



## Implementation of PBL-based Audiovisual Media to improve Students' Critical Thinking Ability

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**Abstract Implementasi Media Audiovisual berbasis PBL untuk Meningkatkan Kemampuan Berfikir Kritis Siswa:** This implementation research is to find out the audiovisual media based on Problem Based Learning (PBL) in improving students' critical thinking skills. The method used was a quasi-experimental pretest-posttest control group design. The research population was all students of class XI MIPA, one of the senior high schools in Bandar Lampung. The sample was obtained by purposive sampling technique, namely class A as the experimental class (learning using PBL-based audiovisual media) and class B as the control class (learning using conventional media). The application of PBL-based audiovisual media is measured by the difference in the average value of n-Gain which is significant on students' critical thinking skills, both in the experimental class and the control class. The results of the calculation of the difference test obtained that the average n-Gain value of students' critical thinking abilities in the experimental class was greater than in the control class. The resulting effect size calculation can be interpreted as learning with PBL-based audiovisual media has an effect on increasing students' critical thinking skills on redox material, by 81%. The conclusion is that the application of PBL-based audiovisual media has an effect and is effective on increasing students' critical thinking skills.

**Keywords:** PBL-based audiovisual media, critical thinking skills

**Abstrak: Implementasi Media Audiovisual berbasis PBL untuk Meningkatkan Kemampuan Berfikir Kritis Siswa.** Penelitian implementasi ini untuk mengetahui mengetahui media audiovisual berbasis Problem Based Learning (PBL) dalam peningkatan kemampuan berpikir kritis peserta didik. Metode yang digunakan kuasi eksperimen pretest-posttest control group design. Populasi penelitian seluruh siswa kelas XI MIPA, salah satu SMA di Bandar Lampung. Sampel diperoleh dengan teknik purposive sampling, yaitu kelas A sebagai kelas eksperimen (pembelajaran dengan media audiovisual berbasis PBL) dan kelas B sebagai kelas kontrol (pembelajaran dengan media konvensional). Penerapan media audiovisual berbasis PBL diukur melalui perbedaan rata-rata nilai n-Gain yang signifikan terhadap kemampuan berpikir kritis siswa, baik pada kelas eksperimen maupun kelas kontrol. Hasil perhitungan uji perbedaan tersebut diperoleh rata-rata nilai n-Gain kemampuan berfikir kritis siswa pada kelas eksperimen lebih besar daripada di kelas kontrol. Perhitungan effect size yang dihasilkan dapat diinterpretasikan pembelajaran dengan media audiovisual berbasis PBL berpengaruh terhadap peningkatan kemampuan berfikir kritis siswa pada materi redoks, sebesar 81%. Simpulannya bahwa penerapan media audiovisual berbasis PBL berpengaruh dan efektif terhadap peningkatan kemampuan berpikir kritis siswa.

**Kata Kunci:** media audiovisual berbasis PBL, kemampuan berpikir kritis

## ▪ INTRODUCTION

Critical thinking ability is a fundamental ability in 21st century learning. Critical thinking is a skill that includes a person's ability to access, analyze, synthesize information that can be learned, trained and mastered (Redecker, 2011). The 21st century skills known as the 4C include critical thinking and problem solving (think critically and solve problems), *collaboration, communication, and creativity*. Integrating 21st century skills into the learning process effectively becomes very important which aims to train and prepare students to master these skills, especially critical thinking (Sari and Trisnawati, 2019).

In fact, students' critical thinking skills are not yet fully developed, based on the results of interviews with high school chemistry teachers in Bandar Lampung. Online learning during the pandemic is supported by platforms such as Telegram, Whatsapp, and Google Meet. The three platforms were used by the teacher to provide subject matter, discuss, and give assignments. The problem that occurs in online learning is that students tend to only act according to what is instructed by the teacher, and students try to be independent in learning to build their own knowledge. As a result, students are less interested in the material, passive in discussions, and their mastery of concepts and critical thinking skills is low (Kristina, 2020). Thus, it is not in accordance with the character of 21st century learning. One of the materials that require critical thinking skills is redox concept material.

Redox concept material is often found in everyday life, but students are less interested in learning it (Kristina, 2020). To train students' critical thinking skills, they need to focus on problem-solving and apply learning models that require active student participation in the learning process, such as problem-based learning models. (hereinafter referred to as PBL). PBL is a learning method where the main center is students or student-centered learning. In PBL students are guided to solve a problem on their own, and the teacher guides students as facilitators (Amir, 2013). So that learning with the PBL model can be packaged more attractively with the aim of attracting students' attention, audio-visual media will be used (Susilowati, 2018). Using audiovisual media as a tool in the classroom learning process can help motivate students to improve their learning outcomes (Sidi and Mukminan, 2016).

The results of previous research showed that there was an increase in student learning outcomes through the PBL model assisted by audio-visual media on acid-base material which was higher than student learning outcomes through the PBL model assisted by a real laboratory (Hikmi, 2019). Based on the description above, the question in this study is, how is the implementation of PBL-based audiovisual media to improve students' critical thinking skills on redox material. This study aims to describe the implementation of audiovisual-based media (PBL) to improve students' critical thinking skills on redox material.

## ▪ METHOD

This study was conducted at one of Bandar Lampung's high schools. Achievement. The population of this study was all class XI-MIPA students divided into five classes. The sample was taken using a targeted sampling technique. Class A as an experimental class and Class B as a control class.

The method in this study is a quasi-experimental with pretest-posttest control group design (Fraenkel, 2012). The variables used are independent variables; namely the PBL learning model without audio-visual media and PBL learning with audio-visual media. This is because the dependent variable is critical thinking ability and the control variable is a conceptual redox substance. Data analysis includes pretest, posttest, and n-Gain values. The calculation of students' posttest and pretest scores was carried out according to Sudjana (2005). The criteria for the n-Gain value are carried out according to Hake, (2002).

The data analysis carried out includes analysis of validity, reliability of critical thinking ability data analysis, data analysis of student responses to PBL-based audio visual media, hypothesis testing and effect size analysis. Study data were processed using Microsoft Office Excel 2013 and analyzed using SPSS version 23.0 for Windows.

Validation analyzes were performed using SPSS Versi 23.0 software for Windows. The instrument is said to be valid if  $r_{\text{count}} \geq r_{\text{table}}$  with a significant level of 5%. Reliability tests were performed using the Cronbach's Alpha formula and then interpreted using the confidence scores of the Guildford scoring tool; Analysis was performed using SPSS software version 23.0 for Windows. Table 1 shows the reliability criteria:

Table 1. Reliability Criteria (Arikunto, 2013).

| Degree of Reliability     | Criteria  |
|---------------------------|-----------|
| $0,80 < r_{11} \leq 1,00$ | Very high |
| $0,60 < r_{11} \leq 0,80$ | High      |
| $0,40 < r_{11} \leq 0,60$ | Currently |
| $0,20 < r_{11} \leq 0,40$ | Low       |
| $0,00 < r_{11} \leq 0,20$ | Very low  |

▪ **RESULT AND DISCUSSION**

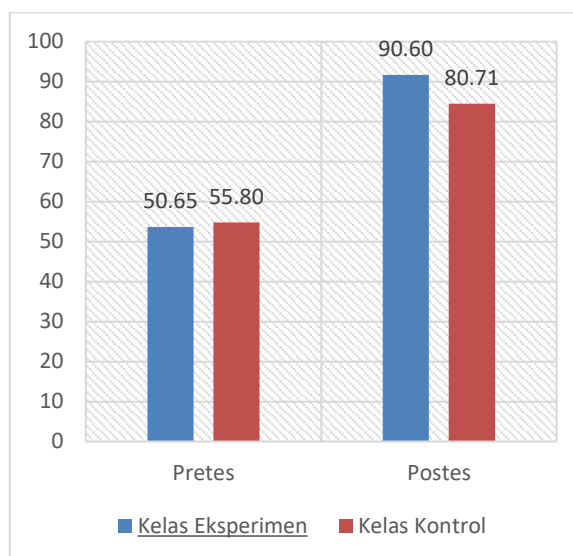
The validity of the pretest posttest questions for students' conceptual mastery was determined by comparing the values of  $r_{count}$  and  $r_{table}$ . shows the validity of the pre-test and post-test for students' mastery of concepts.

**Table 2.** Data on the validity of the items pretest posttest

| Butir Soal | <i>Corrected Item-Total Correlation</i> | $r_{table}$ | Description |
|------------|---|-------------|-------------|
| 1          | 0,451                                   | 0,362       | Valid       |
| 2          | 0,585                                   | 0,362       | Valid       |
| 3          | 0,471                                   | 0,362       | Valid       |
| 4          | 0,852                                   | 0,362       | Valid       |
| 5          | 0,504                                   | 0,362       | Valid       |
| 6          | 0,667                                   | 0,362       | Valid       |
| 7          | 0,894                                   | 0,362       | Valid       |
| 8          | 0,473                                   | 0,362       | Valid       |
| 9          | 0,711                                   | 0,362       | Valid       |
| 10         | 0,441                                   | 0,362       | Valid       |
| 11         | 0,558                                   | 0,362       | Valid       |
| 12         | 0,661                                   | 0,362       | Valid       |
| 13         | 0,672                                   | 0,362       | Valid       |
| 14         | 0,438                                   | 0,362       | Valid       |
| 15         | 0,577                                   | 0,362       | Valid       |

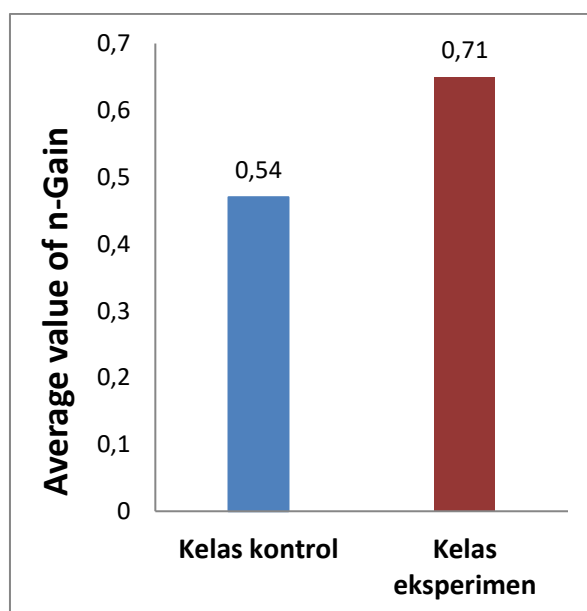
The reliability of the pretest posttest items was determined by comparing the scores  $r_{11}$  and  $r_{table}$ . Reliability is calculated using software for windows SPSS verssion 23 .0 earned value Alpha Cronbach. The test instrument is said to be reliable if  $r_{11} > r_{table}$ . The calculation results obtained the value of Alpha Cronbach sebesar 0,873 whereas  $r_{table}$  of 0.361 so that the test instrument is said to be reliable.

Figure 1 below shows the average scores before and after the critical thinking skill test for students in experimental and controlled classes.



**Figure 1.** Average data acquisition of critical thinking skills

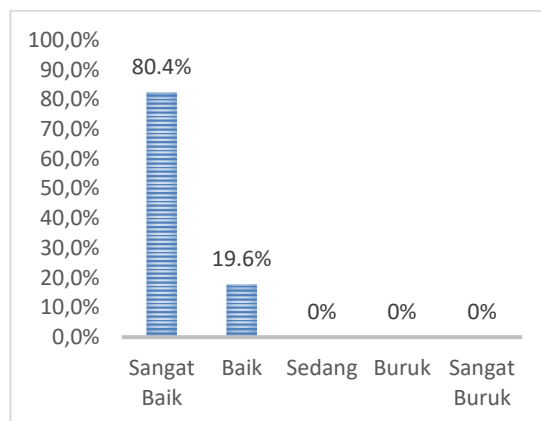
Based on Figure 1, There was no significant difference between the baseline of the experimental and control groups because both classes have the same initial knowledge. Post-test results in the experimental class showed a high average score of 90.60 compared to the control class, which had an average post-test of 80.71. Figure 2 also shows that the average value of students' critical thinking skills increases from the preliminary stage to the next stage, In the experimental group, the average score before and after the test increased by 40.00 points, while in the control group, it increased by 24.91 points. The average nGain resulting from this data analysis is shown in the graph in Figure 2 below:



**Figure 2.** N-gain average gain on critical thinking

Figure 2 shows that the mean value of nGain in the experimental class is the criterion for "high", while the control class is "medium" criteria. Analysis of student

response data aims to measure student responses to the application of PBL-based audio-visual media. Student response questionnaires can be in the form of positive or negative responses to audiovisual media use based on PBL. Figure 3 below shows the percentage of student responses to PBL-based audiovisual media.



**Figure 3.** Percentage of Student Responses to PBL-Based Audio Visual Media

Figure 3 above, shows that 80.4% of students responded with the "very good" criteria, 19.6% of the other students responded with the "good" criteria. This means that students respond very well to the application of PBL-based audio-visual media in learning. The use of audiovisual media is preferred because audiovisual media are more attractive in appearance. Nugroho (2016) stated that audio-visual media can increase students' learning motivation, and learning is not verbalistic.

**Hypothesis testing**

The nGain values of conceptual mastery for the normality tests of the experimental and control classes are shown in Table 3.

**Table 3.** The value of n-Gain results of the normality test

| Research Class | n-Gain | n-Gain     |               |
|----------------|--------|------------|---------------|
|                |        | Value sig. | Test Criteria |
| Experiment     | 0,71   | 0,142      | sig. > 0,05   |
| Control        | 0,54   | 0,180      |               |

In Table 3 above, we can see that the control and experimental groups have sig values > 0.05. sig value. for the and the control class of 0.180 and experimental class of 0,142. This means that the decision to accept H<sub>0</sub> and reject H<sub>1</sub> was that the study data came from a population with a normal distribution. Table 4 presents the results of testing

the homogeneity of the data for conceptual assimilation between the control group and the experimental group.

**Table 4.** The homogeneity test results for nGain

| Research Class | <i>n-Gain</i> | Homogeneity Test  |                    |
|----------------|---------------|-------------------|--------------------|
|                |               | Value <i>sig.</i> | Test Criteria      |
| Exsperiment    | 0,71          | 0,981             | <i>sig.</i> > 0,05 |
| Control        | 0,54          |                   |                    |

The table 4 of the n-Gain value in the control class and experiment class, it is shown that the sig. of 0.981. This means the value of sig. > 0.05 therefore, it is decided to approve  $H_0$  and reject  $H_1$ . This means that the obtained survey data have a uniform variance.

Table 5 shows the difference in results of nGain average values of critical thinking ability.

**Table 5.** Test results for the difference between two mean nGain values

| Research Class | <i>n-Gain</i> | <i>sig.</i> (2-tailed) | Test Criteria                  |
|----------------|---------------|------------------------|--------------------------------|
| Experiment     | 0,71          | 0,000                  | <i>sig.</i> (2-tailed) < 0,005 |
| Control        | 0,54          |                        |                                |

The table 5, it can be seen that the value of sig. <0.05, so the decision to reject  $H_1$  accepts  $H_0$ . That is, significant difference in the average n-Gain value in the control class with the experimental class. This study is consistent with previous studies by Susilowati et al (2018) which stated that the PBL model with audio-visual media was effective to improve students' critical thinking skills. This research is also relevant to the research of Utami et al. (2019) which states that PBL models using audiovisual media effectively improve students' critical thinking skills.

The size of the influence of PBLbased audiovisual media in improvincritical thinking skills of g students was tested through the Effect Size test. The results of calculating the impact test are shown in Table 6.

**Table 6.** Concept ownership impact magnitude test results

| Class            | Nilai   | df | T       | T <sup>2</sup> | Effect Size |
|------------------|---------|----|---------|----------------|-------------|
| <b>Experimen</b> | Pretest | 62 | -20,197 | 407,918        | 0,931       |
|                  | Postes  |    |         |                |             |
| <b>Control</b>   | Pretest | 64 | -18,547 | 343,991        | 0,918       |
|                  | Postes  |    |         |                |             |

Table 6 shows that, the magnitude of the value of  $\mu$ , the effect size in the experimental class has a greater value than the control class. Even though both classes have the same criteria of influence, namely large, the experiment class shows a positive effect, while the control class shows a negative effect. This means that learning using PBL-based audio-visual media on redox material has a greater effect than learning without audio-visual media.

#### ▪ CONCLUSION

The results of data analysis and hypothesis testing, It can be concluded that the use of PBL-based audiovisual media was effective in improving students' critical thinking ability about redox materials. This is proven through the average n-Gain value of the experimental class students who are higher with the "high" criteria compared to the control class with the "medium" criteria. The results of the effect size test state that learning with PBL-based audio-visual media has a greater and positive effect than PBL learning without audio-visual media. So it can be interpreted that the application of PBL-based audio-visual media is effective in improving students' critical thinking skills about redox materials.

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