value

Color Value					Total
1	2	3	4	5	
30	105	125	500	650	1410
30	105	125	570	650	1480
40	105	125	570	650	1490
20	105	125	570	650	1470

Represent Formula. The formulas/mathematical notation written in Microsoft Equation. Mathematical notation and numbering required follow the example as in the formula (1) below.

$$a + b = c$$

and

$$t_{ij}(k) = \begin{cases} 1 & \text{jika terjadi perpindahan dari tarif grup ke-} i \\ & \text{ke tarif grup ke-} j \\ 0 & \text{lainnya} \end{cases} \quad (1)$$

Reference. Referral libraries follow the rules of admission. If the author of more than 3 then simply written the first author, and others like Apriliani et. Al. (2007). Every

library that is referenced in this article should be listed in the bibliography.

Bibliography

(Example bibliography of books)

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(Example bibliography of articles in a book)

Linn, MC, Songer, NB, & Eylon, BS 1996. Shifts and convergences in science learning and instruction. In D. Berliner & R. Calfee (Ed.), Handbook of Educational Psychology, 438-490. NY: Mcmillan.

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IMPLEMENTATION OF WASTE MANAGEMENT TO SUPPORT THE ADIWIYATA SCHOOL DEVELOPMENT

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Abstract

SMAN 12 and SMAN 13 Semarang are two of many educational institutions in Semarang which committed to developing of Adiwiyata program, particularly in managing wastes. The Adiwiyata program is a program to create a school which cares to nature (Sekolah yang peduli dan berbudaya lingkungan), as were regulated in Rule of the Minister of Environment (PERMEN LH No.5/2013). This year (2015) both of schools would like to implement 3Rs concept (recycle, reduce and reuse) waste management program, and implementing recycle concept on the composting. All of activities as part of the learning-based environment. Unfortunately, two schools don't have adequate human resources to manage the waste continuously. Therefore they want to collaborate with Unnes to transfer the knowledge to the students and teachers in order to help the process of developing the program Adiwiyata. Unfortunately both schools don't have the human resources capable for managing wastes continuously. Therefore they want to collaborate with Unnes in order to transfer knowledge, workshop and implementation of waste management program. The collaboration includes: the transfer of knowledge about waste management based on the 3R concept, implementation of composting to profit-oriented. In conclusion, basic knowledge of students to the management of the environment especially wastes management increased in the high category after the implementation of the program, while the level of participation of the students remained on fair category. The compost produced is in the range defined SNI standard No. 19-7030-2004, so it is marketable.

Keywords : Adiwiyata program, waste management, 3Rs concept, composting

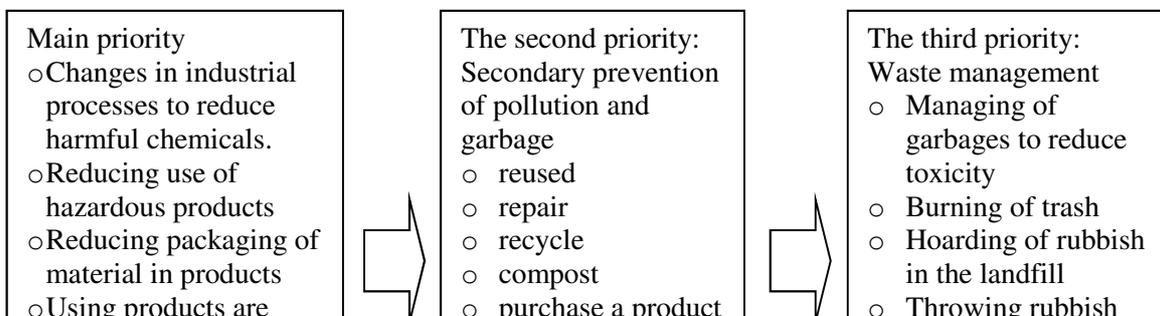
Introduction

Awareness to caring environment is one of the characters that will be achieved in the national education goals. In the school, environmental education has been taught early, since of basic education until the college level. The students have been taught how to dispose of garbage in proper places, how to sort out organic and inorganic wastes, but most of them do not understand why garbages must be sorted prior to disposal, as well as its relationship with environmental damages.

In order to develop environment and education, since 2006 the Ministry of Environment together with the Ministry of Education and Culture started a program called Sekolah Peduli dan Berbudaya Lingkungan or known as Adiwiyata School Program. Adiwiyata School program was launched by Ministry of Environment together with the Ministry of Education and Culture and was strengthened by law (PERMEN-LH) No. 2/2009 and later was revised to PERMEN-LH No.5/2013. Adiwiyata program is implemented based on educational, participatory and sustained principles. One component of Adiwiyata program aims to grow awareness of the natural environment among people in schools,

including positive attitudes and behaviors towards natural environment. The manifestation of this component reflected in the efforts of school community to manage the school with regard to the environmental management principles. The school community consists of the head principal, teachers, all students, janitors, security officers as well as the School Committee.

SMAN 12 and SMAN 13 Semarang are two of many educational institutions in Semarang which committed to do Adiwiyata program. This year (2015) both of schools would like to implement 3Rs concept (recycle, reduce and reuse) waste management program, inventory and managing of plant collections at school with scientific names, cultivation of medicinal plants (i.e. Zingiber officinale). All of activities as part of the learning-based environment. Unfortunately both schools don't have the human resources capable for managing wastes continuously. Therefore they want to collaborate with Unnes in order to transfer knowledge, workshop and implementation of waste management program. The collaboration includes: the transfer of knowledge about waste management based on the 3R concept, and implementation of composting to profit-oriented



Theoretical Review

One solution in waste management, as stated in Law No. 18/2008 on Waste Management, is the application of 3Rs concept (reduce; reuse, and recycle). Wibowo (2010) asserted that the concept of reduce means reducing the volume and weight of waste, reuse is the reuse or reuse materials from the disposal of waste into materials that can be in use again, for example, building construction waste. Recycle is to separate inorganic objects (e.g. bottles, cans, cardboard and other) from a pile of garbage to be processed back into the raw materials or goods that are more useful.

According to Syafrudin (2004), 3Rs concept is still the best waste management strategy to reduce the burden on landfill (TPA). 3Rs concept is able to reduce waste to 68.3% (Trihadiningrum 2010).

Waste management based on the concept of the 3Rs as stated in Law No. 18/2008 on waste management, mentioned *inter alia*: Waste management is an activity that is systematic, comprehensive, and continuous covering waste reduction and handling. As for waste reduction referred to in this case is (a). restriction of waste; (b). recycling of waste; and / or (c) utilization of waste.

Stages of waste management according to Miller (2008) as shown in Figure 1. Basically, Miller (2008) explains that the main priority is reducing of the wastes based on its source, the second priority of reducing the use of trash excessively, and third priority is handling of wastes in landfills. From those three stages, the second priority is generally performed society through applying of 3Rs concept (reuse, reduce, recycle). Reused is reusing stuff junk, to be useful in accordance original or other functions. Reduce, is reducing of waste by means of optimizing use of goods that our used so that the waste produced can be minimized. Recycle is the recycling of waste by destroying and re-processing to be formed into new useful merchandise. One of example is processing organic wastes into compost.

In the International Institute for Sustainable Development (2012), the waste management is not only 3Rs, however 4Rs, namely reduction, reuse, recycling and recovery. When referring to those principles, should amount of garbage that dumped only about 35%, so relieve the burden landfill as well as extending its useful life. However, according to Abdullah (2011), although the principles of waste management has evolved into 4Rs (reuse, reduce,

recycle, recovery), even 7Rs (reuse, reduce, recycle, recovery, replace, relocation, responsible) but the most known by people and easy to applied on their own is the 3Rs concept. Krisnawati (2015), stated that the implementation of environmental learning using module-based 6Ms waste management proved to increase the knowledge and growing positive behavior and attitude towards environmental management. Within the context of waste management are implemented in schools, the participation of the school community, especially students, can be observed based on their participation during sorting the types of organic and inorganic garbages when they were put down in the shelters, participation in the processing, as well as their willingness to reduce the utilization of goods that is not biodegradable (Yolarita 2011). Candra (2012) and Yulastuti et al. (2013) revealed that community participation in waste management is not only seen from the participation of the community in the process of implementation of waste management, but also from indirect involvement as a member of an organization that deals with the problem of waste, and involvement in the payment of garbage service. Directly observable participation is categorized as direct participation (Manurung, 2008).

In addition to the direct and indirect involvement, Riswan et al. (2011) suggested that the student's basic knowledge about waste management would determine the level of participation in waste management to maintain the cleanliness of the environment. Hermawan & Roesman (2008) concluded that knowledge had a positive correlation with the waste management behavior. The results of research (Azizah, 2015) showed that both knowledge and behavioral manifestation of students has increased after being given a problem-based learning strategy is supported by the waste management module. Several previous studies have reinforce the statement that students' knowledge can be maximized. Mulyadi et al. (2010) states that the education level affects the public participation in waste management. If the public knowledge about wastes management is higher, the public participation is also higher because people are increasingly aware of the importance of cleanliness of their neighborhood.

Research Methods

The research was performed in SMAN 12 and SMAN 13 Semarang. Both schools have become partners in school waste management program through a grant named IbM by Higher Education Directorate in 2015, with a 7-month implementation period. A survey with a questionnaire was used to collect information on the knowledge and participation of students in the implementation of 3Rs concept before and after the implementation of Adiwiyata program. Respondents were 50 students of KIR (Karya Ilmiah Remaja) members in each school and were determined purposively. The activities carried out by means of presentations, discussion and implementation. The material about the 3Rs concept in waste management presented as a workshop. Implementation of composting using the method according to Widiyaningrum and Lisdiana (2012), while the inventory of plant and scientific names performed by observation and literature study. Evaluation of the program was conducted by questionnaire to the respondents before and after implementation. Aspects of evaluation in terms of

increased knowledge and participation of students before and after implementation (pretest-posttest). The questionnaire consisted of two parts: (a) Questions to determine the student's basic knowledge about waste management before and after the implementation of the program, consisting of 21 questions referring to research by Abdullah (2011). The correct answer was given a score of 1 (one), wrong answers were given a score of 0 (zero). Thus the highest score was 21 and the lowest value was zero. (b) statements to capture the level of student participation in implementing the 3Rs concept, consisting of 15 items with five alternative answers statements referring Likert scale: frequent (S) - quite often (CS) - rare (J) - ever (P) - never (TP). Each scale was scored 4-3-2-1-0 subsequently, so that the student obtained the maximum score is 60 and the minimum score of 0.

To calculate the percentage of the level of participation and the level of knowledge of students before and after the implementation of the program, we used formula as follows:

$$\text{Level of participation/knowledge} = \frac{\text{gained score}}{\text{maximum score}} \times 100\%$$

The results is then converted back into criteria as shown in Table 1, and the data were analyzed paired t-test

Table 1. Criteria level of knowledge and participation of students in the application of waste management based on the 3Rs Concept

Score (%)	Knowledge criteria	Participation criteria
75 < Score ≤ 100	High	Active
50 < Score ≤ 75	Moderate	Fair
25 < Score ≤ 50	Low	Less Active
Score ≤ 25	Very low	Inactive

The quality of compost is evaluated based on component C / N ratio and some of physical and chemical characters. The results were compared with SNI 19-7030-2004 number (BSN, 2004).

Results and Discussion

Evaluation of the implementation of activities at SMAN 12 and SMAN 13 is presented in a narrative as follows.

Evaluation of the students' knowledge and participation in the wastes management.

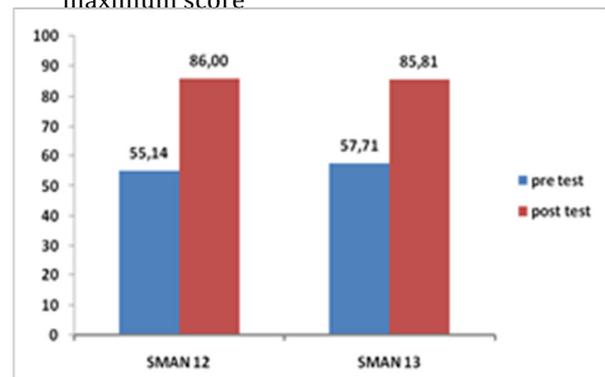


Fig 2. Scores of the students' knowledge of wastes management before and after the implementing the program in both schools.

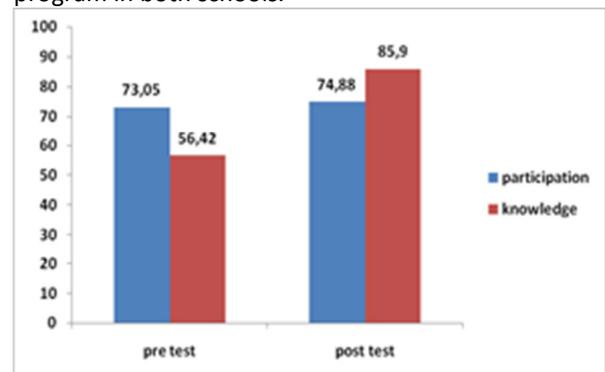
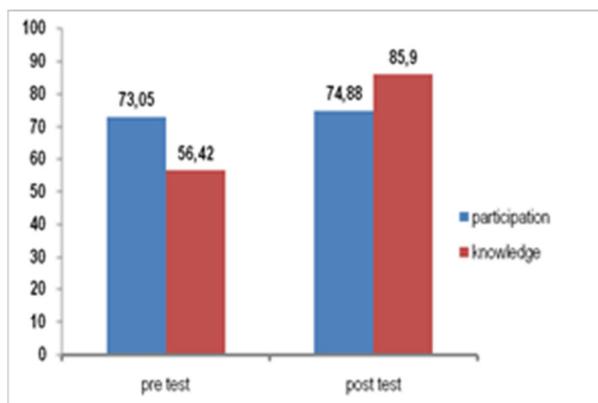


Fig 3. Student participation score (%) in implementing 3Rs concept before and after implementing waste management program in both schools.



Scores of the students' knowledge before and after the implementation of the program (Fig 2) suggests that the level of knowledge of students at both schools before the implementation of the program is still in the moderate category, but after the implementation of the program in the form of basic knowledge transfer and implementation of waste management programs, there was an increase in the high category with an average increase of 29.48%. This suggests that the ability of students to absorb knowledge given is very good. Student's low basic knowledge before program implementation was probably because the environmental management knowledge were not included in the lesson being taught in schools, so that their basic knowledge of waste management in general were obtained from various sources such as internet media, books or public environment. The results showed that in addition to the theory, students' knowledge of environmental management can be maximized through training and implementation of waste management activities.

A way of learning that engages students directly in practice is proven to be more effective and last in the memory of the student than just learning theory. Hermawan and Roesman (2008) revealed that knowledge has a positive relation with a person's behavior in managing waste. While Azizah (2015) in her study proved that knowledge and behavioral manifestations of students had increased after being given problem-based learning strategy and supported by the waste management practice.

Fifteen-item questionnaires were used to collect information about the level of student participation in implementing the concept of reduce, reuse and recycle. The participation of students to implementing of reduce in both partner schools showed lower scores than the scores reuse and recycle. Reduce in this case is any activity that is able to reduce and prevent waste creation. In the school environment, reduction of waste directly from the source (the students) could be used as information about the student's behavior in saving and avoiding the use of containers/packaging, especially plastic.

Items in "reduce" part was gained from the students' effort in reducing plastic waste disposal, including: how often students carrying container/bag themself when shopping, reducing the use of plastic bags by choosing alternative containers which were made from environmental-friendly materials, saving paper by using the paper on both sides, sorting organic and inorganic waste in temporary shelters, as well as avoiding the use of containers /disposable plastic bags.

The survey results before and after the implementation of the program showed that most students could not answer on aspects "reduce". The reason that emerged from the respondents said that most of the light snacks available at the school are in the plastic packaging products and there is no other choice. This led to numerous plastics waste which is difficult to control. Initiatives to bring their own bags when shopping, also got a low score, this is because shopping is often unplanned. Another reason, because the seller always provides a plastic bag to ease buyer in carrying stuffs, and there is no need to object it. Thus, internal rules of not providing plastic bags from food vendors, especially in schools, should be considered, as an effort to encourage the application of the principles of reduce. Students should be encouraged to always bring / provide their own bags when they want to shop.

b. Evaluation of the compost

The result of observation physical and chemical analyzes of the compost after 3 weeks be presented in Table 1

Table 2. The physical and chemical analyzes of the compost after 3 weeks

variables	Compost bioactivat or EM4
1 Weight of raw materials . (kg)	100
2 Compost weight at harvest . (kg)	66.9
3 Depreciation of dry weight . (%)	33.1
4 Material remaining after . sieving (kg)	21.5
5 texture . color . Odor	Smooth, moist black soil odorless
6 Water content (%)*	39.69

7	C organic (%)*	28.29
8	N total (%)*	1.92
9	P2O5*	0.151
10.	K2O*	0.27
11.	pH *	7.46
12.	C/N ratio*	14.73

*) Analysis of BPTP laboratory, Ungaran (2014)

Based on data from Table 2, it appears that some of physical and chemical analysis of components of the compost produced is in the range defined SNI standard No. 19-7030-2004 (BSN, 2004). According to SNI, C / N ratio of compost from domestic organic waste into categories to meet the standards when ranged between 10-20; with a maximum moisture content of 50%. Data of depreciation compost (Table 2) before and after treatment showed significantly.. This is due to the performance-degrading microorganisms in EM4 as an activator being optimal. EM4 used in this training is following the prescribed dosage so that the quality of the compost produced as expected.

Conclusions and Recommendations

Waste management program is implemented in SMAN 12 and SMAN 13 Semarang can improve students' basic knowledge of the management of the environment, but has not affected the level of participation of the students to the application of the 3Rs principle in everyday life. Basic knowledge level of students to the management of the environment especially waste management increased in the high category after the implementation of the program, while the level of participation of the students remained on fair category. Based on several components analysis (physical and chemical), the compost produced is in the range defined SNI standard No. 19-7030-2004, so it is marketable.

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THE FORMATION OF CREATIVE THINKING AND CURIOSITY THROUGH ADVANCE ORGANIZER MODEL BASED ON ATONG IN GEOMETRY SUBJECT

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ABSTRACT

In mathematics learning, creative thinking ability is an ability that can allow students to find various solutions to solve a problem. Here, Advance Organizer learning model based on ATONG applied with cubes and blocks material, which through a structured task matter further and group discussion, the students find their own concept by Observing, Questioning, Analyzing, Associating, and Expressing (ATONG). This research aims to produce effective learning characterized by completeness of creative thinking ability there is a significant influence of curiosity and creative thinking skill towards creative thinking ability, the improvement of curiosity and creative thinking skill. This research is mixed methods. The population is the eighth grade students of State Junior High School Indonesia. This research uses cluster sampling technique and VIII D is selected as the research sample with 5 students

is selected as qualitative subject. Tests, observation, and interviews are used as the instrument for collecting the data. The data is analyzed by average test (completeness), influence test, gain test and descriptive qualitative. The results showed that the effective learning of creative thinking ability was indicated by (1) the average of critical thinking ability test result that was 83.1. It achieved the minimum score, 2) there is a positive influence on the curiosity and creative thinking skill towards creative thinking ability, that was 46.3% with $Y = 46.094 + 0,073X1 + 0,453X2$, and (3) there is an improvement of curiosity and creative thinking skill on the subject with the average of 0.44; 0.21; 0.34; 0.29; 0.16 and 0.13; 0.27; 0.19; 0.18; 0.08. Based on the results above, the formation of curiosity and creative thinking skill were achieved.

Key words - Creative Thinking, Curiosity, Advance Organizer, ATONG

Introduction

Education plays a very important to develop human resources towards a better direction. Indonesia requires human resources in adequate quantity and quality as the main supporter in development (Kemendiknas, 2012: 2). Therefore, the experts and the observers of education and people who care about the development of education devoted intensively in efforts to develop education in Indonesia. One of the notice is directed to the development of mathematics education in Indonesia.

Mathematics is the main science that be a basic of developments of science and technology, mathematics has an important role in developing the power of human thought. Reading and learning mathematics is one effort to control useful knowledge

because it always relate to everyday life. However, many students assume that the field of study that has the characteristics of an abstract object and deductive mindset is considered as difficult subjects, less attractive, and less fun. Even there are one students who assume that mathematics is a scary subject and a bogey at the school.

In the standards of content for units of primary and secondary mathematics courses (Peraturan Menteri Pendidikan Nasional number 22 of 2006 dated May 23, 2006 about the standards of content) has been mentioned that mathematics courses should be offered to all students from elementary schools to equip students with the think logically ability, analytically, systematically, critically and creatively, and cooperative ability. The efforts to increase the ability to

think creatively is not considered as a major thing in teaching and learning in the classroom. Whereas, in the context of mathematics learning, creative thinking ability is an ability that allow students to find various solutions in solving a problem. The students are required to no longer be limited to a convergent thinking, but rather on divergent thinking.

In addition, the background of Curriculum 2006 mention that creative thinking ability are required to master and create the technology in the future so that students have ability to acquire, manage, and use information to survive in a state that is always changing, uncertain and competitive. Thus, we need a method that is applied to encourage students' creative thinking skills to improve students' creative thinking ability in learning mathematics. According to Siswono (2005: 3), the information towards creativity aspect and creative thinking phase will provide an overview level of students' creative thinking that are useful for the design of steps learning to encourage and enhance the students' creative thinking. The students who learn math are not only requiring counting skills but also requiring thinking and reasoning mathematically skills in solving new problems and learning new ideas that will be faced by the future students.

Based on the data from the National Examination report of State Junior High School 30 Semarang by the Centre for Educational Assessment of Research and Development of the Ministry of National Education in the academic year 2011/2012, the absorption of mathematics courses on the tested capabilities that was resolving issues related to the flat broad just reached

45, 38%. Supported by the results of interviews that have been conducted by one mathematics teacher of class VIII of State Junior High School 30 Semarang in the academic year 2014/2015, the students in solving geometry test is not maximal. The

students' ability to think creatively in solving the test is not optimal because the students' thinking ability is still centered on the appropriate completion manner.

The problems above become the researcher's reason to conduct a research by carrying out a study that can lead students to form the character of curiosity (affective aspects) and creative thinking skills (psychomotor aspects). One of the ways used to overcome the problems above is by trying to apply the learning model Advance organizer based on ATONG. According to Ausubel, as quoted by Joyce and Weil (2009: 286), the advance organizer model can strengthen the cognitive structure and improve the retention of new information. Ausubel describes the advance organizer as introduction material that is presented first in the learning task and the level of abstraction and inclusiveness that is higher than the learning task itself. The goal is to explain, integrate and connect the new material in the learning task with the material that has been studied previously. ATONG approach encourages the students to construct knowledge. The learning model advance organizer and ATONG approach teach the students to learn how to find out the concept of the material being studied through the steps of the concept invention where the material that has been studied by the students can serve as a starting point in communicating information or new ideas in learning activities so that students can see the connection between the subject matter which have been studied with the information or new ideas and foster the creativity in solving a given problem.

Based on the background, the main problem of this research is effective mathematics learning in improving the ability of creative thinking of selected students, which is characterized by: (1) Can the students creative thinking abilities who are taught by Advance Organizer based on ATONG in the subject matter of the cube and blocks class VIII achieve the minimum score?; (2) Is

there any influence between the character of curiosity and creative thinking skills towards studnets' creative thinking abilities who are taught by Advance Organizer based on ATONG in the subject matter of the cubes and blocks of class VIII ?; (3) is there any improvement of character curiosity and the creative thinking skills of selected students who are taught by based Advance Organizer based on ATONG in the subject matter of the cubes and blocks VIII class?

The aim of this research is to determine whether the mathematics learning effectively improve the ability to think creatively that is characterized by: (1) the ability of the students' creative thinking who are taught by Advance Organizer based on ATONG in the subject matter of the cubes and blocks of class VIII can reach the minimum score (2) there is an influence between the character of curiosity and creative thinking skills towards the students creative thinking ability who are taught by Advance Organizer based on ATONG in the subject matter of the cubes and blocks of class VIII; (3) there is an improvement in the character of curiosity and the creative thinking skills of the selected students who are taught by Advance Organizer based on ATONG in the subject matter of the cubes and blocks of class VIII.

According to Ausubel cited by Huda (2014: 107) model of advance organizer is designed to strengthen the cognitive structure of the students their knowledge of a particular subject and how to manage, clarify, and maintain that knowledge well. In other words, the cognitive structure must be in accordance with the kind of knowledge of what is in our minds, how much knowledge and how this knowledge is managed. While the approach is learning ATONG patterned with exploration, elaboration and confirmation. Students are always guided to A(Amati/ Observe) condition against all the learning situation, then T(Tanya/ Ask) on any problems exist,

so that they perform O(Olah/ Analize) the answer of the question, then N(Nalar/Associate) for onward until the G(Gagas/Express) a new ideas or innovations (Sukestiyarno, 2013). Learning model of advance organizer based ATONG is a learning model that is designed to associate the new concepts or new information with concepts that already exist in the cognitive structure of students to help students learn to acquire the learning experience in order to achieve an increase in the creative thinking ability where learning approach ATONG to obtain learning meaningful. There are five phase in learning advanced organizer model based-on ATONG, namely stage 1 is orientation Organizer, teachers clarify learning goals to be implemented and provide motivation to the students and inform plan learning activities that will be carried out. Phase 2 is Apresepsi organizer (to observe), the provision of the material prerequisites apperception then presents organizer and material context. Students pay attention and observe what is presented the teachers. Here, students explore the concepts that have been learned in the home. Phase 3 is the Presentation Organizer (to observe and questioning), students observing, discussing and asking things related to problems encountered on the results of exploration conducted in the home with the knowledge acquired in learning through group discussion. Teachers encourage students to think creatively in completing Worksheet (problem) and observe the discussions and provide guidance to students who experience obstacles. Phase 4 is the Presentation task (to analize and assosiate), the students tried to connect the answers to questions that the task has been done with the new knowledge acquired during the learning. With this activity students are required reveals another problem solving (to analize) to stimulate creative thinking (to associate). Phase 5 is the strengthening of cognitive processing (to express), students process and make sense of new

knowledge gained so as to conclude the material (initiated) newly presented by the teacher. Teachers clarify (confirmation) to students on the issues discussed, so that students can understand about the expected completion.

Research relevant to this study include research conducted by Suhartati (2008), indicates that the application of learning models Advance Organizer on material Quadrilateral has to realize the learning completeness in the classical, research conducted by Arifin (2010) concluded that the learning model advance organizer improve results learn math class X material triangle, research conducted by Asfriningsih (2013) show that the learning outcomes of a class of students to apply the learning model of advance organizer tends to be better when compared to the learning outcomes of a class of students who pembelajarannya using the application model of inquiry and research Supartono and Sukestiyarno (2013) based ATONG can significantly shape the values of character education partially in any integrated learning and capable of thinking to a higher level.

The hypothesis of this research is the study of mathematical models of Advance Organizer based ATONG effectively improve the ability to think creatively characterized by: (1) the ability of creative thinking of students who are taught by a model Advance Organizer based ATONG in the subject matter of the cube and the beam of class VIII can reach KKM specified, (2) there is influence between the character of curiosity and creative thinking skills to creative thinking abilities of students who are taught by a model-based Advance Organizer ATONG in the subject matter of the cube and the beam of class VIII. (3) there is an increase in the character of curiosity and creative thinking skills of students who are taught by the choice of the model-based Advance Organizer ATONG in the subject matter of the cube and the beam of class VIII.

Research Methods

This research is a mixed methods or a combination of research methods. Referring to Sugiyono (2013: 404) that the research methods combination is a research method that combines quantitative and qualitative methods that is used together in a research activity, so that more comprehensive, valid, reliable and objective data will be obtained. The study used design of concurrent triangulation (a mix of the balance of quantitative and qualitative). The population of this research was the students of class VIII of State Junior High School 30 Semarang. The sampling technique used cluster sampling technique that is the students of class VIII D. The taking of qualitative subject used purposive technique that is taken from the preliminary test results (5 students), those were the first ranked student, first quartile student, second quartile student, third quartile student, and ranked last student of 32 students.

Research procedure includes the preparation phase, the implementation phase, the data processing stage and the stage of making conclusions. Activities performed on the stage of implementation of the study are: (1) the provision of preliminary tests of creative thinking ability. (2) analyze the results of preliminary tests. (3) the selection of subjects consisting of five students based on preliminary test results. Five students were selected based on the ranking of the results of the preliminary test, representing the highest rank to the lowest rank. (4) observation about the character of the student prior to the application of learning by using a model-based Advance Organizer ATONG. (5) the implementation of learning activities using a model-based Advance Organizer ATONG. (6) carry out observations and observations on a sample of the character's curiosity and creative thinking skills mathematically at each meeting. (7) conduct interviews with a sample of the characters a sense of intending to know and mathematical skills

of creative thinking at every meeting. (8) the implementation of the final tests of creative thinking ability. Problem / test used is a matter of the final tests of creative thinking ability in the form of a description which consists of 8 questions based on indicators determined. Before the test questions were made have been made grating about the test first, then test questions consulted with the supervisor and mathematics teacher at the school. Problem test is then performed tests on samples which have been determined in advance, it aims to determine the theoretical validity of the instrument to be created.

Techniques used include data collection, documentation method used to obtain a sample of student data, test methods used to obtain data on learning outcomes aspects of creative thinking ability, and observation method to determine the character increase curiosity and creative thinking skills of students. Research instruments include observation sheet kerakter curiosity, observation sheet creative thinking skills, creative thinking ability test, interview and the researchers themselves. The data has been obtained from the study, the test data creative thinking abilities, was tested for normality (Chi square test) and homogeneity test. Then test the complete learn to use average test and test the proportions right. Multiple regression analysis using SPSS 17.0. And the test of character increase curiosity and creative thinking skills using test Gain.

Results And Discussion

Results

To test whether the ability to think creatively students completed the classical, the proportion test (test one hand, the right hand). This test is performed to determine whether the value of students who earn at least equal to KKM which 75 achieved at least 75%. From these calculations obtained

value of $z = 2.53$ z_{tabel} then compared with the standard error of 5% and $dk = (n - 1)$ obtained z_{tabel} for the number $n = 32$ by 1.64. Obviously $z_{hitung} = 2.53 > 1.64$ z_{tabel} then rejected means testing criteria H_0 creative thinking ability test scores of students taught by Advance Organizer Model based on ATONG in the subject matter of the cube and the beam of class VIII has reached KKM completely classical.

Test Effect of Character Curiosity and Creative Thinking Skills for Creative Thinking Ability

To determine the effect of each independent variable (character curiosity (X_1) and creative thinking skills (X_2) to the independent character (the ability to think creatively (Y), it is necessary to test for independent variables that influence the dominant to the dependent variable with multiple linear regression test. Test the effect were performed using SPSS 17.0, namely linear regression Multiple regression equation: $Y = 46.094 + 0,073X_1 + 0,453X_2$. The amount $a_1 = 0.073$ means the average change in Y is equal to 0.073 (for each unit change in the variable X_1 if X_2 fixed) and $a_2 = 0.453$ states change in average Y is equal to 0.453 (for each unit change in the variable X_2 if X_1 fixed). The value of R-square is $0.463 = 46.3\%$. This means that character curiosity and creative thinking skills of students affects 46.3% of the students' ability to think creatively and 53.7% are influenced by other factors. Improved Character Curiosity and Creative Thinking Skills Qualitative subject Character curiosity at every meeting to increase it in accordance with the value of creative thinking abilities were completed KKM on the results of test calculations classical completeness to test the proportion of the parties and supported by the initial gain-end test of character curiosity gained 0.73 categorized high, see Table 1 below.

Table 1. Meeting Between Gain Test

Character Curiosity Qualitative Subjects

Nama	Uji Gain Pertemuan				Rata-Rata
	1&2	2&3	3&4	4&5	
S1	0.23	0.3	0.71	0.5	0.44
S2	0.14	0.33	0	0.375	0.21
S3	0.27	0.25	0.33	0.5	0.34
S4	0	0.22	0.42	0.5	0.29
S5	0.107	0.08	0.26	0.176	0.16
Rata-Rata	0.149	0.23	0.34	0.410	0.3
	4	6	4	2	

Table 2. Gain Test Early-End Meetings

Character Curiosity Qualitative Subjects

Nama	Uji Gain	
	Pertemuan 1&5	Kriteria
S1	0.92	Tinggi
S2	0.64	Sedang
S3	0.81	Tinggi
S4	0.77	Tinggi
S5	0.5	Sedang
Rata-Rata	0.73	Tinggi

In addition to seeing an increase character curiosity of students, this study aims to observe the improvement of students' thinking skills through the application of advanced models of learning organizer Atong approach to the material and beam geometry cube. The focus of observation skills of creative thinking is the process of improving the skills of creative thinking on the subject of research. In addition to observation activities are also conducted interviews with the study subjects to supplement the qualitative information on behaviors learned towards the achievement indicators creative thinking skills that subject.

Creative thinking skills at each meeting has increased. This is consistent with the value of the test the ability of creative thinking that is completely KKM on the results of test calculations classical completeness test proorsi one hand, supported by test gain early-end character of curiosity and supported by uj gain early end creative

thinking skills acquired 0, 59 including the medium category.

After observation and interviews with the study subjects that researchers can analyze the creative thinking skills possessed by each subject of study. The following analysis of the results of the observation skills of creative thinking that research subjects are presented in Table 3 and Table 4.

Tabel 3. Gain Test meeting between Creative Thinking Skills Subject Qualitative

Nama	Uji Gain Pertemuan				Rata-Rata
	1&2	2&3	3&4	4&5	
S1	0.083	-0.182	0.615	0	0.13
S2	0.091	0.3	0.29	0.4	0.27
S3	0.07	0.23	0.3	0.14	0.19
S4	0.118	0	0.286	0.3	0.18
S5	0.12	0	0.22	0	0.08
Rata-Rata	0.0957	0.0698	0.341807	0.168571	0.2

Tabel 4. Gain Test Early-End meeting

Creative Thinking Skills on the subject of qualitative

Nama	Uji Gain	
	Pertemuan 1&5	Kriteria
S1	0.58	Sedang
S2	0.73	Tinggi
S3	0.57	Sedang
S4	0.59	Sedang
S5	0.46	Sedang
Rata-Rata	0.59	Sedang

Discussion

In the mastery test individually, with the calculation of the average test (test one hand, the right hand) conducted by researchers showed that the average students' ability to think creatively by 83.1 has reached more than KKM specified is 75, which means students completed in individual. Similarly, in a test of

completeness in the classical, with the calculation of the proportion test (test one side, right side) shows that the proportion of students who earn at least equal to KKM reached 93.75%, so that the proportion of students who earn at least equal to 75 KKM reached more than 75% meaning that students completed in the classical style.

The existence of the acquisition of both individuals and classical mastery of students in this study indicates that learning through models advance organizer ATONG approach taught in class research success.

Based on the results of multiple regression test showed that the character of curiosity and creative thinking skills together affect the ability of creative thinking positively by 46.3% then simple regression test results indicate that the character of curiosity affect the ability of creative thinking positively of 30.1 % and creative thinking skills affect the ability of creative thinking positively by 46.8%.

Learning advance organizer ATONG approach guiding students to construct their own knowledge which is new to the concept of material preconditions that have been studied which aims to construct or find the concept of the materials studied in this research that the geometry of the material. Through learning models advance organizer approach ATONG encourage curiosity of students to be more active to find out by encouraging students to always ask to make students more enthusiastic to dig deeper into the material geometries as well as other knowledge relating to information new knowledge that will be gained by studying the material that will be discussed at the next meeting.

In the advanced model learning organizer ATONG approach emphasizes on providing structured tasks and problems with the completion of the diverse ways in order to train the student's ability to solve problems accurately and relevant. Through new ideas and diverse ways completion students will

be more skilled in selecting appropriate ways or methods to answer a given question or problem.

Based on observations and interviews, the character curiosity fifth research subjects show a change in attitude towards the better, with an increase in the indicator character curiosity from the first meeting until the fifth meeting of which is indicated by a score gain. In general, the five study subjects experienced a change in behavior with an increase different. This

increase is presented in Figure 1, it can be observed that the character of curiosity subject of study from the first meeting until the fifth meeting of the increase. The fourth subject of research, namely S-1, S-2, S-3 and S-4 has shown improvement with high criteria, because the four subjects are able to adapt to the learning conditions imposed to improve the character of their curiosity.

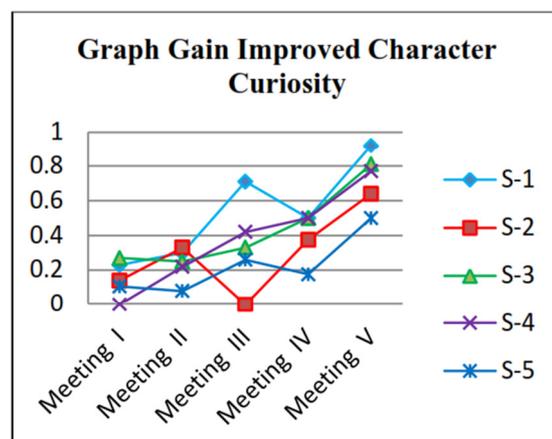


Figure 1. Graph Gain Improved Character Curiosity of Qualitative Subject

This implies that for students with a higher capacity will be easier to improve the character of curiosity than students with less ability. Thus meaning, can not be separated from what has been dibelajarkan to the student in question, namely through learning advanced models organizer ATONG approach. Through learning advanced models organizer ATONG approach with a

series of activities in it has been guiding students to shape the character of curiosity. While the role of the teacher as a facilitator for students to improve the character of curiosity owned. In general it can be said that after the introduction of Advance Organizer learning ATONG approach, character curiosity research subjects has increased.

Observations and interviews on thinking skills keatif indicates that in general the fifth research subjects has increased and the amount of the increase is seen based on creative thinking skills gain scores of fifth subject of research.

Based on Figure 2 can be seen that creative thinking skills research subject of the first meeting until the fifth meeting increased so that it can be said that the study of mathematics by learning advanced models organizer ATONG approach to the material and beam geometry cube can form creative thinking skills of students. A spike shown is based on the observation enhancement aspects of creative thinking skills research subject in each meeting.

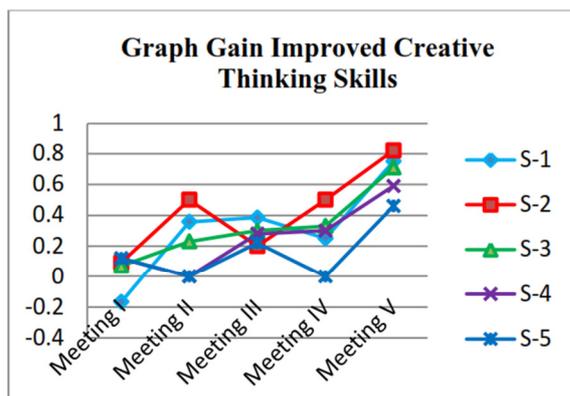


Figure 2. Graph Gain Improved Creative Thinking Skills of Qualitative Subject

At the first meeting, the subject 1 (S-1) is skilled in identifying problems, answer questions appropriately and relevant to the material but not enough skilled in solving the problems with answers are rarely given in general vary. In the second pertemuan S-1 decreased at the time of completing the

quiz question 2, he was less skilled in choosing the method or methods of mathematical problem solving. However, after the third meeting of the S-1 showed a significant shift to the fifth meeting of the S-1 are already skilled in using the methods and formulas are appropriate and can provide answers by way of settlement diverse. Subject 2 (S-2) is skilled in identifying a problem but sometimes still lack confidence in the answer that he considered true. At the third meeting of the

S-2 are already skilled in providing a means of solving diverse when compared with the S-1, so that the increase occurred in the S-2 is slightly higher than the S-1. one student answer sheet S-2 is presented in Figure 3 as follows.

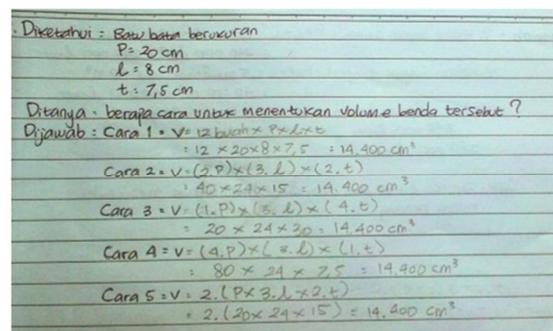


Figure 3. Result Quiz 3 of S-2

To subject 3 (S-3) and subject 4 (S-4) almost have similarities in terms of identifying the problem, has the right but is still too skilled. S-3 at the beginning of the meeting is still lacking skilled in finding ideas and use formulas, so it has not been skillful in choosing how methods work on the problems, while S-4 are not yet skilled in solving mathematical problems with the completion of a diverse, he just focus on one way settlement of a matter of course and not skilled in resolving problems with his own. Different again with the S-5 is more like working in an instant. S-5 are not yet skilled in identifying the problem, the answer given was inaccurate and sometimes not skilled enough to solve the problem in different ways.

But after being given instruction by a sequence of activities in the learning model of advance organizer ATONG approach, almost all the study subjects experienced a change that is good enough. At the third meeting of the S-1 and S-2 demonstrated skills in problem solving with diverse settlement. In the fourth and fifth meetings of S-3 is skilled in identifying a problem and using a formula as well as the appropriate method to resolve the issue. There are improvements made S-4 in resolving the problem in different ways (more than one way of solving). Although not yet skilled enough to resolve the problems with answers are rarely given in general, but the S-5 has shown that he can identify the problem and to answer appropriately.

It can be said that the overall increase in creative thinking skills on the subject of research. The main factor of an increase in research on the subject of creative thinking skills is none other than an advanced model of learning activities organizer ATONG approach undertaken by researchers. Application of advance organizer teaching model ATONG approach is designed so that its activities can improve students' creative thinking skills to solve problems in the form of problem-solving questions.

Stages in the learning model of advance organizer approach ATONG cover five stages, orientation organizer Diman teachers inform the learning activities and provide the motivation to learn, apresepsi organizer teacher gives apresepsi on the material prerequisites and allow students to always ask, and billing tasks structured approach ATONG students find concepts or ideas themselves with the knowledge that has been owned by discussion, solving problems or issues independently as well as training and then giving the task of studying the structure and motivation for further material. Learning advance organizer approach ATONG. The students led teachers to involve itself in finding basic concept, where the concept is attributed to the existing

courses so that students will understand the concept better, then meningat longer and will be able to use these concepts in other contexts and through practice questions and structured tasks given in order to solve the problems of mathematics in various ways completion. This is consistent with the theory of learning Ausubel coined by David Ausubel, as quoted by Hudojo (2005) theory of learning meaningless Ausubel ie material lessons learned must be meaningful (meaningful), meaning that a new lesson to be associated with the concepts that already exist such that the concept of a concept completely new intellectual and emotional absorbed so that learners are involved in teaching and learning activities.

In addition to learning theory Ausubel, students in learning to find or build their own knowledge teaches advanced model learning organizer ATONG approach is also consistent with the theory of constructivism learning that students must build their own knowledge dibenaknya. Referring to Slavin was quoted as saying by Trianto (2014: 70) teachers can give students the stairs that bring students *kepemahaman* higher, with a record of the students themselves who must climb.

The formation of character curiosity and creative thinking skills of students insolving mathematical problems due to several factors. The main factor is the most influential self-awareness of each subject of study. Child character is formed at birth among other physical aspects by physical (apart from nature), influenced by the spiritual aspect and the physical environment (apart from nature). In shaping the character of curiosity and creative thinking skills followed by improving the creative thinking ability of students is also influenced by *pembelajaran* models that facilitate the three aspects. In this study, advance organizer teaching model ATONG approach may increase the third aspect of the research, the character of curiosity (affective), creative thinking skills

(psychomotor), and creative thinking skills (cognitive). The success of the model advance organizer ATONG approach in this study relates to the use of student books, structured tasks and problems / issues with problem solving diverse. Thus, students will be better prepared to accept the problems to improve their creative thinking skills to solve a given problem.

Conclusions and Recommendations

Based on the research results, through the Advance Organizer learning model based on ATONG approach in the subject matter of the cubes and blocks, it can be concluded that the effective mathematics learning towards the creative thinking ability that is characterized by (1) the average score of creative thinking ability test is 83.1, which reaches the minimum score both individually and classically. (2) there is positive influence on the character of curiosity and creative thinking skills towards the creative thinking ability, that was 46.3% (3) there is an improvement of curiosity and creative thinking skills on qualitative subject that is showed by the gain with the average of each meeting, those are 0.44; 0.21; 0.34; 0.29; 0.16 dan 0.13; 0.27; 0.19; 0.18; 0.08.

Suggestions from researchers to the mathematics teachers that can develop the thought to design an innovative learning model in maximizing the students' mathematic learning ability, so that the learning is more effective and meaningful on each material and the students should motivate themselves and increase the awareness in adding the knowledge to be able improve its ability to optimally.

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