



## The Effectiveness of Problem-Based Learning Model Assisted by Augmented Reality Media on The Motivation and Learning Outcomes

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### Abstract

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Pancasila education is a study of the ideology and foundations of the Indonesian state which is taught in elementary schools in Indonesia. Based on interviews and observations conducted with one of the teachers Pancasila Education using the conventional model has an impact on low motivation and student learning outcomes in elementary schools. This research has aimed to determine the effectiveness of the problem-based learning model assisted by augmented reality media on motivation and learning outcomes of Pancasila education. This research used a quasi-experimental research method (Quasi-Experimental Design), while the research design used is Non-Equivalent Control Group Design. Data collection was carried out using questionnaire instruments to determine student motivation and multiple choices tests to determine students' Pancasila Education learning outcomes. The research sample was totaling 20 students as the control grade. Research data analysis used difference tests and data effectiveness tests. Results of the difference test with the independent sample t test with a  $t_{count}$  value of 2.882 for learning motivation and 2.483 for learning outcomes. The results of the effectiveness test used a one sample t test with a  $t_{count}$  value of 4.501 for learning motivation and 4.493 learning outcomes. The research conclusion is the Problem Based Learning (PBL) model assisted by augmented reality (AR) media is effective in terms of motivation and learning outcomes for Pancasila Education.

### Keywords:

augmented reality; learning outcomes; motivation; problem-based learning

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## INTRODUCTION

Education is an effort to support the mental development of students, both physically and cognitively, to direct them toward a better human civilization (Sapitri et al., 2022). Humans need to get education from an early age, called basic education. Basic education is general education which is held for six years in elementary schools (Husein, 2022). Students at the primary education level, especially in the 6–12 year age range, have different developmental characteristics than secondary school students (Khaulani et al., 2020). One of the characteristics of children at this stage is the development of thinking abilities that transitioning from the concrete level to the abstract level. Primary school education is the lowest in Indonesia, which aims to develop attitudes, abilities and basic skills that are essential for everyday life, as well as preparing students to continue to secondary education.



Pancasila education is a study of the ideology and foundations of the Indonesian state which is taught in elementary schools in Indonesia. Pancasila Education purposely to form Indonesian individuals who have the ability to understand, analyze and overcome in a sustainably and consistently the problems faced by society. The main objective of this education is to achieve ideals, national goals and a better Indonesian human civilization (Nadhif & Putri., 2023). Pancasila education comprises four fundamental elements: Pancasila itself, *Bhinneka Tunggal Ika* (Unity in Diversity), the concept of the Unitary State of the Republic of Indonesia, and the 1945 Constitution of the Republic of Indonesia. These four elements are used to cultivate character and skills in the 21st century, along with world developments. Based on the explanations above, learning Pancasila Education is expected to be able to produce Indonesian citizens who can think globally but remain demonstrating behavior that is by local identity and Indonesian nationality.

Pancasila Education learning activities at elementary school based on interviews and observations conducted with one of the teachers are practiced using a conventional learning model. This is considered to be a problem because the one-way learning model is deemed less effective. This kind of learning model makes students less active in participating in Pancasila Education learning. The methods used are lectures and discussions which are less effective when applied in the learning process. Learning Pancasila Education using the conventional model has an impact on low motivation and student learning outcomes in elementary schools (Ramadhan et al., 2023). The models and methods used make students less actively involved in learning activities, so motivation and learning outcomes for Pancasila Education in the class are lacking.

A student's motivation to learn influences his learning outcomes. Learning motivation is related to the overall mental strength within oneself that encourages learning (Maptuhah & Juhji., 2021). As a teacher, learning motivation means that students are encouraged by a teacher with the aim of creating an eagerness and willingness to improve their learning achievements, so that the educational goals expected and set in the school curriculum can be achieved (Fahrudin & Ulfah, 2023). Learning motivation is defined as the encouragement of students' mental strength when carrying out learning activities. Student motivation can be driven by the teacher or come from their own awareness, resulting in a desire to improve their learning achievement.

In the context of implementing learning, it is important for teachers to realize that every student has various potentials that can be developed (Estheriani & Muhid, 2020). These potentials, curiosity and imagination, are require stimulation and development through various learning activities. Learning is a process carried out by individuals to improve their development effectively, so that positive changes occur in behavior, which involves interactions between mental and physical aspects (Efendy, 2021). Changes resulting from the learning process are changes that influence a person's behavior. Learning outcomes refer to students' academic achievements, which basically reflect the level of changes in students' behavior, skills and knowledge that occur during the teaching and learning process within a certain time period (Fajri, 2019). These achievements are then assessed and measured, often expressed in the form of numbers or evaluative statements.

Achievements obtained after students carry out learning activities. Learning outcomes are positive changes in student behavior after receiving stimulation during the learning process. The quality of learning outcomes is measured based on the achievement of learning objectives. As an indicator of teacher success, learning outcomes reflect students' ability to understand learning material. However, in the field, student learning outcomes are often not optimal. Increasing the achievement of student learning outcomes requires the application of quality learning models by educators.

A solution to address the lack of motivation and learning outcomes that researchers propose is the problem-based learning (PBL) model. PBL is an approach that centers on students, emphasizing real-world problems as the focal point of teaching and learning (Iryanto, 2021). PBL requires students to develop critical thinking skills in finding solutions to given problems, so that students gain essential knowledge and skills from the subject matter being studied. Notably, PBL found applicability in Pancasila education, where it enhances student activity and learning outcomes (Hanni, Risfi Aulya, 2023). Rooted in the constructivist paradigm, this student-centered approach promotes active participation and improved results, aligning with contemporary educational practices (Mayasari et al., 2022). In summary, the PBL model emerges as an effective strategy for addressing motivation and learning challenges. By leveraging real-world problems, fosters critical thinking skills and enhances student engagement, making it particularly suitable for subjects like Pancasila education.

The use of problem-based learning models to increase motivation and learning outcomes in class requires learning media as a tool to help convey teaching material. Augmented Reality (AR) media is one of the learning tools that can be utilized by teachers. This contemporary media is also used in this research. AR is a technology that allows users to expand real-world experiences by adding digital elements such as images, video, sound or text via devices such as smartphones or tablets (Kafilahudin & Akbar, 2024).



Figure 1. Augmented Reality Media

The application of Augmented Reality in interactive learning can create more interesting, and effective learning. This process allows students to learn through interactive visual experiences, such as exploring historical locations or conducting experiments in a safe and controlled environment. AR is recognized as advanced technology as a medium for students to interact with the virtual and real world, as well as bringing the potential for improvements in the learning process (Hermawan et al., 2019). AR intend to expand understanding and knowledge of the surrounding environment by inserting digital information related to the real world (Tohir et al., 2024). In addition, AR complements the physical environment with virtual elements, allowing users to interact with both worlds simultaneously, namely the real and virtual worlds.

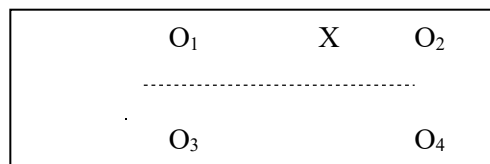
Innovative models such as the PBL model assisted by AR-media are an effort to influence student motivation and learning outcomes for the better. The purpose of this study is to know the effectiveness of the problem-based learning model assisted by augmented reality media reviewed from motivation and learning outcomes for elementary school.

A hypothesis is a provisional answer to a research problem that has been formulated as a question (Sugiyono, 2019: 99). This research has the following research hypotheses:

1. H<sub>01</sub>: The PBL model assisted by AR-media does not effectively enhance the learning motivation of grade 5 students in Pancasila Education ( $\mu_1 \leq \mu_2$ ).  
H<sub>a1</sub>: The PBL model assisted by AR-media effectively enhances the learning motivation of grade 5 students in Pancasila Education ( $\mu_1 > \mu_2$ ).
2. H<sub>02</sub>: The PBL model assisted by AR-media does not effectively improve the learning outcomes of grade 5 students in Pancasila Education ( $\mu_1 \leq \mu_2$ ).  
H<sub>a2</sub>: The PBL model assisted by AR-media effectively improves the learning outcomes of grade 5 students in Pancasila Education ( $\mu_1 > \mu_2$ ).

## METHODS

Quasi-experimental method (Quasi-Experimental Design) was used in this research, specifically using the Nonequivalent Control Group Design. According to Sugiyono (2019:79), type of quasi-experimental design that includes a pretest before treatment and a post-test after treatment is the Nonequivalent Control Group Design. This experimental quantitative research aims to evaluate the effectiveness of Problem Based Learning assisted by Augmented Reality media in terms of learning motivation and outcomes for Pancasila Education among grade 5 students. The experimental design is illustrated in the following table:



**Figure 2.** Experimental Design (Source: Sugiyono (2019:79))

Description:

O<sub>1</sub> = Results before experimental grade treatment (pretest).

O<sub>2</sub> = Results before treatment (pretest) control grade.

X = Treatment in this case uses the PBL model assisted by AR-media.

O<sub>3</sub> = Results after treatment (post-test) experimental grade.

O<sub>4</sub> = Results after treatment (post-test) control grade.

The location for research was at an elementary school in Salatiga City, Central Java. The research was carried out in the 2023/2024 academic year. The research sample used lottery results under details: grade 5/B, totaling 21 students, was used as the experimental grade and grade 5/A, totaling 20 students, was used as the control grade. The material taught in this research is the History of Indonesian Independence

Questionnaires to measure motivation and multiple-choice tests to measure student learning outcomes were used as instruments of the research. The answers to the 40-item questionnaire given by respondents were then scored using a Likert scale which has 5 scores. Multiple choice test material on the History of Indonesian Independence consists of 40 questions. Multiple choice questions are a form of test that has one correct or most appropriate answer (Sudjana, 2014:48). Questionnaires and tests are given before the treatment is carried out (pretest). The treatment given was Pancasila Education learning with material on the Unitary State Elements of the Republic of Indonesia The History of Indonesian Independence in four meetings for 2 hours of lessons each meeting. The post-test is given after completing the Pancasila Education learning activities until the fourth meeting.

The validity test determines whether a research instrument is valid (Sugiyono, 2019:176). This study assessed the validity of the questionnaire and questions through trials conducted with grade VI students. A question item is declared valid if  $r_{\text{count}} \geq r_{\text{table}}$ , while if  $r_{\text{count}} < r_{\text{table}}$ , then the item is declared invalid (Priyatno, 2014:55). The validity test used SPSS version 23 software with the results of 18 questionnaire items and 19 test questions being declared valid. Reliability test, as explained by Sugiyono (2019:121), is used to determine the level of reliability, precision, accuracy and consistency of indicators in the questionnaire. This reliability testing was carried out using the Cronbach Alpha reliability coefficient method with the condition that the Cronbach's alpha value is > (greater than) 0.6, then the instrument in the research is reliable (Sugiyono, 2019:248). Validity test using SPSS version 23 software with 18 questionnaire items and 19 test questions declared reliable.

In this research, data analysis is divided into an initial analysis stage and a final analysis stage. The initial analysis involves prerequisite tests, including normality and homogeneity tests of learning motivation and student learning outcomes in both the experimental and control classes. This step aims to determine whether hypothesis testing can proceed. The normality test is conducted using SPSS version 23 software, focusing on the Shapiro-Wilk column. The decision criteria are: H<sub>0</sub> is accepted if the significance value is > 0.05, and H<sub>0</sub> is rejected if the significance value is < 0.05 (Ghozali, 2018:161). The homogeneity test is also performed with SPSS version 23, using Levene's Test for Equality of Variances column. The criteria for decision-making are: H<sub>0</sub> is accepted if the significance

value is  $> 0.05$ , and  $H_0$  is rejected if the significance value is  $< 0.05$  (Ghozali, 2018:161).

Normality and homogeneity tests as prerequisite tests are used before carrying out the final analysis. This research includes two hypothesis tests: the difference test and the effectiveness test. The final hypothesis testing utilizes parametric statistics (t-test) since the data is normally distributed and homogeneous. Calculations are aided by the SPSS 23 program, with the difference test conducted using the independent sample t-test technique.

## RESULTS & DISCUSSION

The results of the prerequisite test analysis, specifically the normality test for student learning motivation, show a significance value of 0.183 for the experimental class and 0.435 for the control class in the Shapiro-Wilk column. The significance values for both the experimental class ( $0.186 > 0.05$ ) and the control class ( $0.588 > 0.05$ ) are greater than 0.05. This indicates that both sets of student learning motivation data are normally distributed. Similarly, the normality test for student learning outcomes reveals a significance value of 0.106 for the experimental class and 0.286 for the control class. The significance values for the experimental class ( $0.074 > 0.05$ ) and the control class ( $0.276 > 0.05$ ) are also greater than 0.05. Based on the analysis, both groups of learning outcomes data are normally distributed.

The homogeneity test of student learning motivation shows the significance value in the Levene's Test for Equality of Variances column is more than 0.05, namely 0.608 ( $0.608 > 0.05$ ), so it can be seen that the variance of the Pancasila Education learning motivation data for experimental and control class students are homogeneous. The homogeneity test of student learning outcomes shows that the significance value in the Levene's Test for Equality of Variances column is more than 0.05, namely 0.142 ( $0.142 > 0.05$ ), so it can be seen that the variance of Pancasila Education learning outcomes data for experimental and control class students are homogeneous.

**Table 3.** Results of the Effectiveness Test of Pancasila Education Learning Motivation

	<b>Test Value = 41.75</b>			<b>95% Confidence Interval of the Difference</b>	
	<b>t</b>	<b>Sig. (2-tailed)</b>	<b>(2-Mean Difference)</b>	<b>Lower</b>	<b>Upper</b>
Experimental questionnaire posttest	4.501	20 .000	4.298	2.31	6.29

The first hypothesis test assesses the effectiveness of learning motivation in Pancasila Education on the History of Indonesian Independence for grade 5 students, using a one-sample t-test. With a degrees of freedom (df) value of 20 and a 5% error level, the  $t_{table}$  value is 1.725. Referring to Table 3, the  $t_{count}$  value is 4.501, indicating that  $t_{count} > t_{table}$  ( $4.501 > 1.725$ ). Therefore,  $H_0$  is rejected, suggesting that the learning motivation of grade 5 students studying Pancasila Education on the History of Indonesian Independence which received the Problem-

Based Learning (PBL) model assisted by Augmented Reality (AR) media is higher than those using the conventional model. The results of this research are supported by Wahyuningtyas and Kristin, (2021) research that problem-based learning can increase the learning motivation of elementary school students. There is an increase in students' learning motivation from the lowest to the highest.

**Table 4.** Results of the Effectiveness Test of Pancasila Education Learning Outcomes

	<b>Test Value = 80.75</b>					
	<b>t</b>	<b>df</b>	<b>Sig. (2-tailed)</b>	<b>Mean Difference</b>	<b>95% Confidence Interval of the Difference</b>	
					<b>Lower</b>	<b>Upper</b>
Pancasila Education Posttest Score	4.493	20	.000	7.58333	4.0623	11.1044

The second hypothesis test evaluates the effectiveness of student learning outcomes in Pancasila Education on the History of Indonesian Independence for grade 5 using a one-sample t-test. Based on the results of the effectiveness test of learning outcomes, with degrees of freedom (df) equal to 20 and a 5% error level yielding a ttable value of 1.725, the tcount value is 4.493 as per Table 4. Since tcount > ttable (4.493 > 1.725), H0 is rejected. This indicates that the learning outcomes of grade 5 students studying Pancasila Education on the History of Indonesian Independence which received the Problem-Based Learning (PBL) model assisted by Augmented Reality (AR) media are more effective than those using the conventional learning model. The results of this research are supported by Sholikhah's et al. (2023) research that the PBL model based on AR media is effective on student learning outcomes. This is proven by the students' learning results being able to reach the minimum completeness criteria and students getting better learning results compared to those using conventional models.

## CONCLUSION

Based on the hypothesis in this study which tested the effectiveness of the problem-based learning model assisted by AR-media on motivation and learning outcomes for grade 5 students at an elementary school in Salatiga City, it was concluded that: (1) The first hypothesis in this study shows that h0 is rejected. The application of the PBL model assisted by AR-media proves more effective than the conventional model in enhancing learning motivation in Pancasila Education; (2) The second hypothesis shows that h0 is also rejected. the application of the PBL model assisted by AR-media is more effective than the conventional model in improving learning outcomes in Pancasila Education In conclusion, the research establishes that the Problem-Based Learning (PBL) model assisted by Augmented Reality (AR) media effectively enhances motivation and improves learning outcomes in Pancasila Education. Based on the research that has been carried out, the researcher proposes several suggestions for parties related to this research as a reference for other fellow researchers, to be more active in carrying out special research in the field of problem-based learning models and augmented reality media and others.

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