

Influence of The Problem-Based Instruction (PBI) Model Based on Audiovisual Media on Students' Problem-Solving Skills and Cognitive Learning Outcomes

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Abstract: This study aims to describe the results of implementing PBI in Islamic Senior High School on students' learning outcomes and problem-solving abilities. The research adopts a Quasi-Experiment using a nonequivalent control group design. The subjects are tenth-grade students at Al-Aziziyah Islamic Senior High School, West Lombok, with classes XA and XC as the experimental and control groups. Students' problem-solving abilities are measured through assignments while learning outcomes are assessed using a 20-question multiple-choice and essay test. Data on students' problem-solving abilities are analyzed descriptively and categorized as follows: 80 Na 100 (very good), 60 Na 80 (good), 40 Na 60 (fair), 20 Na 40 (poor), and Na 20 (very poor). Students' learning outcomes data are analyzed using descriptive statistics, and a t-test is conducted to determine the difference in students' learning outcomes between the experimental and control groups. The research findings indicate that the audiovisual-based PBI model can enhance students' problem-solving abilities, supported by improving problem-solving abilities from the first to the second meetings in each experimental class. However, the influence of the audiovisual-based PBI model does not significantly impact the improvement of students' learning outcomes. This lack of influence is attributed to researchers' inability to plan, control, and condition the classroom. This results in suboptimal PBI syntax implementation and no significant improvement in students' learning outcomes in the experimental class.

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Introduction

Education is a fundamental element in shaping the potential and skills of individuals to confront the complexity of the continuously evolving world, creating a foundation for developing their cognitive potential and skills (Rieckmann, 2017). In achieving quality education goals, selecting effective learning models becomes crucial (Hizbi et al., 2023). One learning model that has received intense attention in educational literature is Problem-Based Instruction (PBI) (Efendi & Handayani, 2018). PBI is a learning model that emphasizes problem-solving as a core method in the teaching and learning process (Yulidatullah et al., 2018). This model focuses on using real-world situations or problems as the starting point for learning, prompting students to identify, analyze, and seek solutions to these problems. PBI creates an active, collaborative learning environment and emphasizes the development of students' critical thinking and analytical skills (Muah, 2016; Parwata, 2021).

In the current digital and multimedia era, the role of audiovisual media is increasingly important in the educational context (Bambang, 2015). Audiovisual media can provide clear visualization, explain complex concepts, and facilitate better understanding (Purwono, 2014). In the context of PBI, audiovisual media can be a valuable tool for presenting challenging and relevant tasks to students. Using this media, students can be more engaged in problem-solving, understand concepts better, and improve their learning outcomes (Setyani & Darmawan, 2021; Maenah, 2023).

In enhancing the quality of the learning process, learning outcomes, and problem-solving abilities of students, implementing audiovisual-based PBI models is highly feasible at the high school level, especially in Islamic Senior High Schools (Madrasah Aliyah). However, observations indicate that this model has not been implemented in schools, and there is a lack of use of instructional media to assist students in learning. This is suspected to cause the low problem-solving abilities and learning outcomes of students in schools, particularly in Madrasah Aliyah. Information on the implementation of PBI, especially in Madrasah Aliyah, is still scarce. Previous research by Rahmatan (2017) has revealed that PBI can enhance students' attitudes toward environmental care in Madrasah Aliyah. Further research is needed to uncover the impact of PBI on students' learning outcomes and problem-solving abilities. This study aims to describe the results of implementing PBI in Madrasah Aliyah concerning students' learning outcomes and problem-solving skills.

Research Method

This study employs a Quasi Experiment (Hastjarjo, 2019) utilizing the nonequivalent control group design (Bulus, 2021). In its implementation, the experimental and control groups are randomly selected by drawing lots for each class. Both groups undergo pretests to determine the initial conditions, after which they receive the same treatment. The experimental group implements the problem-based instruction learning model, while the control group follows the conventional method. Lastly, both groups are then given post-tests. The research design is presented in Table 1.

Table 1: Nonequivalent Control Group Design

Group	Pretest	Treatment	Post-test
Experiment	X1	Y1	X2
Control	X3	Y2	X4

The population in this study consists of all tenth-grade students of Al-Aziziyah Islamic Senior High School, West Lombok, while the sample comprises two classes selected through Purposive Sampling (Etikan et al., 2016). The chosen classes are XA as the experimental group and XC as the control group.

Students' problem-solving abilities are measured through tests based on problem-solving indicators adopting Tivani & Paidi's (2016) framework. Learning outcomes are assessed using a 20-item test consisting of multiple-choice and essay questions. The data on students' problem-solving abilities are descriptively analyzed and categorized as follows: 80 Na 100 (very good), 60 Na 80 (good), 40 Na 60 (fair), 20 Na 40 (poor), and Na 20 (very poor) (Widiyoko, 2017). Students' learning outcomes data are analyzed using descriptive statistics. Furthermore, to ascertain the difference in students' learning outcomes between the experimental and control groups, a t-test is conducted (Gerald, 2018), assisted by the SPSS program for Windows (Frey, 2017).

Result and Discussion

This study aims to describe the results of implementing the PBI model on students' problem-solving abilities and learning outcomes. The analysis of problem-solving skills is presented in Table 2.

Table 2 Data on Students' Problem Solving Ability

Parameter	Experiment		Control	
	I	II	I	II
Maximum Value	21	27	21	22
Minimum Value	9	15	8	9
Amount	1203,08	1869,21	1205,23	1717,74
Average	44,55	69,23	44,63	63,62
Category	Pretty good	Good	Pretty good	Good

The analysis results of students' problem-solving abilities in Table 2 indicate that the average scores of students' problem-solving skills in the first meeting for the control and experimental classes were 44.63 and 44.55, respectively, categorized as quite good. In the second meeting, students' problem-solving abilities increased in both experimental classes. The average score of students' problem-solving abilities in the second meeting for the experimental class was 69.23, categorized as good, while for the control class was 63.62, categorized as satisfactory. These results demonstrate improved scores and categories of students' problem-solving abilities in both control and experimental classes. These results also show that the average score of students' problem-solving abilities in the experimental class is higher than in the control class.

The findings of this study support previous research indicating that audiovisual-based PBI models can enhance students' problem-solving abilities (Yudhasmara et al., 2018). Problem-Based Instruction (PBI) models utilizing audiovisual approaches significantly influence students' problem-solving abilities. Audiovisual aids in learning add a visual dimension and stimulate auditory experiences, creating dynamic and immersive learning environments. Visualization of complex concepts in audiovisual-based PBI is key to enhancing students' understanding. Research on multimedia learning suggests that visualization can facilitate understanding difficult concepts and increase students' capacity to apply knowledge in problem-solving contexts (Mayer, 2020). Furthermore, audiovisual elements in PBI can create simulations of real-life situations, providing students with direct experiences with problem contexts and enhancing their understanding of the issues they face. Research on multimedia learning also highlights that real-life situation simulations can evoke emotional engagement, motivating students to tackle problems with greater enthusiasm (Clark & Mayer, 2016).

The use of audiovisual media not only enhances information reception but also empowers students in independent learning. By accessing materials independently, students can explore visual resources, deepen their understanding, and actively develop problem-solving skills autonomously (Hattie, 2017). Visualization in audiovisual-based PBI facilitates collaboration and discussions among students. Students can use this media as a foundation for sharing ideas, considering different perspectives, and collectively seeking solutions. This social interaction is key to honing problem-solving skills through discussion and idea exchange (Gysbers & Johnston, 2019). Lastly, audiovisual-based PBI models provide flexibility and accessibility in learning. Students can access materials anytime and anywhere, creating opportunities for repetitive learning. This flexibility supports the development of

problem-solving skills through exploration and deeper understanding (Cook et al., 2018). A t-test was conducted to determine the difference in students' learning outcomes between the experimental and control classes. Before the t-test, homogeneity and normality prerequisite analyses were performed, which are displayed in Table 3.

Table 3. Analysis of normality and homogeneity of students' learning outcomes.

	Group	Kolmogorov-Smirnov ^a			Homogeneity of Variance			
		Statistic	df	Sig.	Levene Statistic	df1	df2	Sig.
Learning outcomes	Experiment	.149	27	.130	2.230	1	52	.141
	Control	.134	27	.200*				

The normality test in Table 3 indicates that the Sig. Value > 0.05 (0.130 and 0.200), hence the students' learning outcomes data are normally distributed. The homogeneity test results also show that the Sig. Value > 0.05 (1.141) indicates that the data have homogeneous variances. After conducting the prerequisite tests, a t-test analysis was performed, the results of which are displayed in Table 4.

Table 4. Results of the t-test analysis of students' learning outcomes.

		t-test for Equality of Means				
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Learning outcomes	Equal variances assumed	.207	52	.837	.74074	3.57984
	Equal variances not assumed	.207	51.145	.837	.74074	3.57984

The t-test analysis results indicate no difference in students' learning outcomes between the control and experimental groups (Sig. > 0.05, 0.837). This suggests that the audiovisual Problem-Based Instruction (PBI) model does not significantly affect students' learning outcomes. These findings contradict previous research that found an impact of the PBI model on students' learning outcomes [1]. The lack of influence of the audiovisual PBI model on students' learning outcomes is attributed to several factors, including (a) researchers' inability to develop more mature lesson plans, (b) inadequate control of classroom conditions, and (c) insufficient time to implement audio-visual-based problem-based instruction effectively. Consequently, the implementation of audio-visual-based PBI becomes suboptimal, leading to poor execution of instructional syntax, limited student understanding of the material, and unimproved student learning outcomes. This research also indicates the need for adjustments to the audiovisual model to align with the characteristics and needs of students, especially in Madrasah Aliyah.

Conclusion

The research results show that the audio-visual-based PBI model can enhance students' problem-solving abilities. This is supported by improving students' problem-solving skills from the first to the second meetings in each experimental class. On the other hand, the impact of the audio-visual-based PBI model on improving students' learning outcomes is not significant. The lack of influence of the audio-visual-based PBI is due to researchers' inability to plan, control, and condition classrooms effectively, resulting in the absence of significant improvement in students' learning outcomes in the experimental classes.

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