



International Journal of Sciences: Basic and Applied Research (IJSBAR)

ISSN 2307-4531
(Print & Online)

<http://gssrr.org/index.php?journal=JournalOfBasicAndApplied>



Application of the Open Ended Approach to Mathematics Learning in the Sub-subject of Rectangular

Andi Irawan^{a*}, Edy Surya^b

^aGraduate Student of the State University of Medan

^bLecturer for Graduate Student of the State University of Medan Jl. Willem Iskandar Psr V, Medan 20221,
Indonesia

^aEmail: andialazhar87@gmail.com

^bEmail: edy_surya71@yahoo.com

Abstract

The purpose of this research is to know the application of open ended approach to learning Mathematics in sub-subject of rectangular in the sixth grade of Private Junior High School of Darma Medan. This study is a type of classroom action research. Data analysis technique in this research is using qualitative quantitative descriptive analysis method, with the aim to know whether learning outcomes of students increased due to the implementation of Open Ended approach. Based on the results of research and data analysis has been done is proven that through the application of open ended approach was the result of learning mathematics students is increasing.

Keywords: Open Ended Approach; Learning Outcomes of Mathematics.

1. Introduction

Mathematics is one of the subjects studied at formal education level ranging from Kindergarten, Primary School, Junior High School, and Senior High School, even college is inseparable from mathematics.

* Corresponding author.

This shows that mathematics plays an important role in efforts to improve human resources. This is in line with what was put forward by Cornelius [1] on the reasons why learning mathematics is important. According to him there are five reasons for the need to learn mathematics, namely: (1) the clear and logical means of thinking, (2) the means to solve the problems of everyday life, (3) the means of recognizing patterns of relations and generalizing experiences, (4) means to develop creativity, and (5) means to raise awareness of cultural development. The classical problem in mathematics education in Indonesia is still low achievement and lack of motivation and desire for learning mathematics.

Based on interviews with mathematics teachers at Private Junior High School of Darma Medan, there are several reasons for conducting this research. *First*, from the list of values, it appears that the achievement of learning outcomes of students on rectangular materials is less satisfactory because almost 45% of students are only able to achieve a score of minimum completeness criteria, while the standard of graduation of learning set by the school must reach 70. The problem of the low value of their learning result is due to the difficulty of remembering the properties or formulas for finding the circumference and the area of a flat structure of rectangular.

Second, based on observations made it seems that learners in learning is less active in receiving subject matter, because the teaching approach applied by teachers is still conventional or teacher centered. And also only lecture method used so that teacher become very dominant factor in learning process hence student feel bored and lazy .

The same thing is also conveyed by [3], namely the difficult impression and lack of interest in learning of the students in general caused by learning in schools that are dominated by the way of learning in the form of memorizing through lectures, notes and discussions without meaning so boring. This will have an impact on the understanding of students who are separated, not related to each other. Selection of good learning methods can affect success to improve learning outcomes of students [23]. In addition, the implementation of appropriate and effective learning strategies in the classroom will empower the potential of students [18]. According to [4] in a reflective view, a teacher acts as a student guide, not passive.

In principle no single method or approach in teaching can be viewed perfectly and is suitable for all subjects in each subject. Therefore as a teacher we must choose the right method or approach in teaching. Teachers should be able to encourage learners to be able to construct their own knowledge through various learning activities so that learning is more meaningful. According to Ausubel [7] meaningful learning is influenced by factors of cognitive, stability and clarity of knowledge in a particular field of study and at any given time.

From the problems mentioned above, it is necessary that there is planning and learning process in accordance with the characteristics of mathematics as well as the characteristics of learners and keep up with the times. During this time the problems of mathematics that are open to solutions and methods are still rarely applied in learning mathematics in schools [9,16]. Open ended is a medium of approach in problem solving used to evaluate the ability of high-level thinking in learning mathematics. This approach involves students in solving problems through the formulation of various appropriate solutions [14].

According to [26] the emergence of an open-ended approach begins with a view of how to judge students' ability objectively, i.e. high-order thinking in mathematics. A series of knowledge, skills, concepts, principles or rules are usually given to students in a systematic way. The open ended approach can give the students the flexibility to think actively and creatively in solving a problem.

Reference [19] states that open ended approaches and questions give students the freedom to express their opinions and ideas in order to improve their thinking skills. Reference [20] says that: The open-ended approach can train and cultivate the originality of ideas, creativity, high cognitive, critical, communication-interaction, sharing, openness and socialization. Students are required to improvise in developing methods, ways or approaches that vary in obtaining answers, in which the answers of the students vary. Furthermore, students are also asked to explain the process in finding the answer. Thus, this learning model is more concerned with the process than the product that will shape the mindset, integrity, openness, and diversity of thinking.

A critical thinking habit is one aspect that must be developed and owned by students in learning [17]. Assignment in mathematics learning should be related to the real world so as to generate in the students good habits of thinking, open thinking and making conclusions based on solid evidence [15]. Critical thinking involves logical reasoning and the ability to separate facts and opinions, test information critically based on evidence before accepting or rejecting ideas or questions relating to problems encountered [25]. The characteristic of students of critical thinking according to [12,10] is able to expose the argument appropriately using the available information.

2. Research method

This research was conducted in Private Junior High School of Darma Medan which is located at Jl. KaryaSehati No.6 of Medan Johor District by using Classroom Action Research type. Classroom action research can be interpreted as a process of studying learning problems in the classroom through self-reflection in an effort to solve the problem by performing planned actions in real situations and analyzing any influence of the behavior [24].

According to [24], the characteristics of classroom action research are as follows:

1. The main purpose of classroom action research is to improve the quality of processes and outcomes of learning.
2. The problem studied in classroom action research is a practical problem that occurs in the classroom.
3. The main focus of research is the learning process.
4. The responsibility for the implementation and results of classroom action research is on the teacher as a practitioner.
5. Classroom action research is carried out in accordance with the ongoing learning program.

According to [28], the procedure of classroom action research includes:

1. fixing the focus of the problem;

2. action planning;
3. implementation of action accompanied by observation and interpretation;
4. analysis and reflection;
5. follow-up planning (where appropriate).

This research was conducted for 2 months from May to June. The subject of this classroom action research is the students of class VII-1 consisting of 36 students.

The purpose of this study is to determine whether the open ended approach can improve the mathematics learning outcomes of students in the sub-subject of rectangular that is rectangular and square. The material of the first cycle is the notion of rectangles and squares. The second cycle is about the properties of rectangles and squares, and the third cycle is about the circumference and the area of the rectangle as well as the square.

According to [6], the steps or syntax of Open Ended approach include presentation of problem, understanding of problem, problem solving, comparing and discussing, as well as concluding. The learning steps by applying the Open Ended approach used in this study include:

1. The teacher presents the problem.
2. Students explore the problem.
3. The teacher records the student's response.
4. Discussion of student responses (classes).
5. Students summarize what is learned.

In the Open Ended approach the teacher presents the problem to the student where the solution is not determined by only one way or another. Teachers should take advantage of the diversity of ways to solve problems to give the students an experience in finding something new based on the knowledge, skills and way of thinking that have been obtained before. The advantages of this approach, among others, are:

1. Students participate more actively in learning and often express their ideas.
2. Students have more opportunities to utilize knowledge and skills of mathematics comprehensively.
3. Students with low math skills can respond to problems in their own way.
4. Students are intrinsically motivated to provide evidence or explanation.
5. Students have more experience to find something to answer the problem.

3. Results

3.1 Pre-Action Description

The pre-action activity is the first step in the classroom action research conducted by the teacher to determine the initial knowledge of the students by giving the test (pre-test) about the rectangular materials. The following is the result of the percentage of students achievement in classical.

Table 3.1: Description of the Level of Ability of Students in the Initial Test

Level of Ability	Category	Number of Students	Percentage of Students	Average score of the class
85 % - 100 %	Very Good	0	0%	37,91% (Very Bad)
70 % - 84 %	Good	5	13.89%	
55 % - 69 %	Fair	2	5.55%	
40 % - 54 %	Bad	6	16.67%	
0 % - 39 %	Very Bad	23	63.89%	
Total		36	100%	

Table 3.2: Description of the Learning Completeness of Students in the Initial Test

No.	Percentage of Completeness	Level of Completeness	Number of Students	Percentage of Students
1.	$X < 75 \%$	Not Completed	31	86.11%
2.	$X \geq 75 \%$	Completed	5	13.89%
Total			36	100%

3.2 Result of Action of Each Cycle

According to the descriptions of the above data, there is a comparison of the improvement of the results of the actions achieved during the research process; more can be seen in the comparison diagram as presented in Figure 3.1 below.

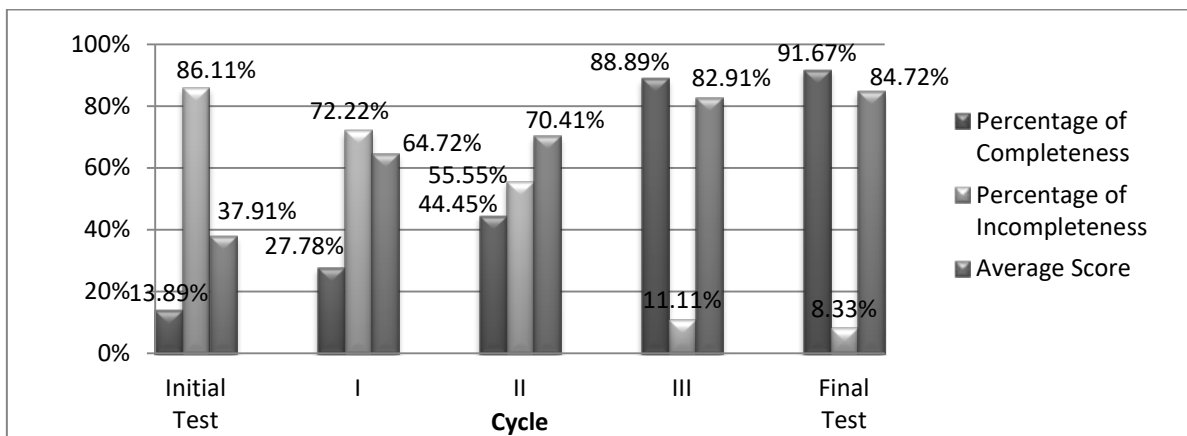


Figure 3.1: Comparative Diagrams of Research Results

The next comparison is to look at the classically completeness of student learning outcomes between initial tests of capabilities and cycle actions (I, II and III) as well as final tests. More can be shown in Figure 3.2 below.

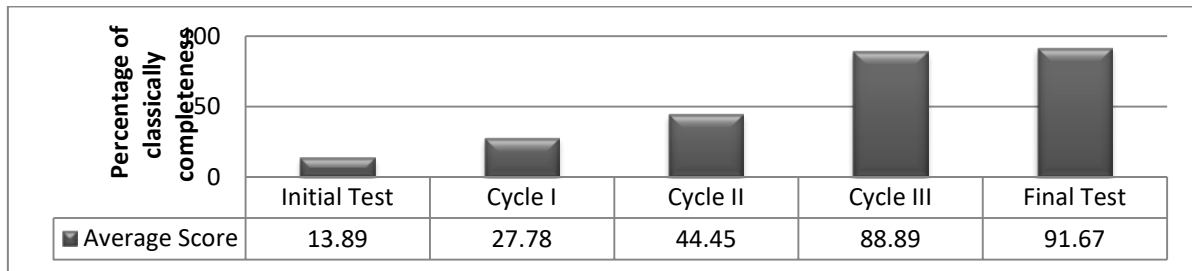


Figure 3.2: Comparative Diagrams of Results of Learning Completeness

From the results obtained in the initial test it appears that the mathematical value of students is still very low, i.e. the students only get an average score of 37.91. Of 36 students only 5 students or 13.89% were able to achieve score of completeness while 31 students or 86.11% have not reached score of completeness. These results show that the learning outcomes of mathematics of students in the sub-subject of the rectangular, i.e. rectangles and squares, are still very low. Based on the problem, an effort is made to improve the learning outcomes of mathematics in the sub-subject of rectangular that is rectangle and square, using *open ended* approach.

In the implementation of research activities with the provision of action in cycle I, learning outcomes of students showed average score 64.72. There are 1 or 2.78% belong to the category score of very good, this student does have high ability in comparison with other friends. Then from cycle I there are also 17 students or 47.22% who belong to the category score of good, these students are seen actively in teaching and learning activities. Furthermore there are 13 students or 36.11%, 4 students or 11.11%, and 1 student or 2.78% who have score in categories of fair, bad and very bad, respectively. This happens because these students are still playing in learning, daydreaming, disturbing his friends during the learning process takes place. To improve learning outcomes obtained by students in cycle I, the teacher must give motivation and attention to students who have score in categories of fair, bad and very bad. Thus, from the data on these results it can be concluded that the results of learning of mathematics of students is still low and not meet the learning completeness criteria, therefore cycle II should be done again for student learning outcomes in accordance with what is expected.

Furthermore, after the provision of actions in cycle II, the learning outcomes obtained by students showed an average score of 70.41. There appears to be an increase in learning outcomes of students if compared to cycle I. Of 36 students only 4 or 11.11% who get score in category of very good. They get the score in the category of very good because they have been serious in the learning activities. Then there are 19 students or 52.78% who got score in category of good, these students get it because they start active in learning. Eleven students or 30.56% got score in category of good, while 2 students or 5.55% got score in category of fair. This is because students lack confidence in expressing their own opinions and are always dependent on others.

Then in the cycle III there are 15 students or 58.33% who meet the score of completeness. This happens because the students get used to the open ended approach, and the students are motivated by the award given by the

teacher. There are 21 students or 58,33% who have score in category of very good, and from that data can be said that there is improvement from cycle II, while 14 students or 38,89% got score in category of good and 1 student or 2, 78% got a score under the criteria of learning completeness. The cause of one student is not completed is because he does not learn actively and only play around, so the score obtained in the final test of the action does not meet the Minimum Completeness Criteria.

Then to know the results of the development of learning scores of mathematics of students thoroughly, the researcher performs the final test after doing the action in cycle III which turned out to achieve the score of completeness. This final test consists of problems previously given in the initial test before performing the actions of cycles I, II and III. In this final test, students get an average score of 84.72. There are 33 students or 91.67% who achieve score of completeness while 3 students or 8.33% have not got score of completeness. It shows that there is an increase in learning outcomes of mathematics of students. Thus it is proven that the Open Ended Approach in mathematics learning in the sub-subject of rectangular can improve the learning outcomes of mathematics of students in Private Junior High School of Darma Medan.

4. Discussion

The journal that can be used as discussion material is entitled "Improve Student's Learning Outcomes In Class X SMK PGRI 2 Sidoarjo Through An Open Ended Approach" written by Nurul Islamiah [15]. Given the math lessons for those who need the technique or the right way for the learning process. Because in principle there is no method or way of teaching that can be perceived perfectly and is suitable for all subjects that exist in each subject. One approach that can be used is an open ended. Some experts claim that this approach is very useful to provide flexibility of student thinking actively and creatively in a problem solving.

Based on data obtained from previous journals shows the average value of student learning outcomes before the applied open approach ended 67.17 and after applied open ended approach increased the average student to 80.21. In the first cycle the students' average learning achievement increased to 74.78 but still there are 23 students (50%) who have not reached KKM. Furthermore, the action in cycle II and the average of student learning outcomes increased to 80.21 but still there are 11 children (23.91%) who have not reached KKM. While 35 children (76,09%) have reached KKM. We recommend that students' assessment activities not only in terms of cognitive, the researchers also need to observe students' affective and psychomotor ability. The results of this study are in line with a journal written by Yusuf [29] suggesting that the giving of open ended questions of triangular and quadrilateral subjects can have a positive effect on student test results. In the first test the students who got the completeness is 77.1%, the students who get mastery on the second test is 74.3%, while the students who get the completeness in the third test is 80%, so that if averaged three tests then there are 77, 2% of students who have gained mastery. Journal Al-Absi [2] also reinforces that tasks that use Open Ended have a positive effect on improving student mathematics achievement, and can assess students in perspective in mathematics learning.

Peterson [22] Suggest that in order to develop higher-order mathematical thinking skills, problem-solving should be the foundation or core of learning activities. With a learning approach that is not directly provide

more autonomy to students in learning and is believed to improve the ability of high-level mathematical thinking. So the open ended approach is very appropriately applied to the subject matter of the subject of the rectangle. Theoretically, the classroom activity reported in this study is based on a constructivist view combined with the concept of zones of proximal development from Vygotsky.

5. Conclusions

Based on the results of the present study it appears that each cycle always shows better results. In the cycle I the students' learning outcomes had an average score of 64.72, where only 10 students or 27.78% were completed, while 26 students or 72.22% were not completed. In cycle II the average score was 70.41, where only 16 students or 44.45% were completed, while 20 students or 55.55% were not completed. In cycle III the average score is 82.91, where the students' completeness increases that is the total number of students who complete the study increased to 32 students or 88.89%, while 4 students or 11.11% were not completed. Thus it can be concluded that the Open Ended Approach in Mathematics Learning in the sub-subject of the rectangular can improve the learning outcomes of mathematics of students in Private Junior High School of Darma Medan.

Suggestions that can be given include: 1. It is suggested to schools that this Open Ended learning approach can be an alternative learning approach that can be used in mathematics learning activities at Private Junior High School of Darma Medan because the application of Open Ended learning approach can improve students' understanding of mathematical concepts. 2. Other researchers can conduct further research on the application of Open Ended learning approaches to improve students' understanding of mathematical concepts in rectangular materials by paying more attention to the planning of learning activities in accordance with classroom conditions, student conditions and time allocation.

References

- [1] Abdurrahman, M. 2009. Pendidikan Bagi Anak Berkesulitan Belajar. Jakarta : RinekaCipta.
- [2] AL-Absi, Mohammad. 2012. "The Effect of Open-Ended Tasks –as an assessment tool- on Fourth Graders' Mathematics Achievement, and Assessing Students' Perspectives about it". SPRING: Jordan Journal of Educational Sciences Vol. 9.
- [3] Aritonang, K.T. 2008. Minat dan Motivasi dalam Meningkatkan Hasil Belajar Siswa. Jurnal Pendidikan Penabur. (Online), 10 (7): 11-21. Diakses pada 15 Maret 2017.
- [4] Barody, A. J. 1993. Problem Solving, Reasoning, and Communicating, K-8: Helping Children Think Mathematically. New York: Macmillan Publishing Company.
- [5] Becker, J.P. dan Shimada, S. (1997). The Open-Ended Approach: A New Proposal for Teaching Mathematics. Virginia: NCTM.
- [6] Betty, Biliya. (2015). Penerapan Model Open Ended Untuk Meningkatkan Keterampilan Proses Dan

Hasil Belajar Siswa Kelas V Sdn 1 Repaking - Wonosegoro – Boyolali. *Jurnal Matematika*, Vol. 5, No. 1, Januari 2015:78 -91.

- [7] Dahar, Ratna Willis. 2006. *Teori-teori Belajar dan Pembelajaran*. Jakarta : Erlangga.
- [8] Djamarah, dkk. 2002. *Strategi Belajar Mengajar*. Jakarta: Rineka Cipta.
- [9] Emilyya, D, dkk. (2010). Pengembangan Soal-Soal Open Ended Untuk Meningkatkan Penalaran Matematika. *Jurnal Pendidikan Matematika* Volume 4 Nomer 2.
- [10] Ennis, R. (2011). *The Nature of Critical Thinking : An Outline of Critical Thinking Dispositions and Abilities*. The Sixth International Conference on Thinking at MIT. Cambridge.
- [11] Erman, Suherman, dkk. 2003. *Strategi Pembelajaran Matematika Kontemporer*. Bandung : JICA UPI.
- [12] Facione, P. (2011). *Critical Thinking : What it is and Why It Counts*. Measured Reason and The California Academic Press. California.
- [13] Hamalik, Oemar. 2008. *Perencanaan Pengajaran Berdasarkan Pendekatan Sistem*. Jakarta : Bumi Aksara.
- [14] Inprasitha, M. (2006). *Open-ended Approach and Teacher Education*. Tsukuba Journal Of Education Study in Mathematics. Volume 25.
- [15] Islamiyah Nurul. 2014. Improve Student's Learning Outcomes In Class X Smk Pgri 2 Sidoarjo Through An Open Ended Approach. *Jurnal Education Mathematic Stkip Pgri Sidoarjo* Vol.2, No.2, Issn: 2337-8166.
- [16] Johnson, E. (2011). *Contextual Teaching and Learning*. Bandung : Kaifa Learning.
- [17] Kwon, O. N, Park J.H. (2006). *Cultivating Divergen Thinking in Mathematics Through an Open ended Approach*. *Asia Pasific Education Review*. Volume 7 Number 1.
- [18] Marzamo, RJ and Pickering, D. 1997. *Dimensions of Learning Teacher's Manual*. USA. McRRel.
- [19] Medriati, R. 2011. Pengembangan Model Siklus Belajar (Learning Cycle) untuk Meningkatkan Kemampuan Penguasaan Aplikasi Konsep (Studi Pengembangan Model Pembelajaran untuk Bidang Sains di Sekolah Dasar). *Jurnal Exacta*. (Online), 9(2): 51-58. Diakses pada tanggal 27 Maret 2017.
- [20] Murni, (2013). *Open ended Approach in Learning to Improve Students Thinking Skill*. *International Journal of Independent Reasearch and Studies*. Volume 2 Number 2.
- [21] Ngalimun .2013. *Strategi dan Model Pembelajaran*. Yogyakarta: Aswaja Presindo.

- [22] Peterson, P.J. (1988). Teaching for Higher-Order Thinking in Mathematics: The Challenge for the Next Decade. Dalam D.A. Grouws, T.J. Cooney, & D. Jones (Eds.), *Effective Mathematics Teaching*. Virginia: NCTM.
- [23] Sagala, S. 2009. *Konsep dan Makna Pembelajaran*. Bandung : Alfabeta.
- [24] Sanjaya, Wina. 2009. *Penelitian Tindakan Kelas*. Jakarta: Kencana Prenada Media Group.
- [25] Semil, R. (2006). Enchancing Thinking Skills in The Classroom. *Human and social Sciences Journal*. Volume 1 :28-36.
- [26] Shimada, S., & Becker J. P. (1997). *The OpenEnded Approach.A New Proposal for Teaching Mathematics*. Virginia: NCTM.
- [27] Tim MKPBM UPI.2001.*Strategi Pembelajaran Matematika Kontemporer*. Bandung: JICA-FMIPA Universitas Pendidikan Indonesia.
- [28] Wahidmurni. 2008. *Penelitian Tindakan Kelas Pendidikan Agama dan Umum dari Teori Menuju Praktik Disertai Contoh Hasil Penelitian*. Malang: UM PRESS.
- [29] Yusuf, Mariska.2009. Pengembangan soal open ended pada pokok bahasan segitiga dan segiempat di SMP. *Jurnal Pendidikan Matematika* Volume 3. No. 2 desember 2009.