Kontinu: Jurnal Penelitian Didaktik Matematika
E-ISSN: 2656-5544
P-ISSN: 2715-7326
Vol. 8, No. 1, Mei 2024
Hal. 66-80

The Effectiveness of Project-Based Learning Assisted by Educational Teaching Aids of Building Blocks on Students' Mathematical Creative Thinking Skills

Lutfi Rahmawati[1*], Hevy Risqi Maharani[1] , Nila Ubaidah[1], Mohamad Aminudin[1]

[1]Program Studi Pendidikan Matematika, Universitas Islam Sultan Agung

*Corresponding email: hevyrisqi@unissula.ac.id

Abstract. The aim of this research is to examine the effectiveness of a project-based learning model assisted by educational teaching aids, specifically construction blocks, on students' mathematical creative thinking skills. The research method employed is a pre-experimental design with a one-group pretest-posttest approach. The research instruments consist of observation sheets and student essay tests. Data analysis techniques include individual minimum mastery criteria (MMC) achievement tests, classical completeness tests, pretest-posttest mean difference tests, and N-gain tests. The individual MMC hypothesis test, using a one-sample t-test, yielded a significant value (2-tailed) of 0.000 < 0.05, indicating that after the project-based learning intervention with construction block educational aids, the MMC exceeded 70. The classical completeness test, utilizing Z statistics, resulted in Z_calculated = 3.560545 ≥ Z_table = 0.6736, demonstrating that the proportion of students meeting the minimum mastery criteria exceeded 75%. Furthermore, the mean difference test showed that students' mathematical creative thinking skills increased from 36.82 to 85.15. Additionally, the N-gain test yielded a score of 0.7675, with a percentage of 76.74%, categorizing it as high and effective. Therefore, project-based learning assisted by educational teaching aids, specifically construction blocks, is effective in enhancing students' mathematical creative thinking skills.

Keywords: Construction blocks, students' mathematical creative thinking skills.

INTRODUCTION

The learning process should encourage students to actively develop their abilities. Through this process, students can enhance essential skills such as critical thinking, creativity, innovation, and collaboration. Mathematics, in particular, plays a crucial role in fostering these skills (Ubaidah & Maharani, 2018). A well-structured education from an early age is necessary to prepare students for real-life challenges. In today's era, creative thinking skills are a primary focus for development.

Teachers use media aids and apply innovative teaching models to make mathematics lessons more engaging for students (Awwalin & Barat, 2021). One example of student-centered learning is the project-based learning model, which delivers curriculum concepts through hands-on activities. This approach allows students to develop their own ideas and take an active role in solving problems. According to Dewi (2022), the advantages of project-based learning include helping students plan and execute processes to reach outcomes, as well as fostering a sense of responsibility. However, there are some challenges, such as: 1) it requires significant time and resources; 2) both teachers and students must be prepared to embrace learning and growth; 3) it demands substantial media and learning resources; and 4) students may lose confidence in working independently, especially if they lack prior individual experience due to group-based tasks.

According to Tawab et al. (2021), the implementation of learning through Project-Based Learning (PBL) consists of six key stages. The first stage involves fundamental questioning, followed by project planning, then scheduling the activity timeline. The fourth stage is monitoring the project's progress, the fifth is testing the results, and the final stage is evaluation and reflection. PBL offers several benefits, as highlighted by Guo et al. (2020), including improving students' knowledge and personal skills. Students also recognize that PBL encourages collaboration and negotiation within group work. In conclusion, PBL not only enhances learning outcomes but also strengthens important interpersonal and teamwork abilities.

Shunhaji and Fadiyah (2020) emphasized that educational teaching aids are essential tools designed to stimulate children's learning through play. In this approach, teachers play a crucial role in enhancing students' intelligence, attitudes, and mental well-being. Teaching aids serve as effective methods for delivering learning materials, helping students grasp concepts more easily and construct knowledge effectively. According to Suliani (2020), these aids are particularly valuable in establishing foundational mathematical concepts. By incorporating teaching aids into the learning process, mathematics can become more flexible, encouraging students to engage their creativity and develop innovative

mathematical thinking. In conclusion, the use of educational teaching aids significantly enhances the learning experience, fostering both understanding and creativity in students.

Creative thinking skills are essential in the learning process of mathematics, as they enable students to effectively find solutions to various mathematical problems (Muthaharah et al., 2018). Furthermore, these skills allow students to articulate their thoughts and provide answers based on diverse approaches. Mathematical creative thinking can be defined as an individual's ability to solve mathematical problems accurately using multiple methods, generate unique ideas, and suggest innovative solutions (Hautauruk et al., 2020). In conclusion, fostering creative thinking skills in mathematics is vital for enhancing students' problem-solving abilities and encouraging originality in their mathematical reasoning.

Mathematics learning is essential for fostering students' creative mathematical thinking abilities. To maximize this development, careful planning of the learning process is crucial (Rukamana et al., 2020). Observations conducted by researchers revealed several challenges, such as students demonstrating low levels of creative thinking and facing difficulties in problem-solving. Furthermore, students often exhibit rigid thinking patterns that impede their ability to generate diverse solutions to problems. In conclusion, addressing these issues through effective instructional strategies is vital to enhance students' creative thinking skills in mathematics.

The factors influencing students' mathematical creative thinking abilities remain largely unidentified, and many students lack ingrained motivation for learning. As a result, they often struggle with self-confidence when it comes to presenting their ideas. This lack of focus on the problem at hand frequently leads to incomplete answers. To address these issues and enhance students' mathematical creative thinking abilities, it is essential to change the teaching approach. One effective strategy is to implement a more active, student-centered learning model. Specifically, using project-based learning with educational construction block tools can engage students more actively in the learning process. The goal of this research

is to examine how project-based learning, supported by these educational tools, can effectively improve the mathematical creative thinking abilities of eighth-grade students at MTs Miratul Muslimien.

Students can discover new concepts through learning, engaging in new experiences, and enhancing their creativity in problem-solving or product creation, thereby making the learning process more effective. This aligns with the views of Karina Puspa Kusuma, Mei Fita Asri Untari, and Veryliana Purnamasari (2023), who emphasize the improvement of students' mathematical creative thinking abilities through project-based learning. In this approach, the researcher facilitated the learning process and presented the materials to the students. Following this, the teacher allocated time for group discussions among the students.

RESEARCH METHOD

This study employs a pre-experimental method conducted with a single group, without a comparison group, using a one-group pretest-posttest design. The research aims to test the effectiveness of project-based learning, supported by educational props, in enhancing students' creative thinking abilities. The study took place in May 2023 at MTs Miratul Muslimien Grobogan, involving all 38 eighth-grade students as participants. Data collection involved simultaneous observation techniques during classroom instruction. Written tests, in the form of pretests and posttests, were administered to compare student outcomes before and after the treatment. The quantitative data analysis included normality tests, hypothesis testing, and N-gain tests.

The research procedure begins with the researcher administering a pretest to assess the students' mathematical creative thinking abilities prior to the learning treatment. In the second stage, the researcher provides the learning treatment using a project-based learning model supported by educational block props. Finally, the researcher conducts a posttest to evaluate the students' mathematical creative thinking abilities after they have undergone the learning treatment with the project-based learning model and educational block props.

RESULT AND DISCUSSION

The initial stage of the research involves conducting several tests: validity tests, reliability tests, discrimination tests, item difficulty tests, and data normality tests. Once these tests confirm that the data are normal and satisfactory, the next step is to administer a pretest to eighth-grade students at MTs Miratul Muslimien. The results of the pretest will be analyzed statistically, and this data will serve as a reference for the research.

In a study conducted at MTs Miratul Muslimien Grobogan, the researcher analyzed the results of the students' mathematical creative thinking ability test scores. The pretest scores revealed that 89.48% of the 34 students fell into the very low category, while both the low and medium categories accounted for 5.26% each. This indicates that the majority of eighth-grade students at MTs Miratul Muslimien exhibited very low mathematical creative thinking abilities. Consequently, there is a pressing need to implement an engaging learning model, specifically project-based learning supported by educational block media. The descriptive analysis of the results from the first test administered to the students during the pretest is presented below:

Table 1. Pretest and posttest statistical values

No	Statistics	Pretest Score	Posttest Score
1	Sample Size	38	38
2	Highest Score	69	100
3	Lowest Score	13	70
4	Average Score	36.81	85.18

Table 1 shows that the highest pretest score is 69, while the lowest score is 13, resulting in an average score of 36.81. This indicates that students' abilities in mathematical creative thinking are still low. To address this issue, it is essential to implement a treatment that involves project-based learning, supported by educational tools such as building blocks. The stages of this learning intervention include students acquiring basic competencies, stating the learning objectives, and the researcher explaining the material related to the volume of flat-sided geometric

shapes. Students are encouraged to ask questions about any concepts they do not understand.

The learning activities concluded with a presentation of the main topics for the upcoming material, followed by a closing greeting. During the initial learning activity, a result of 64% was achieved, indicating active engagement. Similarly, the researcher obtained a score of 72%, which is categorized as good. This reflects the students' active involvement and interest in learning mathematics (Mashuri, 2019).

In the next meeting, the lesson began with greetings, followed by a check of student attendance. The researcher then communicated the learning objectives and basic competencies. Before delving into the material, the researcher posed fundamental questions to the students about the topic of prism volume. Following this, the researcher presented the material as outlined in the lesson plan, emphasizing prism volume. During this session, both the researcher and students engaged in deepening their understanding of the material through the students' mathematical creative thinking abilities. The researcher explained the concepts based on the indicators of fluency, flexibility, originality, and elaboration. Notably, there was an improvement in student learning activities during this meeting, as data indicated that 84% of the activities were teacher-led, while 82% were student-driven, reflecting high student engagement. Enhancing the quality of education requires concerted efforts in classroom learning, particularly in improving the teacher's role in facilitating successful learning outcomes (Kamal, 2021).

During the explanation of the material, one student asked, "Why can we find the result of a geometric shape that is already known by using the formulas of other shapes?" The researcher responded, "This is what we call creativity; we can achieve the same result through different methods. For instance, if we earn a salary of Rp1,000,000, we do not necessarily have to work as a doctor. We can earn this amount by working as a teacher, a farmer, or a police officer. Similarly, we can arrive at the answer of 1728 using various geometric formulas, such as those for the volume of a rectangular prism, cube, or prism." From this response, the researcher concluded that the student's inquiry reflects their mathematical creative thinking

ability in terms of flexibility, which is the capacity to solve problems in multiple ways while reaching the same result (Hanipah, 2018).

In the final meeting of the mathematics lesson focused on polyhedra, the researcher explained and presented material related to the volume of a pyramid. The discussion centered on how to derive the formula for the volume of a pyramid and how to solve problems involving this concept, particularly in the context of students' mathematical creative thinking skills. Mathematical creative thinking involves a process that includes understanding problems, elaborating on issues, seeking solutions, providing evidence, and reporting findings. Additionally, independent learning plays a significant role in enhancing students' levels of creativity (Atiyah & Nuraeni, 2022).

The next stage involves students completing the posttest, which shows an increase in their scores: 15.79% in the medium category, 81.58% in the high category, and 2.63% in the very high category. This data indicates that the implementation of project-based learning has positively impacted students' mathematical creative thinking abilities. To analyze the effectiveness of project-based learning using educational props in building blocks, we will employ inferential statistics to assess their alignment with students' mathematical creative thinking skills. Data found to be normally distributed will undergo hypothesis testing, which will be conducted as follows:

1. The test of individual average KKM achievement in data processing with the t-test shows that if $t_{hitung} \geq t_{(1-a)}$ then H_0 is rejected. Referring to the table above, the t-distribution table with degrees of freedom dk = n – 1 = 38 – 1 = 37 yields $t_{tabel} = 1{,}68709$ therefore t_{hitung}= 12,848 $\geq$ t_{tabel} = 1,687094. Since t_{hitung} is greater than or equal to t_{tabel} . the conclusion is that H_1 is accepted, which means the average KKM for students' mathematical creative thinking assisted by educational block teaching aids is more than 70.
2. The standardized normal data for the classical completeness test at $\alpha = 0{,}05$ is obtained as $z_{0,5-0,05} = z_{0,45}$. with $z_{0,45}$ = 0,6736. The decision criterion for H_0 is rejected when $Z_{hitung} \geq Z_{tabel}$. The results of the classical completeness test yielded Z_{hitung} = 3,56054557415 $\geq$ Z_{tabel} = 0,6736. herefore, the conclusion

is that H_1 is accepted, indicating that the proportion of students has met the completeness category of more than 75%.

3. The mean is the average of the pretest and posttest scores, with the average pretest score being 36.82 and the average posttest score being 85.15. This indicates a difference after implementing project-based learning. Therefore, students' mathematical creative thinking skills can improve after applying the project-based learning model.
4. The results of the N-gain test in the table above indicate that the average N-gain score is 0.7675, with a percentage of 76.74%. Based on the type of N-Gain test, the results shown in the table fall within the range of $g \geq 0.70$, allowing us to conclude that the average N-Gain score is categorized as high, thus the level of effectiveness is effective.

The results of the study indicate a significant change in students' mathematical creative thinking abilities. The pre-test results show that the average score is 36.82%, with 34 students classified in the very low category. Furthermore, 5.26% of the students fall into the low to medium categories, with 2 students in each of these classifications. Notably, there are no students in the high or very high categories, indicating a 0% presence in those classifications. These findings suggest that the overall level of students' abilities in mathematical creative thinking before the implementation of project-based learning using educational block props is low, falling below the classical completeness standard of 75%.

The average post-test score of 85.18% indicates an improvement in students' mathematical creative thinking skills following the implementation of project-based learning supported by educational block models. This score represents a significant increase compared to their performance prior to the treatment. Additionally, the categorization of students based on their abilities in mathematical creative thinking also showed positive results. In the very high category, there was 1 student, comprising 2.63% of the total, while 31 students fell into the high category, accounting for 81.58%. The medium category included 6 students,

representing 15.79%. Notably, there were no students in the low or very low categories, as indicated by a percentage of 0%.

The results of the inferential statistical analysis using the first hypothesis test of the average achievement of the individual Minimum Completeness Criteria (KKM) can be conducted using the t-test formula. If t_{tabel} is distributed with degree of freedom dk = n – 1 = 38 – 1 = 37 we obtained 1,68709 therefore t_{hitung} = 12,848 $\geq t_{tabel}$ = 1,687094. Thus, H_1 can be accepted, proving that the average KKM of students' creative mathematical thinking skills, aided by educational props in the design of eighth-grade MTs Miratul Muslimien, exceeds 70. This is supported by the theory that students recognize that the learning process using project-based learning can yield several benefits, including significantly improving academic achievement and performance (Almulla, 2020).

Learning through project-based learning can enhance academic competence, creativity, independence, and prepare students to better observe real-world conditions (Mursid et al., 2022). The hypothesis test used the classical completeness test with normally distributed data at α = 0,05 resulting in Z_{hitung} = 3,56054557415 $\geq Z_{tabel}$ = 0,6736, Therefore, the decision is that the proportion of students achieving classical completeness exceeds the minimum category of 75%.

The next hypothesis test is the test for the difference in means between the two samples of pre-test and post-test, which yielded an average pre-test score of 36.82% and an average post-test score of 85.15%. This indicates that there is a difference after the implementation of project-based learning using educational props in the form of designed blocks, meaning that there is an effect and students' ability to think creatively in mathematics can improve after the application of this learning model. Muthaharah et al. (2018) argue that students' mathematical creative thinking skills are crucial during the mathematics learning process. The ability to think creatively in mathematics helps students express their opinions or provide answers to problems using different solutions. Therefore, the use of educational props makes mathematics learning more engaging, thus fostering interest and improving learning outcomes.

Lastly, the average N-gain score is 0.7675, which corresponds to a percentage of 76.74%. The type of test result falls within the range of $g \geq 0.70$. In conclusion, the average N-gain value is categorized as high, indicating effective effectiveness.

The process of learning mathematics engages students, making them feel happy and not bored during the lessons. Students are instructed to design three-dimensional shapes using instructional tools that align with their creative thinking abilities. Differing opinions, exchanging ideas, and proposing innovative thoughts foster a sense of teamwork among students, making collaboration not only real but also enjoyable.

Based on the observational results, there were changes in students during the initial activities; some students were preoccupied with playing alone and chatting with friends throughout the session. It can be noted that in the first meeting, there were differing opinions during group division, which resulted in a less conducive classroom atmosphere. The teacher still felt nervous when interacting directly with the students. Group work was not maximized, leading to delays in project deadlines. During the first meeting, when the teacher posed verbal questions to the students, they competed to respond. Observations of teacher and student activities yielded a score of 72% for the teacher, indicating a good criterion. Additionally, student activity in this first meeting was at 64%, categorized as active students. In contrast, during the second meeting, students tended to be more settled as they had become more familiar with the teacher. Students were placed in their respective groups, and each group received educational props in the form of building blocks.

The constructed block will be used by students to foster their creativity. Students' creative ideas will develop when they design educational props using these blocks, allowing them to measure their volume. Many groups successfully completed their project assignments. Observations from the second meeting indicate that the group of male students was active and enthusiastic in discussions. The teacher's activity during this second meeting was at a percentage of 84%, indicating that the teacher's performance was very good. Meanwhile, student activity was at a percentage of 82%, suggesting that the students' learning activities were very active.

Group activities tend to encourage students to compete for the best results. Students can complete project assignments according to their abilities, motivated by the encouragement to be active and conducive, which aligns with the views of Kusmaryono & Ulia (2020). Similarly, in the first and second meetings, during the third meeting, the teacher presented the material effectively, after which students were asked to continue with the project assignments. Project-based tasks are more effective than conventional learning, a statement supported by Sari et al. (2021).

The activities carried out by the teacher have reached 89%, while the students' response is at 80%, indicating that the engagement of both teachers and students has been very effective and active. Learning through project-based learning primarily enhances various academic competencies, such as achievement, levels of thinking, critical thinking, problem-solving skills, creativity, independence, and the ability to present skills to demonstrate a better real-world condition (Mursid et al., 2022).

The results of the analysis indicate that, in applying concepts, facts, procedures, and mathematical reasoning, students can interpret, create, construct, utilize, and evaluate by implementing project-based learning with educational block models. Students showed an increase in the average score on the post-test. Therefore, the conclusion is that project-based learning using educational block models is effective in enhancing the mathematical creative thinking skills of students at MTs Miratul Muslimien Grobogan.

Effective learning is a teaching and learning process that focuses solely on the outcomes desired by students. To achieve effective learning, we must consider the conditions and efforts for its maintenance. Through the advantages of project-based learning, which inspires students to design learning aids upon discovering results, students are encouraged to take responsibility when receiving the information presented (Dewi, 2022).

Through project-based learning, students can express how they collaborate and solve problems as a group and how they can work together to inspire each other's creativity in utilizing new knowledge (Indrawan et al., 2018). The use of instructional aids can enhance students' understanding, as evidenced by improved

learning outcomes. These aids will motivate students, leading to increased engagement. Teachers can design and create their own instructional aids based on the needs of the learning process, as suggested by Susanta et al. (2021). The ability to think creatively in mathematics refers to an individual's capacity to solve mathematical problems correctly, in different ways, with unique ideas, and to generate new solutions to mathematical issues (Hautauruk et al., 2020).

The objective of this learning is to facilitate students in creating, designing, and communicating with one another. Rukamana et al. (2020) state that the ability to think creatively and curiosity about mathematics is designed to enhance students' interest in mathematics, thereby fostering creativity. During the project-based learning activities utilizing educational props such as building blocks, there were, of course, some challenges.

At the beginning of the research, the researcher encountered several challenges. The researcher found it difficult to manage the class and form groups due to the need to unify students from different classes. Many students were reluctant to join the pre-formed groups, as most of them resided in different pesantren (Islamic boarding schools). Additionally, students living in the pesantren faced difficulties in completing project assignments due to a lack of tools and resources. Furthermore, the teacher faced challenges in delivering the material, which required a long time for students to fully understand the content presented. The time allocated for meetings was very limited. As a solution to these challenges, it is advisable for the researcher and students to establish agreements beforehand regarding group formation. The researcher provided facilities for students from the pesantren by allowing them to complete assignments at the school. The researcher and students worked together to manage their time as effectively as possible.

CONCLUSION

The conclusion of this study indicates that the mathematical creative thinking abilities of eighth-grade students at MTs Miratul Muslimien Grobogan were initially low, as evidenced by the results and discussions. Prior to implementing project-based learning with educational block props, the average pre-test score was

36.81%, and 89.48% of students fell into the very low category. However, after the implementation of project-based learning assisted by educational block props, the average post-test score improved significantly to 85.18%, placing it in the high category, with 81.58% of students achieving this classification. The effectiveness of this study is further demonstrated by the individual average achievement test scores (KKM) exceeding 70 and a student completeness rate above 75%. Additionally, the N-Gain test result of 0.7675 suggests that the application of project-based learning with educational block props is effective in enhancing students' mathematical creative thinking abilities.

BIBLIOGRAPHY

Almulla, M. A. (2020). The Effectiveness of the Project-Based Learning (PBL) Approach as a Way to Engage Students in Learning. *SAGE Open*, *10*(3).

Atiyah, A., & Nuraeni, R. (2022). Kemampuan berpikir kreatif matematis dan self-confidence ditinjau dari kemandirian belajar siswa. *Jurnal Inovasi Pembelajaran Matematika: PowerMathEdu*, *1*(1), 103–112.

Awab, Z. Al, Kosim, N., & Putri, M. N. (2021). Pembelajaran berbasis proyek pada pelajaran matematika sekolah dasar. *Jurnal Ilmiah Mahasiswa Pendidikan Matematika*, *1*(1), 77–82.

Awwalin, A., & Barat, J. (2021). Analisis Kesulitan Siswa Pada Materi Bangun Ruang Sisi Datar. *JPMI (Jurnal Pembelajaran Matematika Inovatif)*, *4*(3), 579–586. https://doi.org/10.22460/jpmi.v4i1.225-230

Dewi, M. R. (2022). Kelebihan dan Kekurangan Project-based Learning untuk Penguatan Profil Pelajar Pancasila Kurikulum Merdeka. *Ejournal UPI*, *19*(2), 213–226.

Guo, P., Saab, N., Post, L. S., & Admiraal, W. (2020). A review of project-based learning in higher education: Student outcomes and measures. *International Journal of Educational Research*, *102*(November 2019), 101586.

Hanipah, N. (2018). Analisis Kemampuan Berpikir Kreatif Matematis Siswa Mts Pada Materi Lingkaran. *Aksioma: Jurnal Program Studi Pendidikan Matematika*, *7*(1), 80.

Hautauruk, M. K., Siregar, P. Y., & Siregar, Y. E. (2020). Evektivitas Pembelajaran Matematika Realistik Terhadap Kemampuan Berpikir Kreatif Matematis Siswa Di SMP Negeri 7 Padangsidimpuan. *Jurnal MathEdu*, *3*(1), 54–60.

Indrawan, E., Jalinus, N., & Syahril. (2018). Review Project Based Learning. *International Journal of Science and Research*, *8*(4), 1014–1018.

Karina Puspa Kusuma, Mei Fita Asri Untari, & Veryliana Purnamasari. (2023). Penerapan Model Pembelajaran Project Based Learning Dalam Pembelajaran Matematika Kelas Iv Di Kelas Iv Sekolah Dasar. *Didaktik : Jurnal Ilmiah PGSD STKIP Subang*, *9*(2), 4845–4854.

Kusmaryono, I., & Ulia, N. (2020). Interaksi Gaya Mengajar dan Konten Matematika sebagai Faktor Penentu Kecemasan Matematika. *Mosharafa: Jurnal Pendidikan Matematika*, *9*(1), 143–154.

Mashuri, S. (2019). Media Pembelajaran Matematika. 6–11.

Mursid, R., Saragih, A. H., & Hartono, R. (2022). The Effect of the Blended Project-based Learning Model and Creative Thinking Ability on Engineering Students' Learning Outcomes. *International Journal of Education in Mathematics, Science and Technology*, *10*(1), 218–235.

Muthaharah, Y. A., Kriswandani, & Prihatnani, E. (2018). Analisis Kemampuan Berpikir Kreatif Matematis Siswa SMP dalam Menyelesaikan Soal Bangun Ruang Sisi Datar. *Jurnal Mitra Pendidikan (JMP Online)*, *2*(1), 63–75.

Rukamana, C., Maharani, H. R., & Ubaidah, N. (2020). Identifikasi Kemampuan Berpikir Kreatif Siswa Pada Model Pembelajaran PJBL Dengan Pendekatan STEM. 618–631.

Sari, H. P., Hasan, R., Irwandi, I., & Fitriani, A. (2021). Pengaruh Model Pembelajaran Project Based Learning Terhadap Kemampuan Berpikir Kreatif Dan Hasil Belajar Siswa Di Sma Muhammadiyah 4 Kota Bengkulu. *Jurnal Riset Dan Inovasi Pendidikan Sains (JRIPS)*, *1*(1), 61–80.

Shunhaji, A. (Institut P. J., & Fadiyah, N. (Institut P. J. (2020). Efektivitas Alat Peraga Edukatif (APE) Balok Dalam Mengembangkan Kognitif Anak Usia Dini Akhmad. *Journal of Islamic Education*, *2*(75), 147–154.

Suliani, M. (2020). Persepsi Siswa Terhadap Penggunaan Alat Peraga dalam

Pembelajaran Matematika. *SJME (Supremum Journal of Mathematics Education)*, *4*(1), 92. https://doi.org/10.35706/sjme.v4i1.3143

Susanta, A., Susanto, E., & Rusdi, R. (2021). Pelatihan pembuatan alat peraga matematika kreatif berbahan kertas bekas untuk Guru MI Humairah Kota Bengkulu. *Dharma Raflesia : Jurnal Ilmiah Pengembangan Dan Penerapan IPTEKS*, *19*(1), 1–12. https://doi.org/10.33369/dr.v19i1.13089

Ubaidah, N., & Maharani, H. R. (2018). Pembelajaran Matematika Pada Materi Keliling Dan Luas Persegi Panjang Dengan Metode Power Teaching. *Jurnal Ilmiah Pendidikan Dasar*, *2*(1), 09–22.