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# Development of Problem-Based Learning Based Science Teaching Materials Assisted by Audio-Visual Media to Improve Students' Critical Thinking Skills

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## ABSTRACT

This study is the development of problem-based learning-based science teaching materials that are assisted by audio-visual media in an effort to improve students' critical thinking skills in Grade V. The purpose of this study was to analyze the feasibility and effectiveness of problem-based teaching materials based on problem-based learning assisted audio-visual media on organ motion material in animals and humans. The method used in this study is Research and Development (R&D) with model Analyze, Design, Development, Implementation, Evaluation (ADDIE). SDN Kebon Pelok and SDN Kanggraksan Cirebon became the subject of research. There are two Tests, limited scale test with 15 students and large scale test with 30 students. The results of the material expert validation test 74.75 with good enough categories and the media expert test 89.50 including very good categories. Analysis of normality test results 0.103>0.05 means normal data, homogeneity Test 0.585>0.05 means homogeneous data, t test 0.000 < 0.05 means significant changes after the action and N-Gain score of 0.5478 is in the range of values between 0.3 to 0.7, which means in the medium category.

***Keywords:*** *Problem-Based Learning, Audio Visual, Critical Thinking Skills*

## INTRODUCTION

The fact of low science learning outcomes is also supported by the results of PISA in 2018. Where the average score obtained by Indonesia in science subjects is still in the low category, because it is ranked 70th among 78 countries that follow the OECD. The low PISA results in 2018 are due to the lack of stimulation given by teachers to students to think critically since elementary school education (Sariastuti & Mawardi, 2021).

The use of based learning learning model is supported by opinions that support the approach to problem solving. The assumption is based on the preparation of students in future learning activities (Sinha & Kapur, 2021). Efforts to improve student learning motivation, the use of problem-based learning learning model can be combined with the use of audio-visual media (Jannah et al., 2020).

Based on the results of observations carried out on August 18, 2023 from 8 elementary schools in the Harjamukti Sub-District of Cirebon City, it has been found that in the use of IPAS teaching materials, there are 5 schools that have not used problem-based learning teaching materials, there are 4 schools that have not used audio-visual media-assisted teaching materials, and there are 4 schools that have not used teaching materials that can develop students ' critical thinking skills. Then after a test of thinking ability Kitis students who have been tested on students of SDN Kebon Pelok in District

Harjamukti Cirebon city, the results obtained 65% of students have not reached the expected value and 35% of students have enough value in the critical thinking ability of students.

Previous research (Marnita et al., 2020) from the results of the study showed that: 1) the application of Problem Based Instruction Blended Learning-based learning model can improve students ' critical thinking skills, 2) the response of students to the application of problem Based Instruction Blended Learning-based learning model obtained very satisfactory results. The relevance of the study is about the use of problem-based learning models that can improve students ' critical thinking skills.

Other research also shows that there is an increase in learning outcomes in science learning after the use of audio-visual media is applied. The relevance of this research to this research lies in the use of audio-visual media in science learning (Yosef Firman Narut & Zephisius R. E. Ntelok, 2020).

Based on this explanation, there is a need for research on the development of problem-based teaching materials based on problem-based learning assisted by audio-visual media to improve students ' critical thinking skills in Grade 5 students in elementary school.

## LITERATURE REVIEW

### 1. Teaching Materials

According to the National Center for Competency Based Training (in Maskur et al., 2020) teaching materials are any form of material that has been compiled for the purpose of being able to assist teachers in conducting classroom learning. Meanwhile, according to Purnomo & Wilujeng (in Widari et al., 2021) revealed that teaching materials are a collection of data used to assist students in learning.

The Ministry of national education (in Pusparani, 2017) explained that there are three functions of teaching materials for learning, among others: (A) as guidelines for educators in directing all learning activities; (b) as guidelines for students to direct all activities in the learning process; (c) as an evaluation tool to measure the achievement of learning outcomes.

The preparation of teaching materials must follow the principle of developing teaching materials in order to be in accordance with the provisions and rules in the development of teaching materials so that the teaching materials produced are in accordance with the curriculum and student learning needs.

### 2. Problem Based Learning

Erdiansyah (in Ernawati et al. 2022) explains problem based leraning is a student-centered learning model to be able to train students to have problem-solving skills through questions given by teachers by providing the right solution. According to Jannah et al. (2020) Problem based learning is a learning process that makes a problem in learning by asking questions and facilitating students to be able to analyze and find solutions to these problems so that a communicative dialogue is created between students and teachers.

problem based learning learning model is a learning approach that presents a problem to be analyzed and solved critically by involving some skills that are expected to provide conceptual understanding and bring up an interactive dialogue between teachers and students.

### 3. Audio Visual Media

According to Gabriela (2021) audio-visual media is called auditory-visual media or a combination of audio and visual. The use of audio-visual media makes student teaching materials completer and more optimal. In addition, the media can also make it easier for students to learn because the presentation of the material can be replaced by the media so that teachers can switch positions as learning facilitators to accompany students.

The use of audio-visual media has also proven to be very helpful in the learning process. This is reinforced by the results of Tawil & Dahlan's research (2021) students who take audio-visual media-assisted learning are better at creative abilities and appear to enjoy the method. Audio-visual

media aids provide a significant advantage in learning.

### 4. Critical Thinking Skills

Critical thinking skills will give rise to perceptions that are based on understanding all aspects and experiences of a person. Critical thinking skills are expected to become a habit so that what appears to be a natural thing and happen without realizing it (Ennis in Kapelle et al., 2019).

Critical thinking is a process that aims to assist in decision making by going through the process of finding information from various sources that are valid and reliable so that the resulting decision contains elements of clarity, accuracy, relevance, depth, consistency, rationality, suitability, and significance.

## MATERIALS & METHODS

This study uses the method of research and Development (Research and Development). According to Sugiyono (2017) the research and development method or in English Research and Development is a research method used to create a particular product or work, and test the effectiveness of the product or work. The purpose of this study is to develop problem-based learning science teaching materials to improve students ' critical thinking skills. One of the development models that can be used is the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation).

Data and data sources in this study include research data, data sources for analysis of teaching material needs, validation test data sources, and broad-scale trial data sources. The subjects of the study were Class V with a total of 15 students on a limited scale test at SDN Kebon Pelok and 30 students on a large scale test at SDN Kanggraksan.

Quantitative Data obtained from the validation test with four people, namely from lecturers and class teachers in the appropriate field, then the Kolmogorov-Smirnov normality test (Sukestiyarno, in Pusparani, 2017) with hypotheses for data normality, namely:

Ho: the sample data comes from a normally distributed population.

Hi: the sample data comes from a population that is not normally distributed.

The significance of using 5% (α = 0,05), the decision-making criteria are as follows:

If the significance value > 0.05, then Ho is accepted.

If the significance value is < 0.05, then Ho is rejected.

If both class data are normally distributed, then followed by homogeneity testing and effectiveness test with T-test related formula (Sugiyono, 2017).

$$t = \frac{\overline{x_1} - \overline{x_2}}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2} - 2r\left(\frac{s_1}{\sqrt{n_1}}\right)\left(\frac{s_2}{\sqrt{n_2}}\right)}}$$

Description :

$\overline{x_1}$ = Sample average 1

$\overline{x_2}$ = An average of 2

$s_1$ = Standard deviation of sample 1

$s_2$ = Standard deviation of sample 2

$s_1^2$ = Varians sampel 1

$s_2^2$ = Sample variance 2

$r$ = Correlation between two samples

## RESULT

### Expert Validation Results

There are five aspects of the draft teaching materials include (1) content/material, (2) Presentation, (3) language, and (4) compliance with the PBL learning model, (5) measuring critical thinking skills. Expert validation results as follows.

| No | Aspect | Material Expert Score | | | | Average |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | |
| 1 | Fill eligibility | 12 | 14 | 14 | 14 | 13,50 |
| 2 | Eligibility for presentation | 16 | 18 | 18 | 18 | 17,50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3 | Language Qualification | 20 | 24 | 24 | 24 | 23,00 |
| 4 | Conformance with the model of Problem Based Learning (PBL) and the use of Audio-Visual Media | 20 | 24 | 24 | 24 | 23,00 |
| 5. | Measuring students ' critical thinking skills | 12 | 12 | 13 | 13 | 12,50 |
| **Total Score** | | **80** | **92** | **93** | **93** | **89,50** |

Based on these data, it can be seen that the average validation score of teaching materials experts is 89.50 or if converted into a percentage of 89.50% with very good categories. The media test results are as follows.

| No | Aspek | Skor Ahli | | | | Rata-Rata |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | |
| 1 | The Importance Of Measuring The Quality Of Teaching Materials | 8 | 10 | 10 | 10 | 9,5 |
| 2 | Feasibility Kegrafikaan Cover Design Teaching Materials (Cover) | 20 | 23 | 24 | 24 | 22,75 |
| 3 | Language Qualification | 24 | 29 | 29 | 29 | 27,75 |
| **Total Score** | | **52** | **62** | **63** | **63** | **60,00** |

The conclusion of the data is the average validation score of media experts is 60.00 or if converted into a percent value then it is worth 92.31 %. The value is included in the category of very good.

**Eligibility Test Results**

The results of the test of the effectiveness of Problem-based teaching materials based on Problem-Based Learning assisted by Audio-Visual Media is determined by the acquisition of the initial value and the final value. To determine the difference in the acquisition of these values, the difference test is performed. The effectiveness test was carried out with a wide scale test. The results of the first analysis of the normality test pree test as follows.

| Tests of Normality | | | | | | |
|---|---|---|---|---|---|---|
| | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
| | Statistic | df | Sig. | Statistic | df | Sig. |
| Rate_pree Tests | .159 | 30 | .051 | .931 | 30 | .052 |
| Test_post Value | .153 | 30 | .069 | .937 | 30 | .076 |

Based on these data, it is known that the significance value of 0.052. The significance value of the data is greater than 0.05. This means that the data is normally distributed. Next is the post-test normality test, the following results.

| Tests of Normality | | | | | | |
|---|---|---|---|---|---|---|
| | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
| | Statistic | df | Sig. | Statistic | df | Sig. |
| Rate_pree Tests | .153 | 30 | .073 | .942 | 30 | .103 |
| Test_post Value | .174 | 30 | .022 | .932 | 30 | .055 |

The test results concluded that there is a significance value of 0.103. The significance value of the data is greater than 0.05. This means that the data is normally distributed. Once the data is declared normal distribution, then perform a homogeneity test.

| Test of Homogeneity of Variance | | | | | |
|---|---|---|---|---|---|
| | | Levene Statistic | df1 | df2 | Sig. |
| Learning Outcomes | Based on Mean | .301 | 1 | 58 | .585 |
| | Based on Median | .411 | 1 | 58 | .524 |
| | Based on Median and with adjusted df | .411 | 1 | 57.997 | .524 |
| | Based on trimmed mean | .267 | 1 | 58 | .608 |

The conclusion of these data that there is a significance value of 0.585. The value is greater than 0.05. Then the data is homogeneously distributed. Next Is The Independent Samples Test with the following results.

| | | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
| | | | | | Lower | Upper | | | |
| Results | Initial Test-Final Test | -26.667 | 16.259 | 2.969 | -32.738 | -20.595 | -8.983 | 29 | .000 |

Based on these data, it can be seen that the significance value of 0.00. The significance value of the table is greater than 0.05, so Ho is rejected and Ha is accepted, which means there is a significant difference. The result of t count is greater than T table (t count > t Table), which means that there is an influence between the independent variable and the level of confidence. After test N Gain experimental class and control Class, the result as follows.

| Descriptive Statistics | | | | | |
|---|---|---|---|---|---|
| | N | Minimum | Maximum | Mean | Std. Deviation |
| NGain | 30 | .00 | 1.00 | .5478 | .31510 |
| Valid N (listwise) | 30 | | | | |

Based on the table, it can be seen that the value of N-Gain score is 0.5478. The value is in the range of values between 0.3 to 0.7. So it can be concluded that the-Gain in the application of problem-based learning teaching materials assisted by audio-visual media is in the category of medium.

## CONCLUSION

The feasibility of problem-based teaching materials based on problem-based learning assisted by audio-visual media for the fifth grade of elementary school involves 4 teachers from the elements of lecturers and teachers. The results of the validation test material 74.75 which if converted into the form of percent worth 74.75% with a fairly good category. Media expert validation test results 89.50 or if converted into the form of percent worth 89.50% included in the category of very good.

The effectiveness of the application of problem-based learning-based teaching materials assisted by audio-visual media for Grade V of elementary school was carried out on the basar scale class with normality test results of 0.103>0.05 which means normal data, homogeneity test of 0.585>0.05 which means homogeneous data, t test of 0.000 < 0.05 which means significant changes after action and N-Gain score of 0.5478 is in the range of values between 0.3 to 0.7, which means in the medium category.

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## REFERENCES

1. Ernawati, M. D. W., Sudarmin, S., Asrial, A., Muhammad, D., & Haryanto, H. (2022). Creative Thinking Of Chemistry And Chemistry Education Students In Biochemistry Learning Through Problem Based Learing With Scaffolding Strategy. *Jurnal Pendidikan IPA Indonesia*, *11*(2), 282–295. https://doi.org/10.15294/jpii.v11i2.33842
2. Gabriela, N. D. P. (2021). Pengaruh Media Pembelajaran Berbasi Audio Visual Terhadap Peningkatan Hasil Belajar Sekolah Dasar. *Mahaguru: Jurnal Pendidikan Guru Sekolah Dasar*, *2*(1), 104–113. https://doi.org/10.33487/mgr.v2i1.1750
3. Jannah, A. R., Rahmawati, I., & Reffiane, F. (2020). Pengaruh Model Problem Based Learning (Pbl) Berbantuan Media Gambar Terhadap Hasil Belajar Ipa Siswa Kelas V Gugus Iii Kuta Utara Tahun Pelajaran 2017/2018. *Jurnal Pendidikan PGSD*, *8*(3), 342–350.
4. Kapelle, N. R., Jatmiko, B., Munasir, M., & Wenno, I. H. (2019). Development of PhET-Aid-Based Inquiry Learning Devices to Improve Student Critical Thinking Skills. *International Journal of Multicultural and Multireligious Understanding*, *6*(5), 980. https://doi.org/10.18415/ijmmu.v6i5.1149

5. Marnita, Taufiq, M., Iskandar, & Rahmi. (2020). The effect of blended learning problem-based instruction model on students' critical thinking ability in thermodynamic course. *Jurnal Pendidikan IPA Indonesia*, *9*(3), 430–438. https://doi.org/10.15294/jpii.v9i3.23144
6. Maskur, R., Permatasari, D., & Rakhmawati, R. M. (2020). Pengembangan Bahan Ajar Matematika Berbasis Rhythm Reading Vocal pada Materi Konsep Pecahan Kelas VII SMP. *Kreano, Jurnal Matematika Kreatif-Inovatif*, *11*(1), 78–87. https://doi.org/10.15294/kreano.v11i1.23562
7. Pusparani, H. (2017). *Pengembangan Bahan Ajar Menulis Cerita Rakyat Berbahasa Jawa Bermuatan Kearifan Lokal Pesisir Wetan Jawa Pada Kelas IV SD*. Universitas Negeri Semarang.
8. Sariastuti, S. D., & Mawardi, M. (2021). Evaluasi Kemampuan Berpikir Kritis Pada Problem Based Learning Dengan Setting Online. *Auladuna: Jurnal Pendidikan Dasar Islam*, *8*(1), 28. https://doi.org/10.24252/auladuna.v8i1a3.2021
9. Sinha, T., & Kapur, M. (2021). When Problem Solving Followed by Instruction Works: Evidence for Productive Failure. *Review of Educational Research*, *91*(5), 761–798. https://doi.org/10.3102/0034654321101910 5
10. Sugiyono. (2017). *Metode Penelitian Kuantitatif, Kualitatif, R&D* (26th ed.). ALFABETA, cv.
11. Tawil, M., & Dahlan, A. (2021). Application of Interactive Audio-Visual Media to Improve Students' Creative Thinking Skill. *Journal of Physics: Conference Series*, *1752*(1). https://doi.org/10.1088/1742-6596/1752/1/012076
12. Widari, N. L. P. E., Astawan, I. G., & Sumantri, M. (2021). Bahan Ajar Interaktif Bermuatan Pendidikan Karakter pada Materi Sistem Pernapasan pada Manusia dan Hewan. *Mimbar Ilmu*, *26*(3), 364. https://doi.org/10.23887/mi.v26i3.37088
13. Yosef Firman Narut, & Zephisius R. E. Ntelok. (2020). Pembelajaran Ipa Berbantuan Media Audiovisual Dalam Meningkatkan Hasil Belajar Siswa Di Mis Amanah Ruteng. *JIPD (Jurnal Inovasi Pendidikan Dasar)*, *4*(2), 110–114. https://doi.org/10.36928/jipd.v4i2.612

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