

# CHAPTER I

## INTRODUCTION

### A. Background

Criteria to the implementation of learning in an education to achieve competency standards adapted to some of the principles of learning used. Attached in Permendikbud No. 18A year 2013 on the implementation of the curriculum refers to competency standards and content standards. Learning activities need to use principles: (1) centered on the learner, (2) developing the creativity of learners, (3) create conditions fun and challenging, (4) uncharged values, ethics, aesthetics, logic, and kinesthetic, and (5) provides a diverse learning experience through the application of various strategies and methods of learning fun, contextual, effective, efficient, and meaningful. Based on point 5 on the learning principle above means the educator is required to give the opportunity to students with diverse learning strategies. Based on the national curriculum 2013, educator facilitate students in learning process to get the principle of five learning experience. It was attached in Permendikbud No. 18A year 2013 the principle of five learning experience such as observing, asking, experimenting, associating, and communicating. Those learning experience is a series of scientific approach activities as strengthen in teaching learning activities.

Physics subject already applied the scientific approach in learning process. Physics is one of a subject that provides experiences for students to discover the knowledge through scientific approach. There are so many problems in physics phenomena that students have to prove and solve it to get the truth evidence. In learning process, student will be trained to develop their thinking to solve the

physics subjects. The successful in solve the physics problems is effected by the presentation of representations format from that problems, the representations form are sometimes easier to make students understand of the concept (Deliana, 2012: 3). Learning physics subject expect to students calculate the data, solving the physics problems using mathematically, making a graph to describe the certain concept, communicating the data result. The mastery of physic concept requires the understanding and the ability of different representations or multiple representation way to the concept. The implementation of multiple representations in learning activities will create the atmosphere of learning with the active role of all the potential of students, activates students' learning ability , both minds-on and hands-on, so the learning physics become meaningful (Abdurahman et al., 2011).

Based on the previous research when researcher did teaching practice (PPL) in one of national school, unfortunately scientific consistency has low score is about 38.46. The scientific consistency in every sub got in low score category it's about lower than 4.15 average score, less than 18 students who have scientific consistency. Those phenomena above due to students is not trained the multiple representation in learning physics concept. This can be seen from the way when delivery of physics materials in the classroom more tendency to derivatives the mathematics equation. The physics question is more demanding on mathematical calculations only a few questions that require verbal representation. When student are given the multiple representation questions on the exam, in three different representations such as verbal, picture, mathematics, most of students has difficulties to answer the problems was given. Even though, three questions have the main concept is same. But the presentation is presented in three different forms. Besides that, when students explain the knowledge about

some evidence, students just explain and describe it by verbally. Students very rarely use the other representation at the same time using different representation. For example, teacher order students to solve the mathematic equation in front of the class. Most of students just wrote the calculation of the problem but when teacher order to explain more by verbally and picture, students feel difficult even thought it still same focus. Students find physics difficult because they have to contend with different representation such as experiments, formulas, and calculation, graphs, and the conceptual explanation at the same time (Angell et al. 2004). This makes the representation of students' abilities are limited to one representation, the mathematical understanding of the students who make less deep so, it gives effect less scientific consistency when confronted with a multiple representation test.

The multiple representations in learning activities will be effected on the scientific consistency based on the previous research. Yusuf (2011) found the data that when students were given questions with the same theme in different representations, most of 80% students did not consistent for the answer. The scientific consistency is students' ability to consistent in different representation such as verbal, picture, mathematic with still the same sub concept or theme. If students consistent in correct answer, that student were categorized understand about that concept (Nieminen et al. 2012). The previous research stated that 13.37 on student average who did not have scientific consistency (Krishnayanti, 2015).

The research about scientific consistency to answer the multiple representations problem is measured by Nieminen et al. (2010). He stated that to measure the level of scientific consistency in understanding a physics subject used multiple representations test in the achievement test. To analyze the scientific consistency of student, researcher has been created 3 questions with

different representation (verbal, picture, mathematic) in multiple representation tests to measure 1 same concept on heat concept. Students can be categorized he or she is consistent scientifically if they were be able to answer 3 questions correctly in different representation and there is in understand the concept category of multiple representation test. If students were not in that category, so students are not consistent scientifically. Based on the preliminary research, none of student who answer 3 questions correctly. That means all of students is not in consistent category in that concept. Lack of scientific consistency of students on physics concept is characterized by students' inability to understand and use physics concept on different representation (Krishnayanti, 2015).

Based on the number of students who are not consistent in understanding the physics concept, researcher expects to enhance students' scientific consistency in this study. Student is expected to mastery the physics concept scientifically. Because if students who mastery the concept properly, they would be use the multiple representation ability.

The implementation of problem based learning with multiple representation approach will be used in this study. The reason is suitable with the main objective of physics education, is helping students to use the multiple representation in solving problem and understanding the physics subject well (Van Heuleven & Zou, 2011). Besides that, problem based learning model with multiple representations approach has been applied in another research. Based on Sari (2015) said that the score result of scientific consistency is increase which as gain 0.58 through PBL with multiple representations. It needs for present the problems in the form of different representations to overcome to student individual differences. If problem based learning model combine with the multi-representation approach, students able to solve the problems with various representations. It would be increase the advantages of this learning model.

Amrina Painty Metalinda , 2015

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Researcher expects to implement this learning strategy to improve scientific consistency in school where researcher did teaching practice. The material that will be implemented with this learning model is about heat transfer. Because learning heat concept there are so many opportunities to improve their understanding using PBL with multiple representation approach.

Based on the explanations above, the title in this research is “IMPLEMENTATION OF PROBLEM BASED LEARNING MODEL WITH MULTIPLE REPRESENTATIONS APPROACH TO ENHANCE 7<sup>TH</sup> GRADE STUDENTS’ SCIENTIFIC CONSISTENCY IN LEARNING HEAT TRANSFER CONCEPT”

### **B. Research Problem**

The research problem of this study is “How is the implementation of problem based learning model with multiple representations approach to enhance 7<sup>th</sup> grade students’ scientific consistency in learning heat concept?”

### **C. Research Question**

Elaborating the research problem, the research attempts to explore the following questions:

1. How is the enhancement of scientific consistency in learning heat transfer concept after the implementation of problem based learning model with multiple representations approach?
2. How is the enhancement of students’ scientific consistency category in every sub concept?

3. How is the enhancement of the number of student in scientific consistency category in every sub theme?

#### **D. Limitation of Problem**

In order to make the research become more focused, the problem is limited as follow:

1. Problem Based Learning with multiple representation approach.  
In teaching learning process use Problem Based Learning syntax such as: giving the problem orientation, organizing students to observe, helping student to investigate individually and group, presenting the result, analyzing and evaluating the problem. In learning materials, teacher trigger student to learn the concept using different representations.
2. Multiple representation test as an instrument use three representation such as verbal, picture, and mathematics. Students can be categorized is consistent scientifically if they were be able to answer 3 questions in the same questions indicator correctly
3. Heat concept is the physics concept in 7 grade of junior high school based on curriculum 2013. The sub concept that will be applied are conduction, convection, radiation, sea breeze, and land breeze

#### **E. Research Objective**

This research objective is described specifically as follow:

1. To investigate the enhancement of students' scientific consistency through the implementation of problem based learning model with multiple representation approach
2. To investigate the enhancement of students' scientific consistency category in every sub concept

3. To investigate the enhancement of the number of students towards scientific consistency category in every question indicator

#### **F. Research Benefit**

The results of this study are expected to provide the following benefits:

1. For teachers, this study may give the alternative assessment tool to measure the scientific consistency. This is one of learning strategies in educational field especially in physics education.
2. For students, in learning this approach gives opportunity to learn in diverse ways. Student could solve the physics problems with different representations. Student could feel new experience in learning process.
3. For other researchers, this study may use as precious references in investigating scientific consistency of students.