Final Project

ANALYSIS ON SCIENCE PROCESS SKILLS OF STUDENTS THROUGH CONTEXTUAL APPROACH ON SCIENCE-CHEMISTRY LEARNING IN TAIWAN

by

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DECLARATION

This final project contains no material that has been accepted for the award of any other degree or diploma in any educational institution and, to the best of my knowledge and belief, it contains no material previously published or written by another person, except where due reference is made in the text of the final project.

Semarang, February 2017

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MOTTO AND DEDICATION

MOTTO

"Verily, after every difficulty there is relief."

(Al Sharh: 5)

"Never stop learning, because life never stops teaching."

DEDICATION

To my beloved Father, Mother, Sisters, Brothers, Teachers, and Friends in Department of Chemistry

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Authors hope that this study provides a benefit to the advancement of education, especially chemistry education in Indonesia even abroad.

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Researcher

ABSTRACT

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Chemistry is a science subject which studies on the composition, structure, and properties of substances or materials. Learning chemistry science can be used to improve skills of students, in this case is the science process skills of students. With an appropriate learning models and approach, students will be able to improve not only in comprehend the concepts but also their science process skills. The purpose of this study is to analysis the percentage and profile for each indicator of students' science process skills through contextual approach with model of learning cycle 5E in Classification of Matter as the subject. Research method used in this study is mixed methods, which is a method that uses two methods of quantitative and qualitative data using students' observation sheet, questionnaire and interview. Result from observation sheet as quantitative data proved that science process skills achievement results of students in the classical 24 found that 21 students with a percentage of 87.50% have good science process skills while the percentage of 3 students with 12.50% had moderate science process skills. Science process skills of students has good categories with percentage 85.49%, except for the aspect ask questions with the percentage 75.00% has moderate category. Science process skills of students in chemistry science learning through contextual approach with model of learning cycle 5E gained an average of good category. Indicators of science process skills with highest percentage is observation aspect, while the lowest percentage is ask questions aspect with moderate category. Result from the questionnaire and interview as qualitative data about learning process get positive response from students. Students not only like the learning methods but also have fun and enjoy the learning process. Students of Tainan Municipal Yongkang Junior High School Taiwan have good science process skills.

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CHAPTER 1

INTRODUCTION

1.1 Background

Education is all carried out with conscious effort and aims to change human behavior towards a better and as expected. Education according to the National Education Standards Agency was quoted as saying by Munib (2007) is a conscious effort to develop the personality and abilities of students inside and outside as and lasts a lifetime. Education will stimulate the creativity of a person in order to be able to face the challenges of nature, society, technology, and life is increasingly complex.

Chemistry is a branch of science that studies clump on the composition, structure, and properties of substances or materials from the atomic to molecular scale and changes of matter and energy that accompany these changes (BSNP, 2006). Chemistry is a product, process, and an attitude that can not be separated. Chemical as the product may be legal, concepts, and theories. Chemistry as process includes activities to observe, identify, ask questions, collect data, forecasting, implementing the concept, plan experiments, and communicate the results of observations. Chemistry as a gesture include communication skills, working together, tenacious, critical, creative, responsibility and curiosity were high when encounter a phenomenon.

Chemical education involves the teaching and learning of chemistry at all levels of education (Strate, 2013). Learning process that includes chemical

products, processes, and attitudes expected to produce students who have the various aspects of skill. Skills is called the science process skills. Science process skills in the learning of chemistry involves the ability of cognitive, affective and psychomotor. Cognitive ability (minds on) for student learning thinking, psychomotor abilities (hands on) because students are involved in using the tools and materials, measurement, preparation or assembly tools, and affective abilities (hearts on) because the students interact with each other in carrying out learning activities teach.

Middle school science education is a multi-faceted approach to integrate several general science disciplines with the ultimate intention of instructing students in the basics of science (Bybee, 2003). By this approach, many middle school science teachers have obtained knowledge of many fields of science, including chemistry. Chemistry concepts that are taught include properties of matter, changes in matter, energy and matter transformation, forms of energy, periodicity of elements, and chemical interactions in matter. These chemistry concepts are taught to enrich students' understanding of the natural world. This instruction also serves the purpose of preparing students who are skilled in performing calculations and would serve the public interest if they pursued science careers (Strate, 2013).

Type of process skills according Rustaman (2005) include: observation (observation), interpreting observations (interpretation), classify, predict (prediction), communicate, hypothesize, experiment or research planning, applying concepts or principles, asking questions, and using tools and materials.

Provision of direct experience is emphasized through skill development and scientific attitude in order to understand the concepts and solve problems. By developing the skills of the process, students will be able to discover and develop their own facts and concepts, as well as strengthen and develop attitudes and values required (Semiawan, 1985).

Results of literature studies and observation have shown that students in Tainan Municipal Yongkang Junior High School Taiwan have the ability and knowledge in science that is quite good. However, learning process in Yongkang Junior High School is still oriented by teacher. Teacher-centered is still commonly practiced by many early educators in Taiwan especially in Yongkang High School. Teachers teach the subject of science-chemistry with instilling the concepts verbally and exercises work on the problems. Submission of materials are generally less given a concrete example of direct and visual, students simply packed with information that is theoretical and verbalistic. Students can work on the problems quite well, but they do not know what the true meaning and how to link the concept of what is taught with the real situation in everyday life. Students are not enthusiastic in participating in learning.

The problem for students gets complicated when an unprepared science teacher instructs them in a subject in which they have little background knowledge. Content knowledge is necessary for developing scientific understanding in students (Loughran and Berry, 2004). Without this essential background, science, especially the middle school general sciences, is not being communicated to students in a manner in which they will gain interest. It is this

very concept that researchers believe effective teaching comes from years of practice. As a teacher who is responsible for educating students in the chemical sciences, one should not blame the subject for a lack of student interest and more appropriately blame the need for quality educators (Strate, 2013).

Learning science-chemistry can be used to improve the skills of the students, in this case is the science process skills of students. With the approach and appropriate learning models, students will be able to improve their skills in materials science is taught. Contextual approach is the right approach applied in chemical science learning. Nurhadi (2004) revealed the approach CTL (Contextual Teaching and Learning) is the concept of learning where the teacher brings the real world into the classroom and encourage students to make connections between knowledge possessed by its application in their daily lives. Students acquire knowledge and skills in the process is not instantaneous, but gained little by little from prior knowledge.

Learning cycle is a model of student-centered learning and constructivism based on the view where knowledge is built on the knowledge of the students themselves. Learning cycle can be useful for teachers in designing curriculum materials and instructional strategies in science. At first learning model of learning cycle is divided into three phases: exploration (exploration), introduction of the concept (concept introduction), and application of the concept (concept application). Three-phase is further developed by Lorsbach into five phases consisting of stages of generating interest (engagement), exploration (exsploration), explanation (exsplanation), elaboration (elaboration/ekstention)

and evaluation (evaluation), which became known as the learning cycle 5E (Wena, 2009).

Guidelines for curriculum development confirms that learning science-chemistry in secondary school aims to get a productive human being, creative, innovative, and affective through the strengthening of attitudes, skills and knowledge are integrated. Contextual approach and learning models assessed learning cycle 5E will be able to give a positive response to the students because students will be able to understand the interrelationships concepts in materials science-chemistry taught with everyday life with the scientific process. Students at the middle school level need more than just the topical treatment chemistry taught. Chemistry should be made more interesting to students than other subjects (Kesidou, 2002). Interest in student learning will be more motivated and indirectly will be able to develop students' science process skills. They learn while doing chemistry, and at the same time they obtain a better understanding and their connection to other science subjects (Tobias, 2006).

Based on the background described, the researchers want to conduct a study entitled "Analysis on Science Process Skills of Students Through Contextual Approach on Science-Chemistry Learning in Taiwan".

1.2 Problem Formulation

Based on this background, the problem can be formulated as follows:

1. How much the percentage of science process skills for each indicator of Yongkang Junior High School students in chemistry science learning through contextual approach with model of learning cycle 5E?

2. How is the science process skills of Yongkang Junior High School students in chemistry science through contextual approach with model of learning cycle 5E?

1.3 Limitations

From the formulation of the problem, given the limitations problem as follows:

1. Learning using a contextual approach and model of learning cycle 5E.

2. Indicators observed science process skills include: observing, asking questions, classify, interpret, predict, formulate hypotheses, communicating, planning experiments, using the tools and materials, and implementing the concept.

1.4 Research Objectives

The purpose of this research are:

1. Knowing the science process skills's percentage of Yongkang Junior High School students in chemistry science through contextual approach with model of learning cycle 5E?

2. Knowing the science process skills's profile for each indicator of Yongkang Junior High School students in chemistry science learning through contextual approach with model of learning cycle 5E?

1.5 Research Uses

The uses of this research are:

1. For schools

As input and contribute ideas to improve the quality of learning in Yongkang Junior High School using appropriate learning models and approach.

2. For teachers

Expected to provide an alternative method that can be used to implement learning activities in Yongkang Junior High School.

3. For students

Expected to enhance student understanding, enhance science process skills, and promote the active participation of Yongkang Junior High School students in learning activities.

4. For readers

As an input to conduct further research on the analysis of variations in other science process skills.

1.6 Operational Definitions

1. Science Process Skills

Skills process involves cognitive skills or intellectual, manual and social. Cognitive skills involved because by doing process skills of students using mind. Manual dexterity skills clearly involved in the process because they involve the use of tools and materials, measurement, preparation or assembly tools. Social skills meant they interact with each other in carrying out the teaching and learning activities with process skills (Rustaman, 2005).

2. Contextual Approach

Contextual Teaching and Learning approach by Nurhadi (2004) is the concept of learning where the teacher brings the real world into the classroom and encourage students to make connections between knowledge possessed by its application in their daily lives. Students acquire knowledge and skills in the process is not instantaneous, but gained little by little from prior knowledge.

3. Learning Cycle 5E

The learning model learning cycle is a learning model that provides the opportunity for students to learn how to optimize and develop the students' reasoning power. Learning cycle is a model of student-centered learning (student centered). Learning cycle is a series of stages of activities (phase) is organized such that students can master the competencies that must be achieved in learning with the active part (Fajaroh and Dasna, 2010).

CHAPTER 2

LITERATURE REVIEW

2.1 Theoretical Description

2.1.1 Learning

Learning is essentially a conscious activity to produce a change, concerning the knowledge, skills, attitudes and values. Humans without learning experience difficulties in adjusting to the advancement of science and technology that no other activities are also a product of thinking humans predecessor. Demands to adjust to the ever-changing environment demands a human being from birth until the end. Learning is a lifelong human life demands (life long learning) (Uno, 2007).

Learning is a process attempts person to obtain a new change in behavior as a whole, as a result of his own experience in interaction with the environment in meeting their needs. These changes will be evident in all aspects of behavior (Slameto, 2010). Learning is a daily occurrence in school. Learning is a complex of two things. Learning experienced by students as a process. Students experiencing mental processes in the face of learning materials. The learning material in the form of a state of nature, animals, plants, humans, and the material that has been gathered in textbooks. The learning process for teachers appears to be a behavior learned about something (Dimyati and Mudjiono, 2009). Learning can be defined as the process of behavior as a result of experience or practice and thinking process as well as the students build their own ideas or understanding to

do, think, and interact themselves seamlessly.

Learning by Dimyati and Mudjiono is teaching and learning activities from the point of student activity planned for the teachers experienced by students during the learning process (Dimyati and Mudjiono, 2009). Learning means the process, way, works studied. Teachers teach, students learn, teachers teach while learning interpreted as an attempt teacher organizing the learning environment. Subject of learning is the student. Student-centered learning (Suprijono, 2013).

The terms of learning more influenced by the result of technology that can be used for the needs of learning, students are positioned as a subject of study that holds a major role, so that in setting the learning process students are required to move in full, even individually study material. The term "learning and teaching" or teaching puts teachers in a leading role in providing information, then in learning more teachers act as facilitators, organize a variety of sources and facilities for students studied (Sanjaya, 2009). Learning is essentially a process of interaction between the students and the environment, resulting in a change of behavior towards the better.

2.1.2 Science Process Skills

Skill is the ability to use the mind, reason, and act efficiently and effectively to achieve a specific outcome, including creativity. The process is defined as a device that scientists use complex skill in conducting scientific research. The process is a great concept that can be broken down into components that must be mastered if somebody will do research (Devi, 2010). Semiawan (1985) said that the process skills are skills related to the physical and mental

abilities are fundamental owned, controlled and applied in a scientific activity, so the scientists managed to find something new.

Devi (2010) said that the process skills approach is the treatment used in the formation of learning that emphasizes the skills to acquire knowledge and then communicate the acquisition. Skills gained knowledge can use the ability if thought (psychic) or if the ability to act (physical). Dimyati and Mudjiono (2006) defines the approach as a process facilitator skills or insights fad skills development of intellectual skills, social and physical abilities derived from fundamental capabilities which in principle has existed in students. Semiawan (1985) hang out in the air that the process skills approach is a way of teaching that focuses on the acquisition of skills development that in turn will become a cog discovery and development of facts and concepts, as well as the growth and development of attitudes and values.

Science process skills (SPS) are defined as transferable skills that are applicable to many sciences and that reflect the behaviors of scientists. They are the skills that facilitate learning in physical sciences, ensure active student participation, have students develop the sense of undertaking responsibility in their own learning, increase the permanence of learning, and also have students acquire research ways and methods, that is, they ensure thinking and behaving like a scientist. For this reason, it is an important method in teaching science lessons. SPS are the building-blocks of critical thinking and inquiry in science (Ostlund, 1992).

Learning science lessons by apprehending requires using science process skills (SPS). Having science process skills acquired, at the same time, means preparing future scientists, having scientific literacy acquired, that is enabling students to use science information in daily life (personal, social and global) (Harlen, 1999). Skills process involves cognitive skills or intellectual, manual and social. Cognitive skills involved because by doing process skills of students using mind. Manual dexterity skills clearly involved in the process because they involve the use of tools and materials, measurement, preparation or assembly tools. Social skills meant they interact with each other in carrying out the teaching and learning activities with process skills.

Learning the process skills approach provides an opportunity to actively engage students in learning, so that with the interaction between skill development with the facts, concepts and principles of science will develop the attitudes and values of scientists in students. In addition, the process skills approach gives students the proper understanding of the nature of science, and students can simultaneously learn the process and product knowledge.

Semiawan (1985) said there are several reasons underlying the necessary implementation skills approach in the process of teaching and learning activities, as follows:

a. Rapid development of science knowledge so it is no longer possible teachers teach facts and concepts to students.

b. Students easily understand the concepts are complicated and abstract if it is accompanied by concrete examples, examples of reasonable according to the

circumstances at hand, practicing his own discovery efforts concept through the treatment of physical reality, and the handling of objects correctly -Right real.

c. Discovery science is not absolute (true 100%), but its discovery is relative. A theory may be denied or rejected after a person gets a new dat able to debunk a theory espoused. Reappears new theory, which in principle contains a truth that is relative.

Skill development is very necessary for a student from the beginning, because basically the children had a great curiosity to something. Piaget and Bruner research results revealed that the child may think a high level when he has enough experience concretely and guidance to enable the development of concepts and connect the necessary facts.

American Association for the Advancement of Science classifies process skills into basic process skills and integrated process skills. Basic process skills include observation, measurement, infer, predict, classify and communicate, while the integrated process skills include control variables, data interpretation, hypothesis formulation, operationally defining variables and designing experiments. Basic process skills are a foundation for skills training integrated process more complex. The whole process skills is required when attempting to record scientific problems. Integrated process skills especially needed when doing experiments to solve the problem (Devi, 2010).

The types and the characteristics of science process skills consists of a number of skills that one another are actually inseparable, but there is a special emphasis in each skill that process. Skills process could someday be developed

separately, while the others must be developed in an integrated manner with one another. All existing process skills can not be developed in all fields of study. Teachers are required to have the ability to know characteristic field of study and understanding of each process skills.

The translation of some of the science process skills according Dimyati and Mudjiono (2006) is as follows:

a. Observe

Through observing, we learn about the world around. Human observe the objects and phenomena of nature with the senses to see, hear, feel, smell, and feel/sipped. The information obtained can be demanding curiosity, questioning, thinking, doing interpretations of the environment, and investigate further. The ability to observe the most basic skills in the process of acquiring knowledge and is the cornerstone for developing the skills of other processes.

Viewing has two key properties, namely qualitative and quantitative. Viewing is qualitative if in practice only use the five senses to obtain information. Viewing is quantitative when in actual use senses other than also using other tools that provide specialized information and appropriate.

b. Classify

Classify the process skills to sort objects based on the properties of events in particular, so we get the class / event similar groups of object in question.

c. Communicate

The ability to communicate with others is the foundation for everything that we do. Communicating can be interpreted as conveying and get the facts,

concepts and principles of science in the form of sound, visual or visual noise. Graphs, maps, charts, symbols, diagrams, mathematical equations, as well as words written or spoken a means of communication that is often used in science.

d. Measure

Measure can be interpreted as comparing measured in units of a certain size are predetermined. Skills measure is the cornerstone of quantitative observation, classify, and communicate appropriately and effectively to others.

e. Predict

Prediction is a forecast of what the future might be observed. Predicting can be interpreted as anticipating or make predictions about everything that will happen in the future, based on estimates in certain patterns or trends, or relationships between facts, concepts and principles of science.

f. Conclude

Summing can be interpreted as a skill to determine the state of an object or event based on facts, concepts and pronsip known.

g. Collect and process data

Skills to collect and process data is the ability to obtain information / data from people or other sources of information by means of oral, written or observation and study it more qualitatively or quantitatively as the basis for testing hypotheses or inference.

h. Analyze research

Skill is the ability to analyze research report examines the work of others to improve recognition of the elements of the study.

i. Develop hypotheses

In general, the study is intended to test the hypothesis. Skills draw up hypotheses can be defined as the ability to say "allegations are considered true" about the existence of a factor that is contained in one situation, then there will be a certain result can be expected to arise.

j. Design research

Science and technology is born from a number of studies that preceded it. The results of the study will be to construct or reconstruct a science. So that a study can be performed well and produce something that is useful and meaningful, it is necessary to study design. Designing research can be defined as an activity to describe variables manipulated and responded in operational research, the possibility of its control variables hypothesis being tested and how to test it, and the expected results of the research to be carried out.

k. Experiment

Experimenting can be interpreted as the skills to conduct the testing of ideas derived from the facts, concepts and principles of science in order to obtain information to accept or reject the idea of the idea. Experiment is a form of research undertaken by a person seringkalai unnoticed. Fun activities for students, when directed and connected to hypothesis testing in practice will lead to a simple aksperimen activities.

Rustaman (2005) reveals that the indicators in science process skills are presented in Table 2.1.

Table 2.1. Indicators of Science Process Skills

Science Process Skills	Indicators
Observation	• Use as many senses • Collect and use relevant facts group
Classification	• Take note of any observation separately • Find the differences, similarities • Contrasting traits • Comparing • Finding the basic grouping/classification • Connecting the observed results
Interpretation	• Connecting the observed results • Finding patterns in a series of observations • Concluded
Prediction	• Use patterns observations • To suggest what might happen in circumstances that have not been observed
Asking questions	• Ask what, how and why • Ask for clarification • Ask questions that background hypothesis
Hypothesize	• Knowing that there is more than one possible explanation of the incident • Be aware that some explanation needs to be verifiable by conduct problem solving
Plan the experiment	• Determine the tools, materials and resources that will be used • Determine what will be measured, observed and recorded • Determine what will be implemented in the form of working steps
Using the tool / material	• Using the tool / material • Knowing the reasons why the use of tools / materials • Know how to use the tool / material
Applying the concept	• Apply the concepts learned in new situations • Using the concept on a whole new experience to explain what is happening

Science Process Skills	Indicators
Communicate	• Changing the form of presentation • Checking / describe the empirical data results of experiments or observations with graphs, tables or charts • Develop and articulate a systematic report • Explain the results of an experiment • Reading graphs, tables or charts • Discuss the results of learning activities

Sagala (2010) says that the advantage of the process skills approach is: (1) gives stock way obtain knowledge is essential to the development of knowledge and future, and (2) the introduction process is creative, active students, and can improve thinking skills and acquire knowledge. While weaknesses are: (1) requires a lot of time making it difficult to complete the lesson material specified in the curriculum, (2) requires the facilities are quite good and complete, so not all schools can provide them, and (3) formulate problems, develop hypotheses and designing a attempt to obtain relevant data is a difficult job, not all students are able to carry it out.

2.1.3 Contextual Approach

Nurhadi (2004) says that the approach CTL (Contextual Teaching and Learning) is the concept of learning where the teacher brings the real world into the classroom and encourage students to make connections between knowledge possessed by its application in their daily lives. Students acquire knowledge and skills in the process is not instantaneous, but gained little by little from prior knowledge.

Characteristics of learning Contextual Teaching and Learning (CTL) by Berns, Robert G, and Eicson, Patricia M, was quoted as saying by Sadono and Hidayah (2006) are: cooperation, mutual support, joy, learning with excitement, integrated learning, using a variety of sources, students active, fun, not boring, often with friends, students' critical and creative teacher. Muslich (2009) says that every major component CTL has basic principles that must be considered when to apply them in learning. The basic principles that is visible on the following explanation:

(1) Constructivism

Constructivism is a philosophical thinking of contextual teaching and learning. The knowledge is gradually built up and the result is expanded through narrow and predictable context. The knowledge is not a set of facts, concepts, and norms that is ready to remember but the human constructs the knowledge. Human being gives the meaning through the real experience. The essence of the constructivism theory is the idea that the students must discover and transform complex information to other situation. If they want its information, it becomes theirs. Thus, in contextual teaching and learning, the students construct their own knowledge and experiences, applying the idea to the new situation, and integrating the new knowledge gained with the pre-existing intellectual constructs.

(2) Questioning

The knowledge, which is possessed by someone, always begins from questioning. Questioning is the primary strategy of teaching and learning based on contextual approach. Questioning is the useful procedure in teaching and learning

process to gain information administratively and academically, the students' responses, and the other question from the students. The functions of questioning are also to check the students understanding, to know how far the students' curiosity and what thing known by the students, to focus the students' attention, and to refresh the students' knowledge in learning activity. The question can be applied between the student and the student, the teacher and the student, the student and the teacher, also between the student and the other person coming in the class. Thus, questioning process needs to create the contextual approach. Questioning leads to raise a critical thinking and to exchange the way of thinking, and it adds the students' knowledge.

(3) Inquiry

Inquiry is the core of teaching and learning activity using contextual teaching and learning approach. The knowledge and skills got by the students are not only the result of remembering a set of facts, but it is a result of their own discovering. Inquiry circles are discovering, questioning, hypothesis, data collecting, and the conclusion. The key word of inquiry strategy is that students discover something by themselves. Steps in inquiry strategy are formulating the problem in a subject matter, observing or doing observation, analyzing and presenting the result in writing, report, and other work, and presenting their work to others.

(4) Learning Community

Learning community suggests the result of teaching and learning got from cooperation with other. Learning outcome is got from sharing with friends,

groups, and the known student to the unknown student. Inside the class, outside the class, and outside the school are learning community. The teachers are always suggested doing teaching and learning process in the groups of learning. Students are divided in heterogenic groups' members. The smart student teaches the stupid one; the known student teaches the unknown; the faster learner supports the slower learner, and the conceptor share their idea.

Learning community happens if two directions of communications recurrence. Two or more groups involved in teaching and learning communication mutually study in learning community. One involved in learning community activity gives the information needed by her or his learning partner. This mutual learning activity can happen that if no dominate person or group in the communication, no reluctant person or group for questioning, and no all-known person joins the communication. All people are mutual listening; therefore, all people must feel that everyone has the knowledge, the experience or different skills needed to study.

(5) Modelling

A model imitated by student is better in teaching the skill and learning the certain knowledge. The model gives the great chance for teacher to give the examples how something works before the students do the duty.

(6) Reflection

Reflection is a way of thinking about what something is newly studied, thinking to the back about what we had been done on studying in the past, the students participate what they are newly studied as a new structure of the

knowledge. This process is the enrichment and the revision from the previous knowledge. Reflection also responds toward to recurrence, the activity, and the new knowledge being accepted.

Meaningful knowledge got from learning process and the knowledge possessed by students are expected through the teaching and learning context, and those are gradually expanded, so that the meaningful teaching–learning process and the knowledge are increasingly improved. The teachers or the adult people help the students to feel that they get something useful for themselves about what something is newly studied.

(7) Authentic Assessment

The assessment is the process of collecting data, which can gives a description of the students' learning. The description of students' learning development needs to be known, so the teachers can determine that the students experience the right teaching and learning process. The description of the students' learning progress is needed during teaching and learning process. After data collected, the teachers identify whether the students are sticking in the learning or not. Then, the teacher takes the right action soon. Finally, the students are free from learning sticking.

Learning process is measured from the process, but the progress of students' learning is not measured from the result only. Learning process is done in various ways. A test is a form of assessment. The evaluator is not only the teacher but also other friend and other people. The characteristic of authentic assessment contains that authentic assessment is done during and after teaching

and learning process. It is used for summative and formative test. The skills and performance are not only measured by remembering the facts, but this assessment also contains a continuous and integrative process. Furthermore, authentic assessment is used as a feedback.

Johnson (2010) revealed the approach or the CTL (Contextual Teaching and Learning) has three scientific principles, namely:

(1) Principle of interdependence

Human being could not establish intimacy with one another (Johnson, 2002:28). It means that although the approach consists of authentic learning activity that is conducted group, there is no one can intimidate the other's to follow the certain students. It is a sharing and discussing section when it is conducting in group, so the principle stresses that all of the learners have the interdependence.

(2) Principle of differentiation

When the students are different in their creativity, they could be free to explore their individual talents, cultivate their own learning styles, and progress at their own pace (Johnson, 2002:31). It means that contextual teaching and learning approach can be conducted to the students with different characters, talents, and ability. The importance of the principle is how the contextual teaching learning helps the students to explore their own talent and can have a big motivation to study based on their life context.

(3) Principle of self-regulation

Self-regulation means everything is set up, maintained, and recognized by yourself. The principle motivates the students to show all of their potentials. Moreover, it also explores them to get the new talents. The teacher should give them belief by giving responsibility for taking the decision, behavior, choice, plan, solution etc.

2.1.4 Model Learning Cycle 5E

Learning model is a plan or a pattern which is used as a guide in the classroom learning or learning in the tutorial. Model learning refers to the learning approach that will be used, including teaching purposes, the stages of learning activities, learning environment and classroom management (Trianto, 2010).

The learning cycle is another instructional model based on the constructivist approach, which promotes conceptual change (Stepans, 1988). It is a hands-on, minds-on teaching strategy based on Piaget's developmental model of intelligence that makes students aware of their own reasoning by helping students reflect on their activities. Once students become aware of their own reasoning and apply new knowledge successfully, they are more effective in searching for new patterns (Sunal, 1992).

Paradigm shift toward constructivist education of behavioristik bore models, methods, approaches and new strategies in the learning system. Constructivism stream requires that knowledge is formed by Individuals and experience is a key element of meaningful learning. Meaningful learning will not be realized simply by listening to a lecture or read a book about the experience of others (Trianto, 2010). In constructivist learning students to think critically,

analyze, compare, generalize, draw up hypotheses to draw conclusions from the existing problems, while teachers act as facilitators and motivators of student learning, managing the learning environment of students to be able to conduct classes as well as possible. Because of the involvement of students actively in the learning process supporting the students to construct their own knowledge, so that learning will be centered on the student rather than the teacher.

Learning cycle is a model of learning based on constructivism view where knowledge is built on the knowledge of the student themselves (Djumhuriyah, 2008). Constructivism learning theories of Piaget, defines that learning is the development of cognitive aspects include the structure, content and functionality. Intellectual structure is mental organizations, high level of the individual to solve problems. The contents are the typical behavior of individuals in responding to the problems encountered. While the function of the intellectual development process that includes adaptation and organization.

In addition, learning cycle is a learning model that provides the opportunity for students to learn how to optimize and develop the students' reasoning power. Learning cycle is a model of student-centered learning (student centered). Learning cycle is a series of stages of activities (phase) is organized such that students can master the competencies that must be achieved in learning with the active part (Fajaroh and Dasna, 2010).

Llearning cycle model was first introduced by Robert Karplus in Science Curriculum Improvement Study (SCIs). Learning cycle at first consists of three phases, namely exploration, concept introduction, and concept aplication (Wena,

2009). In 1993, Biological Science Curriculum Study (BSCS) led by Bybee develop a model of constructivist learning known as learning cycle consisting of 5 phases, there are engagement, exploration, explanation, elaboration, and evaluation (Qarareh, 2012).

Wena (2009) revealed that the five phases of the learning cycle 5E can be described as follows:

a. Engagement

Stage generating interest in an early stage of the learning cycle. At this stage, the teacher tried to awaken and develop interest and curiosity (curiosity) students about the topics that will be taught. How to ask questions about the factual process in everyday life (related topic) can be done. Students will respond / answer, then answer the student can be used as a foothold for teachers to know students' prior knowledge on the subject. Then teachers need to identify whether or not the misconception in students. Teachers must make connections between everyday experiences of students with learning topics to be discussed.

b. Exploration

Exploration is the second stage learning cycle model. In the exploration phase formed small groups of 2-4 students, and then given the opportunity to work together in small groups without direct instruction from the teacher. In this group of students are encouraged to test hypotheses and or create new hypotheses, try alternative solutions with a group of friends, conduct and record observations and ideas or opinions that developed in the discussion. This stage teacher act as facilitators and motivators. Basically the goal of this stage is to check the

knowledge of the students if it is correct, it is still wrong, partly wrong, or partly true.

c. Explanation

The explanation is the third stage of the learning cycle. At this stage of learning, teachers are required to encourage students to explain a concept with a sentence / thought itself, ask for clarification on the evidence and explanations students, and to hear each other critically annotations between students or teachers. Given this discussion, the teacher gives a definition and explanation of the concepts discussed, using former student explanation as a basis for discussion.

d. Elaboration

Elaboration of the fourth step in the learning cycle. At the stage of elaboration of students apply the concepts and skills they have learned in a new situation or a different context. Thus, students will be able to learn significantly, because it has been able to implement / apply the newly learned concepts in new situations. If this stage can be designed by the teachers and students' motivation will increase. Increasing student motivation can certainly boost student learning outcomes.

e. Evaluation

Evaluation is the last stage of the learning cycle. At this stage of the evaluation, teachers can observe students' knowledge or understanding in applying new concepts. Students can do a self-evaluation by asking open-ended questions and seek answers through observation, evidence and explanations obtained previously. The results of this evaluation can be made of teachers as an evaluation

of the implementation process of the learning cycle method is being applied, whether it has gone very well, fairly well, or still less. Similarly, through self-evaluation, students will be able to know the lack or progress in the learning process has been done. Learning cycle 5E flow diagram is shown in Figure 2.1.

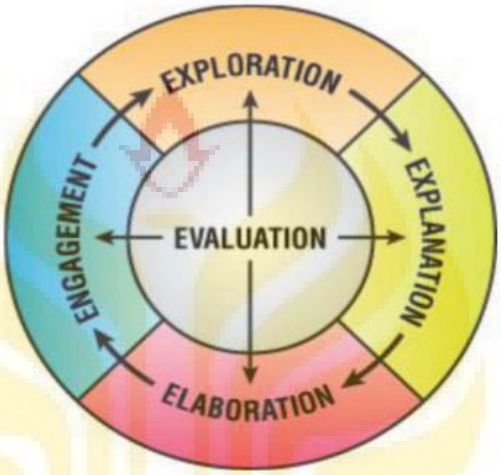

Figure 2.1. Flow Diagram of Learning Cycle 5E

Some of the advantages of learning cycle 5E model according Fajaroh and Dasna (2010) are: (1) helping students develop a scientific attitude, (2) increase the motivation of learning because students are actively involved in the learning process, and (3) the learning becomes more meaningful. While weaknesses are: (1) the effectiveness of learning is low if the teachers did not master the material and learning steps, (2) requires seriousness and creativity of teachers in designing and implementing the learning process, (3) requires the management of more classes planned and organized, and (4) requires time and more energy in planning and implementing learning.

2.1.5 Science-Chemistry Learning

Natural sciences is part of science that originally comes from the English "science". The word science is derived from the Latin word "scientia" which means I know. Science consists of social science and natural science. In the development of science is often translated as meaning natural science, although this definition is less precise and contrary to etymology (Suriasumantri, 1998).

Natural sciences with regard to how to find out about the symptoms of a systematic nature, so that natural science is not only a mastery of knowledge in the form of a collection of facts, concepts, or principles, but also a process of discovery. Science education is expected to become a vehicle for students to learn about themselves and the environment, as well as prospects for further development in applying it in our daily lives. The learning process emphasizes providing direct experience to develop the competencies that the students were able to explore and understand the universe around scientifically. Science education is directed to seek out and doing so can help students to gain a deeper understanding of the nature around (BSNP, 2006).

Chemistry including clump science, therefore, the chemistry has the same characteristics with science. These characteristics are the object of study chemistry (aspect ontology), obtaining (estimologi aspect), and usefulness (axiology aspect). The object of study of chemistry together with the object of study of other science members clumps, such as physics and biology, the study of natural phenomena in the form of facts or events and causal relationships. The chemistry is the science of searching for answers to the question of what, why,

and how natural phenomena pertaining to the composition, structure and properties, changes, dynamics, and energetics substances. Therefore, chemistry subjects learn everything about a substance that covers the composition, structure and properties, changes, dynamics and energetics of substances that involve the skills and reasoning.

Chemistry is a science that was originally acquired and developed based experiments (inductive) but in the subsequent development of chemistry was also acquired and developed based on the theory (deductive). There are two issues related to chemical inseparable, namely chemistry as a process and as a product. Chemistry as the process is defined as knowledge of scientific work. Chemistry as a product is defined as factual knowledge, conceptual knowledge, procedural knowledge, and meta-cognitive knowledge. The learning process chemistry and chemistry learning outcomes assessment must consider the characteristics of chemistry as a process and a product (Sukardjo and Sari, 2008).

Chemistry is not a stand-alone discipline, but associated with a variety of other disciplines. Chemical linkages with other science occur for two reasons, namely (1) the knowledge (concepts, laws and theories) from other disciplines are applied to explain chemical phenomena, and (2) knowledge of chemistry applied in other disciplines. Therefore it is not unusual to find the rules of mathematics and applied physics in chemistry, and at the same time it is not difficult to see the application of chemistry in biology, geology, medicine and agriculture (Team Development of Science Education, 2007).

There are five requirements that need to be met in a chemistry learning, that learning the chemistry is attractive, easy to digest, as well as beneficial for students, namely:

a. Learning chemistry should be able to develop a strong understanding of the students' basic knowledge of chemistry.

b. Learning chemistry should be able to develop the students' ability to investigate and troubleshooting.

c. Learning chemistry should be able to expand students' horizons about the social and environmental impacts related to the implementation or use of chemical products and processes in society.

d. Learning chemistry should be able to meet the physical and psychological needs of students.

e. Chemistry learning should be able to enlighten students about future career related to chemical (Team Development of Science Education, 2007).

2.2 Relevant Research

Research Wildasari (2012) on the analysis of science process skills of students in chemistry learning in class XI SMA N 1 Godean generate profiles of student skills in practical activities for every aspect of skill, which are considered good observation skills (72.69%); good communication skills (62.25%); skills in using tools and materials categorized good (68.36%); characterize skill categorized enough (54.90%); interpreting skills categorized enough (46.70%); skills to analyze categorized enough (56.02%); predicting skills categorized enough (46.08%); and apply the skills considered sufficient (44.10%).

2.3 Conceptual Framework

Learning chemistry science in Tainan Municipal Yongkang Junior High School Taiwan has been quite good, but still tends to be centered on teachers by applying the learning model that only requires a good final result. By learning this kind of active participation of students in participating in learning activities has not been optimal. One of the alternatives that can be done to overcome these problems is to apply the learning model of learning cycle 5E with contextual approach.

Learning with contextual approach has the concept of learning where the teacher brings the real world into the classroom and encourage students to make connections between knowledge possessed by its application in their daily lives. Students acquire knowledge and skills in the process is not instantaneous, but gained little by little from prior knowledge. Characteristics of learning with contextual approach, among others, can increase cooperation, mutual support, joy, learning with excitement, integrated learning, using a variety of sources, students are active, fun, not boring, often with friends, students' critical and creative teacher. Learning by applying the model learning cycle 5E has five stages of the process, namely the engagement, exploration, explanation, elaboration and evaluation.

Model of learning cycle 5E is a learning model that is based on the view of constructivism in which knowledge is built daripengetahuan students themselves, so that the student-centered learning activities (student centered). Through the application of the model learning cycle, students are given the

opportunity to construct their own knowledge, in collaboration with other students to discover concepts, explains the concept with their own words, and apply the concepts that have been obtained in the new situation. Students will be invited to actively interact directly with objects which will require the skills of existing skills in students, such as observing, communicating and using tools / materials. In the implementation of learning teachers act as facilitators and motivators for students. Therefore through learning model learning cycle 5E is expected to be more meaningful chemistry learning and improve science process skills.

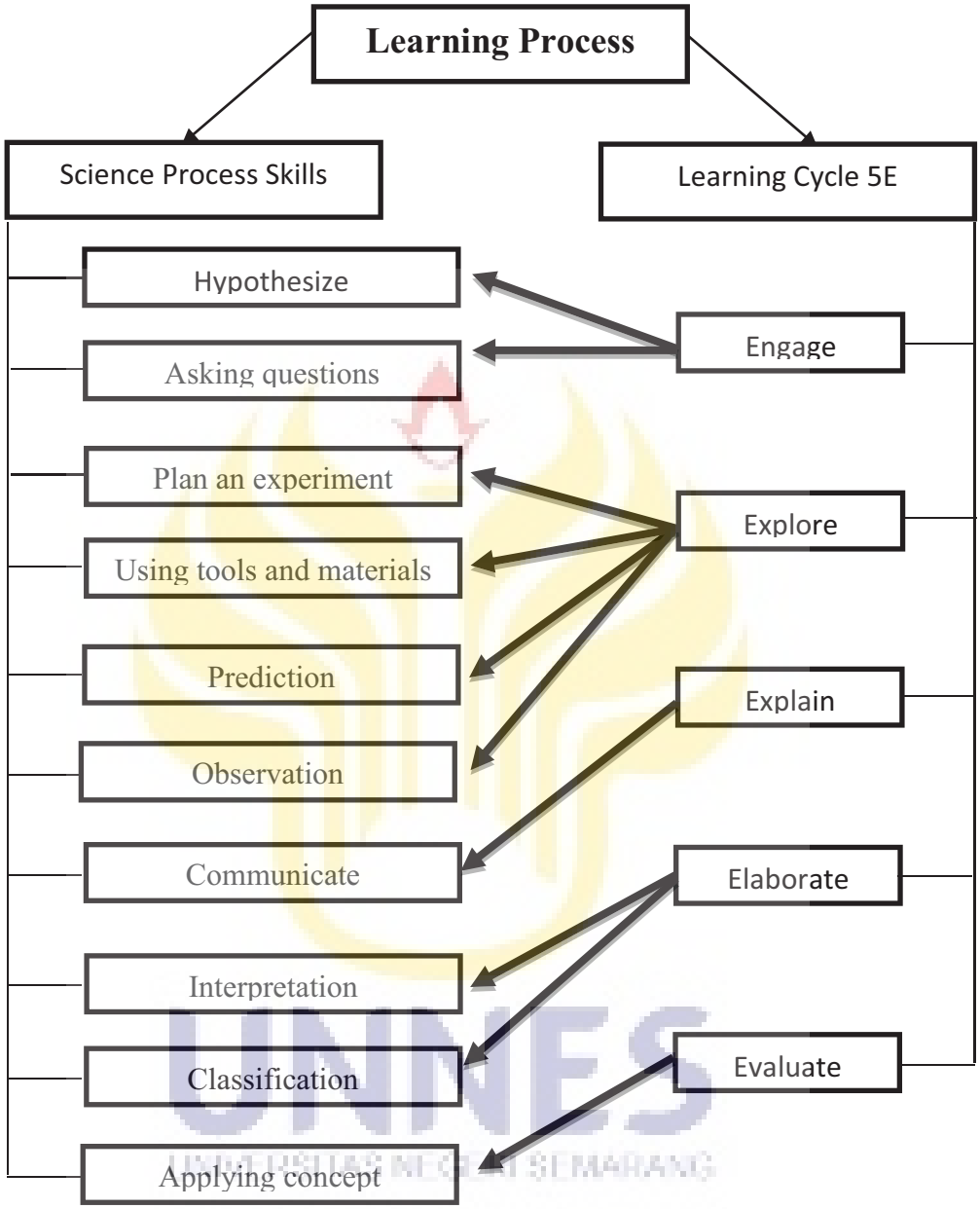

Figure 2.2 Conceptual Framework Scheme

CHAPTER 5

CONCLUSION AND SUGGESTION

5.1 Conclusion

Based on the results of research and discussion that has been done, can be summarized as follows.

1. Science process skills of students in chemistry science learning as classical gained 21 from 24 students with percentage 87.5% has good SPS, while 3 from 24 students with percentage 12.5% has moderate SPS. SPS of students has good categories with percentage 85.49%, except for the aspect of asking questions with the percentage 75.00% has moderate category.

2. Science process skills of students in chemistry science learning through contextual approach with model of learning cycle 5E gained an average of good category. SPS indicator with highest category is observation aspect, while the lowest SPS indicator there is the aspect of asking questions with moderate category. The response of students towards learning process was positive. Students were delighted with the methods of learning games and simple experiments conducted and contextual approach that is applied to make students aware that chemistry is around us.

5.2 Suggestion

Based on the results of research, given some suggestions as follows.

1. We recommend collecting data to be analyzed not only through observation sheet but can be coupled with other instruments, so that the results of data analysis can be more accurate.

2. Should the instruments used actually are in accordance with the conditions in which a study was conducted, so that the results obtained can be more effective.

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