IMPROVING THE PHYSICS EDUCATION ACHIEVEMENT WITH MAPPING CONCEPT

Elia Putri

Department of Physics Education, Universitas Muslim Nusantara AW, Medan, INDONESIA.

eliaputri_umnaw@yahoo.com

ABSTRACT

Many problems appear in teaching learning Physics Education in Senior High School. This paper reported the application of the Mapping Concept in the Physics Education. The Mapping Concept was applied in learning the subject matter of dynamic electricity. The approach used to apply this strategy was the Problem Based Learning (PBL) model. The sample in this study was the first grade of Senior High School (SMA Negeri) 3 Badar. It counted 30 students. The instrument in this study was a post test of control group. After the treatments were administered, the obtained data showed the means of Experimental Group was 13.43. While the Control On was 9.70. The value of t test = 5,930, tested at significant level of 0.05 because t_{count} is greater than t_{table} where t_{count} 5,86 > t_{table} 1,672 then it is significant with hypothesis, "there is a significant effect of Mapping Concept on the Physics Education achievement in the first grade of SMA Negeri 3 Badar, Academic Year 2014/2015.

Keywords: Mapping Concept, Physics Education, improvement

BACKGROUND

Physics Education is one of the Natural Sciences that offered in Senior High School in Indonesian Curriculum. Physic Education shows the phenomena of nature with any attempt to uncover all the secrets and laws of the universe that occur in everyday life. Physics Education has the goal of observing, understanding, and utilizing natural phenomena involving substances (matter) and energy. However, this natural science is considered difficult, so the result of Physics Education learning is still low (6.0).

Based on the results of interviews with Physics Education teacher of SMA Negeri 3 Bandar, it revealed that the students learning outcomes of Physics Education are very low because students assume that Physics Education is difficult to understand because to many formulas that have to be memorized and symbols that student do not understand. Learning model that is often used is direct learning, by lecture method, taking notes, working on questions, demonstrations and less varied so students feel bored. Minimum Completeness Criteria (MCC) in the school for Physics Education subject is 68. However, the average value of daily test obtained by students only about 60-65; so it can be said that the achievement of students during the learning process is less satisfactory.

To overcome these problems, it is necessary to make an innovation in the learning process by designing a model of learning that is accompanied by innovative media that can optimize student learning outcomes. One of the innovative learning models that can be applied in order

Copyright © 2017

to optimize student learning outcomes is the Problem Based Learning (PBL) model by using more varied and interesting learning media, one of them is by using Mapping Concept.

According to Suparno (2005: 111), Mapping Concept is a schematic overview to present a series of concepts and links among these concepts. Mapping concept can improve students' memory in learning. It means that students can learn more effectively and efficiently with reductive thinking by way of summarizing the information much into the main concepts that are interconnected into a diagram or picture. This is much stronger than remembering a sentence structure.

With the Problem Based Learning (PBL) model, students are required to solve the problems presented by digging as much information. This experience is indispensable in everyday life where the development of one's mindset and work patterns depends on how he or she taught himself. In essence, the Problem Based Learning is a learning that uses real-world problems presented at the beginning of learning. Then the problem is investigated to be known solution of the problem solving. The Problem Based Learning model begins with problems; then it leads the students to deepen their knowledge with topic that they already knew and what they needed to know in solving the problem.

PROBLEM FORMULATION

Based on the background, the formulation of the problem to be studied in this research covers;" The effect of Mapping Concept on the Physics Education achievement in the first grade of SMA Negeri 3 Badar, Academic Year 2014/2015.

THEORETICAL FRAMEWORK

Learning is an important process for the change of human behaviour and includes everything that is thought and done. A person is said to learn when there is a certain change in him as from the do not know to know. The problem of understanding this learning, psychologists and education suggests the definition of learning is different according to the point of view and the learning process.

It is noted that the learning is an attempt by a person to gain a whole new behavioural change, as a result of his own experience in interaction with his environment, while Sardiman (2011: 21) said that learning is changing. In this case, the meaning of changing is behavior. So learning will bring changes to the learning individuals. Changes are not only related to the addition of science, but also in the form of skills, attitudes, attitudes, understandings, self-esteem, interests, character, and adjustments.

Trianto (2011: 16) argued "Learning essentially is a process marked by the change in a person". Changes as a result of the learning process can be indicated in various forms such as changing knowledge, understanding, attitudes and behavior, skills and abilities, as well as changing in other aspects that exist in the learning individual.

From some understanding of learning according to several experts, it can be concluded that learning is a process that resulted in behavioral changes as a result of his experience include changes in attitudes, knowledge, skills and other changes.

Problem Based Learning (PBL)

Problem-Based Learning is appropriate to realize the goals of Natural Sciences Education. It is believed that the Natural Sciences Education is based on the practice and interpretation, which is related to real life. The PBL Model is facilitating both relationships. In the PBL, the focus of learning is on the chosen problem so that learners not only learn the concepts that deal with the problem but also understand the concepts relevant to the issues that become the

Copyright © 2017

Leena and Luna International, Chikusei, Japan.
(株) リナアンドルナインターナショナル, 筑西市,日本
ISSN: 2186-8476, ISSN: 2186-8468 Print
www.ajsc. leena-luna.co.jp

center of attention but also gain experience learning related to skills that apply the scientific method in problem solving and cultivate a critical mindset.

According to Arends (2008: 41) the essence of PBL in the form of presenting various problematic situations are authentic and meaningful to the students, which can serve as a stepping stone for investigation. The role of teachers in problem-based learning is to address issues, provide questions, facilitate investigations and dialogue. Most importantly the teacher provides scaffold or a supportive framework that improves inquiry and intellectual growth. PBL is not possible unless teachers create a classroom environment where open and honest exchange of ideas can occur. Problem-Based Learning is the use of the various intelligences needed to confront real-world challenges, the ability to deal with new things and complexities.

The following describes the learning characteristics based on the problem:

a. The problem becomes a starting point in learning.
b. The issues raised are the problems that exist in the unstructured real world.
c. Problems require multiple perspectives .
d. Problems challenge students' knowledge, attitudes and competencies that then require the identification of learning needs and new areas of learning.
e. Learning self-direction becomes the main thing.
f. Utilization of diverse knowledge resources, their use, and evaluation of information resources is essential in PBL.
g. Learning is collaborative, communication and cooperative.
h. The development of inquiry and problem solving skills is just as important as mastering the content of knowledge to find solutions of the problem.
i. The openness of the process in problem-based learning involves the synthesis and integration of a learning process.
j. Problem-based learning involves evaluating and reviewing student experiences and learning processes.

Student learning outcomes

PBL is not designed to help teachers deliver large amounts of information to students, but it is designed primarily to help students develop thinking skills, problem-solving skills, intellectual skills, learning the roles of adults by experiencing them through various real situations that are simulated and become autonomous learners.

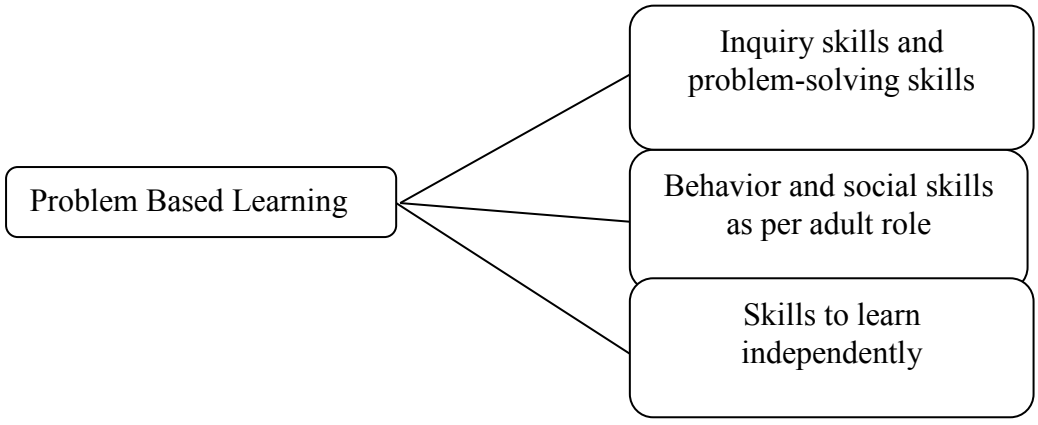

Figure 1. Results Obtained by Students from the PBL Model, Arends (2008:43)

Copyright © 2017

Table 1. Sintaks Model Problem Based Learning (PBL)

Syntax of PBL	The Activity of Teacher
1st Phase: Providing an orientation about the problem to the students	Teachers explain learning objectives, describe important logistical needs, and motivate students to engage in problem-solving activities.
2nd Phase: Organizing students to observe	Teachers help students to define and organize learning tasks related to the problem.
3rd Phase: Assisting independent and group investigations	Teachers encourage students to get the right information, carry out experiments and seek explanations and solutions.
4th Phase: Developing and presenting artefacts and exhibits	Teachers assist students in planning and preparing appropriate artefacts, such as reports, videotapes, and models and helping them to pass it on to others.
5th Phase: Analyzing and evaluating the problem-solving process	Teachers help students to reflect on their investigations and the processes they use.

(Arends, 2008:57)

Mapping Concept Learning

Learning with mapping concept can help students reduce the way of learning by memorizing and improve meaningful student learning by linking concepts. Mapping concept can attract students' attention and reduce difficulties in understanding the subject matter, while it also helps to improve new skills for students in learning, because the concept of mapping is a systematic and brief knowledge but there are many concepts in it.

According to Suparno in Trianto (2011: 158) mapping concept is “a schematic overview to present a series of concepts and links among other concepts". Mapping concept is also links between concepts that have meaning and meaning. Mapping concept is a way to show the concept of science in a systematic way, i.e starting from the relationship with each other to form knowledge and facilitate the understanding of a learning topic. Concept of mapping is used to express meaningful relationships between concepts in the form of proportions. Proportions are two or more concepts connected by words in a semantic unit. Concept of mapping can improve students' memory in learning. It means that students can learn effectively and efficiently by reductive thinking that is by summarizing the information that many into the main concepts are interconnected into a diagram or image is much more powerful than remembering a sentence arrangement.

Drawing concept of mapping is one of the method of teaching that is structured systematically based on concepts that need to be studied, understood, observed, and evaluated in a teaching topic. A concept is made into a coordinate point that can relate to other concepts so that they are related to each other. The concept of mapping plays a role to summarize the subject matter which only shows the essential teaching materials. Mapping concept not only help teachers to deliver course material, but also help students to learn so that students can prepare early for their abilities to learn the lesson materials that will be learned later that will be needed as support.

Copyright © 2017

Leena and Luna International, Chikusei, Japan.
(株) リナアンドルナインターナショナル, 筑西市,日本
ISSN: 2186-8476, ISSN: 2186-8468 Print
www.ajsc. leena-luna.co.jp

RESEARCH DESIGN

This research applied an experimental design that aimed to determine the presence or absence of influence or effect of something caused in the sample of students. The sample taken in this research was divided into two classes, they are problem based learning (PBL) class and conventional class. In doing this research, it involves two different treatments between PBL class and conventional class. The first class is given a PBL model while the second class is explored by the conventional learning model. The research design used was design using treatment and post test.

Thus, the design of this study is as follows:

Tabel 2. Research Design

Class	Treatment	Post test
Experiment	X_1	Y
Control	X_2	Y

(Arikunto, 2010:125)

RESEARCH RESULT

Research was conducted in SMA Negeri 3 Badar Southeast Aceh. It was to know how the effect of the Mapping Concept through different treatments in two groups of learning. The research has been done with maximum and obtained data. Data processing of test result from student learning result using Problem Based Learning model (experiment class) with conventional learning model (control class) was processed for hypothesis testing. In accordance with the data analysis techniques obtained first modified into the form of frequency distribution table that is as follows:

Data Analysis

- Class of Problem Based Learning (PBL) model

Interval = The biggest data – the smallest data

= 18 – 8

= 10

The total of class (k)

k = 1 + 3,3 log n

k = 1 + 3,3 log 30

k = 1 + 3,3 (1,477)

k = 1 + 4,874

k = 5,874 = 6

Length of class (p)

$$p = \frac{R}{k}$$

$$p = \frac{10}{6} = 1{,}66 \approx 2$$

Copyright © 2017

Table 3. Frequency Distribution of PBL Class (X_1)

No	Interval Class	f_i	x_i	$(x_i)^2$	$f_i\ x_i$	$f_i\ x_i^2$
1	8 – 9	3	8,5	72,25	25,5	216,75
2	10 – 11	4	10,5	110,25	42	441
3	12 – 13	8	12,5	156,25	100	1250
4	14 – 15	8	14,5	210,25	116	1682
5	16 – 17	5	16,5	272,25	82,5	1361,25
6	18 - 19	2	18,5	342,25	37	684,5
	Total	**30**	**-**	**-**	**403**	**5635,5**

a. The average value

$$\overline{X} = \frac{\sum f_1 X_1}{\sum f_1}$$

$$\overline{X} = \frac{403}{30} = 13{,}43$$

b. Standard Deviation

$$S_1{}^2 = \frac{n \sum f_1 X_1{}^2 - (\sum f_1 X_1)^2}{n\,(n-1)}$$

$$S_1{}^2 = \frac{30\ (5635{,}5) - (403)^2}{30\ (30-1)}$$

$$S_1{}^2 = \frac{169065 - 162409}{30\ (29)}$$

$$S_1{}^2 = \frac{6656}{870}$$

$S_1 = \sqrt{7{,}650} = 2{,}765$

➢ Conventional Class

Interval = The biggest data – the smallest data

= 14 – 5

= 9

The total of class (k)

k = 1 + 3,3 log n

k = 1 + 3,3 log 30

Copyright © 2017

Leena and Luna International, Chikusei, Japan.
(株) リナアンドルナインターナショナル, 筑西市,日本
ISSN: 2186-8476, ISSN: 2186-8468 Print
www.ajsc. leena-luna.co.jp

k = 1 + 3,3 (1,477)

k = 1 + 4,874

k = 5,874 ≈ 5

the length of class (p)

$$p = \frac{R}{k}$$

$$p = \frac{9}{6} = 1{,}5 \approx 2$$

Table 4. Frequency Distribution of Conventional Class (X_2)

No	Interval Class	f_i	x_i	$(x_i)^2$	$f_i\, x_i$	$f_i\, x_i^2$
1	5-6	4	5,5	30,25	22	121
2	7-8	6	7,5	56,25	45	337,5
3	9-10	7	9,5	90,25	66,5	631,75
4	11-12	9	11,5	132,25	103,5	1190,25
5	13-14	4	13,5	182,25	54	729
	Total	**30**	**-**	**-**	**291**	**3001**

a. The average value

$$\bar{X} = \frac{\sum f_1 X_1}{\sum f_1}$$

$$\bar{X} = \frac{291}{30} = 9{,}70$$

b. Standard Deviation

$$S_2{}^2 = \frac{n \sum f_i X_i{}^2 - (\sum f_i X_i)^2}{n\,(n-1)}$$

$$S_2{}^2 = \frac{30\,(3001) - (291)^2}{30\,(30-1)}$$

$$S_2{}^2 = \frac{90030 - 84681}{30(29)}$$

$$S_2{}^2 = \frac{5349}{870}$$

$S_2 = \sqrt{6{,}148} = 2{,}479$

Copyright © 2017

DISCUSSION

From the process of data tabulation and data analysis until the hypothesis testing, it was obtained that the problem solving skills of Physics Education students taught by Problem Based Learning is better than the ability of problem solving Physics Education students taught by Conventional learning. From the results of research obtained, it showed that the value of t_{count} 5.86 > t_{tabel} 1.671. So there is a significant effect between the results of Physics Education learning are taught by using the model of Problem Based Learning and student Physics Education learning outcomes taught by using conventional learning model.

In this case, it can be seen from the results of learning obtained by second semester students of SMA Negeri 3 Badar Academic year 2014/2015 on the subject of dynamic electrical discussion taught by using Problem Based Learning model is better than the results of student learning taught by using conventional learning model . The value obtained for variable x1 (Problem Based Learning) is the highest value 18 and the lowest value 8 with the average value of 13.43 with standard deviation of 2.765 and for variable x2 (conventional) obtained the highest value 14 and the value the lowest value 5 with the average value obtained is 9.7 with standard deviation of 2.479.

From the calculation above, learning using Problem Based Learning model has a better effect in problem solving and improve student Physics Education learning outcomes compared with students' Physics Education learning outcomes using conventional learning model. The successful use of the Problem Based Learning model in learning is also inseparable from other factors. Some factors such as the teachers teaching techniques, students' interest in following the learning, the level of student intelligence, students' attention to the teacher at the time of learning, student motivation, and the condition of students also greatly affect the use of Learning-Based Learning model in learning.

CONCLUSION

Based on the data analysis, it can be drawn conclusion as follows:

1. Student learning outcomes have been improved with Mapping Concept. The value obtained for variable x1 (Mapping Concept) was the highest value 18 and the lowest value 8 with the average value of 13.43 with standard deviation of 2.765 and for variable x2 (conventional) obtained the highest value 14 and the value the lowest value 5 with the average value obtained was 9.7 with standard deviation of 2.479.
2. Data analysis showed that the value of t_{count} 5.86 > t_{tabel} 1.671. The t obtained was higher than that of table one. Student learning process was more creative, active, innovative, and students were increasingly happy to receive learning. There was a positive effect of students' Physics Education learning outcomes with the Concept Map.

Copyright © 2017

Leena and Luna International, Chikusei, Japan.
(株) リナアンドルナインターナショナル, 筑西市,日本
ISSN: 2186-8476, ISSN: 2186-8468 Print
www.ajsc. leena-luna.co.jp

REFERENCES

[1] Arends, R. I. (2008). *Learning to Teach*. New York: McGraw Hill Company.

[2] Arikunto, S. (2010). *The Procedure of Research is a Practical Approach*. Jakarta: Rineka Cipta.

[3] Sardiman. (2011*). Interaction and Motivation to Teach*. Jakarta: Rajawali Pers.

[4] Slameto. (2010). *Learning and the Factors that Influenced.* Jakarta: Rineka Cipta.

[5] Suparno. (2005). *Misconceptions and Changes in the Concept of Physical Education*. Jakarta: PT Gramedia Widiasarana.

[6] Trianto. (2011). *Designing Innovative Progressive Learning Models.* Jakarta: Kencana.

Copyright © 2017