STUDENTS’ PERFORMANCE ON SOLVING PHYSICS PROBLEM THROUGH THINKING ALOUD PAIR PROBLEM SOLVING (TAPPS) METHOD FOR JUNIOR HIGH SCHOOL STUDENTS

THESIS

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Magister Pendidikan

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APPROVAL

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MOTTO AND DEDICATION

There is no power but from Allah Almighty
Verily, with every difficulty there is relief.

I dedicated this thesis to:
My beloved husband Muhammad Rizal and our beloved baby
My beloved parents Ayahanda Mustofa and Ibunda Sri Mulyati
My beloved parents in law Ayahanda Abdul Jawad and Ibunda Siti Zumaroh
My beloved sister Briliana Hepta Starry Sri Hikmawati
All readers
ABSTRACT


Keyword: Physics Problem Solving, Problem Solving Style, TAPPS Method

Learning with Thinking Aloud Pair Problem Solving (TAPPS) method requires students work in pairs to solve the physics problems. One student as problem solver has to read the problem and think aloud during the problem solving process. Another student as listener attends to the problem solver’s thinking and reminds him/her to keep saying aloud what he/she is thinking or doing, while also asking for clarifications and pointing out errors being made. This research used TAPPS to describe students' problem solving performance that consist of problem solving ability, difficulty and process. Students are grouped based on thinking, feeling, intuitive and sensing problem solving styles by Problem Solving Style Questionnaire (PSSQ). The students’ problem solving ability were investigated to see any significant differences after learning using the TAPPS method for each problem solving style. Data reported were mainly collected through Problem Solving Ability Test, Problem Solving Difficulty Questionnaire, Worksheet and Observation Sheet. The result of research is: there is significant difference problem solving ability of students with dominant thinking, feeling, intuitive and sensing problem solving style after learning with TAPPS; students with dominant sensing style have the highest average of problem solving difficulty, followed by students with dominant thinking, intuitive and feeling style; observation sheet is analyzed to describe the pattern of problem solving process of students with thinking, feeling, intuitive and sensing problem solving style.
ABSTRAK


Kata Kunci: Pemecahan Masalah Fisika, Gaya Pemecahan Masalah, Metode TAPPS

Pembelajaran dengan metode Thinking Aloud Pair Problem Solving (TAPPS) menuntut siswa bekerja berpasangan untuk memecahkan masalah fisika. Satu siswa sebagai problem solver harus membaca soal dan berfikir dengan suara keras selama proses pemecahan masalah. Siswa lain sebagai listener memperhatikan pemecahan masalah oleh problem solver dan mengingatkanya untuk tetap berbicara dengan keras ketika berfikir atau melakukan sesuatu, juga meminta klarifikasi dan menunjukkan jika ada kesalahan. Penelitian ini menggunakan TAPPS untuk mendeskripsikan kinerja pemecahan masalah siswa yang terdiri dari kemampuan, kesulitan dan proses pemecahan masalah. Siswa dikelompokkan berdasarkan gaya pemecahan masalah thinking, feeling, intuitive, dan sensing menggunakan Problem Solving Style Questionnaire (PSSQ). Kemampuan pemecahan masalah diteliti untuk melihat adanya perbedaan yang signifikan setelah belajar menggunakan TAPPS untuk setiap gaya pemecahan masalah. Data diambil melalui Problem Solving Ability Test, Problem Solving Difficulty Questionnaire, Worksheet dan Observation Sheet. Hasil penelitian menunjukkan adanya perbedaan yang signifikan tentang kemampuan pemecahan masalah antara siswa yang memiliki gaya pemecahan masalah thinking, feeling, intuitive, dan sensing setelah pembelajaran dengan metode TAPPS; siswa dengan gaya pemecahan masalah sensing memiliki tingkat kesulitan pemecahan masalah tertinggi, diikuti siswa dengan gaya thinking, intuitive, dan feeling. Lembar observasi dianalisis untuk menggambarkan pola masalah proses pemecahan dari siswa dengan gaya pemecahan masalah thinking, feeling, intuitive, dan sensing.
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Semarang, December 30th 2015

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CHAPTER I
INTRODUCTION

1.1 General Background

Physics is the important part of natural science discusses about physical’s phenomena in all parts of universe. Many science education researches indicated that students have trouble in learning natural science particularly physics (Zewdie, 2014). Physics is basically a study to find the answers to the questions of why and how natural phenomena in daily life occur (Saleh, 2014). In the other words, the purpose of learning physics is to improve students’ ability in solving so many kinds of physical phenomena, by developing student’s deductive and inductive reasoning ability, supported by Physics concept and principle (Permendiknas, 2006).

One of government efforts for gaining education quality is curriculum development especially on learning process, including the ability to problem solving, reasoning, explaining phenomenon, communicating concept, expressing ideas and connecting concept with everyday phenomena (Irawan, 2012). Problem solving is one of the primary tools for college and university science instruction. Problem solving is arguably the most important skill a physicist can have (Adams, 2015). But most students have difficulties to apply the concept to solve problem both on their task and problem in everyday live (Gok, 2010). Solving physics problems requires a deep understanding of fundamental physics concepts. A correct solution embodies both correct physics concepts and their proper
interconnection to other ideas that are related to the physical situation of the problem (Heller, 2010: 17).

Polya claims that true problem solving is accompanied by the cognitive activities of mobilization, organization, isolation and combination, and by the meta-cognitive evaluations of relevancy, proximity, and quality (Carifio, 2015). Problem solving ability needs thinking process engaging with cognitive ability and mental process to give the opinion or make a reaction to the observing object or problem. Problem solving is part of thinking. Thinking process covers a range of different mental activities, such as reflecting on ideas, having new ideas, theorizing, arguing, making decisions and working out problems (Groome, 2005: 101). A problem occurs when in any given state, a goal state needs to be reached, and there is no routine method of solution available. The subsequent process of transforming the given state into the desired goal state is defined as problem solving in which a phase of establishing a representation of the problem is usually followed by the implementation of a solution process (Greiff, 2013).

Problem solving ability improves together with increasing of age and development of cognitive ability. Famous educational expert Piaget delivers a theory about cognitive development. Piaget’s theory asserts that intellectual development is a direct continuation of inborn biological development. That is the child is born biologically equipped to make a variety of motor responses, which provide them with the framework for the thinking processes that follow. Piaget stresses that as children mature mentally, they pass sequentially through four major stages of cognitive development, each stage
having several sub stages. The major stages of cognitive growth are sensory motor stage on 0 to 2 years, preoperational or intuitive stage on 2 to 7 years, concrete operations stage on 7 to 11 years, and formal operations stage on 11 to 15 years (Misu, 2014). Beside of the increasing of age that influence thinking ability, achievement of gaining high problem solving ability is based on initial knowledge and learning.

Junior High School students are about upper primary or on formal operation state (Simatwa, 2010). At this stage the child shifts from the level of concrete operations to the final stage of formal operations. The students must be able to apply all of concrete operation and at least the beginning of formal operation (Lawson, 1995: 111). On formal operation stage student should be able to solve Physics problem with some complex question related with abstract thing. But most students still have difficulties to do it. Students are able to do the question that same with sample question and difficult to do the new one. The questions about everyday live problem are more difficult for them.

Students are expected to develop their problem solving abilities to face challenges by adopting various perspectives. When faced with a problem, students may employ different methods or patterns to solve it (Tai, 2015). The first concept of problem solving styles came from the theory of psychological functions which was developed by Carl Jung. This theory has been further developed by Mitroff, Kilmann and Zmud. Jung’s model consists of four psychological functions as thinking, feeling, sensation, and intuition. Some researchers also developed
instruments to identify problem solving style. One of them is Problem Solving Style Questionnaire (PSSQ) developed by Parker (Godrati, 2014).

Teacher still play the biggest role on learning process in class. To overcome this problem there needs a learning method that can support students to learn actively, so students can develop their thinking and problem solving performance (Trianto, 2010: 5). Problem solving performance consists of ability and difficulty. Students have good performance if having high ability and low difficulty. High problem solving performance means solving problem with correct process and answer without any difficulties (Heller, 2010: 89).

Learning to develop problem solving ability can be done in groups. This learning method commonly called collaborative problem solving or cooperative problem solving (Wishmath, 2015). It is a strategy of instruction whereby students work together in groups of varying composition to achieve common objectives. To be successful in this strategy, students share ideas rather than working alone and assist one another in order to maximize mutual benefits (Esan, 2015). One of cooperative problem solving is Thinking Aloud Pair Problem Solving (TAPPS) Method. TAPPS can facilitate collaborative learning (Pate, 2011a). TAPPS can provide a formative assessment tool for checking students thinking and understanding of technical information for problem solving (Pate, 2011b). This method developed for learning mathematic but has some advantages that can be applied on learning Physics. Students work in pair to solve Physics problem. One student is problem solver and one student is listener. Problem solver works on the question while listener pays attention. Listener may ask questions or give
comments but should not give answers. After completion, problem solver and listener exchanging roles and doing the other problem with same level of difficulty.

There have been many researches that have been learned about problem solving. Among them are researches about problem solving of expert and novices (Jacobson, 2000), problem solving assessment (Gok, 2014; Care, 2014), process of problem solving (Rott, 2013), developing method for problem solving (Phumeechanya, 2013), etc. There also have been many researches about TAPPS (Benham, 2009; Niekerk, 2013; Kani, 2015) and problem solving style (Tsai, 2014). But there is no research on problem solving is viewed from the perspective of problem solving style by using TAPPS method on the learning process. Based on the explanation, the researchers intend to conduct research by the title Students’ Performance on Solving Physics Problem through Thinking Aloud Pair Problem Solving (TAPPS) Method for Junior High School Students.

1.2 Identification of the Problem

Based on general background above, researcher identifies some following problems:

(1) Students have trouble in learning natural science particularly physics.

(2) Students have difficulties to solve physics problem especially physics problem about everyday life.

(3) There is no research on problem solving is viewed from the perspective of problem solving style by using TAPPS method on the learning process.
1.3 Limitation of the Problem

Limitations of research are:

(1) Research Subject:

Students of Junior High School grade VIII from the first semester of 2015/2016 academic year in MTs Ibnul Qoyyim Yogyakarta.

(2) Research Object:

(a) This research uses TAPPS method and observes Junior High School students’ ability, difficulty and process on Physics problem solving.

(b) Physics matter used in this research is about work and energy.

(c) Instrument for this research are Problem Solving Style Questionnaire (PSSQ), TAPPS method syllabus, TAPPS method lesson plan, problem solving observation sheet, worksheet, problem solving posttest and problem solving difficulty questionnaire.

1.4 Statement of the Problem

This research investigates three problems they are:

(1) Are there any differences between learning outcomes of students with thinking, feeling, intuitive and sensing problem solving style after learning with TAPPS Method?

(2) What does Junior High School students’ problem solving difficulty that may occur during learning with TAPPS model?
How does Junior High School students’ problem solving process through learning with TAPPS model for students with sensing, intuitive, feeling and thinking problem solving style?

1.5 The Purpose of Research

The purposes of this research are:

1. To know are there any differences between learning outcomes of students with thinking, feeling, intuitive and sensing problem solving style after learning with TAPPS Method.

2. To describe Junior High School students’ problem solving difficulty that may occur during learning with TAPPS model.

3. To describe Junior High School students’ problem solving process through learning with TAPPS model for students with sensing, intuitive, feeling and thinking problem solving style?

1.6 The Use of the Research

This research may have some benefit they are:

1. For students:
   (a) by understanding about problem solving, students are expected to be able to have awareness about gaining problem solving ability by exercise diligently.
   (b) by learning with TAPPS method, students learn to work together, give opinion and be responsible.
(2) For teachers:

(a) by understanding about problem solving ability, difficulty and process teacher can deliver lesson to support it.

(b) by learning with TAPPs method, teacher can deliver an innovative learning that can support students to be more active in class.

(3) For readers: get information about problem solving style, ability, difficulty, process and also TAPPs method.

1.7 **Keyword Definition**

The following explanation is a definition of the term of the keywords used in this thesis:

(1) Physics problem solving

Problem solving is usually defined as the formulation of new answers which go beyond the simple application of previously learned rules to create a solution (Caliskan, 2010). While physics problem solving means formulation of new answers or solutions for problem related to physics.

(2) Problem solving style

Problem-solving styles are consistent individual differences in the ways people prefer to deal with new ideas, manage change, and respond effectively to complex, open-ended opportunities and challenges.

(3) Thinking Aloud Pair Problem Solving (TAPPs) Method

A learning method begins with grouping students into pairs, one student as a problem solver and the other as the listener. Problem solver does the question
while listener pays attention and gives question. After completion, problem solver and listener exchange roles (Ilie, 2015).