

EFFORTS TO IMPROVE MATHEMATICAL CREATIVE THINKING OF SMK STUDENTS IN 2023 BY USING A *PROBLEM-BASED LEARNING* MODEL ASSISTED BY *QUIZIZZ*

Rayhan Muhammad Akbar¹, Benny Hendriana²

^{1,2}Universitas Muhammadiyah Prof. Dr. Hamka, Jl. Tanah Merdeka Ciracas, DKI Jakarta
e-mail: benny_hendriana@uhamka.ac.id

Abstract

This research is classroom action research (PTK) which aims to increase efforts in students' creative thinking abilities through the application of the Problem Based Learning (PBL) model in class X-DKV SMK MALAKA in the 2022/2023 Academic Year. The subjects of this research were 37 students from class X-DKV SMK MALAKA in the 2022/2023 Academic Year. The results of this research are: a) Students who have very creative criteria; b) Students who have creative criteria; c) Students who have the criteria to be creative enough; d) Students who have less creative criteria; e) Students who have criteria for not being creative. The results of the initial test show that students have criteria for not being creative with an average score of 57.16. After receiving lessons given through the Problem Based Learning learning model, students showed increased creative thinking abilities. This is shown by comparing Cycle I with Cycle II, or by comparing the initial stage of Student Ability Tests. These two comparisons show that, no student can achieve the goal at their current level of creative thinking ability. In cycle I, the overall student success rate was 49% (18 of the total students), with an average score of 63.51. In cycle II, the percentage of successful students increased to 81% (30 of the total students), with an average score of 86.89.

Keywords: Classroom Action Research, Problem Based Learning, Creative Thinking Ability, Quizizz

Abstract

Penelitian ini merupakan penelitian tindakan kelas (PTK) yang bertujuan untuk meningkatkan upaya dalam kemampuan berpikir kreatif siswa melalui penerapan model Problem Based Learning (PBL) di kelas X-DKV SMK MALAKA pada Tahun Ajaran 2022/2023. Subjek penelitian ini adalah 37 siswa dari kelas X-DKV SMK MALAKA pada Tahun Ajaran 2022/2023, dan objek penelitiannya adalah kemampuan berpikir kreatif matematika siswa dalam materi statistika dengan menggunakan model Problem Based Learning (PBL). Hasil dari penelitian ini, yakni : a) Siswa yang memiliki kriteria sangat kreatif; b) Siswa yang memiliki kriteria kreatif; c) Siswa yang memiliki kriteria cukup kreatif; d) Siswa yang memiliki kriteria kurang kreatif; e) Siswa yang memiliki kriteria tidak kreatif. Hasil tes tahap awal menunjukkan bahwa siswa memiliki kriteria tidak kreatif dengan skor rata-rata 57,16. Setelah menerima pelajaran yang diberikan melalui model pembelajaran Problem Based Learning, siswa menunjukkan peningkatan kemampuan berpikir kreatif. Ini ditunjukkan dengan membandingkan Siklus I dengan Siklus II, atau dengan membandingkan Tes Kemampuan Siswa tahap awal. Kedua perbandingan ini menunjukkan bahwa, tidak ada siswa yang dapat mencapai tujuan pada tingkat kemampuan berpikir kreatif mereka saat ini. Pada siklus I, tingkat keberhasilan siswa secara keseluruhan adalah 49% (18 dari total siswa), dengan skor rata-rata 63,51. Pada siklus II, persentase siswa berhasil meningkat menjadi 81% (30 dari total siswa), dengan skor rata-rata 86,89.

INTRODUCTION

Education plays the most important role in influencing the development of the world in the future. Through education, humans are able to develop optimally and can compete well in the future by increasing their potential through the medium of education. Mathematics is a very vital subject because it is able to develop critical, creative, methodical and logical thinking skills for individuals who study it. This contribution of mathematics can be simple

things such as basic calculations to complex things such as numerical analysis in technology. (Simanjuntak, 2023).

Mathematics lessons allow people to develop their mindset to think critically, creatively, logically and methodically. This is the main goal of learning mathematics. One of the strategies that can be used to help students improve their creative thinking skills is to make learning relevant to everyday life (Ed et al., 2023).

Every individual needs to have all four cognitive skills known as the "4Cs", which are critical thinking, collaboration, communication, and creativity. According to (Apriliani, 2016), having deep creative thinking skills in mathematics is important to overcome current problems in the era of globalization. This is due to the importance of generating new ideas and solutions to solve difficulties appropriately. In this regard, efforts have been made to develop abilities and skills in the learning process by improving the quality of learning in terms of understanding the material, using methods, utilizing supporting media, and creating a conducive classroom environment (Jihan & Hendriana, 2023). In accordance with Permendiknas Number 41 of 2007 concerning Process Standards, learning at every level of primary and secondary education must be interactive, inspiring, fun, challenging, and encourage students to participate actively. In addition, it also provides freedom for students to take their own initiative in releasing their creative ideas and stimulating the development of interests/talents and psychology (Aminy et al., 2021).

From the observation of the Mathematics learning process in class X SMK MALAKA, it was found that students' creative thinking skills in solving problems related to Statistics material were still low, with an average score of only 63.51. Students have not optimized their higher order thinking skills, especially in terms of creative thinking. There are four aspects of creative thinking skills observed, namely originality, fluency, flexibility, and elaboration (Miria et al., 2022). As a next step, further observation of students' creative thinking skills was carried out by conducting an initial test to evaluate students' understanding of Statistics material. Based on the results of the initial test, only 13 students managed to reach the math KKM score of 75, so the percentage of students who passed was 35%. Meanwhile, there were 24 students who had not reached the passing standard, with a percentage of 65%. These test results further underline the importance of improving creative thinking skills in all aspects for students.

Mathematical creative thinking ability is considered as something important, but in reality it is still relatively low (Widiyanto & Yunianta, 2021). Many teachers are more concerned with results than processes, provide limited knowledge from textbook content, use passive teaching methods, and underutilize learning media (Indayanti & Sagala, 2023).

In this condition, the learning process becomes less effective because it focuses on the role of the teacher (teacher oriented). Students are only listeners and recipients of information recorded from the teacher. To improve students' creative thinking skills, the role of the teacher in managing learning has great importance. One of the learning models that can be applied to help the learning process is Problem Based Learning (PBL).

The application of PBL is very suitable for improving students' creative thinking skills. Because through the PBL process, students are encouraged to develop divergent thinking skills in solving problems in mathematics learning materials, especially in Statistics materials. Previous studies that have been conducted regarding the use of the PBL model show that this approach has a positive impact on increasing student activity and involvement in the learning process (Anwar et al., 2019).

PBL is learning that focuses on authentic and learner-centered problems (Subekti & Jazuli, 2020). Meanwhile, according to (Kreatif et al., 2021) problem-based learning model is to help students learn to solve problems, better understand what they are doing, and more actively gain knowledge. According to (Nitbani et al., 2020) problem-based learning model, learning activities must be focused on tasks or problems that are real, relevant, and presented in a specific context. Therefore, the role of learning media as a container in delivering learning messages to students. One of the learning media is important to support the success of education, which ultimately created the Quizizz application as a learning media.

The Quizizz application can be used easily if you have an adequate internet connection. In order for Quizizz to develop into a competitive learning application amid the adaptation of the COVID-19 pandemic, continuous development is needed (Salsabila et al., 2020). Quizizz game is a game-based educational application that allows multiplayer activities to be carried out in the classroom and makes classroom exercises more interactive and fun (Mulyati & Evendi, 2020). If well prepared and in accordance with learning characteristics, the quizizz application is very helpful for teachers and students in the learning process.

Based on the above problems, the researcher is interested in conducting a study entitled "Efforts to Improve Mathematical Creative Thinking of Vocational Students in 2023 by Using Problem Based Learning Model Assisted by *Quizizz*".

METHODS

The approach used in this research is classroom action research (PTK) using the Kemmis and Mc Taggart model. In this study the researcher acts as a planner, action implementer, reflector, data collector and data analyzer, as well as debriefing the results of the research, helping schools carry out classroom action research (PTK). It also includes elements. The diagram of this research is based on the diagram developed by Kemmis and Taggart, in which there are four stages of action: planning, implementing, observing, and reflecting. The diagram is in Figure 1. below.

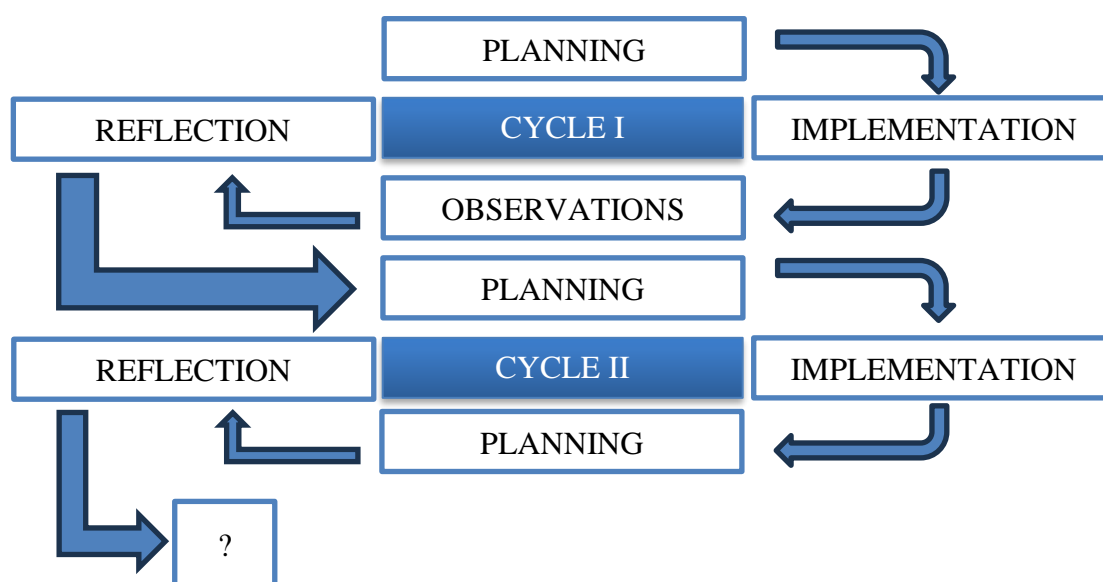


Diagram of the PTK cycle model developed by Kemmis and Taggart

This research was conducted in collaboration with the school mathematics teacher as a researcher and observer. The observer refers to the teacher activity sheet to check the learning process and the student activity sheet. The subjects of this study were class X students of SMK MALAKA in the 2022/2023 academic year totaling 37 people. The data collected include (1) teacher activity observation results and student activity observations, (2) test results at the end of each lesson, and (3) end-of-cycle test results. Data collection procedures in this study include validation of learning and research tools, observation, test

results, and test results. As an indicator of the success of the steps in this study, Problem Based Learning (PBL) is said to have succeeded in improving students' mathematical creative thinking skills, namely (1) The percentage of students who meet the minimum standard, namely 75% of students are in the creative enough criteria, (2) The results of observations of teacher and student activities are in the "good" standard.

Determining students' mathematical creative thinking achievement based on the results of quizzes and tests conducted by students at the end of the cycle. The data was analyzed based on the calculation of the Percentage of Success (*PoS*) using the following formula:

$$PoS = \frac{\text{total creative thinking ability score}}{\text{maximum score of students' creative thinking abilities}} \times 100\%$$

Action Success	Criteria
$95 \leq PK \leq 100$	Very Creative
$85 \leq PK \leq 95$	Creative
$65 \leq PK \leq 85$	Creative Enough
$55 \leq PK \leq 65$	Less Creative
$PK < 55$	Not Creative

Source: (Ikromi, 2018)

To calculate the Percentage of Students (*PoS*) who are in the creative enough criteria, formula (2) is used as follows:

$$PoS = \frac{\text{students who reach the criteria are quite creative}}{\text{student}} \times 100\%$$

A study is said to meet one of the specified success criteria if the results achieved show that at least 75% of students are at least moderately creative.

RESULTS AND DISCUSSION

Results

Description of Early Stage Creative Thinking Ability Test Results

The initial mathematical creative thinking ability test was given to 37 students. The test results show that the level of students' creative thinking abilities, namely: two students or 5% of the total number have very creative abilities; five students or 14% of the total number of students have creative abilities; six students or 16% of the total number of students have moderately creative abilities; ten students or 27% of the total number of students have less

creative abilities; fourteen students or 38% of the total number of students have uncreative abilities. The following table presents a description of the level of student ability below.

Table 1. Description of Students' Ability Level on the Initial Mathematical Creative Thinking Ability Test

Value	Criteria	Many Students	Percentage Number of Students	Average Student Ability
95 - 100	Very Creative	2	5%	57,16 (Not Creative)
85 - 95	Creative	5	14%	
65 - 85	Creative Enough	6	16%	
55 - 65	Less Creative	10	27%	
0 - 55	Not Creative	14	38%	

Description of Creative Thinking Ability Test Results Cycle I

The ability test that I developed for creative thinking skills was given to 37 students. The following is an explanation of creative thinking skills in cycle I, namely: two students or 5% of the total number have very creative abilities; five students or 14% of the total number of students have creative abilities; six students or 16% of the total number of students have moderately creative abilities; ten students or 27% of the total number of students have less creative abilities; fourteen students or 38% of the total number of students have uncreative abilities. The following table presents a description of the level of student ability below.

Table 2. Description of Students' Ability Level on Mathematics Creative Thinking Ability Test Cycle I

Value	Criteria	Many Students	Percentage Number of Students	Average Student Ability
95 - 100	Very Creative	4	11%	63,51 (Creative Enough)
85 - 95	Creative	8	22%	
65 - 85	Creative Enough	6	16%	
55 - 65	Less Creative	9	24%	
0 - 55	Not Creative	10	27%	

Description of Creative Thinking Ability Test Results Cycle II

The proficiency test I gave in cycle I had not yet reached the success criteria of 75% of the total students. So I continued the ability test in cycle II. The following is an explanation of the ability to think creatively in Cycle II, namely: fourteen students or 38% of the total number had very creative abilities; six students or 16% of the total number of students had creative

abilities; eight students or 22% of the total number of students had moderately creative abilities; six students or 16% of the total number of students had less creative abilities; three students or 8% of the total number of students had uncreative abilities. The following table presents a description of student ability levels below.

Table 3. Description of Students' Ability Level on Mathematics Creative Thinking Ability Test Cycle II

Value	Criteria	Many Students	Percentage Number of Students	Average Student Ability
95 - 100	Very Creative	16	43%	86,89 (Creative)
85 - 95	Creative	6	16%	
65 - 85	Creative Enough	8	22%	
55 - 65	Less Creative	4	16%	
0 - 55	Not Creative	3	8%	

Discussion

The discussion of the results of this study is to find answers to the problems raised in the study of how the application of the problem-based learning model can improve creative thinking skills in students in class X-DKV SMK MALAKA. Based on the test data that has been obtained, there is an increase in test results and students' abilities in creative thinking skills during the application of the problem-based learning model in Mathematics in class X-DKV SMK MALAKA.

Class X-DKV was the investigation conducted at SMK MALAKA. Students' mathematical creative thinking ability was evaluated before the implementation of PBL. The results of the initial creative thinking ability test showed a quite disappointing average score of 57.16 points.

The mathematics teacher of class X-DKV of SMK MALAKA tested students' creative thinking ability after the lesson. In the problem-based learning model in cycle I, students obtained an average score of 63.51 on the mathematical creative thinking test, which showed a classical ability of 49%. In cycle II, the students' average score was 86.89, which showed a classical ability of 81%. As a result, students developed greater creative thinking skills.

There is a significant positive correlation of creative thinking skills assisted by quizzes in Statistics material, then these skills can be applied to students' daily lives because of the implementation of Problem Based Learning. The teacher acts as a facilitator and provides

motivation for learning activities so that students become enthusiastic and curious in the teaching and learning process in relation to solving problems. Learning activities direct students to think creatively by encouraging students to express their opinions creatively and produce work that matches students' creativity. From this description it can be understood that Problem Based Learning supports students to develop creative thinking skills, especially in the teaching and learning process, especially statistical material, then these skills can be implemented in daily activities.

In this study it improves the ability to think mathematically creatively as the researchers first conducted several researchers, among them conducted by (Sukmawati, 2019) and (Juwita et al., 2019) which stated improving mathematical creative thinking ability of high school students.

The above description, by applying Problem Based Learning to the Statistics material in class X at SMK MALAKA agree with obtaining the results of research actions carried out by (Vera & Astuti, 2019) by Applying Problems Based learning to learning achieved the success of classical creative thinking skills at cycle I i.e. with an average of 71.4 and in cycle II increased to 74.2. Increased creative thinking skills also influenced the achievement of learning outcomes seen in cycle I, with a classical 71.4 ratio of learning accomplishment in cycles I and II increased to 82.9. Further research conducted (Abdurrozak & Kurnia Jayadinata, 2016) also supports research carried out by researchers by implementing Problem Based Learning on teaching learning activities can develop students' creative thinking skills and can affect the accuracy of students' learning outcomes.

The results of the study were compared with other studies related to the subject, one of which is "Application of Problem Based Learning Model to Improve Students' Creative Thinking Ability in Class VII SMP Negeri 3 Medan" published in 2023 by (Ed et al., 2023). This allows researchers to improve their research results. In this study, it is expected that students' mathematical creative thinking skills using the Problem Based Learning (PBL) model have improved. In relevant research, it meets KKM 75 with a minimum classical of 75%, and students' creative thinking skills using the Problem Based Learning model increase.

The results of this study showed higher completeness compared to previous related studies. The KKM score for this study was 75 with a class of 81%, while the KKM score for the

comparable study was 75 with a class of 75%. As a result, the average score of this study was higher.

CONCLUSION

After receiving lessons provided through the Problem Based Learning model, students showed an increase in creative thinking skills. This is shown by comparing Cycle I with Cycle II, or by comparing the initial Student Proficiency Test. Both of these comparisons show that, none of the students were able to reach the goal at their current level of creative thinking ability. In cycle I, the overall student success rate was 49% (18 out of total students), with an average score of 63.51. In cycle II, the percentage of successful students increased to 81% (30 out of total students), with an average score of 86.89.

ACKNOWLEDGMENTS

The researcher would like to thank SMK MALAKA Jakarta for providing researchers with the opportunity to carry out research at SMK MALAKA Jakarta. Thank you also to the participants who responded to this research.

REFERENCES

- Abdurrozak, R., & Kurnia Jayadinata, A. (2016). Pengaruh Model Problem Based Learning Terhadap Kemampuan Berpikir Kreatif Siswa pada Pembelajaran IPA. *Papanda Journal of Mathematics and Science Research*, 1(1), 49–56.
<https://doi.org/10.56916/pjmsr.v2i1.306>
- Aminy, M., Herizal, H., & Wulandari, W. (2021). Penerapan Model Problem Based Learning Berbantuan Geogebra Untuk Meningkatkan Kemampuan Berpikir Kreatif Matematis Siswa Sma Negeri 1 Muara Batu. *Jurnal Pendidikan Matematika Malikussaleh*, 1(1), 45.
<https://doi.org/10.29103/jpmm.v1i1.4390>
- Anwar, C., Saregar, A., Yuberti, Y., Zellia, N., Widayanti, W., Diani, R., & Wekke, I. S. (2019). Effect size test of learning model arias and PBL: Concept mastery of temperature and heat on senior high school students. *Eurasia Journal of Mathematics, Science and Technology Education*, 15(3). <https://doi.org/10.29333/ejmste/103032>
- Apriliani. (2016). *Analyze of Mathematical Creative Thinking Ability Based On Math Anxiety in Creative Problem Solving Model with SCAMPER Technique*. 2016.
- Ed, W. P., Sirait, K. A. H., & Firdaus, M. (2023). Penerapan Model Problem Based Learning
-
- Efforts to Improve Mathematical creative thinking of SMK Students in 2023 by Using a Problem-Based Learning*
Akbar, Hendriana

- untuk Meningkatkan Kemampuan Berpikir Kreatif Siswa di Kelas VII SMP Negeri 3 Medan. *Paradikma: Jurnal Pendidikan Matematika*, 123–128.
- Ikromi, S. L. (2018). Meningkatkan Kemampuan Berpikir Kreatif Matematis Siswa SMA Melalui Pembelajaran Open-Ended Pada Materi SPLTV. *Jurnal Matematika Statistika Dan Komputasi*, 15(2), 104. <https://doi.org/10.20956/jmsk.v15i2.5719>
- Indayanti, Y., & Sagala, P. N. (2023). Penerapan Model Problem Based Learning Berbantuan Media Geogebra Untuk Meningkatkan Kemampuan Berpikir Kreatif Matematis Siswa di MTs Citra Abdi Negoro. *Journal of Student Research (JSR)*, 1(3), 245–259.
- Jihan, J. R., & Hendriana, B. (2023). Application of ADDIE Learning Model Assisted by Desmos Application to Improve Ability to Understand Mathematical Concepts. *JTMT: Journal Tadris Matematika*, 4(02), 181–189. <https://doi.org/10.47435/jtmt.v4i02.2043>
- Juwita, R., Utami, A. P., & Wijayanti, P. S. (2019). Pengembangan Lks Berbasis Pendekatan Open-Ended Untuk Meningkatkan Kemampuan Berpikir Kreatif Matematis Siswa. *Prima: Jurnal Pendidikan Matematika*, 3(1), 35. <https://doi.org/10.31000/prima.v3i1.814>
- Kreatif, K. B., Handayani, A., & Koeswanti, H. D. (2021). *Jurnal basicedu*. 5(3), 1349–1355.
- Miria, Y., Fahriza, N., & Nizarwati, N. (2022). Peningkatan Kemampuan Berfikir Kreatif Melalui Model Problem Based Learning. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 11(4), 3662. <https://doi.org/10.24127/ajpm.v11i4.5814>
- Mulyati, S., & Evendi, H. (2020). Pembelajaran Matematika melalui Media Game Quizizz untuk Meningkatkan Hasil Belajar Matematika SMP. *GAUSS: Jurnal Pendidikan Matematika*, 3(1), 64–73. <https://doi.org/10.30656/gauss.v3i1.2127>
- Nitbani, A. Y., Nahak, S., & Amsikan, S. (2020). Efektivitas Model Pembelajaran Berbasis Masalah Ditinjau Dari Hasil Belajar Matematika Pada Siswa Kelas Vii Smpk Putra St. Xaverius Kefamenanu Tahun Ajaran 2019/2020. *MATH-EDU: Jurnal Ilmu Pendidikan Matematika*, 5(1), 25–30. <https://doi.org/10.32938/jipm.5.1.2020.25-30>
- Salsabila, U. H., Habiba, I. S., Amanah, I. L., Istiqomah, N. A., & Difany, S. (2020). Pemanfaatan Aplikasi Quizizz Sebagai Media Pembelajaran Ditengah Pandemi Pada Siswa SMA. *Jurnal Ilmiah Ilmu Terapan Universitas Jambi|JIITUJ*, 4(2), 163–173. <https://doi.org/10.22437/jiituj.v4i2.11605>
- Simanjuntak, I. (2023). Penerapan Model PBL Untuk Meningkatkan Kemampuan Berpikir

- Kreatif Matematis Siswa di Kelas XII IPA 2 SMA Negeri 7 Medan. *Paradikma: Jurnal Pendidikan Matematika*, 15(2), 156–160.
- Subekti, F. E., & Jazuli, A. (2020). *Peningkatan Kemampuan Pemecahan Masalah dan Kemandirian Belajar Mahasiswa Melalui Pembelajaran Berbasis Masalah*. 4(1), 13–27.
- Sukmawati, R. (2019). *MATEMATIS SISWA SMP DENGAN MODEL TREFFINGER memecahkan masalah , membantu siswa dalam menguasai konsep-konsep materi yang model Treffinger ?*". 3(1), 17–23.
- Vera, M., & Astuti, S. (2019). *Siswa Melalui Model Pembelajaran Problem Based Learning Pada Kelas Vsdn*. 6(1), 11–21.
- Widiyanto, J., & Yuniarta, T. N. H. (2021). Pengembangan Board Game TITUNGAN untuk Melatih Kemampuan Berpikir Kreatif Matematis Siswa. *Mosharafa: Jurnal Pendidikan Matematika*, 10(3), 425–436. <https://doi.org/10.31980/mosharafa.v10i3.997>