Indonesian Journal of Mathematics Education
Vol. 3, No. 2, October 2020, pp: 52~58
p-ISSN: 2654-3907, e-ISSN: 2654-346X, DOI: 10.31002/ijome.v3i2.3339
e-mail: ijome@untidar.ac.id, website: jurnal.untidar.ac.id/index.php/ijome

Students Motivation and Mathematical Problem Solving Enhancement through SFAE (Student Facilitator and Explaining) in Problem-Solving Strategies

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Abstract

This study was employed to enhance learning motivation and mathematical problem-solving abilities of class VIII A students of SMP Negeri 7 Purwokerto through SFAE learning with problem-solving strategies. The subjects of this study were 31 students of class VIII A SMP Negeri 7 Purwokerto. This study is a Classroom Action Research (CAR), which was conducted collaboratively and participative. The action research was carried out in 3 cycles, with each cycle consisting of 2 meetings. Students were given a questionnaire to measure learning motivation and a test to measure their mathematical problem-solving abilities at the end of each cycle. Data collection techniques in this study include observation, questionnaires, tests, and documentation. Data analysis was carried out by descriptive qualitative and quantitative. The finding showed that implementing of SFAE learning with problem-solving strategies could increase students' learning motivation and mathematical problem-solving abilities. The study found that (1) The average percentage of the overall learning motivation questionnaire is steadily increased from 61.71% in cycle one to 68.10% in cycle two and 76.03% in cycle three. (2) The average percentage of student tests for problem-solving abilities in cycle one also significantly increases from 35.21% to 53.20% in cycle two and 79.61% in cycle three. The average student test rate for each indicator of problem-solving ability has met the study's success criteria.

Keywords: mathematical problem solving, SFAE, students' motivation

INTRODUCTION

The mathematics learning process that applied so far still uses the classical learning model, resulting in students becoming unmotivated to learn actively (Sandra, 2018). Likewise, Richard (2019) stated that the classical learning model could also make the learning process monotonous. Those learning processes can lead to students' lack of mathematical problem-solving abilities.

Based on the observations of the teaching and learning processes at SMP Negeri 7 Purwokerto, the researcher found a problem in the mathematics learning process in class VIII A. At the beginning of the study, the researcher carried out activities by asking students, "have they read the material at home?" and almost all students answered not yet. It is illustrated that students do not have the desire to explore further the material being studied. The researcher continued by conducting a pre-test to determine the students' initial abilities after observing that almost all students could not solve the question given. It appears that students are not resilient in facing difficulties. From these observations, the researcher saw that class VIII A students did not have strong learning motivation characteristics, which can be seen from not having the desire to explore further the material being studied and were not resilient in facing difficulties.

From the problem above, students have not been able to make a plan for completion,

and this is because students often work on practice questions in existing reference books; this results in students becoming more familiar with the form of routine questions rather than the form of an odd question (Martin, 2018). In the learning process, students only memorize the knowledge given by the teacher and use that knowledge to encounter problems related to problem-solving.

Based on the problems that have been identified, thus we need a learning model that can improve student motivation and ability to solve problems. In this case, teachers are required to know, choose and be able to apply learning models that are considered significant to create a conducive learning atmosphere, where students are given the opportunity to be actively involved in the learning process and practice solving the problems they face. One of them is the Student Facilitator and Explaining (SFAE) learning model (Helena, 2017).

The SFAE learning model is a cooperative learning model, where this learning model develops interactions between students (Brown, 2019). The SFAE learning model only presents material and students' discussion in groups to solve a problem. After discussing, students explain to other students the results of the debate from their group. After the students present, the teacher emphasizes each idea given by the students (Brandon, 2018).

A learning model can be combined with a learning strategy. It brings the learning objectives effectively and efficiently. Hillary (2018) said that one of the strategies related to problem-solving abilities is problem-solving strategies. Charless (2017) mentioned that problem-solving strategies aim to provide students' experience for facing various problems. Furthermore, Abraham (2016) said that applying the SFAE learning model with problem-solving strategies in mathematics learning is expected to increase student motivation and problem-solving ability.

Therefore, according to that background, the formulation of the problem enhances students' motivation and problem-solving ability through the SFAE learning model in problem-solving strategies. Meanwhile, the research objective in this study is to improve the students' motivation and ability in problem-solving via the SFAE learning model in the problem-solving techniques.

METHOD

The study used the Classroom Action Research (CAR), intending to enhance learning motivation and mathematical problem-solving abilities by applying the SFAE model learning with a problem-solving strategy. The CAR was carried out collaboratively and participative. Collaborative means the researcher collaborates with the class teacher, while participatory means that colleagues assist the teacher as observers to gather the necessary data. The research subjects were 33 students of class VIII A SMP Negeri 7 Purwokerto, Indonesia, in the academic year 2016/2017, consisting of 19 male and 14 female students.

The design of CAR in this study consist of 3 cycles (Kemmis & Taggrat, 2017). Each cycle consists of four stages: Planning-Action-Observation-Reflection (PAOR).

Planning

1. The teacher set the SFAE learning model with the problem-solving strategy as a learning model.
2. The teacher creating the lesson plan using the SFAE learning model with the problem-solving strategy.
3. Prepare a list of the discussion group.
4. Make a group worksheet discussion.
5. The teacher makes observation sheets and students' mathematical problem-solving abilities adjusted to the SFAE learning model with the problem-solving strategy.
6. Prepare and develop a questionnaire of students' learning motivation.
7. Prepare and develop the tests (evaluation questions for each cycle) consists of 3 question packages.

Action

Classroom action implementation refers to the lesson plan that has been prepared. The teacher carries out teaching activities using the SFAE learning model with the Problem Solving strategy.

Observation

This stage is carried out during the learning implementation. Observation sheets were used to observe activities in this study focused on both teacher's activities, students' motivation, and students' problem-solving abilities. Teacher activity observation sheets are used to determine teacher activities in carrying out learning activities using the SFAE model with the problem-solving strategy.

Reflection

Reflection activity was carried on based on the observations and evaluations to measure the level of success and lack of action implementation. Comment, feedback, and suggestion from the researcher are offered to the teacher. Based on reflection, the teacher then would plan to improve the performance of the next cycle up to the last cycle. The limitations of this study are about the three cycles only for the research.

RESULTS AND DISCUSSION

The activities carried out in the series of research can be summarised as follows.

Planning

At this step, the researcher with the consideration of the supervisor and teacher of class VIII A compiled a lesson plan, group worksheet, quiz questions, cycle test questions to test students' mathematical problem-solving abilities, and a questionnaire to measure students' motivation.

Action

Learning activities in cycle one are carried out based on the learning implementation plan that has been made and involves equipment and teachers as teachers and students who carry out learning.

The learning process begins with the teacher's greetings, followed by asking about the news and ensuring students prepare the necessary tools. The teacher continues by conveying the learning objectives, followed by an apperception about the previous material that is still related, namely about the surface area of a cube and a block as an example of a rectangular prism. Students are also motivated to study the prism surface area material with SFAE learning steps with a problem-solving strategy.

Observation

Based on the observation sheet for implementing learning by applying SFAE with the problem-solving strategy, information was obtained that at the two meetings held in cycle 1, all SFAE components with the problem-solving strategy had been implemented. Based on the observation data, the students' mathematical problem-solving ability in cycle 1 was not optimal. In problem-solving, students are not accustomed to solving it by following the correct procedure, namely, stating general information, asking questions, making plans, implementing plans, and rechecking the answers.

Cycle 1 test results showed that the average score obtained by students was 36.64. The number of students who reached the Minimum Required Competency (or *KKM-Kemampuan Kompetensi Minimum*) was only one student out of 32 students who took the test in cycle 1. The highest and lowest scores were 84 and 18, respectively.

The second cycle test showed the average class score results increased to 52.90, and for students who reached the *KKM* in this cycle. They were increased from 1 to seven students out of 32 students who took the cycle 2 test.

The problem-solving ability test in cycle 3 showed that the average class score obtained was 78.32. The number of students who achieved the *KKM* on this cycle test was 23 of

the 32 students who took the test in cycle 3. The average percentage of the ability to solve math problems measured from the test cycle 3 showed 79.43%.

The questionnaire results on learning motivation in cycle 1 obtained an average overall students' learning motivation of 61.70%. In cycle 2, the overall average percentage of students' learning motivation increased by 6.40% from cycle 1 to 68.10%. The data analysis of the questionnaire on learning motivation in cycle 3 obtained an average students' learning motivation of 76.03%.

Reflection

The result data from cycle 1 shows that students' learning motivation is still low from problem-solving ability indicators, new indicators of understanding problems that have reached above 60%. Therefore, to overcome this problem, SFAE learning with problem-solving strategies needs to be improved.

Improvement of SFAE learning with problem strategies is carried out by optimizing each stage. In the first stage, the teacher delivers the material; the delivery of the material is done so that students are interested in paying attention so that the material is easier to understand

Data from the questionnaire results and test cycle 2 shows that the average percentage of the entire student learning motivation questionnaire has only reached the medium level. For the four indicators of problem-solving ability, only the hands of understanding problems that have got a high category are above 60%. In contrast, the other indicators still have not reached that level. Therefore, to overcome this problem, several SFAE learning stages with problem-solving strategies need to be improved. This stage includes the step of allowing students to explain to other students and the set of presenting all the material.

Improvements at the stage of providing opportunities for students to explain to other students are carried out by optimizing group discussion activities where the researcher recommends that each student be actively involved in working on students' worksheet so that problem-solving abilities, especially the ability to make plans and implement plans, can increase.

The stage of explaining all the material is done by giving affirmation so that students do not skip rechecking the results obtained. With this, it is hoped that the ability to check again will be better.

After implementing the action in cycle 3, the teacher reflects on the activities that have taken place. Based on the data obtained in cycle 3, it can be seen that students' learning motivation has increased from cycle 1 to cycle 3, with the average percentage of students' learning motivation in 76.03%. Likewise, the results of the indicators of students' mathematical problem-solving abilities are more than 60%.

SFAE

Delivering the concepts

The activity begins with the mathematical contextual problems by showing the students the props in the form of food packaged using a hexagon prism and a triangular prism. Then the students are asked what shape is this food packaging? Students answered simultaneously in the form of a prism. Then the researcher checked by asking questions individually to mention examples of prism-shaped objects in everyday life.

Figure 1. Teacher Delivering the Concepts

Discussion

During this group discussion, the teacher asked students to work on a group worksheet that contained the steps for determining the surface area of a triangular vertical prism and a problem calculating the surface area of the prism. During the discussion activity, the teacher monitoring student work. In the group discussion activities, students were lack of coordination because they were not used to having group discussions during learning. Therefore, the teacher came to the group to give directions so that they could do it. After the group discussion, the activity is that the teacher asks two students to present the results of their respective group discussions.

Figure 2. Student Presenting the Idea in Front of The Class

Emphasizing the idea

Emphasizing the idea is the activity after student presentation—a teacher with the students having concluded the idea, for instance, by asking the answer to group eight. The teacher and students must complete the delivering the idea.

Conclusion

Then the teacher explained by emphasizing that the shape of the prism base determines the area of the base. Thus, several forms will be used to determine the surface area of the prism.

Figure 3. The Teacher Concludes the Learning

Problem-Solving Skills

The benefit of problem-solving is enhancing students' problem-solving abilities from cycle 1 to cycle two, as well as the documentation data of student work results. In the problem-solving question of number 1 in cycle 1, some students did not do the test well.

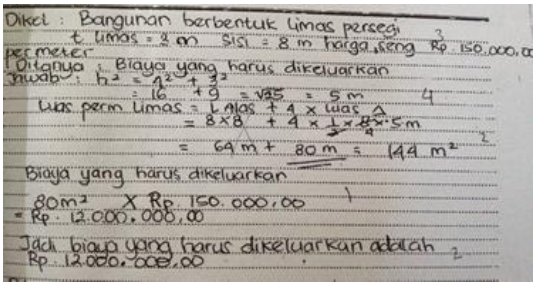

Figure 4. Student Misconception

It can be seen that the students made a mistake in planning to determine the surface area of the pyramid—another example of answers from students who made mistakes in substituting values into the planned formula.

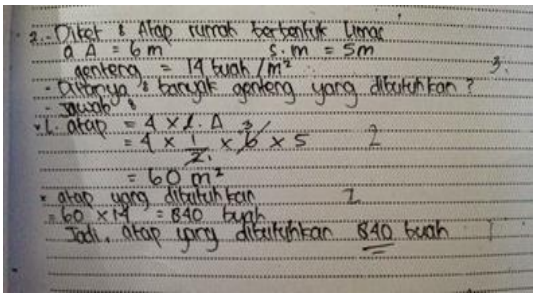

Figure 5. Misconception Student's Answer for Number 2 Exercise

Students should not skip the planning stage; calculating high scores. However, the results of students' work showed an increase in students' abilities in solving mathematical problems.

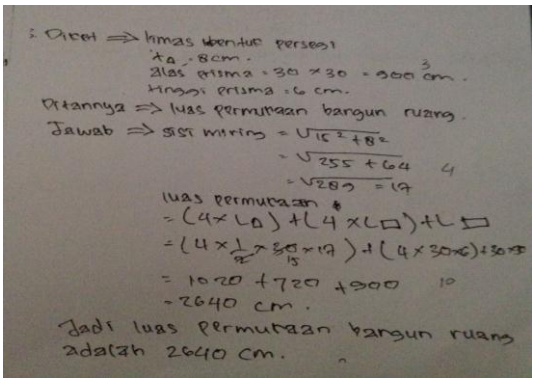

Figure 6. Student's Calculation for Answering Number 3 Problem

Students can solve the problems following the problem-solving strategy. The results of the answers obtained by students are correct and complete. Students have carried out the rechecking stage with a backward working strategy. Therefore, students need time to adjust to the learning being applied. Students are also not familiar with real-life problem-solving.

In the initial cycle of cycle 1, most students had difficulty solving the problems given. It resulted in the time required to solve the questions longer than needed. At subsequent meetings, students begin to get used to the applied learning and solve problems-solving problems related to real life.

CONCLUSION

After observing and evaluating in three cycles with these results, it can be concluded that, as compared to the traditional chalk and talk teaching strategy, mathematics learning with the SFAE model with problem-solving strategies may enhance students' motivation and problem-solving abilities of class VIII A students of SMP Negeri 7 Purwokerto. Overall, students' learning motivation increased from 61.71% at the end of cycle 1 to 68.10% at the end of cycle 2 and 76.03% in cycle 3. The students' problem-solving ability also increased from 35.21% in cycle 1 to 53.20% in the process of cycle 2 and 79.43% in cycle 3.

The nature of classroom action research suggests that the findings could not be generalized due to its limitation and specific context. Therefore, it is suggested to conduct similar CAR in a different context of school and levels.

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