

EXPERIMENTAL METHOD APPLICATION IN TEACHING PHYSICS EDUCATION

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ABSTRACT

Experimental Method in class room makes students get involved in finding the solution of problems. This research focuses on improving students' activeness of Physics through experimental method. It was found that majority of students still have low achievement in Physics lesson. Whilst, the senior high students are demanded to have better Physics achievement so that the students may implement it in daily life, and continue their studies in higher level. With a classroom action research, this research was conducted in Private Christian Senior High School BNKP Gunung Sitoli North Sumatera. There were 40 students of grade X chosen as the subjects of the research. After analyzing the data, students' activeness taught by experimental method was being higher in which in cycle 1 was 56,18%, and in cycle 2 was 57,68%. The significant improvement was found through experimental method. The students were allowed to construct their cognitive structure, and to find out the solution either in personal or in teamwork. The students' activeness who were taught by experimental method was higher in which in cycle 1;= 56,18%, and in cycle 2 = 57,68%. Thus, it could be inferred that students' activeness was quite better. The significant improvement occurred because three kinds of seven activities that had not yet been achieved by the students, namely; oral, motor and emotional activities.

Keywords: *students' activeness, Physics learning, and experimental method*

INTRODUCTION

In Indonesia, Physics is one of essential science subjects taught in senior and junior high schools which aims to develop Indonesian students Physical education. Yet, Indonesian students nowadays show a very critical stage of Physics lesson achievement; which is very low (average under 5.0). Yet, teachers attempt to increase students' physics achievement through some developments, such as; developing Physics teachers' quality, revising the curriculum, improving the facilities, and so on.

Unfortunately, all those attempts that had undertaken by Physics teachers have not affected students' Physics achievements yet. It can be shown from students' Physics achievement is still lower than they should have. Since this urgency, Physics teacher are demanded to develop Physics teaching learning process in order to create more innovative teaching process, thus, the success of students in learning Physics still relies on the teachers.

In teaching learning process, teachers play a very essential role in affecting students' Physics achievement as the teacher directly communicate and interact with the students as long as the teaching learning process in the classroom is being held. Winataputra et al (2007) stated that

the successful learning can be identified, if the students' behavior change since it is a proof that there is an interaction between students and school environments. Particularly, students' school environment involves any stuff found in the school, such as; classroom, teaching source, facility, and teacher who is known as the manager of teaching learning process. In other words, if Physics teachers are much capable in organizing the learning process, surely, it affects students' activeness in the classroom.

Moreover, students' activeness in this research means the whole students' activity done by the students respectively while teaching learning process is being performed. To encourage students' activeness, innovative Physics teachers are urgently needed as teachers will be as the facilitator who have the capability creating learning process which ask the students to involve the learning process actively.

Karyadi (1993) stated that there are two variables of students' activeness, namely; students' involvement in teaching learning process, and students' seriousness in performing all procedures made by the teachers. This theory showed that Physics teachers are urgently demanded to encourage students to involve in each classroom activity. Teachers' attempts have many purposes, such as; applying the innovative approach, models, and methods of teaching, in which all these attempts are implemented to avoid students' boredom when they are studying. Learning is a complete activity that can foster students' understanding, creativity, activeness, thinking, potency and interests. Then, learning activities involve all activities that encourage students to learn actively physically, socially and psychologically in understanding the concepts. Thus, the communication is expected in the process of active learning in order to achieve the optimal learning interaction.

The result of previous observation conducted by the researcher showed that students were less active in following teaching learning process which includes some facts, such as; taking note against teachers' explanations, asking question, and accomplishing home assignments. All these facts occurred because students' activeness of Physics is still very low. Relating to this matter, there are two essential factors affecting students' activeness, namely; economic situation, parents' education backgrounds. Firstly, most students come from low economy status. Secondly, most students' parents were only graduated from elementary school. Moreover, based on the interview among researcher, student, and teacher who live around the school, there is critical fact found that the students only go to school for getting the certificate, so, the boys will be working in the fields for helping their father, while the girls will be responsible for houseworks as well as their mom duties.

Based on the background above, the researcher intended to improve students' activeness in Physics learning through implementing experimental learning method. In this method, the teachers are allowed to present teaching materials by means of doing an experiment so the students will experience the materials by themselves and they will be able to prove what they will have found as well. Absolutely, the students are expected to directly involve in all activity designed by teachers, thus, the students are being brave to undertake some scientific actions, such as; designing laboratory tools, observing, measuring, analyzing, and writing the final report. All these activities will lead the students to be responsible and discipline in developing their intellectual skills that can be shown in asking question and finding out the answer accordance with their curiosity. Thus, the students' Physics achievement through experimental learning can be investigated through asking the critical question, finding and collecting the data, the analyzing all findings logically.

In short, this research focuses on "The improvement of Students' activeness level in Physics Teaching Learning Process in Private Christian Senior High School BNKP Gunung Sitoli Through Experimental Method".

THEORITICAL FRAMEWORK

The Characteristics of Physic Learning in Indonesia Senior High School

The Physics is part of Natural Sciences is concerned with how to find out the natural phenomena systematically, thus, natural science is not only the ability of collecting the knowledge through facts, concepts or principles, but, it is also a process of discovery . Science education is expected to be a media for students to learn about themselves and the environment. Then, the students are demanded to carry on the further development in applying what they have learnt in daily life. In learning Physic, the learning process emphasizes providing the experiences to develop the students' competencies so that they are able to explore and to understand the natural surroundings scientifically. Science education is directed to find out and experience so that it can help the students to gain a deeper understanding of the natural environment.

Physics is one of the science subject branches that underlies the development of sophisticated technology and the concept of living in harmony with nature. The rapid development of information and communication technology today is actually triggered by Physics research findings, such as; the invention of microelectronics devices which is capable of loading a lot of information through a very tiny size. While, through the concept of living, the students learn Physics which also provides a good lesson for humans to live in harmony in accordance with nature law. Then, the liveable environemnt will be achieved optimally due to two comprehensive understanding toward Physics, such as; the management of natural resources and the environment, and the reduction of the impact of natural disasters.

Based on The Regulation of Minister of Education Number 22 of 2006 concerning Physics considered as important subjct taught as a separating subject with two considerations. Firstly, providing knowledge to students, so, Physics is expected as a media to gain students' thinking skills that are useful for solving problems in daily life. Secondly, preparing the students' ability includes knowledge, understanding and skill required to go through higher education and to develop science and technology.

Furthermore, Abu Hamid (Suryono, 2012) stated the three outline of Physics, namely;

1. Physics learning process concerns with some basic components, such as; concepts, principles, theories, and nature law besides, Physics learning process also focus on generating reactions, and answering all the matters accepted objectively, honestly and rationally.
2. Teaching Physics is an attempt to choose educational and teaching strategies that are appropriate to the material to be conveyed, and efforts to provide conducive conditions Physic teaching learning process, so that students physically and psychologically can perform the exploration process to find concepts, principles , theories, and nature law and to apply them in aily life.
3. The result of Physics learning is the awareness of the students to acquire the concept and network of Physics concepts through exploration and experiments, then, students' awareness can be to solve the problems faced in their daily life.

Based on the explanation above, it can be inferred that the Physics learning is known as the process of developing the ability to understand the concepts, principles and Physics law, that is why teaching Pyhsic are suggested using the appropriate methods, strategies effectively.

In brief, Physics learning in high school is one of science subjects that can be used by the students as media for learning about themselves and the environment. Through studying physics, science processes experience and science products understanding that got by means of direct experience will be very fruitful in shaping students' concepts. This is also in accordance with the level of mental development of high school students who are being in the transition phase from concrete to formal concept. Thus, studying Physics invites the students to formulate the concept inductively based on empirical facts.

Learning Activity

a. The definition of learning activity

The effective learning process is learning that provides learning opportunities for students so they have changes to perform their own activities by themselves. Essentially, learning activity is the significant principles in teaching learning interaction by using the learning object wholly as it will give a great impact to the knowledge construction process. Totally, if the students have opportunity to construct knowledge process, they will not have difficulties in teaching learning process since they certainly will experience the improvement of learning activeness. According to Sardiman (2012) learning activity is the series of students' activity that have an impact on the learning fruitfulness. Thus, learning activity can be assumed as the basic element that aims to achieve students' achievement

b. Kinds of learning activity

According to Paul Dierich (in Oemar, 2013) there are eight kinds of learning activity, namely; 1) visual activities. These activities include reading, identifying picture, observing the experiment, demonstration, exhibition, observing others' activities, and playing. 2) oral activities. It is kind of activity that allows students expressing a fact then they should relate the fact found with an event, besides, it also includes asking question, giving suggestion, expressing the opinion, interview, discussion and interruption. 3) listening activities. These activities include presenting the materials, listening to the conversation, listening to the game, and listening to the radio. 4) writing activities. This includes writing the story, writing the report, reviewing the composition, composing the conclusion, accomplishing the assignment, completing the questionnaire. 5) drawing activities. These activities contain some drawing works, such as; drawing, designing a graph, a chart, a diagram, map and pattern. 6) motor activities. It includes performing an experiment, choosing the stuff, doing an exhibition, designing the model, playing the game, dancing and gardening. 7) mental activities. This kind of activity that contain some actions, such as; memorizing, problem solving, analyzing factors, investigating, and deciding. 8) emotional activities. It relates to the students' feeling inside, such as; boredom, nervousness, bravery, and calm.

While, Getrude M. Whipple divides students' activities into four, they are; a) studying with visual aids, b) excursions and trips, c) identifying the problems, and d) appreciating the literature. Based on the kinds of activities above, the point is students need to be encouraged by teacher to be dominantly more active in teaching learning process, while teachers just to be as mentor or facilitator.

c. The benefits of learning activities

Relating to the learning activity, there are eight benefits of performing learning activity very well in the classroom, namely:

- a. The students have opportunity to experience the experiment by themselves
- b. The students are allowed to build up their personality
- c. The students have opportunity to strengthen teamwork among them

- d. The students have share based on their own skill and interest
- e. The students are demande to be dicipline and indepent
- f. Building up relationship between school and soiey, and between parents and teachers.
- g. Critical thinking based-teaching in creating students' understanding
- h. Interactive teaching learning process, (Oemar, 2013)

Moreover, the characteristics of active students are elaborated as following;

- a. Asking question frequently
- b. Accomplishing the assignment very well
- c. Answering the question correctly
- d. Being excited finishing the task
- e. Being brave presenting the materials without teacher's command
- f. Doing something related to teaching materials
- g. All knowledges are being studied, experienced and found by the students
- h. Trying the concepts
- i. Expressing the opinion, suggestion and idea.

Students' Physics achievement

Masdjo (1995) stated that achievement essentially refers to behavior changes experienced by the students that includes three domains; cognitive, affective and psychomotoric. In other words, students' achievement is th result of the interaction occuren as long as teaching learning process is being carrie out. The teachers end up their duty through evaluation, while students finished their learning process through students' achievement (Dimyati and Mudjiono, 2006).

Students' achievement involves skills owned by the students after receiving the learning experiences that can be shown from the evaluation. The evaluation aims to find out the accurate data which measures the students' ability as the realization of learning purposes.

RESEARCH METHOD

The method used in this research is classroom action research (CAR). Classroom action research involved four cycles, namely; a) planning, b) performing, c) observing, and d) analyzing the data, then after analyzing the data, the researcher would focus on the reflection. Through the reflection, the research had possibility to review continuously so the research would be stopped if the researcher were satisfied with the result. In this research, the researcher was asked to perform among analysis, synthesis, and evaluating the result, thus, in case the result had no successfully achieved yet, the researcher was allowed to repeat the research started from first cycle to last cycle. classroom action researh aims to increase the activeness of grade X students in Phyisc teaching learning process through experimental methods which had been conducted in Private Christian Senior High School BNKP Gunung Sitoli

FINDING AND DISCUSSION

Finding

Based on previous observation conducted by the researcher in the last two years, students' Physics achievement with score 65 was less than 80% of students which was still far from the expectation. In addition, as that has been stated previously, the aimed of this research was to raise students' activeness in Physics learning through experiential method. Relating to the

students' activeness, there seven kinds of activity performed by the students as long as teaching learning process is being carried on, namely; visual, oral, listening, writing, motor, mental, and emotional activities.

In cycle 1, the average of activeness aspects of students taught by experimental method was quite higher with the average 90,14 of ideal score 5. Thus, there were 56.18% of students who successfully achieved the score standard. The data found showed that the students were not active in following learning process in which the students were categorized as active student if there were 65% of students or more achieved the standard score.

In order to investigate overall students' activeness, the observation had been conducted in three meetings. In meeting 1, the students' activeness was 62,40. Then, in meeting 2, it was being higher with 70,50. Last, in meeting 3, the students' activeness moved slowly with 72,40. Based on the data found, it could be inferred that students' activeness was being higher, even, there was no significant difference.

In cycle 2, the average of activeness aspects of students taught by experimental method was 91,44 of ideal score 155. Thus, there were 57,88% of students who successfully achieved the score standard. Clearly, it showed that the students were categorized as active student if there were 65% of students or more achieved the standard score. Also, the observation of teachers' activity had been conducted in three meetings. In meeting I, teachers' activity was 76,40%. Then, in meeting 2 it increased with 82,00%. In meeting 3, teachers' activity was higher with 88,40%. It could be inferred that teachers' activity raise slowly, yet, it showed an improvement.

DISCUSSION

Based on finding elaborated above, students' activeness taught by experimental method was being higher in which in cycle 1 was 56,18%, and in cycle 2 was 57,68%. It could be inferred that students' activeness was quite better. The significant improvement occurred because three kinds of seven activities that had not yet been achieved by the students, namely; oral, motor and emotional activities. Firstly, students' oral activities was quite low since most students were not confident expressing their idea, opinion, and suggestion in front of classmates. Secondly, there was a little improvement of students' motor activeness in cycle 1 and cycle 2 in which there were few students who were aware to build up the teamwork outside the classroom. Thirdly, emotional activities were affected by motor activeness in which most students did not involve directly in performing the experiment in the classroom, for instance, the students did not follow the procedures, the students did not work in teamwork, and the students did not answer the question. Even though, students' emotional activity in cycle 1 was higher than cycle 2.

The students' activeness of Physics learning could be improved by implementing experimental method. As Kholifuddin (2011) found that students' Physics achievement was significantly affected by inquiry learning collaborated with experimental and demonstration methods of static fluid materials in senior high school students, yet, learning style did not significantly affect students' Physics achievement.

CONCLUSION

After analyzing the data, conclusions are drawn as the following;

1. Experimental method improved students' activeness in Physics teaching learning process. Moreover, students' achievement in cycle 1 was 8,24 of ideal score 15. There were only 17,50% of students which meant 7 of 40 students who completely the standard of

achievement , then, there were 56,84% of students did not show a significant achievement.

2. The data found could be used as the measurement which showed that students' cognitive aspect was lower than expected. It assumed that students did not understand the materials which taught in early learning process, so the students were not able to accomplish the task completely. Through experimental method, the students were allowed to construct their cognitive structure, and to find out the solution either in personal or in teamwork.

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