



## Analysis of Problem Based Learning Model with Mind Mapping to Increase 21<sup>st</sup> Century Skills

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### Abstract

Education in the 21<sup>st</sup> Century is expected to produce human resources that have the ability to face the challenges in the development of science and technology so fast. 21<sup>st</sup> Century skills that need to be developed in students include critical thinking skills, creative thinking, collaboration, and communication. This research has purpose to determine the effectiveness of the model of Problem Based Learning (PBL) aided mind mapping to increase creative thinking skills and student collaboration. Type of research was mixed methods research design sequential exploratory. The sample of the research were 30 students of grade VIII D consisting of 16 male students and 14 female students. The analysis of the data in this research using qualitative and quantitative analysis techniques. The results showed that there is an increase in scores obtained by students in creative thinking and collaboration skills. The benefits of this research for educators are to provide effective learning model reference to be used in developing the creative thinking skills and student collaboration. Based on the result of the research, can be concluded that the PBL teaching model with mind mapping in motion and force effective to be applied in developing the creative thinking skills and student collaboration.

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## INTRODUCTION

Creative thinking is considered a dynamic mental process, including thinking convergent and divergent thinking (Nadjafikhah & Yaftian, 2013: 348). Creative thinking can be developed if students get good support from the environment and a strong urge from within himself. Learning environment that allows for creative thinking, the thinking processes will be highly appreciated than the memorization of information to assimilate knowledge (Sener & Bag, 2017). Basically memorize is one of the obstacles for students to develop their creativity.

Data from the Global Creativity Index 2015 showed an average score of student achievement and Indonesia ranked 115 out of 139 countries evaluated in the Global Creativity Index 2015 (Florida et al., 2015). Based on observations in science teaching in class VIII, creative thinking skills students are yet to be seen in the learning process. This is consistent with the results of interviews with science teacher stating that the student is likely to be low in delivering new ideas.

The ability to think creatively rather low resulting in students tend to follow that in the book (Sriatun et al., 2018). Some research has been done to mention that the factors that lead to low skills of creative thinking of students, among others: (1) Students are still afraid to try or do new things, so that teachers have difficulty in knowing the creative thinking abilities of students (Sulistiarmi et al., 2014); (2) The learning method used by the teacher is still conventional, so that the interests of students are still lacking in the following study (Hutahaean et al., 2017); and (3) Students are often still memorize concepts without knowing the process of discovering the concept itself (Fatima, 2015).

Other 21<sup>st</sup> century skills that are focused on the research collaboration skills. Collaboration is a skill to work effectively together which aims to train students' fluency and willingness to make the necessary decisions to achieve a common goal (Greenstein, 2012). Skills mutual collaboration encourages students to work together and work together, as well as

participate in discussions either by way of brainstorming and listening to the opinions of others.

Efforts to develop creative thinking skills students need an appropriate and effective method, so that the learning process is more optimal (Rahmatan & Redjeki, 2012). Based on literature studies that have been conducted by the researchers showed that PBL models most commonly used in improving the skills of creative thinking. PBL is a learning model that provides an authentic problem situations and meaningful to students (Wilsa et al., 2017). PBL provides opportunities for students to take more responsibility for their own learning (Ulger, 2018).

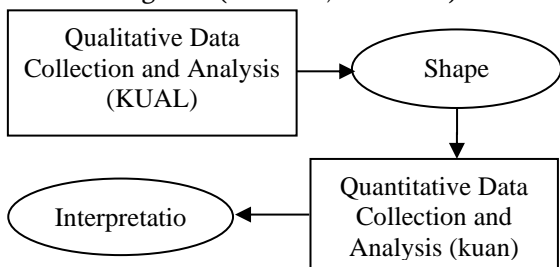
PBL can also train students in the group collaboration capabilities. Several studies that have been done show that the model PBL can develop creativity and student learning outcomes (Sham & Ramlah, 2015; Shinta et al., 2015). Other research shows that the model PBL effect on student collaboration skills enhancement (Ilmiyatni et al., 2019).

In this research, PBL models integrated with mind mapping method that aims to develop creative thinking skills of students as outlined in a draft form of images. Noting mind mapping technique allows individuals to organize facts and thoughts in the form of a map that contains the main theme that glows in the central image (Tee *et al.*, 2014).

PBL model of research in improving the skills of the 21<sup>st</sup> century has been done, as research conducted by Wilsa et al., (2017) who studied the PBL models to develop critical thinking skills and communication students. The other study was conducted by Fitriyani et al. (2019) and Shinta et al. (2015) who studied the use of PBL models to improve the skills of collaboration and creativity of the students. Research to improve the skills of creative thinking by using mind mapping ever done by Fatmawati (2014). The purpose of this research was to analyze the effectiveness of the model PBL mind mapping aided in improving the skills of creative thinking and collaboration.

**METHODS**

Type of research is mixed methods design where researchers explore sequential exploratory qualitative data first, and then use the findings of the quantitative phase (Creswell, 2016). Here is a sequential exploratory mixed methods design shown in Figure 1 (Creswell, 2016: 294).



**Figure 1.** Exploratory Sequential Design Layout

In the first stage sequential design exploratory research using qualitative methods to find the hypothesis. The measures consisted of: (1) Define and analyze the potential and problems; (2) To review the theory that aims to facilitate researchers in collecting and analyzing data; (3) To collect and analyze data; and (4) Finding a complete picture of the object, construct meaning and hypotheses.

In the second stage of sequential design exploratory research using quantitative methods to test the hypothesis. The measures consisted of: (1) determine the research sample to test the hypothesis; (2) Developing instruments for data collection; (3) Analyze the data obtained; and (4) Make conclusions and suggestions.

The population of this research is class VIII SMP Negeri 1 Rembang. The research sample included 30 students of class VIII D consisting of 16 male students and 14 female students. The sampling technique used using random cluster sampling technique, in which all members of the population have the same opportunities as research subjects.

In this research, there is only one experimental group were given treatment (treatment) in the learning process, using mind mapping aided PBL models. Data collection techniques used in this research include: observation, interviews, and questionnaires. Improved creative thinking skills of

students were analyzed using mind mapping percentage of the value of achievement, while the increase collaboration skills based on self-assessment and peer assessment analyzed using ANOVA test to see whether there are significant differences between self-assessment and peer assessment.

**RESULTS AND DISCUSSION**

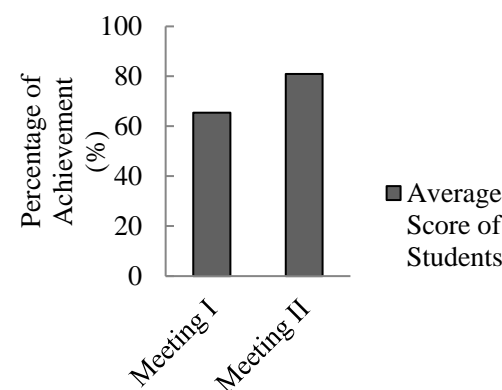
**Creative Thinking Skills**

Analysis of creative thinking skills of students using mind mapping ratings are based on the indicators of creative thinking which consists of fluency, flexibility, elaboration, and originality. The results of the data analysis skills of creative thinking student achievement include the percentage of students (Table 1) and the mean score obtained by students (Figure 2).

**Table 1.** Percentage of Number of Percentage of Students Based Achievement Criteria

Criteria	Percentage of Students at the Meeting (%)	
	I	II
Very good	0	30
Good	26.7	70
Average	73.7	0
Bad	0	0

Model-assisted PBL mind mapping can be said to be effective in developing creative thinking skills of students when the percentage score obtained > 50% with a category quite well.



**Figure 2.** Average Score of Creative Thinking Skills

Based on Figure 2 shows an increase in scores obtained by students at each meeting, so that the model PBL effectively used mind mapping aided in improving the skills of creative thinking of students. This is consistent with the results of research that has been done by Fatmawati (2016) which shows that the use of mind mapping in learning to encourage students to express their creativity idea.

Mind mapping used in this research encourages students to provide new ideas related to the material being studied. In addition, students are also asked to put it in the various forms of symbols or images and colors systematically. Here is an example of mind mapping made by the students is shown in Figure 3.

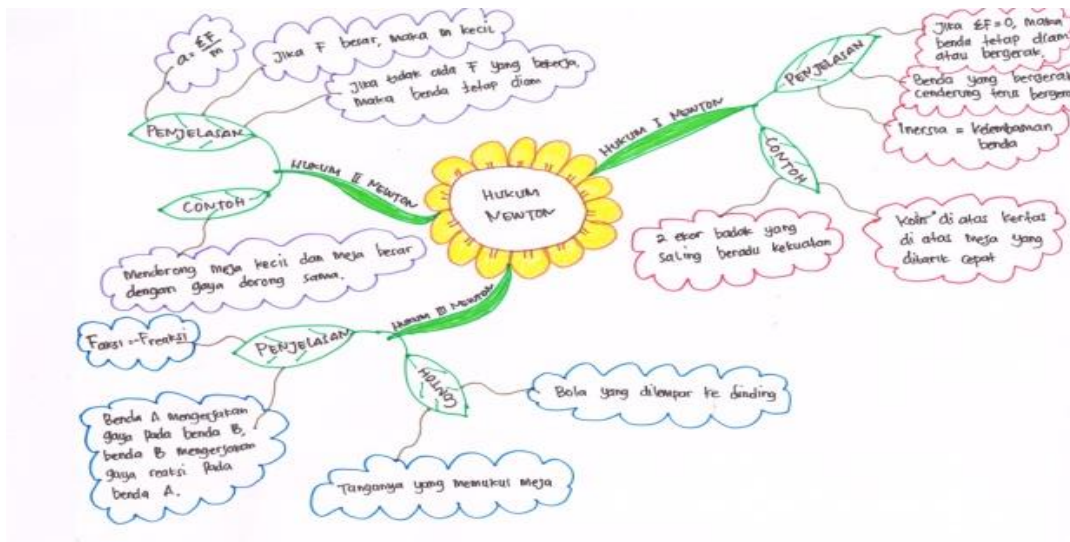


Figure 3. Example of Mind Mapping Made by the Students

In the indicator of fluency, students are able to express ideas that are relevant and use mind mapping different form the others. In indicator flexibility, students were able to provide an explanation regarding the matter and express ideas were varied.

In indicator originality, students use various forms of symbols or pictures with various colors and use the phrase itself in providing an explanation. In indicator elaboration, students are able to make connections between concepts and using the obvious keywords. PBL model application periodically with mind mapping in the learning process is able to develop the creative thinking skills of students in a more optimal.

**Collaboration skills**

Analysis of student collaboration skills using the self-assessment and peer assessment that has been modified based on research conducted by Ofstedal and Dahlberg (2009). Sheet self-assessment and peer assessment used to measure

the skills of collaboration aimed at students who are guided by the aspects of the collaboration include: contributions, motivation/ participation, the quality of learning, preparedness, problem solving, interaction with others, the flexibility of the role, and reflection.

The results of the data analysis skills of collaboration student achievement include the percentage of students (Table 2), the Post Hoc LSD test (Table 3), and the mean score obtained by students (Figure 4).

Table 2. Percentage of Number of Students Based on Achievement Criteria

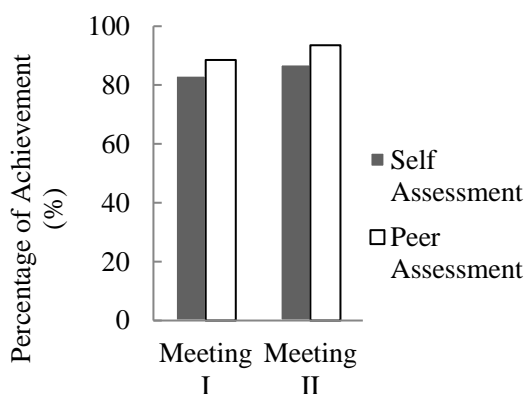
Criteria	Self Assessment		Peer Assessment	
	Percentage of Students at the Meeting (%)			
	I	II	I	II
Very Good	66.7	80	80	100
Good	33.3	20	20	0
Average	0	0	0	0
Bad	0	0	0	0

Model-assisted PBL mind mapping is said to be effective in developing student collaboration skills when the percentage score obtained > 50% with a category quite well.

**Table 3.** Output of Test Post Hoc LSD

LSD	Result of Collaboration Skills	Result of Collaboration Skills	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
	Self Assessment	Peer Assessment	-6.53333*	1.19489	0.000	-8.9000	-4.1667
	Peer Assessment	Self Assessment	6.53333*	1.19489	0.000	4.1667	8.9000

Based on the results of Post Hoc LSD test at significance level of 5% shows that the significance of the self-assessment value of  $0.00 < 0.05$  and peer assessment of  $0.00 < 0.05$ . This shows the significant difference or  $H_0$  is rejected. Based on these data can be concluded that the value of self-assessment and peer assessment have significant differences.



**Figure 4.** Mean Scores of Collaboration Skills

Based on Figure 4 shows an increase in scores obtained by students, both self-assessment and peer assessment. Stages of mind mapping aided PBL models that encourage students to develop the skills of collaboration is the student activities during the experiment and analyze the data obtained along with the group. Based on data from the results of the self assessment and peer assessment shows that students feel motivated to actively participate in solving the problem with the group.

The learning activities in developing collaborative skills of students in the student activities include work in groups and analyze data on the experiments or observations along with the group. Upon learning activities carried out, students were asked to fill out a self-assessment and peer assessment independently. This is consistent with research that has been done by

Saenab et al. (2019) who studied the collaboration skills using self-assessment instrument.

The use of self-assessment and peer assessment aims to facilitate researchers to measure the effectiveness of PBL aided model of mind mapping to student collaboration skills. Self-assessment aims to train students ability to assess their self in mastering specific competencies (Noviyanti et al., 2014), while peer assessment happens when students evaluate each other based on their performance at work team (Sambell et al., 2013).

**CONCLUSION**

Based on the results of this research concluded that the model PBL-aided teaching mind mapping in motion and force effective enough to be applied in developing creative thinking skills and student collaboration. This is shown in the increase in scores obtained by students at the meeting II.

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**REFERENCES**

Creswell, J.W. (2016). *Research Design Pendekatan Metode Kualitatif, Kuantitatif, dan Campuran*. Yogyakarta: Pustaka Pelajar.  
 Fatimah, S. (2015). Devoting to enhance the critical thinking skill and the creativity of students in seventh grade through PBL model with JAS

- approachment. *Jurnal Pendidikan IPA Indonesia*, 4(2), 149–157.
- Fatmawati, B. (2016). The Analysis of Students' Creative Thinking Ability Using Mind Map in Biotechnology Course. *Jurnal Pendidikan IPA Indonesia*, 5(2), 216-221.
- Fitriyani, D., Jalmo T., & Yolida B. (2019). Penggunaan Problem Based Learning untuk Meningkatkan Keterampilan Kolaborasi dan Berpikir Tingkat Tinggi. *Jurnal Bioterdidik*, 7(3).
- Greenstein, L. (2012). *Assessing 21<sup>st</sup> Century Skills: A Guide to Evaluating Mastery and Authentic Learning*. California: Corwin.
- Hutahaean, R., Harahap, M. B., & Derlina, D. (2017). The Effect of Scientific Inquiry Learning Model Using Macromedia Flash on Student's Concept Understanding and Science Process Skills in Senior High School. *IOSR Journal of Research & Method in Education (IOSRJME)*, 7(4), 29–37.
- Ilmiyatni, F., Jaimo T., & Yolida B. (2019) Pengaruh Problem Based Learning terhadap Keterampilan Kolaborasi dan Berpikir Tingkat Tinggi. *Jurnal Bioterdidik*, 7(2): 35-45.
- Nadjafikhah, M. & Yaftian N. (2013). The Frontage of Creativity and Mathematical Creativity. *Procedia Social and Behavioral Sciences. Iran University of Science and Technology*, 90, 344 – 350.
- Noviyanti, L., Indriyanti D.R., & Ngabekti S. (2014). Pengembangan Instrumen Self dan Peer Assessment Berbasis Literasi Sains di Tingkat SMA. *Lembaran Ilmu Pendidikan*, 43(1).
- Rahmatan, H. & Redjeki, S. (2012). Pengembangan Model Pembelajaran Biokomia Berbasis Komputer untuk Membekali Keterampilan Berpikir Kreatif Mahasiswa Calon Guru Biologi. *Jurnal Pendidikan IPA Indonesia*, 1(2), 178–182.
- Saenab, S., Yunus S.R., & Husain. (2019). Pengaruh Penggunaan Model Project Based Learning terhadap Keterampilan Kolaborasi Mahasiswa Pendidikan IPA. *Jurnal Biology Science & Education*, 8(1), 29-41.
- Sambell, K., McDowell L., & Montgomery C. (2013). *Assessment for Learning in Higher Education*. Abingdon: Routledge.
- Sener, N. & Tas E. (2017). Improving of Students' Creative Thinking Through Purdue Model in Science Education. *Journal of Baltic Science Education*, 16(3), 350 – 365.
- Shinta, Z.E., Marpaung R.R.T., & Yolida B. (2015). Pengaruh Penerapan Model PBL terhadap Kreativitas dan Keterampilan Berkomunikasi Tertulis Siswa. *Jurnal Bioterdidik*, 3(9), 60-72.
- Sriatun, Ellianawati, Hardyanto W., & Milah I.L. (2018). Analisis Kemampuan Berpikir Kreatif Siswa pada Praktikum Asas Black Berbasis Problem Based Learning dan Berbantuan Makromedia Flash. *Physics Communication*, 2(1), 70-75.
- Sulistiarmi, W., Wiyanto, & Nugroho S.E. (2014). Analisis Kemampuan Berpikir Kreatif Siswa Kelas XI-IPA Pada Mata Pelajaran Fisika SMA Negeri Se-Kota Pati. *Unnes Physics Journal*, 3(1), 7–13.
- Syam, N. & Ramlah. (2015). Penerapan Model Pembelajaran *Mind Mapping* dalam Meningkatkan Hasil Belajar Pada Mata Pelajaran Ilmu Pengetahuan Sosial Siswa Kelas IV SDN 54 Kota Parepare. *Jurnal Publikasi Pendidikan*, 5(3), 184-197.
- Tee, T. K., Azman M. N. A., & Mohamed S. (2014). Buzan Mind Mapping: An Efficient Technique for Note – Taking. *International Journal of Social, Human Science and Engineering*, 8(1).
- Ulger, K. (2018). The Effect of Problem – Based Learning on The Creative Thinking and Critical Thinking Disposition of Students in Visual Arts Education. *Interdisciplinary Journal of Problem Based Learning*, 12(1).
- Wilsa, A.W., Susilowati S.M.E., & Rahayu E.S. (2017). Problem Based Learning Berbasis Socio-Scientific Issue untuk Mengembangkan Kemampuan Berpikir Kritis dan Komunikasi Siswa. *Journal of Innovative Science Education*, 6(1), 129-137.