Improving Students' Interest and Achievement in Mathematics Learning Through Problem-Based Learning Model

by R. Rusli

Improving Students' Interest and Achievement in Mathematics Learning Through Problem-Based Learning Model

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ABSTRACT

This is classroom action research that aims to increase students' interest and achievement in learning mathematics by using the problem-based learning model involving 30 students. This study was conducted in two cycles. Data collection was done by delivering the learning interest questionnaire and achievement tests at the end of each cycle. The research results revealed that the students' learning interest and achievement increased from cycle to cycle. At the end of the first cycle, 80% of students reached the minimum fair category of learning interest. This percentage increased to 90% in the second cycle. Meanwhile, 63.33% of the students reached the minimum high level of learning at the end of the first cycle. And, it improved to 80% in the second cycle. At the end of the second cycle, both the research success indicators of learning interest and learning achievement were fulfilled.

Keywords: Learning interest, learning achievement, problem-based learning.

1. INTRODUCTION

Mathematics is an important discipline studied at secondary schools. It is concerned with the investigation of, the relationships between, and the abstraction of patterns and structures often found in the surrounding world [1]. In learning mathematics, school students deal with how to utilize all their knowledge and apply them in solving various mathematical problems [2]. School mathematics covers a pedagogic discourse recontextualizing the syntactic knowledge of mathematics discipline and the substantive knowledge of learning mathematics [3]. For school students, mathematics generally is a challenging subject where they encountered difficulties in the attempts to develop their conceptual mathematical understanding.

The observation of the mathematics learning process in one class at SMAN 2 Pangkep, Sulawesi Selatan, Indonesia, revealed that the students encountered problems in understanding the mathematics teacher's explanation. The students relied on their textbooks as the only media for learning. Such a learning atmosphere was advantageous for high-ability students only. They could be actively engaged in learning activities. However, the low-ability students facing learning difficulties preferred to be just quiet or involved in activities other than learning. The teachers seemed unaware of the situation. They argued that the drawbacks were due to the low learning interest of the students resulting from their perception of mathematics as a difficult subject.

The students needed to be facilitated in learning activities where they could shape their mathematical knowledge, solve problems, and cultivate positive attitudes towards mathematics. It was expected that the students would be persistent to learn mathematics although they found mathematics to be difficult and challenging. Through this action research, it was expected that their learning achievement and learning interest would improve to reach the prescribed standard level.

This research employed the problem-based learning model as a research action in the observed

class. Problem-based learning is learning where students are involved in solving the novel-real world problems [4]. In this authentic learning model of project-based instruction, teachers propose problems and questions, as well as facilitate inquiry and discussions to improve the intellectual development [5].

In problem-based learning model, students are engaged in activity of solving complex, realistic problems facilitated by the teachers, and research has shown that the problem-based learning is effective in fostering comprehensive understanding, ensuring knowledge retention, and improving students' learning achievement [6]. Learning activities that provide students with chances to share their experiences and knowledge and to ask questions could shape their learning interest [7].

Interest and learning have a strong connection, and learning interest changes within specific, supporting learning environment [8]. Interest to learn is crucial for continuous, independent learning and development of skills [9]. Students with learning interest will seek opportunities to learn [10, 11], involve meaningfully in learning activities [12, 13], self-regulate their learning better [14-16], focus on their learning objectives, and be more effortful and persistent to encounter challenges [17,18]. Problem-based learning as an authentic learning model [5, 19] facilitates learning activities that help students develop their interest to learn [20].

2. METHODS

This study was classroom action research. It was an investigation on how the problem-based learning model functioned as an action to facilitate the students to achieve the research objectives, that was employed in a spiral-cyclical procedure of planning, implementing the action, observing, and reflecting [21].

This research was conducted in a class at SMA Negeri 2 Pangkep, Sulawesi Selatan, Indonesia. There were 30 students participating as the research subjects. In the planning phase, the lesson plans and the instruments for gathering the data were developed. Also, the indicators of the research success were formulated, namely, minimum 80% of the students reached the fair level of learning interest, and minimum 80% of the students achieved the high level of learning achievement. The action planned in the lesson plans were then implemented. The research covered two cycles, each of which were

students are involved in solving the novel-real world implemented in three lessons. At the end of each cycle, the questionnaire of learning interest and the achievement test were delivered to the participating students. This was the observation phase of the action research. The data were analysed descriptively and categorized based on the criteria, one developed Arikunto [22] and another developed by the researcher. The data analysis results were used in the reflection against the research indicators to find whether or not the indicators were achieved.

3. RESULTS

The problem-based learning model was implemented as an action in order to improve the students' learning interest and achievement and reach the research indicators. The questionnaire and the test were delivered to the students at the end of each research cycle.

3.1. Cycle 1

3.1.1. The Students' Learning Interest

The data of the students' learning interest obtained from the questionnaires were analysed descriptively. The frequency distribution is presented in the following table.

Table 1 Distribution of the students' learning interest

Scores	Criteria	Frequency	Percentage (%)
81–100	Very good	2	6.67
61–80	Good	8	26.67
41–60	Fair	14	46.67
21–40	Poor	6	20.00
0–20	Very poor	0	0.00

The learning interest of the students in the first cycle, in general, was already fair. Of 30 participating students, 80% reached the minimum category of fair. Only 6 students had not reached the expected category as prescribed in the research success indicator. Based upon these results, the indicator of learning interest was already achieved.

3.1.2. The Students' Learning Achievement

Table 2 Distribution of the students' learning achievement

Scores	Criteria	Frequency	Percentage (%)
85–100	Very high	8	26.67

70–84	High	11	36.67
60–69	Moderate	7	23.33
45–59	Low	2	6.67
0–44	Very low	2	6.67

45–59	Low	2	6.67
0–44	Very low	2	6.67

In terms of learning achievement, the results of the data analysis are displayed in Table 2. There were 8 students reaching the very high level of achievement and 11 students in the high level. These form a total of 63.33% of the students reaching the minimum high level of learning achievement. The rest 36.67% had not reached the prescribed level of learning achievement. With this performance, the research success indicator of learning achievement was yet not reached.

3.2. Cycle 2

3.2.1. The Students' Learning Interest

Table 3 Distribution of the students' learning interest

Scores	Criteria	Frequency	Percentage (%)
81–100	Very good	2	6.67
61–80	Good	8	26.67
41–60	Fair	17	56.67
21–40	Poor	3	10.00
0–20	Very poor	0	0.00

In the second cycle, there was no big change of learning interest of the students which, actually, already satisfied the indicator in the first cycle. Of 30 participating students, 90% finally achieved the minimum category of fair. It was 10% higher than the percentage in the first cycle. Only 3 students had not reached the expected category as prescribed in the research success indicator. The results showed that the indicator of learning interest was already achieved.

3.2.2. The Students' Learning Achievement

Table 4 Distribution of the students' learning achievement

Scores	Criteria	Frequency	Percentage (%)
85–100	Very high	9	30.00
70–84	High	15	50.00
60–69	Moderate	2	6.67

Regarding the learning achievement in the second cycle, the results of the data analysis are displayed in Table 4. Half of the total number of the research subjects were in the high level achievement category. With 9 students in the very high category, they accumulated to 80% of the students reaching the minimum high level of learning achievement. It means that in this cycle, the indicator of learning achievement was reached as well. Finally, at the end of the second cycle, both research indicators were successfully fulfilled.

4. DISCUSSION

The implementation of the problem-based learning model as an action aimed to improve the students' learning achievement and interest in one of the classes of SMA Negeri 2 Pangkep, Sulawesi Selatan, Indonesia has shown promising results. This success is proven by the results of the data analysis and reflection of this action research. The data gathered at the end of the first cycle revealed that the students' learning interest has already reached the predetermined research success indicator. However, the second indicator pertaining to learning achievement has not been achieved. As a part of the action research cycle, some improvements in the implementation of the action were attempted in the second cycle. These included the refinement of the mathematical problems presented to the students in learning activities. The students were also set better to follow carefully the problem solving procedure theorized by Polya [23].

The students' performance shown in the test administered at the end of the second cycle proved that the refinement of the implemented action succeeded. The number of the students reaching the good level of learning achievement improved from 63,33%, in the first cycle, to 80%, in the second cycle. And, this ensured the fulfilment of both indicators of research success.

Prior to the implementation of the problem-based learning, the students experience problems of not being engaged in the learning activities. The employment of this authentic learning model provided them with opportunities to think and self-direct their own learning [24]. The model has set a learning environment that forced the students to be actively involved in learning activities. Problems that were carefully formulated succeeded to attract the

students where they had to critically think, observe, and reflect on which resources to use and how to use them to solve the given problems [25]. The role of the teacher was crucial in terms of facilitating the discussion, asking the directive questions, and triggering critical thinking. The students were required to explore and consider alternative solutions to the problems under investigation [26].

The reflection at the end of the first cycle led the researchers to perform some improvements in the implementation of the learning model. The emphasis on the Polya's [23] strategy of problem solving was fruitful. Problem-based learning, just like any other learning model, requires proper lesson plans along with clear learning objectives [24].

It is claim that the problem-based model could improve the students' commitment to learning activities [19, 20]. This research has revealed that the students' learning interests improved significantly. The research success indicator of learning interest has been reached even at the end of the first cycle. Activities of solving problems as the main part of the problem-based learning model where the students must communicate with their peers, do research for formulating the problem solution, have shaped the students' responsibility, and at the same time, have improved their interest to learn [7].

AUTHORS' CONTRIBUTIONS

All the authors conceived and developed the study. Arianto Asmira implemented the action research. Rusli and Sabri were involved in the preparation of the research implementation and data analysis. All authors jointly wrote the article and contributed to the revision of the manuscript. All authors read and approved the final manuscript and agreed to be responsible for its content.

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