

The Effect of a Values-Based Problem-Based Learning (PBL) Model, drawing on the Novel *Teruslah Bodoh Jangan Pintar*, on Improving Science Literacy and Environmental Awareness Among Year 10 Students at MA Al-Amiriyyah

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ABSTRACT

Students' science literacy levels, as measured by PISA scores, are classified as low. Students' lack of skills, the low application of scientific knowledge in daily life, and the slow decision-making process are caused by low science literacy and a lack of environmental awareness. One approach to improving science literacy and environmental awareness is the use of a values-based problem-based learning model, as illustrated in the novel *Teruslah Bodoh Jangan Pintar*, to be implemented. This study aims to: 1) Determine the significant effect of using a values-based problem-based learning model, as illustrated in the novel *Teruslah Bodoh Jangan Pintar*, on improving the science literacy of Year 10 students at MA AL-Amiriyyah. 2) To determine the significant effect of using a problem-based learning model supported by values from the novel *Teruslah Bodoh Jangan Pintar* on improving the environmental awareness of Year 10 students at MA AL-Amiriyyah. This study employed a quantitative approach using a quasi-experimental design, specifically a non-equivalent control group design. The study population comprised Year 10 students at MA AL-Amiriyyah, Banyuwangi, with a purposive sampling technique used to select Class X F as the experimental group and Class X H as the control group. Data collection techniques included questionnaires, tests, and documentation. Data analysis employed the Z-test. The results indicate that there is a significant effect of using a values-based problem-based learning model, informed by the novel *Teruslah Bodoh Jangan Pintar*, on improving science literacy and environmental awareness among Year 10 students at MA AL-Amiriyyah. Based on the results of the Mann-Whitney U test, Sig (2-tailed) = 0.000 < 0.05, with a strong category for science literacy, and based on the results of the Z-test, Sig (2-tailed) = 0.001 < 0.05, with a weak category for environmental awareness. Based on the data analysis, it can be concluded that science literacy skills and environmental awareness attitudes improved through the problem-based learning model supported by the values in the novel *Teruslah Bodoh Jangan Pintar*.

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1. INTRODUCTION

In line with human development and the advancement of civilisation, the people of a nation are required to be competent and adaptable in their efforts to become excellent and high-quality human resources. The quality of education is a key determining factor. Therefore, the progress of a nation is directly proportional to the quality of its educational system [1]. Based on this, science literacy is a fundamental skill for every citizen within a nation.

A nation's development will be achieved if it possesses quality science education. Learners who possess the ability to understand scientific facts and the relationships between science, technology and society, as well as being able to apply their skills to problem-solving in real life, are referred to as a scientifically literate society. Mastery of science literacy, which involves thinking and acting scientifically, is crucial for students to recognise and respond to social, environmental, health, economic, and modern technological issues. Therefore, science literacy assessment needs to be conducted to improve the quality of education in Indonesia so that it can compete with other nations [2].

Science literacy in Indonesia shows varying results; this is consistent with research by Agustin et al., which found that students' science literacy achievement in the city of Kendari varied, with a dominant score of 50% in the low range. Research conducted by Rahmadani et al. at SMAN 1 Kuripan indicated a low category, with a dominant score of 66% low and 34% moderate. Research by Nasrun et al. in Biringkanaya Sub-district showed a low category with scores of 51% moderate, 3.1% very high, 9.3% high-category students, 18.03% low-category students, and 17.9% very low-category

students. Research by Mariani and Evi in the city of Pekanbaru indicates that students' science literacy levels in Pekanbaru are very low; this is attributed to learning styles, parental background, and teaching methods [3]

The level of science literacy among students in Indonesia, based on PISA scores and previous research, has been consistently low year on year, making it a crucial issue in Indonesia. Students' lack of skills, the low application of scientific knowledge in daily life, and the slow decision-making process are caused by low science literacy and a lack of environmental awareness [4]

The low level of students' science literacy is caused by several factors, including: 1) Students have a poor understanding of basic scientific concepts but lack the initiative to ask questions when they encounter difficulties; 2) Teaching methods in schools are not interactive enough; 3) Students' ability to interpret tables and graphs remains weak; 4) There is a neglect of the development of reading and writing skills as core competencies that students must master; 5) The role of teachers [5].

In addition to low science literacy, students also exhibit an attitude of environmental concern that still needs to be improved; this is consistent with research by Annisa et al., which showed a percentage of 45.74% in the aspect of environmental balance and change, 46.81% in the aspect of environmental concern, and 42.55% in the aspect of waste management. Research conducted by [6] showed a percentage of 52% in the aspect of the ability to identify environmental issues, 54.1% in knowledge of the environment and environmental conditions, and 46.3% in knowledge of environmental pollution (analysis of causes, impacts, and environmental changes). Research by Suminar et al. indicates a

percentage of 51% regarding curiosity about environmental issues, 44% regarding concern for environmental quality, and 44% regarding efforts to improve environmental quality.

The low level of environmental awareness is attributed to several factors, namely: 1) a lack of knowledge about environmental conservation; 2) a lack of knowledge regarding waste management; 3) a lack of personal awareness of the environment; 4) existing public policies and legal regulations; 5) a culture of discipline and a consumerist lifestyle that has become ingrained in society. Teachers occupy a vital position in the learning process. The selection of appropriate models and methods, the provision of adequate facilities and infrastructure, and the selection of appropriate exercises and questions for the development of science literacy are the responsibilities of teachers. If even one aspect is overlooked in efforts to develop science literacy, the consequences for students' levels of science literacy and their environmental awareness will be severe.

MA AL-Amiriyah Banyuwangi is a school under the auspices of a Salaf-modern Islamic boarding school; the existence of certain unbreakable rules has led to many aspects of formal educational activities being restricted. The prohibition on internet access for students during lessons results in a lack of information regarding social, environmental, health, economic, and modern technological issues, as well as inadequate facilities and infrastructure, as all educational institutions are housed within the same building. This not only hinders learning but also demands more innovative teaching methods from teachers. The selection of learning models and media capable of stimulating students to think critically and solve problems using scientific reasoning throughout the process, whilst remaining within the established regulatory framework, is the appropriate solution [7]

Based on an interview conducted with Ms Dhika, a Year 10 biology teacher at MA AL-AMIRIYAH, on Tuesday, 25 November 2025. The school does not have a

library containing the latest biology books and journals, so students cannot access the most recent publications; a ban on the use of communication technology prevents students from independently seeking information using digital sources; and the use of digital resources is limited to videos shown by the teacher during lessons. This results in a low level of motivation among students to ask questions, argue, and solve problems. From the interviews I conducted, the teacher stated that students are unable to independently carry out activities such as searching for or finding answers to problems through investigation, critical analysis, and logical thinking, as well as integrating their knowledge.

Furthermore, based on the interviews conducted, teachers stated that students' environmental awareness is relatively low. Students are unable to distinguish between right and wrong behaviour when faced with environmental issues. Teachers noted that when students are asked questions whose answers relate to solving environmental problems, they are often hesitant to answer, and their responses frequently indicate that they engage in practices that pollute the environment. Teachers gave examples of how students dispose of rubbish; students replied that they throw it into rivers or burn it, as if these were acceptable practices. Consequently, students were found to have a low level of environmental awareness. This is also influenced by teachers who frequently assign group discussion tasks without guiding the discussion process.

As a relevant solution, the PBL (Problem-Based Learning) model encourages students to contribute to real-life problems, seek information, and find solutions that align with scientific literacy and an environmentally conscious attitude. In PBL (Problem-Based Learning), the focus is on the problem itself, thereby enabling students to solve problems using scientific concepts and principles [8].

The success of the PBL (Problem-Based Learning) model must be accompanied by the selection of appropriate learning

media [9]. However, the limited availability of facilities and infrastructure at MA AL-Amiriyyah Banyuwangi presents a unique challenge for educators in selecting relevant learning media that do not violate regulations. In this regard, the author identified a niche in the search for suitable media for use at MA AL-Amiriyyah Banyuwangi, namely novels; novels serve as recreational reading material for students at MA AL-Amiriyyah. Therefore, the selection of novels as contextual media in the implementation of PBL is an appropriate choice.

Based on the background of the problem outlined above, the researcher was motivated to conduct a study titled 'The Effect of the Novel-Assisted Problem-Based Learning Model as a Contextual Learning Medium on Improving Science Literacy

Among Year 10 Students at MA AL-Amiriyyah Banyuwangi'.

2. RESEARCH METHOD

This study employs a quantitative approach. Quantitative research is research that emphasises the analysis of numerical data using statistical methods. (Sudaryana & Agusiady, 2022) The type of research used in this study is an experiment with a Quasi-Experimental Design. This design includes a control group but cannot fully control external variables that influence the conduct of the experiment [10].

The population in this study consists of all Year 10 students, comprising a sample of 241 students at MA AL-AMIRIYYAH BANYUWANGI, Blokagung, Banyuwangi.

Table 1. Distribution of Year 10 Student Population at MA Al-Amiriyyah

Class	Number of Students
X A	27
X B	23
X C	24
X D	22
X E	25
X F	26
X G	32
X H	26
X I	27
Total	232

Purposive sampling, a technique for selecting samples based on specific criteria, was used in this study. The criteria used in this sampling were based on learning habits

in the classroom, average daily test scores, and the number of students in each class.

The following table shows the average marks of Class X F and X H students in the subject of biodiversity:

Table 2. Research Sample

Class	Number of Students	Average Score
X F	26	85
X H	26	85

In this study, the techniques used for data collection were tests, documentation, and questionnaires. Data collection instruments are tools selected and used by researchers in the process of gathering data. The research instrument used in this study was a science literacy attitude test.

Data analysis is the process of transforming raw data into organised information, presented in quantitative or descriptive form, to provide the insights needed to address the research questions or objectives of a study [11]. The researcher employed quantitative data analysis as the

study was an experimental design; quantitative data analysis utilises a statistical approach. In data analysis techniques using statistics, there are two types of statistics: descriptive and inferential. Descriptive statistics are used to analyse data by describing or depicting the data that has been collected. Inferential statistics, often referred to as inductive statistics or probability statistics, are statistical techniques used to analyse sample data, with the results applied to the population. Inferential statistics are divided into two categories: parametric and non-parametric statistics. In this study, the researcher used parametric statistics to test population parameters through statistics or to test sample parameters [11].

3. RESEARCH FINDINGS AND DISCUSSION

This study was conducted to determine the effect of a problem-based learning (PBL) model incorporating values from the novel *Teruslah Bodoh Jangan Pintar* on improving science literacy and environmental awareness among Year 10 students at MA AL-Amiriyyah. This study involved 52 students from MA AL-Amiriyyah Banyuwangi as research subjects, 26 of whom were in the control group and 26 in the experimental group. The study comprised two independent variables (X) and one dependent variable (Y), namely science literacy (X1), environmental awareness (X2) and the problem-based learning model (Y).

3.1 Data on Students' Science Literacy

The following are the results of the science literacy assessment for Year 10 students at MA Al-Amiriyyah: The maximum score on the learning interest questionnaire is 100. Based on the students' science literacy data in Table 4.5, the experimental class achieved an average score of 67.95 and the control class achieved an average score of 29.83. Analysis and Hypothesis Testing

3.2 Frequency Distribution

An overview of the data results obtained includes the categories and

frequencies of data from each instrument, as detailed below: Based on Table 4.7 above, science literacy among students in the experimental class was classified as 'very good' for 2 students, representing 7.69%; 4 students were in the 'good' category, accounting for 15.38%; 6 students were in the 'adequate' category, accounting for 23.07%; 3 students were in the 'poor' category, accounting for 11.53%; and 11 students were in the 'very poor' category, accounting for 42.30%.

Based on Table 4.8 above, science literacy among students in the control class with the 'very good' category was 0 students, science literacy with the 'good' category was 0 students, science literacy with the 'adequate' category was 0 students, science literacy with the 'poor' category was 0 students, and science literacy with the 'very poor' category was 26 students, representing 100%.

3.3 Descriptive Analysis

The descriptive analysis of the two variables can be seen in the data presentation below:

Science Literacy Results Data

Based on Table 4.11 above, it is evident that the post-test scores of students in the experimental class, as shown in the appendix, have a mean of 67.84; a median of 64.5; a variance of 217.815; a standard deviation of 14.758; a minimum score of 42; a maximum score of 96; and a range of 54. Meanwhile, the post-test scores for the control class had a mean of 28.57; a median of 27; a variance of 19.374; a standard deviation of 4.401; a minimum score of 25; a maximum score of 42; and a range of 17.

3.4 Inferential Analysis

a. Prerequisite Tests

1) Normality Test

The normality test in this study used the Kolmogorov-Smirnov test using SPSS Statistics ver 26. The data is said to be normally distributed if the significance is > 0.05 ; if ≤ 0.05 , the data distribution is not normal

[12]. Practical Steps in Statistical Analysis with SPSS for Windows [12].

2) Homogeneity Test

The homogeneity test in this study used the Levene test with the aid of SPSS Statistics ver 26. The decision rule for the Levene test is that if the significance value (Sig.) is > 0.05 , the population variances are equal (homogeneous), and if the significance value (Sig.) is < 0.05 , the population variances are unequal (non-homogeneous). Based on the results of this test, it can be concluded that the science literacy study is not homogeneous

b. Hypothesis Testing

Results of the Hypothesis Test on the Effect of Problem-Based Learning (PBL) Model Assisted by Values in the Novel *Teruslah Bodoh Jangan Pintar* on Students' Science Literacy: Based on the results of the hypothesis test above, the significance value for students' learning interest is $< \alpha$ (0.05), namely 0.000. Thus, it can be concluded that H_0 is rejected and H_a is accepted, meaning there is a significant difference in the science literacy of students taught using the Problem-Based Learning (PBL) model supported by values from the novel *Teruslah Bodoh Jangan Pintar* in Class X at MA AL-AMIRIYYAH.

3.5 Discussion

1. Description of the influence of the Problem-Based Learning model supported by values from the novel *Teruslah Bodoh Jangan Pintar* on the improvement of literacy among Class X students at MA AL-Amiriyya

It can be seen that there is a significant gap between the results of the descriptive analysis in the diagram above. The mean score for the experimental class was 67.84 and

for the control class 28.57; the median for the experimental class was 64.5 and for the control class 27; the minimum score for the experimental class was 42 and for the control class 25; the maximum score for the experimental class was 96 and for the control class 42; and the range for the experimental class was 54 and for the control class 17.

The research data indicates an improvement in science literacy in the experimental class compared to the control class. This suggests that in PBL-based learning, students frequently utilise their foundational knowledge to identify relevant concepts when addressing a problem, thereby acquiring new knowledge from the learning activity [13].

2. The Effect of Using the Problem-Based Learning (PBL) Model, Supported by Values from the Novel *Teruslah Bodoh Jangan Pintar*, on Improving Science Literacy Among Year 10 Students at MA AL-Amiriyyah

Before the intervention, the experimental and control classes had the same initial ability, as evidenced by their average marks in daily tests. Both classes had the same average marks, so it can be concluded that the students' interest and learning outcomes indicated they had the same initial ability.

From the results of the observation, problem-solving, questioning, and expressing opinions were skills possessed by only 1 to 2 students. This was in stark contrast to the average marks from the daily tests previously set by the teacher; the situation in the classroom did not reflect the average marks observed at the outset. This was caused by the use of peer-learning methods, a lack of supervision from the teacher, and students who were unwilling to ask questions when they encountered

difficulties. Therefore, problem-solving is the first step towards developing good scientific literacy in students.

The improvement in problem-solving skills can be seen from the test results given to the experimental class and the control class; the average score for the experimental class was 67.84, whilst the control class had an average score of 28.57. Differences in students' learning interest scores can be seen in Table 4.5. This demonstrates that there were differences before and after the intervention in the experimental and control classes, with these differences indicating the influence of the problem-based learning model supported by values from the novel *Teruslah Bodoh Jangan Pintar*.

Based on the research results and discussion, it is evident that the problem-based learning model is capable of improving students' science literacy. These findings align with research conducted by Nuzula and Sudibyo, who stated that the application of the problem-based learning model can enhance students' science literacy regarding additive substances. The aspect of scientific competence or process showed the highest improvement, falling into the moderate category.¹²⁷ A similar study was also conducted by Alatas and Fauziah, who stated that students' science literacy skills improved with the problem-based learning (PBL) model [14].

Furthermore, research by Evalina et al. showed that the application of the Problem-Based Learning (PBL) model with its complete syntax effectively encourages active student engagement and facilitates meaningful scientific content learning [15].

Based on the above description, the Problem-Based Learning model, supported by the values in the novel *Teruslah Bodoh Jangan Pintar*, can improve students' scientific literacy

4. CONCLUSION

Based on the research results, the Problem-Based Learning (PBL) model supported by the values in the novel *Teruslah Bodoh Jangan Pintar* has a positive influence on improving the literacy of Year 10 students at MA Al-Amiriyyah. This influence is demonstrated by the increased science literacy skills and environmental concern attitudes in the experimental class compared to the control class. The average science literacy score for the experimental class reached 67.84, higher than that of the control class, which scored 28.57, whilst the average environmental awareness score for the experimental class was 74.34 and for the control class 68.88. These results indicate that the application of the PBL model supported by the novel is capable of creating more meaningful learning and supporting improvements in students' literacy.

Based on the research findings, the use of the Problem-Based Learning (PBL) model, supported by the values in the novel *Teruslah Bodoh Jangan Pintar*, had a significant effect on improving the science literacy of Year 10 students at MA Al-Amiriyyah. Before the intervention was implemented, the experimental and control classes had relatively similar initial abilities. However, following the implementation of the PBL model, there was an improvement in problem-solving skills, the ability to ask questions, and the ability to express opinions, all of which contributed to the improvement in students' science literacy. This is evidenced by the difference in average test scores between the experimental class (67.84) and the control class (28.57). Thus, the PBL model supported by values from the novel *Teruslah Bodoh Jangan Pintar* has proven to be effective and influential in improving students' science literacy.

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