



Optimizing Bilingual Learning to Improve Students' Critical Thinking Skills Through PheT Media

Nyak Umi Anggiani¹, Susanna Susanna², Abdul Hamid³, Musdar⁴

^{1,2,3}Department of Physics Education, Universitas Syiah Kuala, Banda Aceh– Indonesia

⁴Department of Physics Education, Universitas Serambi Mekkah , Banda Aceh– Indonesia

Email: nyak.umi.anggiani.djalil16@gmail.com

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ABSTRACT

Optimizing bilingual learning through PheT media is one of the conscious efforts of teachers to improve students' critical thinking skills. This study aims to optimize bilingual learning using Phet's media on the critical thinking skills of class XI students at SMA Teuku Nyak Arif Fatih Bilingual School. This type of research is quasi-experimental that uses a nonequivalent control group design model. The population in this study was all class XI which amounted to 2 classes. The sample in this study was taken using a total sampling technique, namely the number of samples equal to the total population of 36 students. The data collection technique used is pretest and posttest learning outcomes tests. The data analysis technique used a two-party t-test with the normality test and homogeneity test first as a prerequisite for the analysis. The results obtained based on data analysis using a two-party t-test, namely $-t_{(1-\frac{1}{2}\alpha)} = -1,690 < t_{hitung} = 1,07 \leq t_{(1-\frac{1}{2}\alpha)} = 1,690$. So according to the hypothesis $-t_{(1-\frac{1}{2}\alpha)} < t_{hitung} \leq t_{(1-\frac{1}{2}\alpha)}$ then H_o is accepted and H_a is rejected, it can be concluded that bilingual learning using PheT media is not optimal to improve the critical thinking skills of students at SMA Teuku Nyak Arif Fatih Bilingual School.

Keywords: Critical Thinking Ability, Bilingual Learning, PheT Media, Optimization

INTRODUCTION

Technological developments in the era of globalization have had a very large impact on the world of education, where according to the Education Development Index (EDI) data released by UNESCO in 2021 ago, Indonesia was ranked 54 out of a total of 78 countries included in the ranking of world education levels. From this reference, Indonesia is still inferior compared to other Southeast Asian countries such as Singapore which is ranked 21, Malaysia is ranked 38, and Thailand is ranked 46 (Maulana, et al, 2022; Hasanatul, 2022). This encourages the world of education to be able to keep up with technological

developments by creating an education system that has international standards so that later it is expected to create human resources that can compete with global developments.

The above problems are contained and strengthened by Law No. 20 of 2003 concerning the National Education System article 50 paragraph (3) which states, "The government and regional governments that organize at least one education unit at all levels of education, to be developed into standard education units. international". This has become a benchmark for the Ministry of National Education (Depdiknas) to issue a bilingual program with the target of schools, namely junior and senior high schools in all districts in Indonesia in the hope that they can face the environment that is always undergoing increasingly rapid changes. The Ministry of National Education program requires target schools to implement learning programs using a bilingual system, both in learning resources and learning media (Khunaifi and Matlani, 2019).

Based on initial observations made at SMA Teuku Nyak Arif Fatih Bilingual School on April 14, 2021, with sources of information obtained from teachers and students, it is known that this school has implemented a bilingual learning system. According to Sugianto (2014), "a bilingual class is a class where learning is carried out and delivered in a foreign language which will have an impact on increasing the competitiveness of students". The results of initial observations found that bilingual learning was effective in motivating students in the learning process, which could be seen from the enthusiasm of students when listening to the teacher's explanation explaining the subject matter in English. Bilingual learning turns out to have several weaknesses, especially in physics, one of which is that it is difficult for students to understand the subject matter presented by the teacher because it is constrained by language, this affects the way students think about what they have to re-translate the learning material into Indonesian. This problem is supported by research researched by Razi and Rahmat (2020) regarding the obstacles to bilingual learning. The results show that students who come from different educational backgrounds, make students less understanding of the material explained in English. In addition, the difficulties experienced by teachers in learning physics in bilingual classes are that teachers find it difficult to find the right learning media to be implemented in bilingual learning so the bilingual learning process is not optimal to encourage students to understand the subject matter that has an impact on students' critical thinking skills. This is supported by research by Jannah, et al (2018), "The problem faced in implementing this bilingual program in physics lessons, in particular, is the less than optimal use of media and technology which makes learning less varied so that it does not affect activities, interests, and motivation much. student learning which of course will affect their learning achievement. The use of appropriate learning media will affect the learning process and is expected to have an impact on increasing students' critical thinking skills so it is also expected to help optimize the learning process designed for bilingual classes.

The virtual lab media, namely PheT, is a learning media designed to help the bilingual learning process because the ease of operation of the PheT media is very helpful for optimizing learning in a bilingual class. Later this is expected to encourage participants to understand the lesson well so that it has an impact on increasing critical thinking skills and

this itself is also following research conducted by Abdurahman (2019), "PheT simulation can make students build critical thinking skills and are also able to describe something that is not visible and attracts students' interest to be more involved in learning activities. PheT simulation needs to be applied to students at the secondary school level because it emphasizes the formation of skills to acquire knowledge and communicate it.

The results of bilingual learning through PheT media on the learning process of students that are designed actively by involving students in discussions related to problems in the learning process can later be an effort to stimulate the critical thinking skills of the students themselves, because according to Anugraheni (2018), "Critical thinking is the ability and tendency of a person to make and make assessments of conclusions based on evidence and state that by thinking critically, a person can regulate, adjust, change, or improve his thoughts, so that he can make decisions to act more appropriate". In addition Anugraheni (2018) also said that, "the use of PheT simulation media will make it easier for students to understand the material or concepts conveyed by educators because in this PheT simulation they can properly visualize material concepts that are initially difficult to understand when learning is presented with lecture, direct learning, and discussion methods. PheT simulations can also provide incentives for students to be more active and develop abilities and can improve students' thinking skills towards the concepts that have been studied because students can interact directly with the media".

It is important to study the optimization of physics learning in a bilingual class using PheT media to obtain clear information about the optimization of physics learning in the bilingual class through Phet's media on the critical thinking skills of students in a bilingual class. Therefore, the researcher intends to research "Optimization of Bilingual Learning to Improve Students' Critical Thinking Ability through PheT Media".

Problem of Research

Based on the background described above, the problem in this study is that students do not understand the physics learning material delivered by the teacher because it is constrained by language so it affects students' critical thinking skills, where this is supported by research researched by Razi and Rahmat. (2020) regarding the obstacles to bilingual learning, it is found that students who come from different educational backgrounds, make students less understanding of the material explained in English. In addition, teachers also find it difficult to find the right learning media to be implemented in the learning process, making learning less than optimal in the bilingual class, this is supported by research by Jannah, et al (2018: 6), "The problems faced in implementing this bilingual program In physics lessons, in particular, the use of media and technology is not maximal, which makes learning less varied so that it does not affect the activities, interests, and motivation of students to learn which will certainly affect their learning achievement.

Research Focus

Based on the background and problems above, this study focuses on finding out the optimization of bilingual learning to improve students' critical thinking skills through PheT

media. This is corroborated by Muzana's research (2018: 41) which states, "The learning outcomes of students taught using PheT media are better than students' learning outcomes taught without using PheT media on the subject of Alternating Flow Circuits at SMA Negeri Abulyatama". Hermansyah (2015: 100) stated, "There is a significant difference between using PheT media and without using PheT media in physics learning so that it has a positive effect on mastery of concepts and students' critical thinking skills". The research shows that there is a positive effect of the learning process using PheT media on the critical thinking skills of students.

METHODOLOGY OF RESEARCH

General Background of Research

This research was conducted at SMA Teuku Nyak Arif Fatih Bilingual School which is located at Jln. Teuku Nyak Arief No.1, Lamnyong, Syiah Kuala District, Banda Aceh City, Aceh. The reason for choosing the location in this study is because this school implements a bilingual learning system. While the implementation of this research will be carried out in the Odd Semester of the 2022/2023 Academic Year from July 13, 2022 to August 13, 2022.

The method used in this research is quantitative. According to Sugiyono (2013: 7), "The quantitative method is a scientific/scientific method because it has fulfilled scientific principles, namely concrete/empirical, objective, measurable, rational, and systematic". This method is called the quantitative method because the research data is in the form of numbers and the analysis uses statistics.

The research design that will be used is quasi-experimental. According to Sugiyono, (2013: 77), "This design uses two groups, namely the experimental group and the control group as a comparison". The design used in this study is a quasi-experimental design that uses a nonequivalent control group design model.

Subject of Research

The population taken in this study were all students of class XI SMA Teuku Nyak Arif Fatih Bilingual School starting from class XI-A which amounted to 18 students and class XI-B which amounted to 18 students, thus the total population of students was 36 students. . The samples selected in this study were students XI-A, totaling 18 students and class XI-B, totaling 18 students. The sample selection for the control class and the experimental class will be carried out after the normality and homogeneity tests have been carried out and the data from the pretest results for both classes are normal and homogeneous.

Instrument and Procedures

Data collection techniques are ways to obtain data relevant to this research. The data was collected in the form of test results data. This data was collected before the learning process in the form of a pretest and after the learning process in the form of a posttest. The research instrument used in this study consisted of several research tools such as lesson plans

with material moments of force, student worksheets, and PheT learning media. In addition, there are also learning outcomes tests which consist of an initial test or pretest and a final test or posttest. In this study, the researcher used 10 questions in the form of an essay. The questions consist of several levels of difficulty, starting from level C3 to the more difficult level, namely C6 it is proposingly used to measure the critical skills of the student while they are working on the test do they understand the question clearly or not.

Data Analysis

Quantitative data were obtained from the test results, namely the results of the pretest and posttest of students from the experimental class and the control class. The posttest value data will be processed using a two-party t-test with both pretest and posttest samples being tested for normality and homogeneity as a prerequisite for analysis. A normality test was conducted to determine whether the sample was normally distributed or not by using the Chi-square test formula (X^2) to determine X^2 using the following formula:

$$X^2 = \sum_{i=1}^k \frac{(O_i - E_i)^2}{E_i}$$

With the following test criteria:

1. If $X_{hitung}^2 < X_{tabel}^2$ with dk = (k-1) it means that the two data are normally distributed.
2. If the price is other than that or $X_{hitung}^2 \geq X_{tabel}^2$ then the two data are not normally distributed.

Test the homogeneity of the two samples to see the similarity of variance for the two groups using the F test with the formula

$$F_{hitung} = \frac{\text{varian terbesar}}{\text{varian terkecil}}$$

and the homogeneity test criteria used SPSS V20 application with the following criteria:

1. The significance value < 0.05 means that from a population that has an unequal/non-homogeneous variance.
2. The significance value of 0.05 means that the population has the same/homogeneous variance.

This study uses hypothesis testing. Hypothesis testing is used to determine whether this hypothesis is proven true or not and to see the optimization of bilingual learning with PheT media to improve students' critical thinking skills. By using the statistical formula, namely the two-party t-test, namely:

$$t_{hitung} = \frac{\bar{X}_2 - \bar{X}_1}{Sd^2 \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

Hypothesis testing was carried out using two-party t-test, namely the right and left parties with a significant level = 0.05. The test criteria are as follows: If $-t_{(1-\frac{1}{2}\alpha)} < t_{hitung} \leq t_{(1-\frac{1}{2}\alpha)}$ then H_o is accepted and H_a is rejected, it means that the learning outcomes taught by the media PheT are not yet optimal.

RESULTS AND DISCUSSION

The data collected in this study is the result of research at Teuku Nyak Arif Fatih Bilingual High School. The data collected is in the form of pretest scores given before the learning process and final test scores (Posttest) given after the learning process. Data were obtained from two classes, namely class XI-A as an experimental class which in the learning process uses PheT media on the force moment material, and Class XI-B as a control class that does not use PheT media in the learning process with force moment material.

The results of the research analysis using statistical analysis for student learning outcomes in the experimental class and control class after the learning outcomes test was carried out. The normality test data from the experimental class and control class are as follows:

Table 1. The normality test

Sample	N	X_{hitung}^2	X_{tabel}^2	Conclusion
Kelas Eksperimen	18	17,2041	27,587112	Normal
Kelas Kontrol	18	11,1669	27,587112	Normal

Based on the table above, it can be seen that the calculation of the posttest value normality test in the experimental class and control class obtained $X_{hitung}^2 < X_{tabel}^2$ so it can be concluded that the data is normally distributed.

Furthermore, to find out whether the data obtained are homogeneous or not homogeneous, a homogeneity test is carried out

Table 2. Homogeneity test

Sample	N	F_{hitung}	F_{tabel}	Conclusion
Kelas Eksperimen	18	1,57	2,33	Homogen
Kelas Kontrol	18	1,57	2,33	Homogen

By using the F test formula above, the value of $f_{hitung} = 1.57$ is then compared with the value of $f_{tabel} = 2.33$ so that $f_{hitung} < f_{tabel}$ is $f_{hitung} = 1.57 < f_{tabel} = 2.33$ then the posttest value of the two classes is declared homogeneous.

To test the hypothesis in this study using a two-way t-test. With the hypothesis that learning outcomes in bilingual classes taught with PheT media are optimal

Table 3. Hypothesis Test

No	t_{hitung}	t_{tabel}	Hypothesis
1	1,70	1,690	H_a ditolak

Based on the results of hypothesis testing using a two-way t-test, shows that the value of $-t_{(1-\frac{1}{2}\alpha)} = -1,690 < t_{hitung} = 1,07 \leq t_{(1-\frac{1}{2}\alpha)} = 1,690$. Based on the acceptance criteria of the two-way t-test hypothesis, it is known that H_a is rejected. Thus, it can be concluded that learning physics in the bilingual class using PheT media is not optimal for improving the thinking skills of students at SMA Teuku Nyak Arif Fatih Bilingual School.

This study found that bilingual learning using PheT media was not optimal to improve students' critical thinking skills. This can be caused by several things, including students who are less independent during the learning process, and students themselves quickly feel bored in the previous lesson, so students feel tired before the learning process takes place. The above is strengthened by research by Ulfah (2020) with the results that, "The shortcomings of PheT Simulation as a virtual laboratory-based learning media, include the following: 1) The success of virtual laboratory-assisted learning depends on the independence of students to participate in the learning process; 2) Access to carry out virtual laboratory activities depends on the number of computer facilities provided by the school; 3) Students can feel bored if they do not understand the use of virtual laboratories, causing a passive response to experiment. In addition, the lack of interaction between teachers and students also makes the learning process less than optimal. This is also following Daryanto (2013: 5) stating, "To achieve maximum learning objectives, student activity is needed which can be obtained from positive interactions between teachers and students". Agustina, et al (2020) in their research found that the increase in the average value of critical thinking skills using PhET media was not maximized due to several factors, one of which was the lack of experience of students in using PhET media so that time was wasted explaining how to use it. The effectiveness of group work is still low, there are still students who do not work optimally in conducting virtual labs.

Student success in learning can be influenced by internal and external factors. Internal factors come from within oneself in the form of biological factors such as health factors and psychological factors such as intelligence, talent, interests, attention and motivation. While external factors are factors related to the school environment (Aspian, 2018; Astika, et al, 2018; Saraswati et al, 2019). While Maulidina and Bhakti (2020), "these factors are students, teachers, learning objectives, subject matter, learning facilities, interactions between students and materials, interactions between teachers and students, interactions between students and the learning environment".

Thus it can be concluded that the optimization of bilingual learning in an effort to improve students' critical thinking skills is not solely based on the results of using PheT media, but has been an accumulation of several student activities including the activeness of students in class, discipline and does not rule out the possibility assessment of student ethics. The lessons are difficult, and boring. The passivity of students in the learning process is a

problem in learning because the teacher does not know whether the student is silent because he has understood the lesson being taught or not.

CONCLUSIONS

Based on data analysis and discussion of research results on optimizing physics learning in the bilingual class to improve students' critical thinking skills using PheT media on the force moment material at SMA Teuku Nyak Arif Fatih Bilingual School, it can be concluded that in testing the hypothesis by using two t-tests parties accept the hypothesis H_0 and reject H_a . These results identify that physics learning in the bilingual class using PheT media is not optimal to improve student learning outcomes

H_a 's refusal, among others, can be caused by students being less independent during the learning process, and students already feeling bored during the learning process because students already feel tired in the previous learning process.

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