The Implementation of PBL (Problem Based Learning) Model Assisted by Monopoly Game Media in Improving Critical Thinking Ability and Self Confidence

Mikke Novia Indriani[1]✉ , Isnarto[2] & Scolastika Mariani[2]

[1] Universitas Islam Negeri Walisongo, Semarang, Indonesia
[2] Universitas Negeri Semarang, Indonesia

Article Info	Abstract
	This study aimed to describe the quality of PBL learning assisted by monopoly games on students 'critical thinking skill, and describing students' critical thinking skills through PBL learning assisted by monopoly game in terms of self-confidence. This study used mixed methods with *concurrent embedded* designs. The research subjects were seventh grade students of SMP N 18 Semarang. The results of this study showed that implementation PBL assisted by *monopoly game* improve the students' mathematical critical thinking skills. In the aspect of the process of mathematical critical thinking skills, students with high self-confidence are able to master the five aspects very well**.** The five indicators of critical thinking are elementary clarification skills, basic skills building skills, inference skills, advanced clarification skills, and strategies and techniques. Students with medium self-confidence, mastering four aspects maximally, those are skills to give simple explanations, inference skills, advanced clarification skills, and strategies and techniques. Meanwhile, students with low self-confidence, only able to master one aspect well but not maximally that is ability to give a simple explanation (elementary clarification).

✉ Correspondence address:
Walisongo No.3-5, Tambakaji, Ngaliyan,
Semarang, Jawa Tengah, 50185
E-mail: mikkenoviaindriani@gmail.com

INTRODUCTION

Moretti & Frandell (2013), Education is a means for risk prevention, as well as a tool that can be used to improve the quality of human life in a sustainable manner. As disclosed in law number 20 of 2003 concerning the National Education System, education is a conscious and planned effort to realize the learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and the skills needed by themselves, society, nation and state. One of the important subjects in developing students' potentials is mathematic.

Mathematic is taught in every level of educational institutions; at the elementary, middle, high school and tertiary level, because mathematics is a compulsory subject in the education curriculum, especially in primary and secondary schools (Permendikbud, 2016). This important is due to the fact that mathematics subjects can develop students' abilities and skills in solving problems in everyday life.

Various abilities that must be possessed by students can encourage or motivate students in developing their own potential in an increasingly advanced education world. This is in line with Sanders (2016) & Suherman, et al. (2003) that in mathematics learning critical and creative thinking skills are needed.. Mathematical critical thinking ability is the ability to think mathematically, to analyze, and to solve a problem that occurs in everyday life and other disciplines. Based on the statement of Dewi, Wardono, & Soedjoko (2015) that Mathematic is studied and developed to equip students with the ability to think logically, analytically, systematically, critically, and creatively.

The stages of critical thinking skills according to Ennis, as quoted by Setyowati (2014) are giving elementary clarification, building basic support, inference, making advanced clarification, strategies and techniques.

Critical thinking skills are not only to be considered in education term, but also necessary to be able to manage and place themselves wherever they are. According to Waluya (2012) stated that a person's success is not determined solely by knowledge and technical abilities (hard skills), rather by the ability to manage themselves and others (soft skills). A person's calm attitude will have a positive impact on every activity he or she does without hesitation called self confidence.

According to Iswahyudi (2016), self-confidence is a person's beliefs and attitudes towards ability in themselves by accepting both positive and negative what is formed and learned through the learning process with the aim of happiness. Self confidence of students will be more easily developed if the teacher uses learning that is in accordance with the students' self-characteristics.

Learning will succeed if it is accompanied with good teacher competency and the right learning model. Rochmad & Masrukan (2016) stated that the main support in the success of learning is occur in the classroom because the teacher uses the right and varies learning model, teaches well (good teaching) and uses good questions (good question). One of the lessons that can improve mathematical thinking skills so as to enable students to learn optimally and support the ability to think critically mathematics is PBL (Problem Based Learning). Botty as quoted in Pujiastuti, Mulyono, & Soedjoko (2018) stated that PBL is a learning model that is able to improve students' ability to solve problems both in mathematics and other subjects.

PBL is a learning model that presents contextual problems which is able to stimulate students to learn (Wardono, Waluya, Kartono, Mulyono, & Mariani, 2018). According to Arends (2007) the implementation of the PBL model has 5 main stages (syntax) including; giving problem orientation to students; organize students for investigation; conducting investigations; develop and present results; analyze and evaluate the investigation process.

Hosnan (2014) mentioned that PBL's main goal is to develop critical thinking skills and problem-solving abilities, as well as simultaneously develop students' ability to actively build their own knowledge. In addition to learning models that can build student activity,

media and teaching aids are needed. The use of games as media or teaching aids in teaching is a solution for teachers to improve the quality of learning.

According to Hidayah (2018), mathematics learning assisted by manipulative teaching aids is not only to find concepts and principles, referring to the implementation of 2013 Curriculum; but also expected to strengthen students' competencies in aspects of attitude, knowledge, and skills, capable of completing problems in everyday life. One of the media that can be used is a monopoly game. The game proude contain of math lessons so that students can learning mathematics while playing. The game of mathematical monopoly is customized in such a way that students are able to actively carry out discovery activities, so that students are more interested in learning mathematics as presented in Figure 1.

Figure 1. Monopoly Game Board

In the planning process of learning process, the average learning device validation score is 4.52. The following is a detailed validation score of the research instrument in Table 1.

Table 1. Results of Research Instruments' Validation

Research instrument	Average score	Category
Monopoly game media	4.52	Very well

Based on the results, it can be stated that the research instrument is in the category of very good and feasible to use.

Monopoly game is a square with several pictures and colors so students are interested and enthusiastic in taking lessons. The rules of the game are there are 6 students for each group, one of student in every group has to be a leader in a discussion and 5 other students as players 1, 2, 3, 4, and 5. Then students do suit, the different one gets the first turn and the friends continue to the left so that it rotates clockwise. Player 1 starts from the "Start" as a home, and takes the lottery to find out the next destination.

The next rule of monopoly game is there are 15 buildings (traditional markets, modern markets, mini markets, and others that have questions. There are also two help cards; an *"opportunity"* and *"reward"* cards on the board. The *"opportunity"* cards are taken by students if they cannot answer questions from the place he obtained from the dice throw and in it also contained a short question, if the correct answer on the *"opportunity"* card did not get a star, while the reward card was taken by the student if he managed to answer the question from the place he got from the dice. right then it will get 1 star.

Short question content on opportunity and reward cards such as asking students to mention formulas for finding purchase prices where students can answer briefly and clearly about the formula. In this case what distinguishes opportunity and rewards cards is in the giving of stars, if students are correct in answering since the first question until correctly answering the question on the reward or the chance card of getting a star. But if you answer incorrectly from the start, when you get a chance card or reward, you can answer correctly, so you don't get a star.

The game will be continued by player 2 if player 1 has successfully answered the question from the place he obtained from the dice throw. Every question has a star. Students can take 1 star if they can answer questions. If the student cannot answer then he takes the lottery in the opportunity box containing a short question. If he can answer then he still can't get a star because he has used the opportunity card. The judge for justifying the answers is the leader of the discussion in every group.

When students begin to roll the dice and get a place where there are questions related to social arithmetic, the student must answer the question. From this process, students are trained to focus on the questions received, able to analyze and use strategies in answering correctly. This student has gone through aspects of critical thinking that is giving elementary clarification, developing basic support and using strategies and techniques.

The answer of students which are playing must be explained to their group mates and the task of their group mates, which is to match their own answers. Then the group makes the decision whether the answer is right or wrong. The decision of the group's answers will influence the group's assessment. In this process, students through critical thinking aspects are making an advanced clarification and inference.

The game is finished if there is one player who has reached the finish. Collecting scores is seen from the number of stars obtained by each group.

Based on the explanation above, learning by using a monopoly game-assisted PBL model makes the learning more meaningful because *monopoly game* media trains students to think critically through problem solving stages based on the stages of critical thinking skills that are arranged coherently and correctly.

METHODS

The type of this research is a *concurrent embedded design mixed method,* a research method that combines the use of quantitative and qualitative research methods by mixing these two methods unevenly (Sugiyono, 2016).

The study was conducted in SMP N 18 Semarang with study population of second grade students (VII) in the academic year of 2017/2018. The research subjects were 36 students for class with the learning process using PBL assisted by *monopoly* game, and 36 students with PBL learning only.

Quantitative data analysis is divided into two steps, namely initial data analysis and final data analysis. The initial data analysis was taken from odd semester UAS scores to find out the two classes came from the same initial conditions and the final data was taken from the results of the students' critical thinking ability to investigate individual, classical, and two proportions. For qualitative data analysis using three main steps, namely data reduction, data presentation, and making conclusions. Data collection techniques in this study using triangulation techniques include documentation, interviews, posttest of mathematical critical thinking skills, and questionnaire of self-confidence.

RESULTS AND DISCUSSION

Based on the results of the initial data analysis in the form of odd semester exam scores, data obtained showed that the sample came from a population with normal distribution, had homogeneous variances and had the same means. Learning was conducted four times, the experimental class used PBL with monopoly game assistance, while the control class used PBL model. The final data on mathematical critical thinking skills was obtained through the posttest of the experimental class and the controls that were carried out after the treatment.

Experimental and control class students was having posttest about mathematical critical thinking skills and it is obtained data on the posttest scores of the two critical thinking skills in the two classes as in Table 2.

Table 2. Posttest Score Data of Critical Thinking Ability

Class	N	Average	Standard deviation
Experiment	36	84.08	12.30
Control	36	66.72	9.33

Table 2 above shows the average mathematical critical thinking ability of students who use the PBL assisted monopoly game model is better than the average mathematical critical thinking ability of students who use the PBL model only. The average of students' critical thinking skills using monopoly game-assisted PBL model is 84.08. While the average mathematical critical thinking ability of students who use the PBL model is 66.72.

The percentage of mathematical critical thinking skills completeness of students who use the PBL assisted monopoly game model is better than the percentage of students who just using PBL models. The percentage of completeness of critical thinking skills in mathematical students who use the PBL assisted monopoly game model is better than the percentage of students' completeness of critical thinking skills using PBL models. In the experimental class of 36 students there were only 2 children who did not complete the study while in the control class there were 36 students who took the critical thinking ability test in which 15 children were not finished learning.

In the learning process that integrates critical thinking skills, the teacher facilitates students to be thinkers and problem solvers by providing problems that allow students to use critical thinking skills. The following is an example of the results of discussion of students thinking critically on high, medium and low category subjects based on their sub-solutions.

Figure 2. Examples of High Category Student Work Results

Based on figure 2 shows that students write down the problems that appear in the case presented in the worksheet, then look for the information obtained in the illustration, then make the hypothesis. Students are able to answer correctly and conclude correctly. From the students' answers above it can be said that the students in the high category are able to master the five aspects of critical thinking skills, starting from giving simple explanations to using strategies and techniques.

Figure 3. Examples of Medium Category Student Work Results

Based on figure 3 shows that students write down the problems that arise in the case presented in the worksheet, then look for the information obtained in the illustration, then make the hypothesis. Students are able to answer correctly. But students do not write conclusions at the end of the settlement. From the students' answers above can be said students in the medium category, able to master the four aspects of critical thinking skills; giving elementary clarification, building basic support skills, making an advanced clarification, and strategies and techniques.

Figure 4. Examples of low category Student Work Results

Based on figure 4 shows that students are only able to write down the problems that arise and write down what was asked in the case presented in the worksheet. However, when completing the question only answers partially without knowing the final answer and the conclusion. From the students' answers above can be said students in the low category, only able to master one aspect of critical thinking skills, which is giving a simple explanation (elementary clarification).

Based on the self-confidence questionnaire, the results of the improvement were measured using a normalized gain test. Details of individual improvement results can be seen in Figure 5.
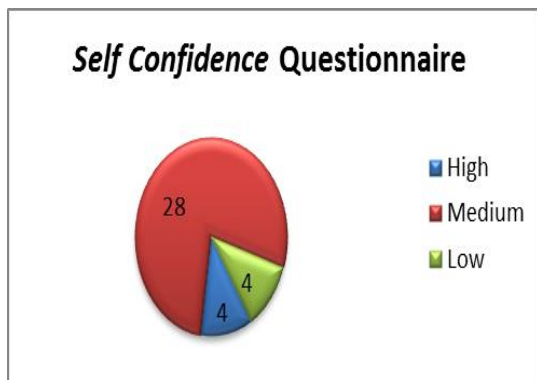

Figure 5. Results of the Self-Confidence Questionnaire

Based on the analysis above, out of 36 students in class VII B of SMP N 18 Semarang, there were 4 students of high self-confidence, 28 students of medium self-confidence and 4 students with low self-confidence.

In the assessment phase of learning outcomes, it was found that the results of the tests of critical thinking skills were normally distributed and homogeneous. In calculating the completeness test and comparative test, the significant level or α used is 0.05. The proportion of completeness obtained by Z_{value} = 2.94 and Z_{table} = 1.64 so that $z_{value} \geq z_{(0,5.\alpha)}$. Therefore, H_1 is accepted. Means that the number of students who have achieved completeness is more than 75% of all students in the experimental group. In other words, the class that gets the PBL learning model assisted by monopoly games has fulfilled the classical learning completeness.

The selection of subjects through interviews was chosen by each of the two students in each level of self confidence. Interviews were conducted to determine the character of students' self confidence in depth. Self confidence indicator is self-confidence, optimism, objective, responsible, rational and realistic. Based on the results of the self confidence analysis, six research subjects were selected in Table 3.

Table 3. Research Subject

Subject	Category
SCT-1	High
SCT-2	High
SCS-1	Medium
SCS-2	Medium
SCR-1	Low
SCR-2	Low

From the results of tests of critical thinking skills and interviews with subjects, it can be concluded that students who have high self-confidence have high critical thinking skills and vice versa. Mathematical critical thinking ability of students with high self-confidence is better than students' mathematical critical thinking skills with medium and low self-confidence.

Significant differences are also seen from students who have critical thinking skills need to repeat what is said to the student. The differences in student conditions have an influence on the learning achievement achieved.

Aspects of building basic skills include the process of group work to convey results in the group. Because the learning process is carried out in groups, many indicators on this aspect can be achieved by students. Group discussions can develop students' basic skills together. Skills to provide explanations are carried out by students by giving feedback by the teacher. The teacher gives a question and the student makes an answer based on their understanding.

The ability to set strategies and tactics had shown by students in presentation and question and answer activities between groups. One member of the group will give his/her opinion about the solution related to a problem that concerns about social arithmetic as the subject of discussion. The aspect of providing further explanation got the lowest percentage. The indicators that are assessed are determining the definition of a term, giving detailed explanations, identifying and handling problems, and constructing arguments.

The ability of students to provide detailed explanations and construct arguments is lacking, while defining terms, identifying and handling problems is only controlled by a few students. Based on interviews conducted by researchers, the factors that influence this are because students

have not studied the material to be taught, and students lack reading literature.

Setyorini, et al. (2011) have examined the implementation of Problem Based Learning models in improving students' critical thinking skills in regularly changed straight motion material. The results of the study showed that the Problem Based Learning model can improve students' critical thinking skills on the subject of regularly changed straight motion material. This is indicated by the acquisition of critical thinking ability test results that 75% of students have critical thinking skills and have an average of 73.38 which is included in the good category.

The use of PBL models in the learning process becomes more active and fun for students because students understand more about the things they often experience in everyday life. In addition, with monopoly-assisted learning games can motivate and facilitate students in learning about a mathematical problem directly with tools. Thus, the scientific activity of students in the learning process will affect the growth of psychomotor aspects.

Problem Based Learning (PBL) is a learning approach that uses real world problems as a context for students to learn about critical thinking and problem solving skills, and to acquire essential knowledge and concepts from lecture material or subject matter. Teachers in problem-based learning play a role in presenting problems, giving questions, holding dialogues, helping to find problems and providing research facilities.

PBL learning process is characterized by problems (can be raised by students and teachers), then students deepen their knowledge of what is known and how to solve problems in groups to help each other so that they are able to cooperate in solving mathematical problems. Through PBL models with various group members allows students to exchange ideas, discuss and collaborate to solve problems that ultimately can improve critical thinking skills. Thus the application of the PBL model also helps students in improving critical thinking skills. This is in accordance with the theory of constructivism (Anni & Rifa'i, 2012) that which is the basis of the teacher's actions in carrying out the learning process in order to facilitate students to construct themselves a concept on the idea of this research in the form of concepts of social arithmetic material problems.

According to Pluck, et al. (2011) "*In recent years more complex teaching methods have been adapted for use within second language teaching that involve evoking student curiosity. The two primary forms are task based learning (TBL) and Problem Based Learning (PBL)*", which means that one of the teaching methods that involves curiosity is the PBL model. From this statement, it can be found that learning with PBL models emphasizes the activeness of students in learning which is indicated by students' curiosity in learning.

The benefit of the game according to Desmita (2007) is to develop social aspects of children. Playing and learning with peers can make children learn to build social relationships with other children who are not yet known and overcome various problems caused by the relationship.

Based on the relevant research, to improve students' mathematical critical thinking skills, teachers use models that contain group work by creating ideas, creating new innovations, and using appropriate learning approaches. One learning model that can be used is a monopoly game assisted PBL model.

CONCLUSION

Based on the results of the research and discussion described earlier, the following conclusions are obtained; the mathematical critical thinking skills of students on PBL assisted by monopoly game learning models can achieve classical completeness, and description of the characteristics of mathematical critical thinking skills and self-confidence of students who obtain PBL assisted by *monopoly game* as follows; The mathematical critical thinking skills of the subject at a high level of self-confidence shows that students fulfill the five indicators of critical thinking; the skill of giving *elementary clarification*, skills in *building basic skills*, *inference skills*, skills in making *further explanations*, clarification, as well

as *strategies and techniques*. This is supported because in the high self-confidence character, students have high trust, leadership spirit, have innovation and dare to take risks.

Subjects at the medium level of self - confidence are showing that students fulfill all four indicators of critical thinking, namely the skill of giving elementary clarification, inference skills, advanced clarification skills, and strategies and techniques.

Subjects at low self confidence level showed that students only fulfilled the indicators of critical thinking skills that is elementary clarification skills. Students are only able to provide a basic explanation of what problems are in the problem without knowing how to solve them. In low self-confidence characters, students tend to have low self-confidence, where students are not sure of their answers.

REFERENCES

Arends, R. I. (2007). *Learning to Teach*. New York: McGraw Hill.

Desmita. (2007). *Psikologi Perkembangan*. Bandung: PT. Remaja Rosdakarya.

Hidayah, I. (2018). Pembelajaran Matematika Berbantuan Alat Peraga Manipulatif Pada Jenjang Pendidikan Dasar dan Gerakan Literasi Sekolah. *PRISMA, Prosiding Seminar Nasional Matematika*, 1, 1-11. Retrieved from https://journal.unnes.ac.id/sju/index.php/prisma/article/view/20762

Hosnan, M. (2014). *Pendekatan Saintifik Dan Kontekstual Dalam Pembelajaran Abad 21*. Bogor: Ghalia Indonesia.

Iswahyudi. (2016). Pengaruh Percaya Diri dan Pengendalian Emosi Diri terhadap Efikasi Guru Dimoderasi Idealiasasi Pengaruh di SMP Negeri Kecamatan Juwana, Kabupaten Pati. *Thesis*. Semarang: Universitas Negeri Semarang.

Moretti, G. A. S., & Frandell, T. (2013). Literacy from a Right to Education Perspective. *Report* of the Director General of UNESCO to the United Nations General Assembly 68th Session. Retrieved from http://unesdoc.unesco.org/images/0022/002214/221427e.pdf

Permendikbud. (2016). *Salinan Permendikbud no. 21, 22, 23, dan 24*. Jakarta: Kemendikbud.

Pluck, G., & Johnson, H. (2011). Stimulating Curiosity to Enhance Learning. *GESJ: Education Sciences and Psychology*, 2(19), 24-31.

Pujiastuti, E., Mulyono., & Soedjoko, E. (2018). Pengungkapan Koneksi Matematis sebagai Sarana Penelusuran Kemampuan dan Proses Memecahkan Masalah Peserta Didik. *PRISMA, Prosiding Seminar Nasional Matematika,* 1, 618-627. Retrieved from https://journal.unnes.ac.id/sju/index.php/prisma/article/view/20207

Rifa'i, A., & Anni, C. T. (2012). *Psikologi Pendidikan*. Semarang: UPT Unnes Press.

Rochmad, & Masrukan. (2016). Studi Kinerja Mahasiswa Dalam Menganalisis Materi Pada Pembelajaran Kooperatif Resiprokal. *Kreano, Jurnal Matematika Kreatif-InovatifI,* 7(1), 47-57. Retrieved from https://journal.unnes.ac.id/nju/index.php/kreano/article/view/4986

Sanders, S. (2016). Critical and Creative Thinkers in Mathematics Classrooms. *Journal of Student Engagement: Education Matters*, 6(1), 19-27. Retrieved from http://ro.uow.edu.au/cgi/viewcontent.cgi?article=1043&context=jseem

Dewi, S. C., Wardono., & Soedjoko, E. (2015). Implementasi Model PBL dengan Pendekatan Realistik Berbantuan Edmodo untuk Meningkatkan Literasi Matematika Siswa Kelas VII. *Unnes Journal of Mathematics Education*, 4(2), 164-171. Retrieved from https://journal.unnes.ac.id/sju/index.php/ujme/article/view/7599

Setyorini, U, S., Sukiswo, E., & Subali, B. (2011). Penerapan Model *Problem Based Learning* untuk Meningkatkan Kemampuan Berpikir Kritis Siswa SMP. *Jurnal Pendidikan Fisika Indonesia*, 7(1), 52-56. Retrieved from https://journal.unnes.ac.id/nju/index.php/JPFI/article/view/1070

Setyowati, Y. (2014). Pengembangan Media *Question Card* Berbasis Pendekatan Masalah untuk Meningkatkan Kemampuan Berpikir Kritis. *Undergraduate Thesis.* Semarang: Universitas Negeri Semarang. Retrieved from http://lib.unnes.ac.id/22996

Sugiyono. (2016). *Metode Penelitian Kombinasi* (*Mixed Methods*). Bandung: Alfabeta.

Suherman, E., Turmudi, Suryadi, D., Herman, T., Suhendra, Prabawanto, S., Nurjanah, & Rohyati, A. (2003). *Strategi Pembelajaran Matematika Kontemporer*. Bandung: FMIPA UPI

Undang-undang Nomor 20 tahun 2003, *Sistem Pendidikan Nasional,*pasal 1 ayat (1).

Waluya, S. B. (2012). Peran Matematika dan Pendidikan Matematika dalam Membangun Karakter Bangsa. *Prosiding*. Seminar Nasional Matematika dan Pendidikan Matematika, November, 10 2012. Yogyakarta: FMIPA Universitas Negeri Yogyakarta. Retrieved from http://eprints.uny.ac.id/7468

Wardono., Waluya, S. B., Kartono., Mulyono., & Mariani, S. (2018). Literasi Matematika Siswa SMP pada Pembelajaran *Problem Based Learning Realistik Edmodo Schoology*. *PRISMA, Prosiding Seminar Nasional Matematika,* 1(1), 477-497. Retrieved from https://journal.unnes.ac.id/sju/index.php/prisma/article/view/20138