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The Problematic Use of Open-Ended Approach in Mathematics Learning in Elementary School

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ABSTRACT

This study is motivated by the emergence of problems experienced by teachers in using the Open-Ended approach in learning mathematics in elementary schools. This study aims to describe the obstacles faced by teachers in implementing mathematics learning using an open-ended approach in class, as well as provide solutions that can be done as an effort to overcome the obstacles encountered. This research used descriptive qualitative method. The data analysis technique used is the Miles and Huberman data analysis technique which goes through data reduction, data presentation, and verification. This research was conducted at SDN 13 Parit Putus, Ampek Angkek District, Agam Regency. The results showed the problems experienced by teachers in using the open-ended approach in learning mathematics in elementary schools.

Keywords**:** Problematic; Open Ended Approach; Mathematics Learning; Elementary School

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1. INTRODUCTION

Education plays an important role in efforts to develop a society that has technological and media skills, communicates effectively, thinks critically, solves problems well, and cooperates with each other

(Sulianto et al., 2019). Education has various fields of study that are taught at school by teachers as educators and students as learners. The development of science and technology requires individuals who are creative, logical, consistent, develop ideas, critical, and able to work together. One of the fields of science in education that is in accordance with the demands of the times is the field of mathematics in elementary schools (Rahmadani, 2020) (Wahyuni & Palupi, 2022).

The demands of the 21st century require an educator to prepare graduates who are able to live independently and play a role in their environment. After graduating, they are able to face the challenges of an increasingly globalized world. This requires critical thinking, independence, and discipline. In an increasingly digital world, learners need a variety of skills such as innovation and creativity, collaboration and communication skills, research skills and information fluency, critical thinking, problem solving and decision making, as well as digital literacy and technology utilization (Halimah, 2022). Most curricula in developed countries include these 21st century skills as expected learning outcomes for learners. So it is not only focused on knowledge, but also prioritizes skills and creativity.

The same applies to the independent curriculum. The independent curriculum is interpreted as a learning design that provides opportunities for students to learn calmly, relaxed, fun, stress-free and pressure-free, to show their natural talents. An independent learning curriculum means giving students the freedom to learn, discuss, respond, and be active during learning (Nasution, 2021). Independent learning focuses on freedom and creative thinking. With the existence of an independent curriculum, it is a rearrangement in the national education system in Indonesia, which (Yamin & Syahrir, 2020) suggests that this statement is in order to welcome changes and progress in the nation in order to adapt to changing times. Changes in the learning system certainly also occur in mathematics learning.

Mathematics is a science that cannot be separated from problems and their solutions. In practice, math learning is displayed in the form of problems with a certain level of difficulty that require solving (S. Lestari, 2021). All fields of life require mathematics in their application and are influential in the development of science (Utami et al., 2020). Mathematics also teaches how to think critically and analytically, and systematically in solving problems that arise in various fields of life (Hamidah & Ain, 2022) (Wanelly & Fauzan, 2020). Here the teacher's role is to encourage students to arouse curiosity and understand student differences so that the teacher can find the right method in learning (Samaratungga et al., 2021). Students who are encouraged to have high curiosity will become individuals who are interested in continuing to explore knowledge and find solutions to various problems found.

The mathematics curriculum used in elementary schools contains dense mathematical material. Learning mathematics requires not only students' reasoning power but also requires understanding skills. Students need maturity of thought to solve complex mathematical problems (Murdiana et al., 2020). Some students think that math material is difficult to solve, less interesting, and boring (Amallia & Unaenah, 2018). In addition to the difficulty of math lessons, students also find problems experienced

in the implementation of mathematics learning. One example of problems in learning mathematics is the low problem solving ability. This low ability affects learning outcomes and student attitudes towards learning mathematics (Sintawati et al., 2020).

In its implementation, mathematics learning requires students to solve problems using formulas and requires reasoning (Wahyudi & Marsidin, 2019). Mathematics learning is one of the most interesting lessons to learn and has an abstract object (Anggraini, 2021). Mathematics education is important to learn because it is very useful for solving problems in life. In addition, mathematics education contains rules that are useful as an effort to develop accurate reasoning so that it can be used as a way of thinking to solve complex problems and requires reasoning and creativity (Agustyaningrum et al., 2022).

Students need an open-ended math problem solving activities. The open-ended approach provides opportunities for students to solve math problems openly and deeply, developing student's abilities in construct math problems creatively and students will have their own understanding in solving math problems (Utami et al., 2020) (Wulandari et al., 2020). Open ended approach is an approach that is able to provide opportunities for students to think freely, critically, creatively, actively and innovatively in problem solving activities based on their own ways (Situmorang, 2022) (Sihombing et al., 2021). The open ended approach requires students' way of thinking to be open. Students are directed to arrive at the answer, not just looking for the right or correct answer, the correct answer can be more than one (Aedi, 2018). The open ended approach makes it easier for students to solve math problems through varied answers and strategies (Hendriani & S, 2023) (Febriani et al., 2021). Learning using this approach builds students' creative activities and develops students' mathematical thinking patterns simultaneously (Happy et al., 2020).

In addition to making it easier for students to solve math problems, the open ended approach also has advantages as an approach that fosters students' positive attitude towards mathematics. The approach used by this teacher will make students more open in receiving and solving the material and problems presented. Students will be encouraged to present creative and different ideas in learning (Dwipayana et al., 2018). In its application, the Open-Ended approach begins with presenting open ended problems. Furthermore, this approach will provide experience to students to find new and diverse answers or solutions (Raharjo et al., 2020). The steps of the open ended approach are 1) Introduction or orientation; 2) Presentation of the problem; 3) Individual problem solving; 4) Group discussion; 5) Appearance of discussion results; 6) Closing (Febriani et al., 2021).

This study aims to describe the obstacles faced by teachers in implementing mathematics learning using an Open-Ended approach in class V SDN 13 Parit Putus. The importance of this research was conducted to see the low reasoning ability and creativity of students in solving mathematical problems caused by students not being accustomed to learning mathematics by using open-ended problems because teachers very rarely use an open-ended approach that uses open-ended problems in learning activities. So this research was conducted to see and examine what obstacles are faced by teachers as

well as provide solutions that can be done as an effort to overcome the obstacles encountered. This research will be a guideline for teachers in applying the open-ended approach in mathematics learning.

2. METHOD

The type of research used is qualitative. Furthermore, the research design is descriptive qualitative research. Qualitative researchers seek meaning, understanding of a phenomenon, event or human life by being directly or indirectly involved in the setting studied contextually and thoroughly (Harahap, 2020). The focus in this research is the problematic of teachers in implementing mathematics learning with an Open-Ended approach in elementary schools, especially high grades.

The research data were collected through in-depth interviews, observation and documentation. In-depth interviews were conducted with informants to explore information about the implementation of mathematics learning in their respective classes and the various difficulties faced by teachers. Observations were non-participatory. Observations were made to see how the application of the Open-Ended approach in learning mathematics at SDN 13 Parit Putus. Documentation from this study are (1) photos of teacher activities when teaching mathematics and some examples of practice problems done by students, (2) brief identity of informants, (3) videos and interview transcripts.

The data used in this research are secondary data and primary data. Primary data was obtained from interviews that researchers conducted with informants who are high grade teachers at SDN 13 Parit Putus, observing the object of research, and documenting through photographs. Secondary data was obtained from interviews and various theoretical sources related to the research problem.

The data validity test is conducted with a triangulation test which is a technique that can be done by researchers to collect research data by combining various techniques with available data sources (Guntur & Aliyyatunnisa, 2020). The data analysis technique used is the Miles and Huberman data analysis technique which goes through several stages starting from data reduction, data presentation, and verification. The reduction stage includes summarizing activities, selecting the main things, and determining the focus related to the research topic. The data presentation stage is a description of the data that has been collected. And the last stage is verification which is drawing conclusions to find the meaning of the data obtained (Apriadi, 2023).

3. RESULTS & DISCUSSION

SDN 13 Parit Putus is an elementary school located in Parit Putus, Ampek Angkek District, Agam Regency. This elementary school is accredited A. In 2022 this school implemented the independent curriculum for grades 1 and 4, and the 2013 curriculum for grades 2, 3, 5 and 6. Based on the results of observations, questionnaires and interviews with high grade teachers in carrying out mathematics

learning activities with an Open-Ended approach, there are several problems experienced by teachers. The following is a description of these problems.

The first problem found was that teachers at SDN 13 Parit Putus still had difficulties in applying the open ended approach in accordance with the theory and steps of open ended in the learning process. This can be seen from the statement of one of the teachers "I often give math practice problems that are open-ended, where one problem can produce several different answers or solutions, but in giving assignments it is the same as other problems, there are no different steps for certain activities".

When referring to the theory of the Open-Ended approach, the learning steps conducted with the open ended approach are the start of learning by the teacher by introducing open-ended problems. The teacher ensures that each student understands the given problem. Furthermore, the teacher will ask students to solve the given problem through groups or personally. In this problem solving activity, students will show how to solve the problem with their own solutions and ways. Meanwhile, the teacher will make a thorough observation of student activities and ask students to write and detail the answers that have been done on the board, with the aim that other students can see and understand. In the next step, the teacher and students will compare the diverse and varied answers that have been given and discuss the variations of answers. Next, students will be asked to write down the things they have learned in order to make it easier for the teacher to assess the effectiveness of the learning. Finally, the teacher concludes the lesson and assesses the students' learning process.

In summary, the steps of learning with an Open-Ended approach are as follows (Aras & Tarakan, 2021): 1) The teacher introduces an open-ended problem to students; 2) Students solve the problem with various answers, the teacher is in charge of supervising the course of learning well; 3) Students write down answers and conduct discussions; 4) Students are asked to write down the things they have learned; 5) The teacher summarizes the learning; 6) Teacher conducts assessment. However, from the answers given, it can be seen that teachers do not fully know about the steps of the Open-Ended approach applied in learning. Teachers only know that the Open-Ended approach is used in solving open ended problems. But the teacher only gave the problems without following the steps of the Open-Ended approach.

The second problem in conducting mathematics learning using the Open-Ended approach is the limited experience and limited time for teachers to design open ended problems. Teachers have not been able to design their own Open-Ended problems so they only use the problems found in the package book, LKS, or problems obtained from the internet. The lack of variety of problems owned by teachers makes the implementation of the Open-Ended approach still rarely implemented in mathematics learning. This can be seen from the following excerpt from the interview with the teacher: "Making questions is not an easy thing for me, because in compiling the questions I have to review the competency standards, basic competencies, indicators, and learning objectives, then make a question grid so that the questions written are really effective to see the achievement of learning. The questions that I have made also need to be reviewed whether they are in accordance with the indicators and the

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level of difficulty can be reached by students, plus this Open-Ended problem has a variety of answers or solutions, I find it quite difficult to design these questions ".

The third problem is the low level of students' reasoning ability which impacts on the limited time to conduct learning activities with an Open-Ended approach. The following is an excerpt from an interview with the teacher "Open-Ended problems require reasoning in solving, so to solve just one problem students need quite a long time. To understand story problems, especially those of HOTS nature, students still need to be guided so that they can understand the intent and purpose of the problem". The answer given by the teacher is actually very much in accordance with the reality and data encountered, students' numeracy literacy skills are still low, so to solve math problems their reasoning is still difficult. This can be seen from the results of the Minimum Competency Assessment in 2022 which was attended by all grade V elementary school students. The following is the education report card of West Sumatra Province in 2022.

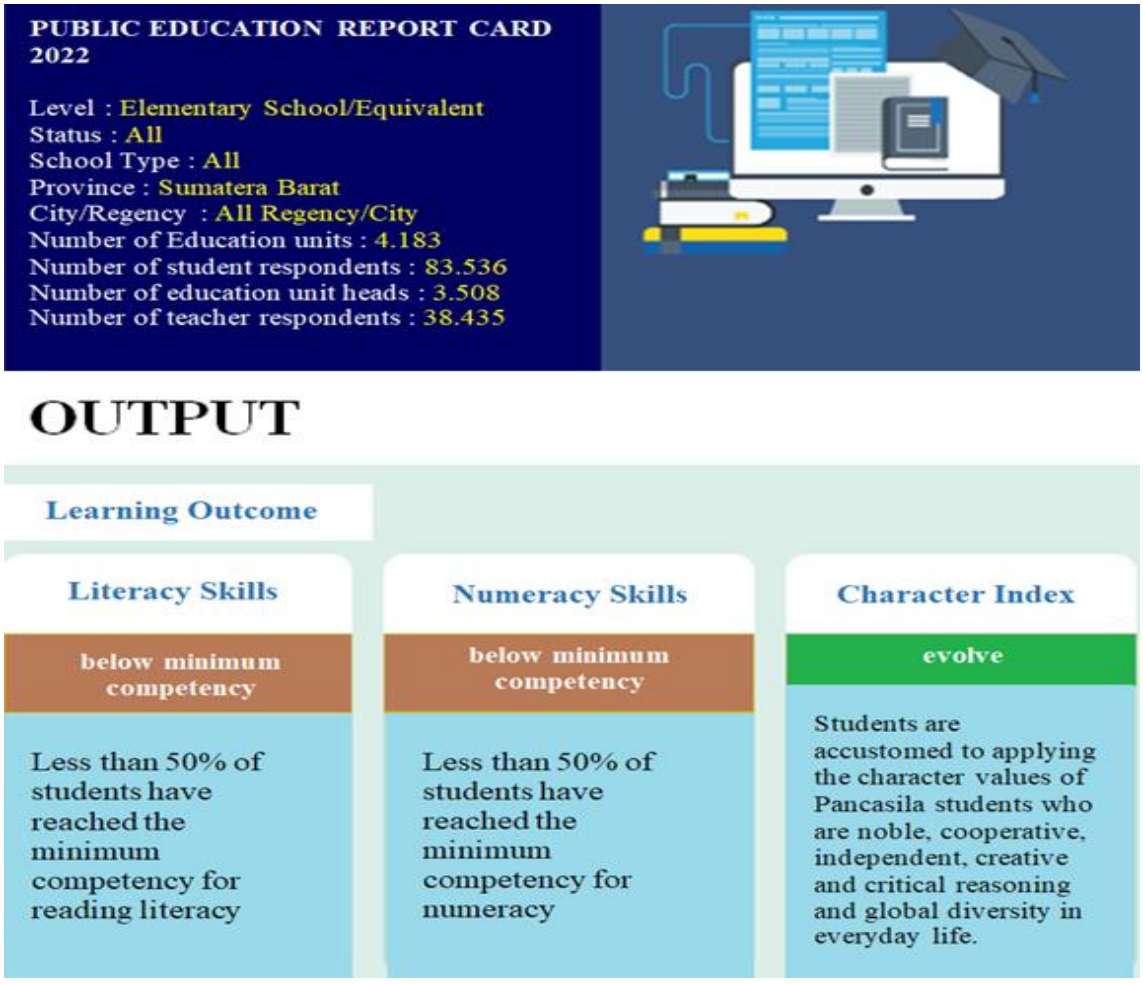

Figure 1. Education Report Card of West Sumatra Province in 2022 from the official website of the Ministry of Education and Culture Research and Technology

So, the problem of numeracy skills is not only found at SDN 13 Parit Putus, but is an overall problem for Indonesian education.

The fourth problem is in evaluation activities, after the implementation of learning using this Open-Ended approach, the teacher will conduct an assessment of learning. Here the teacher's problem arises in doing this activity. Teachers have a lack of understanding in terms of assessing the Open-Ended tasks that students have done. The assessment of Open-Ended tasks is done by requiring a special scoring rubric that is different from the assessment of ordinary problems. This is because one given problem can produce varied answers that cannot only be assessed with a correct or incorrect predicate.

The scoring rubric that can be used by teachers in this Open-Ended approach is a 4 or 0 - 3 point scale. The explanation of this assessment shows in table below (Scoring, 2008):

Table 1. Scoring Rubric in Open Ended Approach

No	Points	Explanation
1.	3 points	The student will get 3 points if the student gives a complete response and shows an understanding of the concepts in the given problem. The student describes in detail and clearly the answer to the question so that it is easy to read and conclude, but there may be minor errors made by the student
2.	2 points	The student will earn 2 points if the student provides a sufficient response and understanding of the problem. The answer given by the student may have minor errors, but it is still easy to understand and conclude
3.	1 points	The student will earn 1 point if the student provides a limited answer and understanding. The answer detailed by the student is incomplete and may contain considerable errors. This also allows for some difficulty in understanding and inference
4.	0 points	The students will get 0 points if students do not understand the problem and mathematical concepts. Students make major mistakes in detailing the answers, so the answers given are classified as difficult to understand and conclude

This problem can be seen from the answers to the interview results stated by the teacher "I still don't understand about open ended assessment by scoring students' answers. Usually, I only give open-ended problems for examples which we will then discuss together, after that we write the various answers found on the board for students to copy in their books. So, this question is not used as an exercise that will be assessed as a daily grade.

The fifth problem is that there are no teaching materials owned by teachers that contain learning with an open-ended approach that can be used by teachers as guidelines in applying the open-ended approach in learning. All teachers interviewed stated that "If there are teaching materials that contain the steps of Open-Ended activities equipped with materials and practice questions then it would be very easy for us to use this approach more often in learning because we can directly follow the guidelines contained in the teaching materials".

Considering the advantages of the open ended approach for learning mathematics in elementary

schools, the author provides several solutions related to the problems experienced by teachers, as follows: The solution to the first problem, namely the limited understanding of teachers regarding the open ended approach, teachers need to further improve their competencies and must be able to apply various learning variations that are in accordance with student learning development, teachers must be creative and always open to new knowledge in order to improve their competence. Because creative and innovative teachers will be able to produce generations of nations who are also creative and innovative and able to think critically in facing the times (Putu, 2022). This ability to be innovative and creative will be needed not only to keep up with the times, but also to face the increasingly advanced world of competition. Literacy and 21st century competencies require teachers to have basic literacy skills that can be an asset for teachers to present learning that is more varied, creative, innovative and not monotonous which only relies on one learning method so that it often makes students not develop optimally (Mulyasa, 2021). Learner development that does not go well will interfere with the learning process, causing gaps between students.

The solution to the second problem, namely limited time in designing learning activities and open-ended questions, is to maximize the activities of teachers' working groups in schools, clusters and sub-districts. KKG is a form of continuous professional development for teachers which is a forum for various teacher activities and basically aims to respond to developments in science and technology that demand adjustments and professional development of teachers. Through this forum, teachers can communicate, consult and share information, tasks and experiences (Faozan Ahmad, 2022). In addition to sharing ideas through the KKG forum, teachers can also work together and share tasks in developing lesson plans with an open-ended approach and designing questions with more effective time.

The solution to the third problem, namely the low reasoning ability of students so that it impacts on the limited time to conduct learning activities with an open ended approach, is by making habituation and consistently giving non-routine problems in mathematics learning, this is in accordance with (Turmudi, 2008) who states that mathematical reasoning is a brain habit that like other habits must also be developed consistently. In general, mathematics lessons require a mathematical reasoning ability in order to obtain the right solution to mathematical problems.

The solution to the fourth problem, namely the lack of teacher ability and understanding of open ended learning evaluation, is to familiarize teachers to always collaborate with peers to share knowledge and make it easier for teachers to develop appropriate evaluation instruments. Collaboration for teachers plays a role in improving teacher competence including the competence of knowledge, skills, and teacher experience which ultimately acts as a support for teacher performance in improving student learning achievement (Kasmawati, 2020). A teacher who lacks a competency will need help from other teachers to improve the competency that must be mastered, and vice versa. Good teacher collaboration will produce competent teachers.

The solution to the fifth problem, namely the unavailability of Open-Ended teaching materials

that can help teachers and students in learning activities, can be overcome by teachers developing teaching materials that refer to the steps and open ended problems. Teachers' skills in developing appropriate teaching materials can help students' reasoning process to understand concepts (Nurfatanah et al., 2018), develop students' understanding, and can provide students with motivation to foster creativity in thinking using mathematical procedures. Teachers can improve their skills in developing teaching materials through various activities such as seminars.

The contribution of this research to the development of education is the knowledge that can be obtained by teachers in applying open ended methods in learning mathematics in elementary schools. Teachers know the problems experienced and the right solution to overcome these problems. Open ended learning helps students to improve their creative thinking skills and increase student activity (Utami et al., 2020). Creative thinking will bring up ideas and strategies that are appropriate and diverse for solving mathematical problems (Lailatul Auliah, Syaiful, 2020).

The implication of this research is the emergence of a new mindset for teachers in implementing learning. Teachers are more open in accepting and implementing changes for the advancement of education. Teachers will be better able to choose the right learning approach to use (S. P. Lestari et al., 2019). Open ended learning creates an active and creative mathematics learning atmosphere. Through the approach chosen by the teacher, it will provide a great opportunity for students to practice abilities that are relevant to the learning needs (Febriani et al., 2021).

4. CONCLUSION

Based on the explanation of the research results above, researchers found problems experienced by teachers in implementing mathematics learning using an Open-Ended approach. The open ended approach provides an opportunity for teachers to become facilitators who can develop students' creative thinking skills, increase student activity, and increase students' understanding of the mathematics material studied. The researcher found five problems experienced by teachers in applying the open ended approach in mathematics learning, namely the lack of teacher understanding of the steps of the approach, limited experience in designing open ended problems, low student reasoning skills, lack of teacher understanding of the assessment of open ended tasks, and the absence of teaching materials that contain the open ended approach.

The open ended approach provides opportunities for students to think freely and come up with creative ideas in solving mathematical problems. Students are able to provide varied solutions based on their abilities. In the end, this approach will make it easier for students and teachers to represent mathematical problems appropriately.

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