

Research Article

Implementation of the jucama learning model assisted by tangram media to improve students' mathematical creative thinking skills in plane figure material

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ABSTRACT

The mathematical creative thinking skill is crucial in learning mathematics. However, the problem encountered in learning mathematics in class VII-B at SMP (Junior High School) Wahid Hasyim Malang was that the teacher did not involve students in exploring and providing opportunities to improve mathematical creative thinking skills. In overcoming this problem, the researcher applied the Jucama learning model assisted by tangram media on plane figure material. This research design was Classroom Action Research (CAR) which consisted of (1) Planning, (2) Implementation, (3) Observation, and (4) Reflection. The research subjects were 30 students in class VII-B SMP Wahid Hasyim. Data was collected through teacher and student activity observations, end-of-cycle test results, and questionnaires. This research was conducted in two cycles, with two meetings. The results indicated an increase in the percentage of observations of teacher and student activities, end of cycle test results, and questionnaire results. The results of observations of teacher activities in cycle I reached an average percentage of 75%, while in cycle II, it increased to 86.875%. The results of observing student activities in the first cycle reached a percentage of 73.125%, while in the second cycle, it increased to 85.75%. The end of cycle I test results showed that the completeness of student learning outcomes attained 63.33% with an average class score of 72. In comparison, the completeness of student learning outcomes in cycle II increased to 86.67%, with an average class score of 83.47. The results of the questionnaire in cycle I indicated that the percentage of success reached 46.67%, while in cycle II, the questionnaire results increased, with the percentage of success attaining 83.33%. Based on the results of data analysis, it can be implied that applying the Jucama learning model assisted by tangram media could improve the mathematical creative thinking skill of class VII-B students of SMP Wahid Hasyim Malang in the plane figure material.

Keywords: Jucama Learning Model; Tangram Media; Mathematical Creative Thinking; Plane Figure

1. INTRODUCTION

Creative thinking skill is vital in learning mathematics. Learning mathematics requires that each student has the skill to solve problems, create mathematical models, and create media (Nasir et al., 2022:180). It denotes how significant it is for someone to improve their mathematical creative thinking skills. The mathematical creative thinking skill is the skill to solve a mathematical problem with many ideas, generate different solution ideas, create new forms, and produce the correct answers (Putri, 2021:8). The mathematical creative thinking skill relates to one's divergent and convergent thinking, as well as finding problems, solving problems, observing new things, and making connections between ideas, ways, and applications of an object (Hadar and Tirosh, 2019). Through good mathematical creative thinking skills, students can bestow ideas according to their perspective to solve math problems with correct answers.

According to Hendriana et al. (2017:111), the mathematical creative thinking skill is an essential mathematical skill that needs to be mastered and developed in students who are studying mathematics. The importance of creative thinking in mathematics allows students to apply concepts and opinions actually, and get used to facing new challenges and problems; thus, students can improve the processes and results of learning mathematics (Sosriyati et al., 2021:2). Meanwhile, Rasnawati et al. (2019:164) mention that mathematical creative thinking is the activity of a person solving a mathematical problem by generating several diverse ideas, being able to expand an idea and being able to create new, different solutions. It implies that the better students' mathematical creative thinking skills, the easier it is for these students to solve mathematical problems. Someone who has good creative thinking skills means being able to solve

problems flexibly and fluently and has novelty in answers (Silver, 1997; Siswono, 2018:40). Meanwhile, according to Suherman and Vidakovich (2022:2), someone who involves mathematical creative thinking skills will be able to create something new from results, ideas, descriptions, concepts, experiences, and knowledge related to mathematics which includes fluency, flexibility, originality, and elaboration.

Nowadays, the problem of learning mathematics generally does not involve students exploring and providing opportunities to improve mathematical creative thinking skills. Students are not allowed to find answers or ideas different from those taught by the teacher. Teachers frequently do not allow students to construct their own opinions or understanding of mathematical concepts (Kurniawati et al., 2019:89). Learning that involves students' mathematical creative thinking skills is considered complex and demanding; hence, alternative solutions are needed to support teachers and increase the possibility of student involvement in learning (Ketelhut et al., 2020). According to Wardani et al. (2021:88), mathematics learning activities are often only oriented toward delivering teaching materials, thus causing an increase in students' mathematical creative thinking skills to be less than optimal.

Based on the results of observations in class VII-B SMP Wahid Hasyim Malang, the researchers discovered that most students' mathematical creative thinking skills were still relatively low. The percentage of completeness of students' mathematical creative thinking skills in the previous material only reached 43.33%, with an average class score of 59.86. According to the interview results of mathematics teachers, the implementation of learning still employed conventional models with the lecture method and has not employed learning media that could help deliver material adapted to teaching materials. Hence, it became one of the factors that students had not been able to play an active role in learning, which caused students' mathematical creative thinking skills to be low. One of the reasons for the importance of developing an appropriate learning model is that it can effectively help and facilitate the process of achieving learning objectives and will have implications for students' interest in participating in learning (Asyfh, 2019:20). As an effort to overcome this problem, it is necessary to apply one of the learning models which is expected to be able to improve students' mathematical creative thinking skills, i.e., the Jucama learning model.

The Jucama learning model is a learning model that engages many students in playing an active role in asking and solving problems (Siswono, 2018:81). Through submission and problem-solving, students will involve their creative thinking skills to find solutions to the problems posed. Submission and problem-solving are closely related to improving one's mathematical creative thinking skills. According to Wardani et al. (2021: 9-90), posing problems can empower students when they decide which questions to solve later, thus breaking the assumption that there is only one way to solve problems with the correct answer. The application of the learning model in this research was combined with media which could be a tool for posing and solving problems in plane figure material. Learning media functions to channel messages in the form of ideas, feelings, and students' attention to the subject matter as well as a tool that helps the interaction process between teachers and students (Hasiru et al., 2021: 60; Suryani et al., 2018:5; Pagarra et al., 2022:21; Susilana and Riyana, 2018:10). The alternative media used in this research was tangram media. Teachers can employ tangram as a simple learning medium for geometry material. In addition, it can also be a medium that supports the development of students' creative thinking (Cahyanita et al., 2020:2; Andini et al., 2019:30).

Tangram is a square-shaped puzzle game from China with seven plane figure pieces. There are three plane figures to arrange a square on the tangram: five triangles, a square, and a parallelogram (Hu et al., 2019). Tangrams can be made with simple materials such as cardboard and wooden planks (Rahmani and Widyasari, 2017:132-133). The use of tangram media in plane figure material is employed as a concrete visualization medium for students and as a medium to increase student interest in learning (Mufti et al. 2020:93). The use of tangram media in this research was modified according to the needs of students to learn plane figure material as well as a medium to assist in submitting and solving problems in the material.

The syntax of the Jucama learning model assisted by tangram media in this research was adapted from the syntax of the Jucama learning model according to Siswono (2018:94), namely conveying goals and preparing students, orienting students to problems through solving and submitting problems by using tangram media and organizing students to learn, guiding solving individually or in groups, presenting the results of problem-solving, checking to understand and provide feedback. Therefore, combining the Jucama learning model with tangram media is expected to be alternative learning that can help improve the mathematical creative thinking skills of class VII-B SMP Wahid Hasyim Malang in the plane figure material.

2. RESEARCH METHOD

The research design was Classroom Action Research (CAR) which aimed to apply the Jucama learning model assisted by tangram media to improve students' mathematical creative thinking skills. The study was conducted at SMP Wahid Hasyim Malang from March 27, 2023, to April 14, 2023. The research subjects were class VII-B students for the 2022/2023 academic year, totaling 30 students. The classroom action research procedure in this research included four stages of activity, namely (1) planning, (2) implementation, (3) observation, and (4) reflection, which was carried out repeatedly until the specified action success criteria were achieved (Lewin, 1990:17; Arikunto *et al.*, 2015:42; Farhana *et al.*, 2020:29).

The data collection instruments employed in this research consisted of observation sheets of teacher and student activities, tests of mathematical creative thinking skills, and questionnaires. Meanwhile, the researcher determined indicators of the research success, including the results of observations of teacher and student activities attaining a percentage of $\geq 81\%$, the percentage of completeness of the end of cycle student test, i.e., $\geq 75\%$ of students obtaining a score of ≥ 75 with an average class score of ≥ 75 , and student responses to the actions given in the form of questionnaire results indicated $> 50\%$ of students with a percentage of the results of the questionnaire $\geq 81\%$.

3. RESULTS AND DISCUSSION

Cycle I Action

The implementation of classroom action research in this research consisted of two cycles. Each cycle included the planning, implementing, observing, and reflecting stages. The planning stage in cycle I was carried out to prepare various things needed in research, including determining research targets, preparing learning materials, compiling learning tools in the form of Lesson Plans (RPP) and Student Worksheets (LKPD), compiling research instruments in the form of observation sheets of teachers and students' activities, questionnaire sheets and end of cycle test questions. In addition, at this stage, the researcher also validated learning tools and research instruments, prepared learning media, and determined research success criteria.

The implementation stage of the cycle I was carried out after the planned research activities had been fulfilled. Cycle I action was carried out in two meetings. The first meeting was giving action in the form of applying the Jucama learning model assisted by tangram media on parallelogram and rectangular material based on the Lesson Plan (RPP) that had been prepared. Along with teaching, two observers conducted observations of teacher and student activities, i.e., the mathematics teacher and research colleagues. The circumstance of learning activities in cycle I can be seen in [Figure 1](#).



Figure 1. Students' Activity in Asking Problems

Observation of teacher and student activities was implemented by filling out the provided observation sheets. Teacher and student activities during learning were adjusted to the stages contained in the Lesson Plan (RPP), which consisted of preliminary, core, and closing activities. The average percentage gain from observations of teacher activities in cycle I attained 75%, while the percentage gain from observations of student activities in cycle I attained 73.125%.

After the action was carried out by applying the Jucama learning model assisted by tangram media in cycle I, then at the next meeting, the end of cycle test was carried out to determine students' mathematical creative thinking skills. Furthermore, to find out students' responses to the actions given, students were asked to fill out a questionnaire after completing the end of cycle test questions. The end of cycle I test results revealed that the percentage of completeness reached 63.33%, in which 19 out of 30 students were declared passed because they received a score of ≥ 75 , and the average class score obtained reached 72.9. Meanwhile, student responses to the actions given in the form of questionnaire results indicated that 46.67% of the total number of students, or 14 out of 30 students, responded to the actions given by obtaining a score of the questionnaire results, attaining a percentage of $\geq 81\%$.

Data from observations of teacher and student activities, end of cycle test results, and questionnaire results obtained in cycle I did not meet the specified success criteria. After being analyzed, the management of learning by the teacher in cycle I found several shortcomings, including the teacher was not firm when reprimanding students for making noise. Attention was not given evenly to all students, and teachers could still not stimulate students to participate actively in proposing and solving problems. Meanwhile, the implementation of learning in cycle I by students had several shortcomings, including many students who had not actively submitted and solved problems, less visible collaboration in groups, and less conducive classroom conditions for learning. It caused students' mathematical creative thinking skills not to be declared passed, and student responses to the actions given were not satisfactory. Data on the results of the cycle I actions can be seen in **Table 1**.

Table 1. Results of Cycle I Actions

No.	Results of Cycle I Actions	Success Criteria
1	Percentage of action success (observation of teacher activities) = 75 %	Percentage of action success (observation of teacher activity) $\geq 81\%$
2	Percentage of action success (observation of student activities) = 73.125%	Percentage of action success (observation of student activities) $\geq 81\%$
3	63.33% of students obtained end of cycle test scores of ≥ 75	$\geq 75\%$ of students obtained end of cycle test scores ≥ 75
4	The average class value at the end of cycle test = 72.9	The average class score on the end of cycle test ≥ 75
5	46.67% of students showed the results of the questionnaire with a score percentage of $\geq 81\%$	$> 50\%$ of students showed the results of the questionnaire with a score percentage of $\geq 81\%$

Based on the acquisition of these data, the actions given in cycle I did not meet the predetermined success criteria. Hence, researchers needed to take action in the next cycle by considering and correcting the lacking matters while giving cycle I action.

Cycle II Action

As the actions of Cycle I, each stage was carried out carefully and structurally in Cycle II. The giving of cycle II action referred to the results of the reflection of the cycle I action; thus, some obstacles are attempting to be fixed so that the results obtained have increased for the better. In the planning stage of cycle II, the researcher prepared various things needed as in the planning stage of cycle I. The implementation of cycle II actions was carried out in two meetings. At the first meeting, the researcher gave action by applying the Jucama learning model assisted by tangram media on the square and triangular material that was prepared and adjusted to the Lesson Plan (RPP). During the implementation of learning, observations were also applied to the teachers' and students' activities. The circumstance of learning activities in cycle II can be seen in **Figure 2**.



Figure 2. Students' Learning Activities in Groups

The average percentage obtained from observing teacher activities in cycle II reached 86.875%. Meanwhile, the average percentage gained from observing student activities in cycle II reached 85.75%. It indicated that the results obtained have increased and meet predetermined success criteria. After analyzing the results obtained, the teacher's activities in managing learning were better than before. Additionally, most students were seen to be more active and enthusiastic in participating in learning activities. Students were also more active in asking and solving problems in groups. Thus, it can be implied that the teachers' and students' activities in this cycle have increased.

The second meeting in this cycle was implementing the end-of-cycle test to determine the increase in students' mathematical creative thinking skills and fill out a questionnaire to determine students' responses to the actions given. The end-of-cycle II test results revealed that the percentage of completeness reached 86.67%; 26 of 30 students were declared passed because they received a score of ≥ 75 and the average class score reached 83.47. Meanwhile, student responses to the actions given in the form of questionnaire results indicated that 83.33% of the total number of students, or 25 of 30 students, responded to the actions given by obtaining a score of the results of the questionnaire attaining a percentage of $\geq 81\%$.

Data from observations of teacher and student activities, end-of-cycle test results, and questionnaire results obtained in the cycle II actions met the specified success criteria. After being analyzed, the management of learning by the teacher in cycle II was better than in the previous cycle. Moreover, most students were seen to be more active and enthusiastic in participating in learning activities and more active in asking and solving problems in groups. Some of the deficiencies found in cycle I could be corrected so that the end-of-cycle test results of students and student responses to the actions given in the form of questionnaire results also increased. In addition, students' mathematical creative thinking skills, which were known from acquiring the end-of-cycle II test results, have increased and were better than in the previous cycle. Most students' responses to the actions showed an excellent increase in results. Data on the results of cycle II actions can be seen in [Table 2](#).

Table 2. Results of Cycle II Actions

No.	Results of Cycle II Actions	Success Criteria
1	Percentage of action success (observation of teacher activities) = 86.875%	Percentage of action success (observation of teacher activity) $\geq 81\%$
2	Percentage of action success (observation of student activities) = 85.75%	Percentage of action success (observation of student activities) $\geq 81\%$
3	86.67% of students obtained an end-of-cycle test score of ≥ 75	$\geq 75\%$ of students obtained an end-of-cycle test score of ≥ 75
4	The average class value at the end-of-cycle test = 83.47	The average class score on the end-of-cycle test ≥ 75
5	83.33% of students show the results of the questionnaire with a score percentage of $\geq 81\%$	$>50\%$ of students show the results of the questionnaire with a score percentage of $\geq 81\%$

Based on the data obtained in the second cycle of action, the implementation of actions related to the application of the Jucama learning model assisted by tangram media to improve the mathematical creative thinking skills of class VII-B students of SMP Wahid Hasyim Malang has increased and fulfilled all predetermined success criteria. Thus, it can be implied that the action in cycle II has been successful, and the research can be stopped, or in other words, the research is completed without having to take further action.

Discussion

According to the results of observations in class VII-B of SMP Wahid Hasyim Malang, the researchers found the fact that most students' mathematical creative thinking skills were still relatively low. The percentage of completeness of students' mathematical creative thinking skills only reached 43.33%, with an average class score of 59.86. It was one of the factors that students had low creative thinking skills, i.e., the use of inappropriate learning models and media. Based on these problems, the researchers conducted classroom action research by applying the JUCAMA learning model assisted by tangram media. This research aims to improve students' mathematical creative thinking skills after applying the JUCAMA learning model assisted by tangram media on plane figure materials in class VII-B of SMP Wahid Hasyim Malang in the 2022/2023 academic year. After the implementation of the research with two cycles, the results indicated that the actions given met the success criteria and improved students' mathematical creative thinking skills.

The application of the tangram media-assisted learning model was mentioned to be successful if the percentage of success of the action on teacher and student activities during the implementation of the action reached $\geq 81\%$, with a

success rate in the excellent category. The observations of teacher activities in the first cycle indicated that the percentage of success reached 75%, with a success rate in the good category. In contrast, it increased to 86.875% in the excellent category in the second cycle. Meanwhile, the observations of student activities in the first cycle implied that the percentage of success reached 73.125, with the level of success in the good category. In contrast, it increased to 85.75% in the excellent category in the second cycle.

The students' mathematical creative thinking skill in this research was stated to increase if the results of the end-of-cycle test of students reached the specified success criteria, i.e., there were $\geq 75\%$ of students obtaining the end-of-cycle test score of ≥ 75 , and the acquisition of average class scores reached ≥ 75 . The percentage of completeness in the first cycle reached 63.33%; 19 of 30 students were declared passed because they received a score of ≥ 75 with an average class score of 72.9. While the percentage of completeness in cycle II reached 86.67%, 26 of 30 students were declared passed because they obtained a score of ≥ 75 with an average class score of 83.47. The questionnaire results, i.e., student response data to the actions given in this study were said to be successful if $> 50\%$ of students showed the questionnaire results with a percentage score of $\geq 81\%$. The results of the questionnaire in cycle I indicated that the percentage of success reached 46.67%; i.e., there were 13 students with a questionnaire score attaining a percentage of $\geq 81\%$. Whereas, in cycle II, the questionnaire results increased with a percentage of success attaining 83.33%; i.e., 26 students with a questionnaire score attaining a percentage of $\geq 81\%$.

Improving students' mathematical creative thinking skills after applying the JUCAMA learning model was in line with Wardhani et al. (2019)'s opinion that the Jucama learning model is a learning model based on submission and problem-solving that can encourage the development of student creativity. Hence, students' creative thinking skills with the Jucama learning model will be better than conventional models. Khaulah (2018) states that learning mathematics with the Jucama model assisted by algebraic block media can make students active and creative in developing new ideas in proposing and solving mathematical problems; therefore, students' mathematical creative thinking skills increase. In addition, Indriyani et al. (2017) also state that learning mathematics with the JUCAMA model shows better learning achievement than the Problem-based Learning model. Other opinions that are relevant to the research results include Prihantini et al. (2019), which state that the mathematical creative thinking skills of students who use the Problem-based Learning model with the help of tangram media are better than students who use the Problem-based Learning model without the help of tangram media. Atini (2018) states that tangram media can be employed to train the speed of creative thinking and to train students to develop creative thinking skills. Furthermore, Mufti et al. (2020) stated that tangram media in plane figure material is employed as a concrete visualization medium for students to increase student interest in learning. It implies that the use of tangram combined with the Jucama learning model can help students pose and solve mathematical problems to improve their mathematical creative thinking skills.

Based on the description of the research results, this research has generally improved mathematical creative thinking skills. The results indicated that all success criteria had been fulfilled. In other words, classroom action research by applying the Jucama learning model assisted by tangram media had succeeded in improving the mathematical creative thinking skills of class VII-B students of SMP Wahid Hasyim Malang.

4. CONCLUSION

The results of the classroom action research that has been carried out implied that learning mathematics in class VII-B of SMP Wahid Hasyim by applying the Jucama learning model assisted by tangram media could improve students' mathematical creative thinking skills in plane figure material. It happened because, during the learning process, students were allowed to be active in proposing and solving mathematical problems with the help of tangram media, thereby involving students' mathematical creative thinking skills. The results of the end-of-cycle test indicated an increase and completeness of learning outcomes individually and classically. Learning mathematics with the Jucama learning model assisted by tangram media could be carried out well, and student responses to the actions given were also in the excellent category. Based on the research results and conclusions that have been presented, the researchers suggest several things, including (1) it is recommended for teachers to apply the Jucama learning model assisted by tangram media or media adapted to the learning material being taught as an alternative that can be employed to improve students' mathematical creative thinking skills; (2) it is suggested that students maximize learning by actively conducting questions and answers related to learning materials, having high interest and enthusiasm for learning, and increasing their mathematical creative thinking skills; (3) it is suggested to future researchers who will apply the Jucama learning model assisted by

tangram media to be able to research aspects related to other mathematical skills that have not been studied and focus on other factors that cause problems in learning mathematics. In addition, future researchers can also apply the JUCAMA learning model assisted by other media adapted to the material being taught.

CONFLICT OF INTEREST

There are no conflicts of interest declared by the authors.

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