

## Mind Mapping to Improve Critical Thinking Skills and Learning Achievement of Elementary School Student

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### Article Info

#### History Articles

Received:

October 2019

Accepted:

November 2019

Published:

January 2022

#### Keywords:

*critical thinking skill,  
learning achievement mind  
mapping,  
problem based learning*

#### DOI

<https://doi.org/10.15294/jpe.v11i3.27773>

### Abstract

This research aims to find out differences of critical thinking skill and learning achievement among students taught by using mind mapping activities. This quasi experimental research used non-equivalent control group design. The sample consisted of 50 students from 2 Primary Schools in Jati, Kudus district. Experimental class with 25 students were implementation problem based learning with mind mapping and Control class with 25 students used conventional learning with mind mapping. The data collection used was performance test. The techniques of analysing data were requirement using variance and N-gain tests. The findings showed that problem based learning model and mind mapping activities could improve critical thinking skill and learning achievement of student. The critical thinking skills in problem based learning classes obtained better than that of the convention class as well as than learning achievements. Based on the results of the study it can be concluded that problem based learning model by using mind mapping could improve critical thinking skill and social study learning achievement of student.

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**p-ISSN 2252-6404**

**e-ISSN 2502-4515**

## INTRODUCTION

Critical thinking skill is a reflective, critical, and creative reasoning activity oriented on intellectual process by involving construction of concepts, application, analysis, and gathered information assessment (synthesis) or created through observation, experience, reflection, interaction, and communication as principle of a belief and action Busthan Abdy (2016).

Critical thinking skill is a reasoning process by involving mental operation, such as induction, deduction, classification, and reasoning. According to Ennis as quoted by Fisher (2009), critical thinking is a logical – reflective thinking way based on reasoning to determine what is being worked and believed. Critical thinking skill refers to an individual's thought in judging validity and righteous of an idea, notion, and perspective and the ability of an individual to share response based on evidence and causal – effect relationship. Morgan as quoted by Suprpto (2008) provided framework about the importance of thinking learning: (1) it is needed to develop supportive attitude and perception to create positive situation in a class, (2) thinking needs to get and integrate knowledge, (3) thinking need to broaden knowledge, (4) thinking actualizes meaning of knowledge, and (5) thinking develops beneficial thinking behaviors.

Wulandari (2011) argued that the reason of poor educational quality in Indonesia is weak learning process. Students' brains are forced to memorize and store various information without understanding them. The impact is when the students graduate from the school, they will be theoretically smart but they have poor implementation. Education at school dominates students' brains to memorize the learning material. The function of education is to facilitate students in constructing their own knowledge about world rather than passively obtaining information.

Based preliminary observation, it was found that the cause of poor learning achievement was critical thinking skill of the students. One of the factors of poor critical

thinking skill was seen in learning activity done by the teacher. The teacher was only asked students to memorize and read the book without trying to develop the learning activity which could develop their critical thinking skill. Critical thinking skill should be developed as early as possible. It was prepared for them to be tough problem solvers, well decision makers, and never – stop learning people. It is in line with Sujarwo's finding (2016) that critical thinking skill at primary school remained poor. Setyowati *et al.* (2011) stated that currently learning process experienced by students remained on transefering knowledge stage. It had not reached thinking skill development to foster independent learners. Creative thinking is not caused by genetic factor but it is obtained through habits done by an individual (Gunantara *et al.*, 2017). Critical thinking skill has not been internalized completely to students so it could not function maximally in society. It was happened because of teacher's incapability to develop learning activity which could improve creative and critical thinking skills.

Basically students are very difficult to understand a material taught by the teacher because of the demands of the teacher to memorize and record all the material provided so that material that should be absorbed and applied by students cannot be absorbed by students optimally so that critical thinking skills and student learning achievement can not increase optimally. A solution to overcome this poor critical thinking skill and learning achievement of the students could be done by creating innovative and creative learning model based on problems through problem based learning with mind mappingto support critical thinking of the learners through problem solving process. Problem based learning is a learning by using problem as the basis to learn. Bidokht and Assareh (2011) explained *problem based learning* is an approach to trigger students in learning through real problem. Therefore, the important elements of *problem based learning* are real – life problem participation, cooperation, and critical thinking question focus from the faced problems so their critical thinking skill would be developed.

Ersoy and Baser (2014) stated that PBL is an active teaching since *problem based learning* depended on students' activeness. The principle of this model is students' awareness to their responsibilities in independently learning and to actively participate in learning process.

Various studies about *problem based learning* showed positive result. Mariani (2014) showed that the average score of learning achievement of control group was 74.99 while the experimental group was 84.37. The result of the control group was not significant because it was lesser than 0.005 while the experimental group was significant. Therefore, it could be concluded that *problem based learning* could improve learning achievement of students. Masek (2011) showed that critical thinking skill and average score of learning achievement of the students were high. On aspect of questioning, it was obtained 58.3%, the data collection aspect 86.7%, presenting discussion 75%, and sharing opinion 90%. The learning outcome influenced significantly to learning achievement.

## METHODS

This quantitative – experimental research used *nonequivalent control group* design. The

procedure of this research used quantitative data. This research was done in two stages: initial stage and quantitative stage. The initial stage consisted of observation, learning and research instrument formulation, and learning and research instrument validation. The instruments of try out question test was used to take experimental and control group data. It was done to find out the validity, reliability, difficulty level, and comparative power of the test questions. The data of try out test was analyzed and revised based on the needs. The quantitative stage covered initial skill test and final skill test of students for both critical thinking skill question, creative thinking skill question, and evaluative question. The data was analyzed quantitatively to find out the improvement of each reasoning skill on each learning aspect.

## RESULTS AND DISCUSSION

### Critical Thinking Skill Improvement

The results were critical thinking skill and learning achievement on cognitive aspect in learning taught by using PBL. It could be seen on the Table below. Each analysis critical thinking skill aspect of both groups as in Table 1.

**Table 1.** Critical Thinking Skill Test

		t-test for equality of means				
		t	df	Sig. (2-tailed)	Mean difference	Std. error difference
Scores	Equal variances assumed	3.460	48	.001	8.240	2.382
	Equal variances not assumed	3.460	47.714	.001	8.240	2.382

Based on the Table 1, it was known that t-test result obtained  $t_{\text{value}} = 3.460$  and  $t_{\text{table}} = 2.011$ . It showed that critical thinking skill of

experimental and control grouped improved because  $3.460 = t_{\text{value}} > t_{1.\alpha} = 2.011$  then  $H_0$  was denied.

**Table 2.** Critical Thinking Skill

Components	Experimental group		Control group	
	Pre-test	Post-test	Pre-test	Post-test
Numbers of students		25		25
Average	63.68	85.08	70.08	76.84
N-Gain		0.58		0.22
passing grade %		85%		76%
MPG		75		75

Based on the Table 2, the critical thinking skill of both groups improved. The N-gain score (g) obtained 0.58 for experimental group,

categorized high while the control group obtained 0.22, categorized poor. The critical thinking skill of the students improved significantly between a

group taught by *problem based learning* and a group taught by *conventional method* by lecturing.

The improvements of the experimental group's critical thinking skill was due to the changes of learning model. It covered activities to train them critically thinking. PBL model required students to actively involve in learning process. PBL has 8 stages to make students actively participated in learning process. The activeness of students in learning process could train them thinking critically. Meanwhile, in control group, taught by conventional with lecturing, the students only just listened the teacher's explanation. Thus, they passively learned so that their learning was just about

memorizing and could not apply the concept in real world. Meanwhile, the activeness of the students was needed in learning process. However, in conventional learning model, the activeness of the students did not appear since the learning was centralized on teacher. It made the students' critical thinking skills of the control group poorer.

### Learning Achievement

In this research, the students' learning achievements were seen on cognitive aspect during learning taught by PBL. It could be seen on Table 3. The analysis of learning achievement of both groups could be seen below.

**Table 3.** Learning Achievement t-test

		t-test for equality of means				
		t	df	Sig. (2-tailed)	Mean difference	Std. error difference
Scores	Equal variances assumed	2.236	48	.030	5.32000	2.37933
	Equal variances not assumed	2.236	46.280	.030	5.32000	2.37933

Based on the table, it was known that t-test of the students' learning achievement showed  $t_{\text{value}} = 2.236$  and  $t_{\text{table}} = 2.011$  so  $2.236 = t_{\text{value}} > t_{1,\alpha} = 2.011$ . Thus,  $H_0$  was denied. The average of learning achievement average of the students

taught by *problem based learning* with *mind mapping* was higher than the conventional group.

The result of learning achievement on cognitive aspect in learning taught by PBL is presented on Table 4.

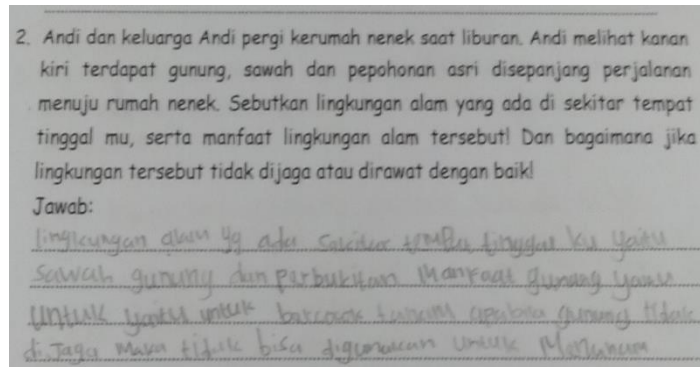
**Table 4.** Learning Achievement Skill

Components	Experimental		Control	
	Pre-test	Post-test	Pre-test	Post-test
Average	65.76	81.96	70.08	76.64
N-gain	0.47		0.21	
% passing grade	34%	88%	40%	68%
MPG	75		75	

Based on the table, it was known that learning achievement improvement from the post-test score evaluation of experimental group obtained data of minimum passing grade achievement score 88%. The students reached the minimum passing grade were 22 while those under the minimum passing grade were 3 students. It meant the classical average was  $81.96 < 75$ . The posttest of the experimental group was said passing the grade because the average score was higher than minimum passing grade, 75. The control group's posttest evaluation result obtained passing grade achievement 68%. There

were 8 students passing the grade and 17 students were under the passing grade. The classical average score was  $76.64 > 75$ . The posttest result of the control group was said passing the grade since the average score of control group was higher than minimum passing grade score, 75.

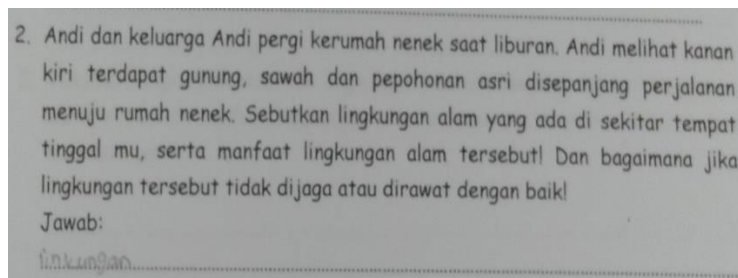
In Figure 1 it can be seen that the problem of critical thinking by applying the problem based learning model has shown the critical thinking skill. Students with problem based learning model learning are able to understand problems and solve problems appropriately. Here is one of the works of problem based learning students in.



**Figure 1.** The Works of Problem Based Learning Student

On the Figure 1. It can be seen that the work of student shown creative thinking ability. The learners taught by problem based learning and mind mapping passed the minimum passing grade. The classical passing grade obtained that proportion of the experimental group students had passed 75%. Besides that, the researcher also conducted variance test for both groups. Based on the test, the variance of critical thinking skill and learning achievement of experimental group was

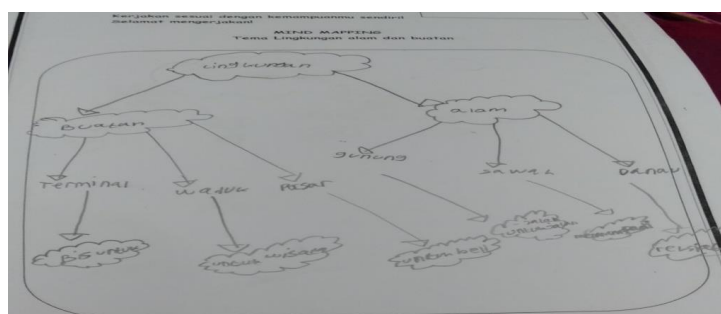
better than control group. It was caused because the syntax implemented during the learning would demand learners to habitualize based on problem, critical thinking, creative thinking in given problem to solve. The learning model and supportive strategy would surely develop critical thinking skill of the students with their own freedom. Here is one of the works of conventional in figure 2.



**Figure 2.** The Works of Conventional Student

In Figure 2 is the result of conventional student critical thinking skills using mind mapping, students only answer as much as they can with short answer, while in picture 1 student are able to answer question in detail.

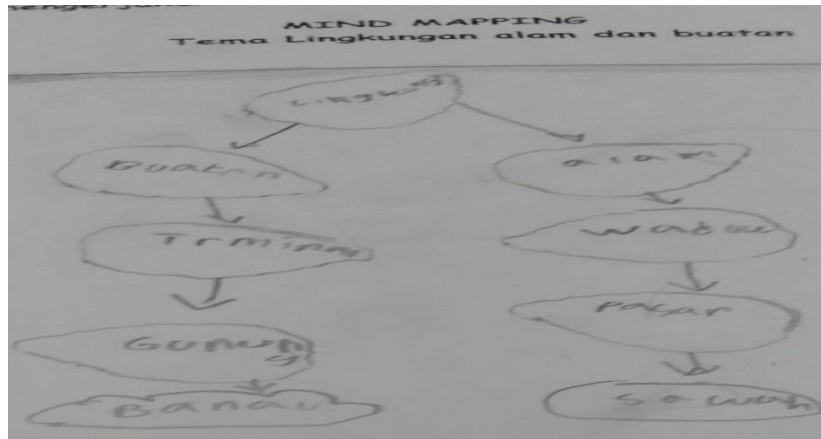
Following are the results of one student's mind mapping work by applying problem based learning in Figure 3 and 4.



**Figure 3.** Results of Mind Mapping by Applying Problem Based Learning

In figure 3 it can be seen that the application of the problem based learning model has shown the ability to think critically, students are able to complete mind mapping in accordance

with the results of their minds after applying the problem based learning model in the experimental class. Here is one of the works mind mapping of conventional in figure 4.



**Figure 4.** Results of Mind Mapping by Applying Problem Based Learning

In Figure 4 is the result of student's mind mapping in conventional models. Students are not quite right in completing mind mapping because the teacher applies conventional models with the lecture method. Problem based learning with mind mapping is supported by Jhon, Benjamin, and Emmanuel. (2013) in their research comparison of the learning effectiveness of problem based learning (PBL) and conventional method of teaching Algebra. The findings showed that students taught by PBL reached higher learning achievement significantly as seen in the posttest than by using conventional method. Vygotsky's opinion was strengthened by Brunner in Warsono (2012) that all interaction in providing assistance from an expert to novice learners could be considered as scaffolding. Scaffolding in Brunner means temporal step stone. When students have poor cognitive skill and are required to develop high cognitive skill, teacher needs to act as scaffolder with better cognitive capacity. Teacher needs to guarantee learning to trigger curiosity and minimize failure risk. It is also need to be relevant to students' needs.

## CONCLUSION

It is concluded that problem based learning with mind mapping could improve critical thinking skill and learning achievement of the students in studying social study. The findings showed that problem based learning with mind mapping could improve critical thinking skill and learning achievement of social study. There was also significant improvement of critical thinking skill and students' learning achievement through implementation of problem based learning by using mind mapping.

## ACKNOWLEDGMENT

We would like to thanks to the reviewers who help us intensively in making the manuscript ready to published. Thank you to the principal, teacher, and all students of SDN 01 Tanjung Karang for giving us opportunity to conduct the research.

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