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**THE EFFECT OF STUDENTS' RESPONSE IN USING PROBLEM
BASED LEARNING WITH SIMULATION TOWARD STUDENTS'
ACHIEVEMENT (LIGHT CONCEPT)**

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ABSTRACT

Background: In many circumstances, students' alternative conception on light concepts have encountered in previous studies. One of the causes factor is the lack of students' response, and it may allow student to have a low achievement. According to Educational Unit Level Curriculum (KTSP), an active learning such as Problem Based Learning (PBL) can help students meet high achievement. In addition, learning through simulation is also increased students' response.

Aims: Based on rationale of this study, we concern to see the effect of students' response toward students' achievement in learning physics through PBL with simulation.

Methods: There were 27 grades eighth students had been involved as participants. This study had been conducted by posttest only control design, and quantitative analysis had been used to analyze the data. Twenty items of questioner of students' response, and twenty item of posttest of light concept had been applied to gather data.

Results: Our findings revealed that students who have learned by PBL with simulations have shown a great response with score 76.37 %. The students' achievements have exceeded the minimum completeness criteria (KKM) with the score $73.15 > 70$. However, the correlation of students' response towards students' achievement is very low with the correlation value $r = 0.1801$. Moreover, it merely 3.2 % of students' achievement is influenced by learning through PBL with simulations.

Conclusion: In short, leaning through PBL with simulation allows students to have a great response, but they aren't giving a significant effect to the students achievement, and it should be another factor that we missed.

Keywords: Student' response, Problem Based Learning, Simulations, Student's Achievements

INTRODUCTION

Science learning process is emphasized on giving direct experience, and let the learners to explore and to understand their surrounding environment via scientific ways [1]. According to Liliyasi [2], science is a group of discipline which is consisted of physics, biology, geology, or astronomy that attempt to describe a natural phenomenon. In learning science such as physics, students often have various alternative conceptions toward the formal learning environment [3]. The students' alternative conception may come from various sources such as textbooks [4], using phrases in daily life [5], or even teacher explanations [6]. In physics terms, light is the most scientific concept which has various students' alternative conception upon it. Several previous studies revealed that

students have many problems with source of light, definition of light, speed of light, reflection, refraction, and even images on mirror [5,7,8].

In order to fix the students' alternative conception had appeared in light concept, the active learning approach should be implemented. Based on Trianto [9], learning included in Educational Unit Level Curriculum (KTSP) should be more applicable in daily life. The level of learning should be improved from memorizing and understanding to be analysis, application in skill of problem solving. One of learning model is commonly used in learning physics is Problem Based Learning (PBL). It is an innovative learning that will give active learning situation to the students [10]. In term of implementation, PBL is often integrated with media such as simulation [11-13]. Other than that, the students' responses are also can allow students to fix their misconception as well as improve their achievements [14]. As concerning of various matters at the above, we attempt to integrate the simulation in problem based learning approach to investigate the effect of students' response against students' achievements on learning physics of light concept. All issues related to the problem based learning, simulation, and students' response will be described on the next topic.

LITERATURE REVIEW

Problem based learning in affecting students' achievement

Problem-based learning (PBL) is a student-centered, independent, self-directed learning style which is guided by a facilitator [15]. In PBL, student learning process is emphasized to problem directed than teacher-directed [16]. Naturally, PBL is described as a learning approach which contain of the carefully selected problem that emphasize the learners to have self-directed learning strategies, ability to solve the problem, participation skills, and critical thinking knowledge instead of teachers' instruction [17]. In fact, PBL was developed originally for adults, in order to train doctors in how to approach and solve medical problems [18]. Although PBL is effective learning and enhances retention in medical education, many studies had proved that PBL could also ameliorate the students' achievement in science education, especially in physics [19].

In certain cases, learning through PBL can enhance students' achievements, positive attitude, and even students' motivation [20]. A study conducted by Mandeville and Stoner [21] towards undergraduate students had proven the students who have learning activity by PBL showed students' achievement greater than their colleagues who learned via traditional lecture. PBL is recommended to be adopted as a learning strategy to promote meaningful learning in the classroom [22]. Moreover, PBL allow student to see a physics problem directly, working as a scientist, and obtain knowledge by themselves in order to solve their misconception. By the completion of their misconception, it may lead students improve their achievement [23].

In several condition, a realistic situation is needed to develop PBL strategies had been clearly stated by several literatures [24], it emphasize the essential problem of the context [25]. In PBL, the contextualization is the key composition to be successful in learning [26]. Hence, it is merely the simulation as impeccable media to present a real problem in PBL.

PBL with simulation

The principles of collaborative and constructivism learning may allow the best collaboration of PBL with simulation based [11]. These matter happens because the adaptability of high-fidelity simulations to a various learning strategy, and its essential elements [27]. A number of previous

studies found that the integration of PBL with simulation increase self-efficacy and enhance students' performance [28].

METHODS

According to research objective on this study, quasi experimental design and quantitative analysis will be implemented in interpreting the results. There are two variables were contained of dependent variables (students' achievement) and independent variables (Students' response). Furthermore, participants, research instruments, and how the participants are threatened in data collection will explained as follows.

Participants (population and sample)

The entire students of secondary school at (SMP N 22) eighth grades is the population of participants. As many as 27 students at grades eighth (VIII-C) were chosen as a sample of these study. *Simple Random Sampling* methods had been used to determine the sample, it means the VIII-C students have similar capabilities (homogeny).

Research Instruments and Data Collection

The students' name, age, and grade was collected from school's data base. Participants had been taught about the light concept using PBL with simulation in three meetings. Twenty item of students' responses questionnaire have been applied to participants in the last meetings. Questionnaire items contain of six response element which are (1) tendency to accept or reject, (2) feeling (prejudice or suspicious), (3) alternative conception, (4) ideas, (5) fear (threats), and (6) belief in a specific case [29], and five scales of Likert's scale had used. Furthermore, twenty item test of multiple choices questions had also been developed based on physics concept of "Light" in order to evaluate the students' understanding after treatment. Data which is collected by both research instruments have been analyzed by linear regression.

RESULTS AND DISCUSSION

Problem Based Learning (PBL) and simulation which were implemented to eighth graders have shown positive effect. Based on findings, 0.7637 or 76.37 % of students had a high response in learning through PBL with simulation. It means most of students having a good attention, relevance, confidence, and satisfaction against PBL with simulation. It was consistent with a study which conducted by Oliver and Omari [30], the using of online technologies such as simulation in sustaining PBL can enhance students' responses to transform the learning environment.

The positive response of students allow them to improve their learning achievement. The posttest results revealed that 70.37 % students have passed the minimum completeness criteria (KKM) with the average score $70 \leq N \leq 100$. It means about 19 of 27 students reach their learning achievement above average, and 29.63 % or 8 students did not passed their learning goals. The percentage of students who have a high response is not much different with percentage of students who have passed the minimum learning standard. It proved that learning by PBL allow students to have a great response and motivation, and even has significant effect to physics learning achievement [10]. The studies that had been conducted by Agbayewa [31] and Iroegbu [32] had proven that students who have learn by PBL performed greater than those taught by traditional methods.

In addition, we found the relation among the students' response and students' achievement in learning using PBL with simulations. Statistically, output showed that the role of students' response in affecting students' achievement in learning physics is relatively low. The value of coefficient of

correlation $r = 0.1801$ has proven that its correlation is very low, and merely 3.2 % of students' achievements were influenced by PBL with simulation. In detail, a graphic of simple linear regression will be shown as follow.

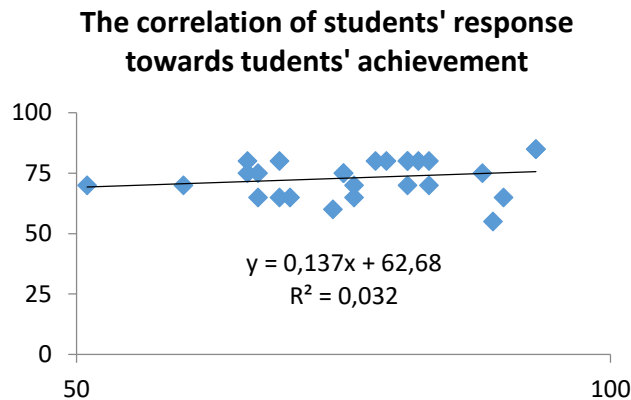


Figure 1. Simple linear regression

There are many factors that may induce the relationship between both variables are low. We have found several students who have high response score weren't directly proportional to his/her learning achievement (e.g., student number sixth, get 93 for response, and only 85 in the learning achievement). These kind of data may cause the correlation of response and learning achievement became very low.

Based on Watson [33], PBL is a learning model which allow students to improve their independence and motivation in science learning, particularly in physics learning. It may allow student to solve the problem which is occurred in daily life with currently knowledge that they had [34]. Other than that, PBL may create an original concept for students to obtain new knowledge and blend it with students' alternative conception to promote learning [35]. Rationally, we believed that PBL is one of the factor which affect the students' learning achievement.

CONCLUSION

According to our results, we sum up that problem based learning (PBL) with simulation are an example of integrating learning approach which can promote students' achievement. There is an effect of students' response when students learn trough PBL with simulation towards learning outcome, but the correlation among variables are really low. Students' response is not only the factor in affecting students' learning achievement, and it can be from PBL with simulation itself.

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