

An Analysis *Experiential Learning* on The Mathematical Critical Thinking Ability in Primary School

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Abstract. Learning process that can achieve the goal of education can be done by using the appropriate models, methods, and approaches in the learning process. The purposes of this research are to know learning process in the class and the problem about of critical thinking ability of elementary school student in mathematics and to offer some solutions. This research employs qualitative research method focusing on Experiential Learning which can play a role in developing critical thinking skills of elementary school students. Mathematics is considered as difficult subject which requires good reasoning skills. The result of pretest in V grade students in Islamic elementary school Cokroaminoto Surakarta shows that 85% of students get lower score than minimum mastery criteria with an average of 42,083 in solving mathematics problems. In addition the results of pretest, researchers also conducted observations and interviews on teachers and students. It's found that students are less motivated and consider mathematics as a difficult subject. Teachers also tend to use traditional methods. As a result, it is needed to implement an appropriate learning method to cultivate students' interest in learning and stimulate students' critical mindset. Experiential learning method done by the teacher with presenting the real object to provide experience to students. The experience of learning mathematics is expected to help students solve problems in learning mathematics that requires good critical thinking skills. This study consists of abstract, introduction, research method, result, discussion, conclusion, acknowledgements and reference.

Keywords : *Experiential learning* , critical thinking ability. mathemathics

INTRODUCTION

Education is a must-have for individuals, in every dogma it explains that every individual should strive to get an education. Education not only plays a major role in the nation's progress but also related to competitive between countries, education should be seen to accommodate the public for a country to have quality human beings. According to Law no. 20 the year 2003, it contains several national education goals, one of the goals is to develop the potential of learners to become creative. One of the lessons that students find difficult and boring is the subjects of mathematics. Mathematics is one of the basic lessons taught in schools and students are taught in formal and nonformal education.

In mathematics, formal education is studied from elementary to university level. Mathematics as a deductive science, in learning, is not enough with memorization and reading but requires thought and understanding. That mathematics have a role as a symbolic language that is a scientific means in developing logical thinking in individual self. Mathematics is one of science that is very useful to solve the problems in everyday life and play an important role in the development of science and technology. [1]

The process of mathematics learning requires good critical thinking skills, so how to convey mathematics learning must be creative and innovative. So that students are interested and happy in learning mathematics. One of the capabilities students need in completing the subject of mathematics is the ability to think critically. [4] That critical thinking is concerned with reasoning, reasoning, and evaluating reasoning as well as possible.

Meanwhile, [4] he reveals that critical thinking can be interpreted into several meanings: (a) as an attitude to consider a matter or problem by considering, with problems that exist within the reach of people's experience, (b) as knowledge of methods of logical investigation and reasoning, and (c) some skills in applying such methods. Revealed that one way to improve students' thinking ability is to facilitate students through challenging activities and use appropriate modeling strategies in primary schools [12].

So, in bridging the critical thinking ability of children increases, a teacher needs to apply a model or method of learning that can encourage students' critical thinking skills so that students will and enthusiastic in following mathematics learning and the value or purpose of learning can be achieved as planned. If the assumption of students' maths tedious and difficult has not been lost on students' mind, then the results of student learning mathematics will always be low. So, it needs a method or learning model that makes math fun.

Development of students' abilities, such as memory, creativity, and sensitivity to achieve knowledge [1]. It can be argued that experience education emphasizes the important role of experience through the learning process [1]. In this way, students are able to utilize the results of discoveries and experiments in learning through observation and interaction, and simultaneously students explore the real world from their personal interests or learning tasks [1]. So in developing the critical thinking skills of primary school age students can use Experiential Learning model or learning that emphasizes the student's experience. Teachers provide or grow a real thing as a student experience as a basis for students to foster students' critical thinking skills. Because the primary school-age students' stage of thinking still uses the idea of reality instead of abstract.

Experiential Learning is a learning method that focuses on the experience of children by exploiting their environment and benefiting from the environment [6]. In moving the spirit of student learning, the learning process that can be accepted students occur when students have experienced information before acquiring learning materials to be learned [7]. [7] that Experiential Learning is a learning process that uses the experience as the core of learning. In addition, Experiential Learning is a learning that is done through reflection and a meaningful process of direct experience which is experienced by students. This method focuses on the capabilities of each individual. Meanwhile, [11] suggest that experience may underlie all learning but that does not always result in a learning, we must engage and cultivate that experience into a good learning outcome through reflection.

[6] The stages of children using learning activities through Experiential Learning starting from the first stage, the children are actively involved, then the second stage of the children directly involved with materials and tools found in the surrounding environment. The third stage, in this stage, children begin to find ideas to test and use these ideas. Meanwhile, [7] the stage to conduct Experiential Learning must go through four stages, experiencing, reviewing, concluding, and planning. Learning method to be studied the role of its implementation in the learning process is the method of Experiential learning that is a method by bringing the real object to provide experience to students, so students brought the real world is not only using the lecture method.

Besides referring to previous research studies [6], the equation in this study is the use of experiential learning. The difference is applied to knowing and for the development of professional teachers to be able to make lessons meaningful. This qualitative study was conducted to observe the behavior of professional teachers in Ireland who applied experiential learning in the learning process and proved the use of this method of learning objectives can be achieved both in terms of motivation and student learning outcomes.

Furthermore, the previous relevant research [10], the equation with this research is experiential learning method. the difference of this research on the creative thinking variable of junior high school students and using quantitative research. In this study shows that there is an increase in the experimentalized gain test in the experimental class of 0.52, there is an increase in creative thinking ability in the experimental class with a moderate level. The standardized gain test of control class is 0.28, there is an increase of creative thinking ability in control class with low level. The test results of the average of these two classes obtained a significant value of 0.00. This value is smaller than the level of the significance test is 0.05 which means H_0 rejected and H_1 accepted. So, there is an increase in students' creative

thinking ability by applying Experiential Learning rather than using only conventional learning. So Pebriani's research was declared successful.

The innovation in this research is the study of the implementation of *Experiential Learning* method in improving students' critical thinking ability in learning mathematics of primary school students, especially in this research is the students of class V.

METHOD

This research uses qualitative research method of study case type by doing observation and literature study to find out the problems that happened in primary school and to know the readiness of implementation of mathematics learning practice which implemented by the teacher when applying of learning method in an effort to improve students' critical thinking ability. In addition, researchers also conduct studies of theories of experts and relevant research to be a material consideration of the suitability of learning methods used by teachers in providing solutions of learning problems. Subjects in this study have classroom teachers and students, teachers named Mulyadi (a pseudonym), a teacher at a private school in Surakarta City, Central Java. He is 53 years old from Java. And a student of 24 consists of men and women. Mulyadi is a senior civil servant and has educator certificates issued by the Ministry of Education. This study was conducted in the academic year of 2017/2018 at one of the primary schools in Surakarta.

The data obtained through interview, observation, and pretest. The score of students' critical thinking ability is seen from the score of pretest result about mathematics subject. The result of pretest in grade V students in Cokroaminoto Islamic Elementary School Surakarta shows that there are 85% of students get less value than KKM with an average of 42,083 in solving math story problem. The data about the use of teaching methods used by teachers obtained from the results of teachers' interviews and students along with the results of observation of the learning process conducted by teachers. Observation of the learning process is used to determine the process of mathematics learning applied by the teacher. Only a few sessions were recorded to obtain data about the mathematics learning process by teachers in knowing the critical thinking ability level of primary school students in grade V. Interviews were used to find out the learning method used by the teacher and to know the difficulties experienced by the students.

Data analysis technique used in this research is interactive model technique (interactive model). This analysis technique is done by four stages according to Miles and Huberman [13] is data collected, data reduction, data display, and conclusion. Research of collect data is to find out the process of learning that exist in the field then do a review of theories about learning methods in accordance with the problems then with the teacher to determine the solution. Once the solution is found, then look at the result of the role of the applied method based on its usefulness in troubleshooting.

RESULT AND DISCUSSION

The results of this qualitative study were obtained through several data collection techniques. Researchers conducted interviews, pretes, and observations in Cokroaminoto Islamic Elementary School Surakarta for several days with the aim to know the process of mathematics learning students of grade V of primary school. The first day of study was conducted on January 3rd, 2018 by interviewing teachers and students first. The results of interview problems experienced by students are on the subject of mathematics less motivated students while learning takes place. In addition, learning tends to focus on the teacher, the teacher explains the material with the lecture method and then assigns the task by working on the question on the student worksheet.



FIGURE 1. Observation and Interviews about Mathematic Learning Process

[2] Indicators of students' critical thinking skills are listed in the table below:

TABLE 1. Indicators of Critical Thinking Skills (Ennis, 2011)

No.	Indicator of Critical Thinking Ability
1	Find a problem or focus the question
2	Be able to analyze arguments
3	Be able to ask questions and answer questions
4	Be able to determine the credibility of a source
5	Be able to observe a report
6	Be able to make a difference material
7	Be able to make and decide important factors in making decisions
8	Decide on a definition of theory
9	Be able to associate by using the abilities
10	Have sensitive feelings
11	Be able to determine an action to solve the problem

[2] Indicator of critical thinking ability for primary school age students can be modified according to students' needs. Modification of indicators of critical thinking skills in mathematics learning of grade V students of primary schools among others as follows:

TABLE 2. Modified Indicators of Critical Thinking Ability on Mathematics Learning of Grade V Elementary School Students

No.	Indicator of critical thinking ability
1.	Students are able to focus on questions. Students are able to identify and formulate questions relating to math material well according to the material and consider the possibility of the correct answer.
2.	Students are able to analyze arguments. Students are able to identify questions and be able to make a summary of mathematical material that is studied appropriately and the right argument.
3.	Students are able to ask questions and answer questions. Students are able to make questions related to math material clearly and provide answers and explanations appropriately.
4.	Able to observe a report. Students are able to respond to reports or answers given by other students appropriately.
5.	Determining an action. Students are able to express the problem according to the material and provide the solution or answer in the mathematical problems that exist appropriately

Then to support the data, the researchers on the second day do the pretest using the story related to mathematics material that is being studied by the students. Before working on the problem, teachers provide guidance in pretest workmanship. Furthermore, individually students do the pretest given. Based on the pretest results, it can be seen there are only 3 students who score above the criteria for completeness of a minimum of mathematics learning. The following data pretest results of students of class V Cokroaminoto Islamic Elementary School Surakarta about the ability to think critically on mathematics learning.

TABLE 3. Pretest Result of Grade V in Cokroaminoto Islam Elementary School Surakarta

Number	Name	Score	Information
1	AA	33	TL
2	NSN	37	TL
3	APP	33	TL
4	FDY	33	TL
5	FHR	20	TL
6	MJH	47	TL
7	DMS	27	TL
8	AAS	27	TL
9	DAS	47	TL
10	RA	53	TL
11	SAA	53	TL
12	MAJ	53	TL
13	HH	27	TL
14	ABA	33	TL
15	MPTS	33	TL
16	EA	47	TL
17	FAJ	60	L
18	YSF	40	TL
19	NAAK	53	TL
20	AHP	40	TL
21	FNA	47	TL
22	AAP	67	L
23	ANL	67	L
24	FSI	33	TL
Jumlah		1010	
KKM		60	
Rata-rata		42,08333	

Based on pretest result data in Cokroaminoto Islam Elementary School Surakarta can be known from the number of students of grade V that is 24 students who pass the KKM (60). there are only 3 people who pass the KKM and the average class is 42,083.

In the next day, the research was done by observation on the process of mathematics learning in the classroom. At the beginning of the teacher's learning greeting then convey the purpose of learning to be achieved. Then, the teacher gives the material by using the lecture and question and answer method. The teacher in front explains the material by writing the formula and the material on the board. After the explanation is completed, the teacher gives the students the opportunity to ask about the material that is not clear yet. But, all the students don't ask about learning materials provided by the teacher. Students tend to be passive and as recipients of material only without any feedback. After giving the teacher question and answer opportunity, then give an assignment to the student which is on student worksheet and package book. Individually, students do the questions, there are some students who are still confused, so there are still students who work together and ask each other with friends. Then after all the students have completed the tasks assigned by the teacher, the student's work is corrected together in exchange for their seatmate. After being corrected it can be seen the results of a student with low math score, it indicates that the expected learning objectives have not been achieved. The teacher does reflection on the learning process of mathematics in grade V after

implementing the lesson. Together with researchers and through various teacher literature studies determine the solution to apply to mathematics learning. The solution is given to applying the experiential learning method that is the method of presenting the real experience of the students, the students are trained to active learning by observing the object presented by the teacher.

The research on the next day on January 6th, 2018, teachers apply *experiential learning* method. The stages of students in learning by using the *Experiential learning* method is done through four stages [7]. The first stage is *experiencing*. *Experiencing* is giving experience and exploration of students to new experiences. Then, the second stage is *reviewing*. *Reviewing* stage is the stage that students are able to communicate the results of their new knowledge from the learning experience. Next is *concluding* stage, *concluding* is the conclusion of the learning that has been obtained by the students. And the last stage is *planning*. *Planning* is the plan to overcome the lack of learning result experienced by students. In the application of *experiential learning* method, teachers bring objects by learning videos, students look enthusiastic when the teacher convey the learning objectives and will play the learning video (*orientation*). When the learning session has begun and the video learning is showing, the class' condition starts to be conducive. Students observe and pay attention to learning video well (*experiencing*). After showing a learning video related to mathematics material that is geometry, the teacher gives the student worksheet. The question that exists on the student worksheets related to the material that has been delivered. As individually, working on the questions that have been given, it appears that there are only a few students who still ask their friends. While the other students have been doing their own task. Then the students are asked to explain the answer and the other students listen to it (*reviewing*). Then after knowing the random answers from some students, students and teachers conclude the correct answer and the use of the correct formula (*concluding*). Furthermore, for the remaining students who have the wrong answer asked to learn again with a lot of reading and studying at home (*planning*). After the time is over, the task is gathered and the teacher closes the learning session by drawing conclusions about the learning process and giving the closing greetings. Teachers correct the learning result, it can be seen that almost 59% of students get a score above KKM. This shows that with *experiential learning* method students are more motivated, enthusiastic in following the learning of mathematics. Besides, the active student learning is able to improve students' critical thinking skills in mathematics.

This shows that Experiential Learning is a learning method that emphasizes the children's experience by utilizing the role of the environment [6]. In moving the spirit of learning to students, an effective learning process is when students have received experience and also information before acquiring learning materials to be learned [1] while from the other argument of critical thinking that critical thinking is concerned with reasoning and evaluating the reasoning as good as possible [4]. So, the learning process by using experiential learning method is suitable to use in mathematics learning which emphasizes students exploration. Exploration is done in several ways. One of them is learning by using *experiential learning* method by giving direct experience, that is students are presented as a real object then students are asked to observe, think, make a reason, explore, and develop the material obtained according to their understanding. In that case, the teacher invites students in developing activities of the ability to think critically on learning mathematics by students. Then at the end of the mathematics lesson, the teacher evaluates by making a question (story question) and asking the students to come forward to answer. This is done to determine the response of students if the students' enthusiast to compete to answer many questions and the results of the students are correct it can be said *experiential learning* method is instrumental in improving the ability to think critically on mathematics learning.

Based on the observations of the researchers, students' enthusiasm when using experiential learning method is bigger than using traditional methods only and teachers as the main source in the learning process. Basically, a good learning should emphasize the active students in learning and teachers as facilitators. This is supported by the opinion of the experts who say that education is obtained not only by listening to words but also by the students' own experiences on the environment [2]. Basically, every individual has the ability and advantages of each depending on how the teacher in developing students' skills to become better. With the use of *experiential learning* method that emphasizes direct experience to the students, students are asked to explore the material which is presented more fun and easily understood by students than students that only think abstractly from the lecture method used by the teacher. So it can be said that *experiential learning* method plays a role in improving students' mathematical thinking skills.

Mathematics learning is a learning that combines the use of reasoning power, critical thinking, and knowledge of mathematics itself so that in mathematics learning is more emphasized in the process of exploration and investigation of mathematics by students [3].

The implementation of the steps of *Experiential Learning* in learning the ability of critical thinking from the experience stage that students are given experience by the teacher by invited to experience directly using the senses,

both sense of touch, sight, smell, and hearing by watching the media brought by the teacher. Next stage is a *review*. In this stage, students are given the task to creative and imagination according to their respective abilities. The third stage is *concluding*. Concluding is the stages for students to apply their imagination based on experience after seeing the real media and giving the task given by the teacher to solve the math's question problem. Indicators achieved by students are able to provide arguments or opinions and at the same time able to ask and answer questions based on the results of the *review* stage. The last stage is planning, this stage is the last stage as a form of further steps of the learning process, so students are able to determine the less action and improvement steps made from the results of mathematics learning, at this stage, students will perform indicators of critical thinking skills in determining an action that must be done when facing a problem. So in overcoming the problems that occur in the field of low students' critical thinking skills and based on the observation of experiential learning methods play a role in the implementation of learning methods to improve the critical thinking skills of grade V elementary students in learning mathematics.

After learning using the experiential learning model the results of the students can be increased from the showed learning activities that the students score at the beginning is low, besides it, the students do a lot of their own activities and like to talk with their friends in the use of experiential learning models. In addition students also work on the questions on the student worksheet well. Of the 20 questions, there were an average of 5-7 questions that were wrong, this showed that besides the level of student boredom decreased, also the results of student learning increased.

CONCLUSIONS

Critical thinking is the thinking ability that concerns reasoning, giving a reason and evaluating reasoning as well as possible. In critical thinking requires constant efforts to test one's beliefs or the expected form of knowledge based on evidence to support them and produce good conclusions. So in bridging for the critical thinking skills of children increases a teacher needs to apply an appropriate model of learning to encourage students' critical thinking skills so that students want and enthusiastic in following the learning of mathematics and the value or purpose of learning can be achieved as planned. One suitable model is *Experiential Learning*. *Experiential Learning* is a learning process that uses experience as the core of learning. In addition, *Experiential Learning* is a learning that is done through reflection and a meaningful process of direct experience experienced by students. This method focuses on the skills or abilities of each individual.

Stages of the child's use of learning activities through *Experiential Learning* starts with children actively involved with the exercise of sensory organs and the development of their physical coordination. Then the child is directly involved with the materials and tools found in the surrounding environment, then the child's stages begin to find ideas to test and use these ideas. Based on previous research results, *Experiential Learning* appropriate to be used to develop students' thinking skills. Good critical thinking, creative, and analysis. Because the learning of *Experiential Learning* invites students to explore what has been owned and stored in the mind of students and then developed through the problems or students' problem can solve the problem according to the experience which they already have.

The results of this study is the application of Experiential learning method plays an important role in developing students' critical thinking skills in learning mathematics in primary schools.

ACKNOWLEDGMENTS

Acknowledgment of the writer for the principal and teacher at Cokroaminoto Islamic elementary school who is willing to give the writer an opportunity to do research. The writer also thank the supervisor, parents, brother, and beloved institution of Sebelas Maret University who always facilitate and guide researchers in making scientific works. Thanks to Icriems which provides experience for writers in making scientific work and assistance in making this scientific work as a media for the realization of this scientific work.

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