



Implementation of Problem-Based Learning based on Islamic Context on Set at Year 7 Students

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Abstract. Mathematics is closely related with daily life, including religious life. Islam explicitly makes mathematics a scientific discipline that is widely used to solve various problems in lives. The aim of this research is to assist students in achieving learning objectives by problem-based learning models based on Islamic context. This research uses quantitative methodology and the type of research was used pre-experimental design with pre-test and post-test group design. All students at Year 7 from one of junior high schools in Banda Aceh, Indonesia as t population. The research data was collected through tests (pre-test and post-test) using instruments in the form of test question sheets containing questions related to Set. The results of the study concluded that student learning outcomes improved after implementing a problem-based learning model based on an Islamic context. The improvement of student learning outcomes from the average value of 17.69 with 0% completeness before the intervention, which subsequently increased to an average value of 75.4 with 92.3% completeness after the intervention. Learning by problem-based learning models based on Islamic context can be a good alternative learning strategy that can be implemented.

Keywords: Islamic Context, Problem Based Learning Model.

1 Introduction

As a special region, Aceh has special autonomy in the areas of religion, custom and education. This is supported by Article 3(2) of Law No. 44/1999 which states that the Aceh region has four privileges: (1) Organization religious life; (2) the organization of customary life; (3) the organization of education; and (4) the role of *ulama* in the establishment of regional policies. Based on these laws and regulations, Aceh's education system can be used as a means of enforcing Islamic law in Aceh.

Mathematics is closely related to Islam, and numerous concepts explained in the Quran involve mathematics. Mathematics helps Muslims practice one of the sciences taught in the Quran [1]. Due to the significance of mathematics, it is hoped that students will comprehend the presented concepts and perform mathematical tasks with precision. Mathematics teaches individuals to perform various calculations. As Allah

SWT says in Surah Al-Isra' verse 12, "We designed the night and the day as two signs of Our greatness. The sign of the night is abolished and the sign of the day is made bright so that you may seek the bounty of your Lord, know the number of years, and the reckoning of time. We have explained everything in detail." [2]. Therefore, integrating mathematics into Islamic contexts can enhance students' comprehension, leading to mastery of the learning outcomes. To ensure objectivity, it is crucial to exclude any subjective evaluations and focus solely on presenting clear and concise information.

Islamic context has real-life relevance. According to Trianto [3], students tend to find meaning in every learning process if they learn through real-world situations, which leads to a more relevant and enjoyable learning experience. Islamic context-integrated mathematics learning aims to develop students' potential in both knowledge and spirituality. Incorporating an Islamic framework into the learning environment is expected to reduce behavioral problems and improve students' character in the classroom. The use of the Islamic context in learning not only enables students to gain mathematical knowledge but also strengthen their godliness and faith in Allah SWT. As a result, it can change students' perspectives that mathematics is not only about numbers and formulas, but also has an Islamic context.

Learning mathematics in an Islamic context is an approach that enables students in the Pesantren (Islamic school) environment to solve problems related to Islamic values in their daily lives. Moreover, it can change the thinking about mathematics that is mutually separated between mathematical science and Islamic contexts [4]. Students will learn more effectively if they integrate mathematical concepts with Islamic context [5]. According to Aji [6], science and mathematics are regarded as Islamic treasures and should be considered for their progress. To achieve the desired learning outcomes for students in schools, it is essential to take an active role in integrating Islamic context into mathematics education.

Set is one of the mathematical ideas found in the Qur'an. Set is presented to students through story problems to help students understand the concept. According to Winarni, Harmini, & Kamsyach [7] story problems are mathematical problems expressed in words or sentences in the form of stories based on reality. Story problems that contain Islamic values can strengthen students' understanding related to mathematics. Mathematical concepts because they have connections and uses in everyday life. For example, in Surah Fatir verse 1 which contains the concept of sets, the translation is: "Praise be to Allah, the Creator of the heavens and the earth, who made angels as [His] messengers, who have wings, which can be two, three, or four" [8]. In the letter there is a group of angels or in mathematics it can be called a set. Therefore, mathematics is closely related to the Islamic context. Another example is in the science of *mawaris*, which is grouping heirs who are entitled to inheritance.

There are many studies on the integration of mathematics with Islam. These studies comprise, among others: (1) Incorporating numerical verses from the Quran with Islamic principles [9]; (2) Advancing the integration of mathematics [10]; and (3) Creating student worksheets featuring Islamic elements in mathematics education [11]. It is noteworthy that these studies encompass a broad range of perspectives. However, a more thorough examination of research on teaching mathematics with Islamic implications and integrating mathematics learning with models still needs attention.

This article presents a concept or example that teachers can adopt to incorporate Islamic values (Islamic context) into mathematics education.

The problem-based learning models in learning activities usually begin with a problem. According to Fogarty [12], the problem-based learning model is a type of instruction where students are given real-world situations that are unclear, open, or unstructured. In Masek and Yamin's research [13], problem-based learning is a teaching method that aids in the development of critical thinking skills of students. The problem-based learning model can be connected to real-life situations, making it particularly useful in helping students understand the Set integrated Islamic context. To improve students' understanding of sets, a problem-based learning model is needed.

According to Arends and Soejipto [14] the problem-based learning model is a learning activity that includes the presentation of actual and significant circumstances that become the basis for student inquiry and investigation. Islamic context is one of the actual circumstances relevant to students' daily lives. Real problems found in everyday life will trigger and motivate students to solve these problems. Thus, the Islamic context and problem-based learning model can help students' to improve their understanding of learning activities and can motivate them to learn.

Problem-based learning models integrated with Islamic context have several advantages. One of these advantages is the ease with which calculations can be taught [15], making learning more interesting [16], being able to understand mathematics with the concept of each verse of the Quran [17], expanding mathematical formulas, giving enthusiasm in the world of numbers and understanding the Al-Qur'an and Hadith more and more, and forming students to have *Akhlakul Karimah*. Hayati [18] conducted a study using two cycles utilizing class action research methodology. The research findings suggest that implementing the problem-based learning model on set, can improve student learning activities and outcomes. The pre-cycle average was 51.31%, while the cycle II average was 77.08 or increased by 25.77%.

Based on an initial evaluation of mathematical learning at a junior high school in Banda Aceh, the teacher provided information indicating that several students were struggling to meet the minimum required standards. This difficulty arises because most students only solve problems in the way the teacher exemplifies. Observations by researchers suggest that students are passive during classroom learning activities. Because students are focused too much on their teachers, it has a negative impact on their academic achievements. This is demonstrated by the daily average scores of students who have not yet achieved the minimum criteria for mastering their learning. This aligns with the viewpoints of Hasanah and Hidayati [19]. The causes of poor academic outcomes in students, particularly those in Islamic boarding schools, stem from inadequate learning facilities both at the school and in the boarding schools, low interest in learning among students who tend to prefer religious classes to general classes, and the learning approach used.

Based on preliminary interviews with a mathematics teacher at the school, it was discovered that teachings focused on Set through Islamic contexts are not yet applied and remain general in delivery. Furthermore, since the school prioritizes Quran memorization, the Islamic context is of utmost relevance to student life. The integration of problem-based learning models into an Islamic context is carried out to attain comprehensive Learning outcomes for students. In doing so, it can cultivate a generation that not only has an understanding of mathematics but also Islamic context

mathematics learning. Using a problem-based learning model based on Islamic context is an alternative approach to creating a learning experience that is relevant to students' lives, with the expectation of improving the completeness of learning outcomes. However, there is still a scarcity of studies on the implementation of problem-based learning models based on Islamic contexts. Therefore, it is necessary to investigate the effectiveness of implementing the problem-based learning model based on Islamic context in order to assess the quality of the learning outcomes achieved through this approach. The research question for this study is: Have the students' learning outcomes improved after the application of the problem-based learning model based on Islamic context for the given topic?

2 Method

This research used a quantitative methodology. The type of research design used was pre-experimental, which utilizes a pre-test and post-test group design. At the onset of learning, O1 was conducted as a pre-test, followed by administering X to provide treatment or intervention, and at the end of learning, O2 was conducted as a post-test [20]. The research population of this study consisted of 13 of Year 7 students from a junior high schools in Banda Aceh. Because the population did not reach 30 participants, the entire population became the sample.

The test is a method of collecting data that is used in research. The test questions contained three descriptive questions which were then analyzed or processed using the validity test. Each test question contains an Islamic context about the division of inheritance (faraidh). After conducting the test, the validity of the test items is assessed using the product moment formula. In the next stage the test results are tested for normality and hypothesis testing. The hypotheses tested are as follows:

$H_0: \pi_0 = \pi_1$ (Students have not achieved the completeness of learning outcomes after implementing problem-based learning models based on Islamic context on set)

$H_1: \pi_0 \geq \pi_1$ (Students achieve learning completeness after implementing problem-based learning models based on Islamic context on set)

3 Results and Discussions

This research was conducted at one of junior high schools in Banda Aceh with a research population of 13 students in Year 7. The aim was to implement the problem-based learning model based on Islamic context to help students achieve minimum criteria of learning outcomes.

3.1 Item validity test

After conducting the test, the item validity test was carried out. The product moment formula is used to calculate the validity test results on three pre-test and post- test questions. The instrument is said to be valid if $r\text{-count} \geq r\text{-table}$ but the instrument is said to be invalid if $r\text{ score} < r\text{ table}$ [21]. Because the table value $r_{XY} > r\text{-table}$ than the pre-test and post-test questions are valid.

3.2 Descriptive statistical analysis

In addition, Table 1 below indicates the outcomes of a descriptive analysis conducted before implementing the problem-based learning model based on the Islamic context, which revealed that not all students achieved the completeness of learning outcomes:

Table 1. Descriptive Statistical Analysis Results of Pre-Test Scores

Statistics	Statistical Score
Sample Size (N)	13.00
Maximum Score	60.00
Minimum Score	5.00
Average Score	17.69
Standard Deviation	14.80
Students who completed	0.00
Students who did not completed	13.00

According to Table 1, the pre-test minimum score is 5, with average score of 17.69 and a standard deviation of 14.80. It is noteworthy that the number of students who completed the test is unavailable. Thus, implementing the problem-based learning model based on Islamic context is expected to achieve the minimum completeness criteria learning outcomes on Set in the Year 7. Integrating the problem-based learning model into the Islamic context prioritizes the development of students' thinking abilities [22-23]. Table 2. illustrating the percentage of complete learning outcomes on the Set before implementing the problem-based learning models based on Islamic context is provided below:

Table 2. Learning Outcomes Before Implementing The Problem-Based Learning Model

Score range	Level of mastery	Frequency	Percentage (%)
$0 < x < 70$	Incompleted	13	100
$70 \leq x \leq 100$	Completed	0	0
Total		13	100

Table 2 presented that 100% were incomplete. Thus, none of the students achieved complete learning outcomes as required. To achieve this, integration of mathematics with Islamic context is recommended. Mathematics is closely related to the spiritual tradition of Muslims, who are familiar with the Holy Qur'an. Additionally, Muslims can use mathematics as a "path" to achievement [24-30]. Therefore mathematics is one of the subjects that can be integrated with Islamic values.

The learning outcomes of Year 7 students using the problem-based learning model based on Islamic context. The results of the descriptive analysis of students' post test scores as presented at Table 3.

Table 3. Descriptive Statistical Analysis Results of Post-Test Scores

No	Statistics	Statistical Score
1	Sample Size	13
2	Maximum Score	98
3	Minimum Score	60
4	Average Score	75.4
5	Standard Deviation	22.02
6	Students who completed	12
7	Students who did not completed	1

Table 3 presented that the lowest score on the post-test was 60, with the average score of 75.4 and a standard deviation of 22.02. There were 12 students who completed the test, while 1 student did not. The results suggest that most students successfully completed the test. Table 4 below displays the learning outcomes achieved through the implementation of a problem-based learning model based on Islamic context.

Table 4. Learning Outcomes Using Problem- Based Learning Model Integrated With Islamic Context

Score range	Level of Mastery	Frequency	Percentage
$0 < x < 70$	Incompleted	1	7.7
$70 \leq x \leq 100$	Completed	12	92.3
Total		13	100

Table 4 presented that 92.3% of students could achieve all the required learning outcomes, while 7.692% could not achieve all the required learning outcomes. Therefore, it can be concluded that most students are able to complete the predetermined learning outcomes of 70, as determined by the school. As presented at Table 4, most students have achieved excellent results in terms of completeness of the learning outcomes [31].

Table 5. Success Rate Criteria

Level Success	Description
>80%	Very high
75-79%	High
70-74%	Medium
65-69%	Low

The results above show that the success rate of students achieves very high criteria. The implementation of problem-based learning models based on Islamic context can help to improve the understanding and achieve the completeness of the students' learning outcomes on the set. This finding is consistent with the conclusions drawn from previous research [32-33], that the integration of Islamic context in mathematics helps students to gain a more holistic understanding of mathematical concepts. The implementation of problem-based learning models in the Islamic context can apply Islamic values to students' lives. Research results [34-35] demonstrate that the application of Islamic values, including honesty, thoroughness and fairness, in learning mathematics positively impacts the development of the critical thinking skills of students. Such an approach ensures that students not only achieve a complete understanding of learning outcomes, but also acquire Islamic values through their learning activities.

3.3 Hypothesis testing

Based on the findings, hypothesis testing using the proportion test and 5% significance level resulted in $Z\text{-table} = 1.64$, which indicates H_0 is accepted if $Z\text{-score} \leq 1.64$. As a result of obtaining $Z\text{-score} = 1.76$, H_0 is rejected, so all students who took the post-test met the minimum completeness criteria which is 70.

From the previous description, it can be observed that the students achieved the minimum criteria of completeness. The utilization of the problem-based learning model based Islamic context leads to the inference that the learners' achievements were superior. Previous studies suggest that problem-based learning models can enhance learning outcomes, foster student autonomy in learning, increase student involvement in the learning process, boost motivation, and improve student perceptions [36-42]. Problem-based learning models that present contextual problems integrated with Islamic context generate learning outcomes that will enable students to comprehend the usefulness and implementation of mathematics in life, so that students become more motivated and engage in meaningful learning.

4 Conclusion

The study results concluded that students' learning outcomes improved after implementing the problem-based learning model based on Islamic context in the learning process. The improvement in student learning outcomes is evident from the average value of 17.69 with 0% completeness before the intervention, which

subsequently improved to an average value of 75.4 with 92.3% completeness after learning with a problem-based learning model based Islamic context.

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