APPLICATION OF ARCS-BASED PROBLEM BASED LEARNING IN IMPROVING MATHEMATICS LEARNING OUTCOMES ON TWO-VARIABLE LINEAR EQUATION SYSTEM FOR GRADE VIII A STUDENTS SMPN 1 BUNGAH GRESIK

Sugiarti
SMPN 1 Bungah Gresik
sugiartiagis@gmail.com

Abstract

Teaching and learning are conducted through gradual procedures beginning at uncomplicated materials and ending at more complex topics. This is to avoid the assumption that learning process at school is very difficult, especially math subjects. For students of SMPN 1 Bungah Gresik, many students complain that mathematics subjects are scary, unattractive and difficult; it does not seem to be related to everyday life. This reality is a negative perception of mathematics. Meanwhile, there are also students who enjoy the preoccupation of mathematics and are challenged to solve every math problem. This reality is a positive perception of mathematics. After several class action research activities conducted in Class VIII a SMPN 1 Bungah Gresik, the writer intends to deliver following result:

1. Students are increasingly active in learning on the subject of two-variable linear equation system through Problem-Based Learning model with ARCS motivation strategy (*Attention*, Relevance, *Confidence*, Satisfaction).
2. Students acknowledge the Problem-Based Learning model with ARCS motivation strategy (*Attention*, Relevance, *Confidence*, Satisfaction).
3. With the help of the ARCS (*Attention*, Relevance, *Confidence*, Satisfaction) in two-variable linear equation system topic, students of Grade VIII A SMPN 1 Bungah Gresik successfully improve learning outcomes. This is indicated by obtaining the average value of the formative test cycle I, II, III respectively 7.02; 7.34; 7.70 (above 7.0 which is the benchmark of success), also indicated by the achievement of classical learning completeness cycle I, II, III with 66%, 76%, 91% respectively.

Keywords: Mathematics, ARCS, Problem Solving

Abstrak

Belajar mengajar dilaksanakan secara bertahap dari mudah, sedang kemudian sukar. Hal ini guna menghindari anggapan belajar pada jalur sekolah adalah sangat sukar, apalagi mata pelajaran matematika. Untuk siswa SMPN 1 Bungah Gresik , banyak siswa mengeluh mata pelajaran matematika menakutkan, tidak menarik dirasakan sukar dan tidak tampak kaitannya dengan kehidupan sehari-hari. Kenyataan ini adalah sebuah persepsi negatif terhadap matematika. Sementara itu ada juga siswa yang menikmati keasyikan matematika dan tertantang untuk memecahkan setiap soal matematika. Kenyataan ini adalah persepsi positif terhadap matematika. Dari seluruh kegiatan penelitian tindakan kelas yang dilakukan di Kelas VIII A SMPN 1 Bungah Gresik disampaikan sebagai berikut.

1. Siswa semakin aktif dalam pembelajaran Pada materi Sistem Persamaan Linear Dua Variabel melalui model Problem Based Learning dengan strategi motivasi ARCS (*Attention*, Relevance, *Confidence*, Satisfaction).
2. Siswa mengetahui model Problem Based Learning dengan strategi motivasi ARCS (*Attention*, Relevance, *Confidence*, Satisfaction).
3. Melalui model Problem Based Learning dengan strategi motivasi ARCS (*Attention*, Relevance, *Confidence*, Satisfaction) dalam Pada materi Sistem Persamaan Linear Dua Variabel untuk siswa Kelas VIII A SMPN 1 Bungah Gresik dapat meningkatkan hasil belajar. Hal ini ditunjukkan dengan peroleh nilai rata-rata tes formatif siklus I, II, III berturut-turut 7,02; 7,34; 7,70 (di atas 7,0 yang menjadi tolok ukur keberhasilan), juga ditunjukkan dengan pencapaian ketuntasan belajar klasikal siklus I, II, III berturut-turut 66%, 76%, 91%.

Kata Kunci: Matematika, ARCS, Problem solving

INTRODUCTION

The achievement of learning outcomes is determined by several factors (Sudjana, 2006), among others: 1) factors that come from within the students, such as their ability, learning motivation, interest and attention, attitudes and learning habits, perseverance, socioeconomic, physical and psychological factors; 2) factors that come from outside the students or environmental factors, such as the quality of teaching which includes the effectiveness of the teaching and learning process in achieving teaching goals. The quality of effective teaching is characterized by the use of effective learning media by teachers (Herawati et al., 2020; (Asfiyah, n.d.; Hamdu & Agustina, 2011; Nurtanto & Sofyan, 2015).

The demands of students' ability in mathematics do not only ask for the ability to count, but also perform the ability to reason logically and critically in problem-solving. Solving this problem is not merely theoretical practice in the classroom, however, they are expected to solve real-world problems. Such mathematical ability is known as mathematical literacy ability. Someone who is literate in mathematics does not merely understand about mathematics but also utilizes it in solving everyday problems(Fathani, 2016; Inovasi et al., 2021; Mussardo, 2019; Susanti et al., 2017; Ulya, 2014)

The Problem-Based Learning Model with the ARCS motivation strategy (*Attention*, Relevance, *Confidence*, Satisfaction) seems to be able to train students to listen to the opinions of others and summarize the opinions of themselves or friends in writing. Group tasks will be able to stimulate students to work together, help each other in integrating new knowledge with their retained knowledge (Nurtanto & Sofyan, 2015). Teachers have been conducting classical learning model at SMPN 1 Bungah

Gresik, in addition, there has never been a research effort to improve student learning outcomes using Problem Based Learning model with ARCS motivation strategy (*Attention,* Relevance, *Confidence,* Satisfaction).

Based on the results of these observations, the researcher intends to improve the learning process in Class VIII A of the 2018/2019 academic year in order to improve student learning outcomes and learning motivation to study mathematic. A predicted learning strategy to improve students' learning motivation is an application of Problem Based Learning model with ARCS (*Attention,* Relevance, *Confidence,* Satisfaction) strategy. It is expected that applying these learning strategies may increase the motivation to learn mathematics, improve students 'interest in mathematics, and provoke students' curiosity about the material learned so that students will more easily understand it. Thus, student achievement will increase as well.

Based on the above description, researchers and teachers chose to apply the Problem Based Learning model with ARCS motivation strategy to increase the motivation of Class VIII A students. With this research, it is expected that the motivation of Class VIII A students can be improved. Thus, it is expected that the achievement of learning mathematics in Class VIII A will increase.

One of the efforts to improve student learning motivation is the use of the Problem Based Learning Learning model that has been in accordance with the provisions of the 2013 curriculum with ARCS motivation strategy. Problem-Based Learning Models are closely related to learning that can lead to students' ability to think critically. The use of ARCS motivation strategies will benefit, among others, fostering interest and attention of students; gaining confidence during the learning process; creating a more comfortable atmosphere to explore the topic. Based on the description above, researchers and teachers choose to apply the learning model Problem Based Learning with ARCS motivation strategy to increase the motivation of Class VIII A students. With this research, it is expected that the motivation of Class VIII A students can be improved. Thus, it is expected that the achievement of learning mathematics in Class VIII A will increase.

Motivation strategies are motivational principles that are applied in learning. The motivation strategy used in this study is ARCS motivation strategy. ARCS has four categories of motivation that teachers should consider in an effort to produce

interesting, meaningful, and challenging learning for students. The four categories of motivation are *Attention* (A), Relevance (R) or Relatedness, Confidence (C), and Satisfaction (S). ARCS motivation strategies are motivation principles that can be implemented in learning. Attention is concentrating and focusing mental resources. Attention of the learners appear by curiosity.

This research uses Problem Based Learning model with ARCS motivation strategy. Problem-Based Learning model is a learning model that uses real-world problems related to the subject matter as a context for students to learn about critical thinking and problem-solving skills, as well as to acquire essential knowledge and concepts from the subject matter. Students are shaped as problem solvers. With such learning, it is expected to generate students' curiosity in learning mathematics which can further increase their motivation to observe the subject deeper and in more active manners. This Problem Based Learning model will be combined with ARCS motivation strategy. ARCS motivation strategies are motivational principles that can be implemented in learning. According to Keller (2000), there are four classifications of motivation that can be implemented teachers: *Attention* (A), Relevance (R), *Confidence* (C), and Satisfaction (S). Based on this, it is expected that the Problem Based Learning model with ARCS motivation strategy may increase student learning motivation.

RESEARCH METHODS

Class action research entitled "The Initiatives to Improve Student Learning Outcomes of Class VIII A SMPN 1 Bungah Gresik in Learning Two-Variable Linear Equation System through Problem Based Learning Model with ARCS Motivation Strategy (*Attention*, Relevance, *Confidence*, Satisfaction", was held at SMPN 1 Bungah Gresik. The implementation of research and improvement was scheduled by the author with the following schedule details:

Table 3.1. Action Execution Time

Number	Cycle	Execution Time	Description
1	Pre Cycle 1	December 10, 2018	
2	Cycle 1	December 17 and 18, 2018	
3	Cycle 2	December 24 and 26, 2018	

The subjects studied were students of Class VIII A 2018/2019 school year SMPN 1 Bungah Gresik . Class VIII A consists of 36 students. This class action research is designed to be implemented in 3 cycles. Each cycle consists of four stages: planning, implementation / action, peer reflection. The benchmark of success in this class action research is if the results of learning mathematics for students of class VIII A in SMPN 1 Bungah Gresik towards two-variable linear equation system topic increased. The results cover student learning outcomes in the subject matter achieved average score at least 7.5 and completion of student learning reached at least 85%.

RESEARCH RESULTS AND DISCUSSION

1. Pre-action Data

The following are the results of observations of each indicator of learning motivation obtained from peers/observations.

Table 4.1.

Percentage of motivation to learn each indicator in the pre-cycle session

Number	Indicators of Learning Motivation	Percentage
1	Students are eager to answer questions, express their opinions	31,43%
2	Students are brave and confident to present the results of their group discussions to the front of the class	0%
3	Students ask less understandable things to teachers and friends	44,64%
4	Students are active in group/class discussions.	46,43%
5	Students focus during learning (not doing activities outside of learning) and pay attention to what the teacher says during the teaching and learning process	84,49%
6	Students listen to the opinion of a peer presentation	0%
7	Students practice to answer the problems in their exercise sheet (LKS) or questions given by the teacher.	64,29%
8	Students answer questions/evaluation given by teachers independently	28,57%
9	Students perform an action as a response to teachers'	35%

	initiatives because of the awards given	
10	Students perform an action as a response to teachers' initiatives because of the punishment given	17,14%

Table 4.2.

Percentage of Students According to Learning Motivation Category

Category of Motivation	Presentation
High	39,29%
Medium	35,71%
Low	25%

Based on the results of observations in Table 4.2, it is known that 25% of students demonstrated low motivation, 35.71% of students belonged to the medium category, and 39.29% of students maintained high motivation in the classroom. Based on initial observations, teachers taught with the lecture method combined with question and answer for the introductory stage of the classroom. The teacher delivered the material and then continued to provide examples of problems and solutions. Teachers and students discussed and completed aforementioned problems; in other words, they worked together in discovering procedure to solve the problems.

Results of Cycle Action I

Observation of students' math learning motivation is performed by a direct peer toward student activities during the learning process by one observer using a validated observation sheet. The results of peer data on each indicator of student motivation of Class VIII A SMPN 1 Bungah Gresik during the first cycle process are presented in Table 4.3.

Table 4.3. Percentage of Learning Motivation on Each Indicator in Cycle I

Number	Indicators of Learning Motivation	Percentage
1	Students are eager to answer questions, express their opinions	31,55%
2	Students are brave and confident to present the results of their group discussions to the front of the class	19,64%

3	Students ask less understandable things to teachers and friends	45,23%
4	Students are active in group/class discussions.	46,43%
5	Students focus during learning (not doing activities outside of learning) and pay attention to what the teacher says during the teaching and learning process	85,23%
6	Students listen to the opinion of a peer presentation	78,57%
7	Students practice to answer the problems in their exercise sheet (LKS) or questions given by the teacher.	66,07%
8	Students answer questions/evaluation given by teachers independently	30,36%
9	Students perform an action as a response to teachers' initiatives because of the awards given	35,71%
10	Students perform an action as a response to teachers' initiatives because of the punishment given	21,43%

Most of the indicators increased, in addition to indicator 4 which obtained the same percentage of 46.43%. Indicator 1 increased by 0.12% from 31.43% in the cycle and became 31.55% in cycle I. Indicator 2 increased by 19.64% from 0% in the cycle to 19.64% in cycle I. Indicator 3 increased by 0.6% from 44.64% in the cycle to 45.23% in cycle I. Indicator 5 increased by 0.31% from 84.92% in the cycle to 85.23% in cycle I. Indicator 6 increased by 78.57% from 0% in the cycle to 78.57% in cycle I. Indicator 7 increased by 1.78% from 64.29 in the cycle to 66.07% in cycle I. Indicator 8 increased by 1.79 from 28.57% in the cycle to 30.36% in cycle I. Indicator 9 increased by 0.71% from 35% in the cycle to 35.71% in cycle I. Indicator 10 increased by 4.29% from 17.14% in the cycle to 21.43% in cycle I.

Table 4.4 Percentage of Students According to Learning Motivation Category

Category of Motivation	Presentation
High	50%
Medium	39,29%
Low	11,57%

Results of Cycle II Action

Observation of students' math learning motivation is conducted by direct peer observation of student activities during the learning process by three observers using validated observation sheets. The results of peer observation data on the motivation of students of Class VIII A of SMPN 1 Bungah Gresik during the first cycle process are presented in Table 4.7 below:

Number	Indicators of Learning Motivation	Percentage
1	Students are eager to answer questions, express their opinions	45,83%
2	Students are brave and confident to present the results of their group discussions to the front of the class	30,36%
3	Students ask less understandable things to teachers and friends	46,43%
4	Students are active in group/class discussions.	67,86%
5	Students focus during learning (not doing activities outside of learning) and pay attention to what the teacher says during the teaching and learning process	88,63%
6	Students listen to the opinion of a peer presentation	96,42%
7	Students practice to answer the problems in their exercise sheet (LKS) or questions given by the teacher.	73,21%
8	Students answer questions/evaluation given by teachers independently	30,36%
9	Students perform an action as a response to teachers' initiatives because of the awards given	35,71%
10	Students perform an action as a response to teachers' initiatives because of the punishment given	27,38%

Most indicators of learning motivation increased except indicator 9 which showed the same percentage of 35.71%. Indicator 1 increased by 14.29% from 31.55% in Cycle I to 45.83% in Cycle II. Indicator 2 increased by 10.72% from 19.64% in Cycle I to 30.36% in Cycle II. Indicator 3 increased by 1.2% from 45.23% in Cycle I to 46.43% in Cycle II. Indicator 4 increased by 21.43% from 46.43% in Cycle I to 67.86% in Cycle

II. Indicator 5 increased by 0.34% from 85.23% in Cycle I to 88.63% in Cycle II. Indicator 6 increased by 17.85% from 78.57% in Cycle I to 96.42% in Cycle II. Indicator 7 increased by 7.14% from 66.07% in Cycle I to 73.21% in Cycle II. Indicator 8 increased by 35.71% from 30.71% in Cycle I to 66.07% in Cycle II. Indicator 10 increased by 5.95% from 21.43% in Cycle I to 27.38% in Cycle II.

Table 4.9. Percentage of Students' Completion in the Final Test of Cycle II

Category of Motivation	Presentation
High	64,29%
Medium	35,71%
Low	0%

In Figure 4.4 it is seen that as many as 35.71% of students of Class VIII A of SMPN 1 Bungah Gresik showed low motivation and the remaining 64.29% maintained high motivation. This shows an increase from Cycle I where 11.71% of students demonstrated low motivation, 39.29% had moderate motivation and the remaining 50% maintained high motivation.

CONCLUSION

From a series of classroom action research activities conducted in Class VIII A of SMPN 1 Bungah Gresik academic year 2018/2019, the application of the Problem Based Learning model with ARCS motivation strategy can improve learning outcomes and students' motivation to learn mathematics. This fulfills the achievement indicator in Cycle II which approximately 64.29% of students remain in high category motivation. Based on the observation results of learning motivation, the ranges of student learning motivation percentage are 25% in the low category, 35.71% in the medium category, and 39.29% in the high category. In the first cycle, 11.71% of students were in a low category, 39.29% of students were in the medium category, and 50% of students were in the high category of learning motivation to study mathematics. In the second cycle, there was no single student categorized in the low motivation (0%), as many as 35.71% of students were in the medium category, and 64.29% of students maintained a high level of learning motivation.

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