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THE EFFECT OF THE MAKE A MATCH COOPERATIVE LEARNING MODEL ASSISTED BY WINGEOM ON STUDENTS' MATHEMATICAL CONCEPTUAL UNDERSTANDING

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ABSTRACT

This study aims to analyze the effectiveness of Wingeom application in cooperative learning type Make A Match to improve students' mathematical conceptual understanding. The study was motivated by the low performance of Indonesian students in mathematics as reported in PISA 2022 (OECD, 2022). The research employed a quasi-experimental method with a posttest-only control group design. The sample consisted of 72 eighth-grade students of SMP Negeri 25 Kota Tangerang, divided into an experimental class (using Make A Match with Wingeom) and a control class (conventional learning). The research instrument was an essay test consisting of 11 items that had been validated and tested for reliability. The study provides strong evidence of measuring genuine improvement in students' mathematical conceptual understanding, as reflected in the significant difference between the experimental group's mean post-test score of 28.78 and the control group's mean score of 22.69, supported by a large effect size of 0.893. Therefore, the Wingeom application proved effective in improving students' mathematical conceptual understanding through cooperative learning type Make A Match.

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1. INTRODUCTION

The rapid development of science and technology enables individuals to access abundant information quickly and easily from various sources. This advancement also influences the development of mathematics, which increasingly demands critical, systematic, logical, and creative thinking as well as effective collaboration skills to face global challenges. As a fundamental discipline in formal education, mathematics plays an essential role in improving the quality of education. Mastery of mathematical concepts is crucial because mathematics is built upon interconnected conceptual structures; students will struggle with new material if prerequisite concepts are not well understood.

However, mathematics learning in schools still encounters various challenges. Many students perceive mathematics as difficult and uninteresting due to conventional instructional practices that place teachers as the dominant source of information. Classrooms commonly rely on lectures, formula memorization, and repetitive exercises, resulting in passive learning and limited conceptual understanding. These conditions contribute to students' misconceptions, low motivation, and weak problem-solving abilities. This problem is reflected in Indonesia's performance in international assessments. According to PISA 2022, Indonesian students scored 366 in mathematics well below the OECD average indicating persistent deficiencies in conceptual understanding and higher order thinking skills. (Organisation for Economic Co-operation and Development, 2022), indicating insufficient conceptual understanding and higher order thinking skills.

Previous studies highlight that one of the key factors affecting students' conceptual difficulties is the lack of meaningful learning experiences and inappropriate instructional models (Purba & Jailani, 2023). Effective mathematics learning should provide opportunities for students to engage actively, represent concepts in multiple forms, and construct their own understanding. Cooperative learning is one approach that supports these principles. Among its many types, the Make A Match model is considered capable of creating an interactive learning environment through card-matching activities that encourage collaboration, reinforcement, and conceptual recall (Aeni dkk., 2024; Dewi dkk., 2025; Kurniasari dkk., 2019)

In addition to pedagogical models, the use of technological media is increasingly essential. Technology based tools, such as the Wingeom application, offer dynamic visualization features that enable students to explore geometric objects, manipulate representations, and observe abstract concepts more concretely (Ahmad Budi Sutrisno, 2020; Putrawangsa & Hasanah, 2018; Rohmaini dkk., 2020). Wingeom's capability to generate animations, diagrams, and geometric constructions makes it particularly relevant for topics like circles, where understanding relationships among elements (radius, diameter, chord, arc, etc.) is fundamental. Studies have shown that integrating technology in cooperative settings significantly enhances students' mathematical comprehension (Akmal, 2022; Azizah & Irawati, t.t.; Martha Rusmana, t.t.).

Despite these developments, research that specifically examines the effectiveness of integrating the Wingeom software into the Make A Match cooperative learning model remains limited. Existing studies tend to focus on either cooperative learning alone or the use of dynamic geometry software in isolation. Therefore, there is a research gap concerning how these two components interact to improve students' conceptual understanding particularly on geometric topics such as circles, which require strong visualization and conceptual linkage.

To address this gap, the present study investigates **"The Effect of the Make A Match Cooperative Learning Model Assisted by Wingeom Software on Students' Mathematical Conceptual Understanding in the Topic of Circles."** This study not only responds to the need for innovative pedagogical strategies but also contributes to the growing body of research on the integration of technology and cooperative learning in mathematics education.

2. METHOD

This study employs a quantitative approach with a quasi experimental method. The research design is a posttest only control group. The population consists of all eighth-grade students at SMP Negeri 25 Kota Tangerang in the 2024/2025 academic year. The sample was determined using a cluster random sampling technique, because the population was naturally divided into intact classes, making individual randomization impractical (Sugiyono, 2019). This technique ensures efficiency in data collection, maintains instructional integrity, and provides each class with an equal chance of being selected, given the relatively homogeneous characteristics across classes, resulting in the following:

Table 1. Research Subjects

Class	Sample Size	Note
VIII-C	36	Control Class
VIII-D	36	Eksperimental Class
Jumlah	72	-

E	X	O
K		O

Figure 1. *Cluster Random Sampling* Technique

The research instrument was an essay test consisting of 11 items representing indicators of mathematical conceptual understanding according to (National Council of Teachers of Mathematics, 2014), The indicators of mathematical conceptual understanding measured in this study include: (1) restating a concept; (2) classifying objects based on specific characteristics; (3) providing examples and non-examples of a concept; (4) presenting concepts in mathematical representations; (5) developing necessary or sufficient conditions of a concept; (6) using and selecting certain procedures or operations; (7) applying concepts or algorithms in problem solving. The instrument had been tested for validity and reliability. To determine validity, the product-moment correlation formula was used:(Sugiyono, 2019)

$$r_{xy} = \frac{N\sum x_i y - (\sum x_i)(\sum y)}{\sqrt{\{N\sum {x_i}^2 - (\sum x_i)^2\}\{N\sum y^2 - (\sum y)^2\}}}$$

Based on the 13 items tested, 11 were found valid, while 2 items were classified as invalid because two items were removed because their item total correlations did not meet the minimum validity threshold (r_{tabel} = 0,361), indicating inadequate discrimination power. The low correlation indicates that these items did not function effectively in distinguishing students with high and low conceptual understanding.

Table 2. Validity Test Results

Item No.		Correlation Coefficient r_{XY}	r_{tabel}	Result
1	a	Undefined		Invalid
	b	0,164		Invalid
	c	0,486		Valid
	d	0,528		Valid
2	a	0,655		Valid
	b	0,710		Valid
	c	0,614	0,361	Valid
3		0,565		Valid
4		0,528		Valid
5	a	0,370		Valid
	b	0,632		Valid
	c	0,688		Valid
6		0,731		Valid

To determine the reliability of the test, Cronbach's Alpha formula was used: (Sugiyono, 2019)

$$r_{11} = \left(\frac{k}{k-1}\right)\left(1 - \frac{\sum \sigma_t^2}{\sigma_t}\right)$$

Based on the calculation of the reliability test of the instrument items, the result obtained was $r_{11} = r_{count} = 0{,}808$ with $r_{table} = 0{,}361$. Since $r_{count} = 0{,}808 > 0{,}361 = r_{table}$, the test is considered highly reliable.

Data analysis techniques included: (1) Normality test (Liliefors) with a significance level of α = 0.05; (2) Homogeneity test (Fisher); (3) Hypothesis testing using an independent two-sample t-test; and (4) Calculation of effect size to measure the level of effectiveness using the formula: (Suharsimi Arikunto, 2018)

$$ES = \frac{\overline{Y_E} - \overline{Y_C}}{S_C}$$

Description :

ES : *Effect Size*
$\overline{Y_E}$: mean score of the experimental class
$\overline{Y_C}$: mean score of the control class
S_C : standard deviation of the control class

Using the criteria proposed by Cohen regarding the magnitude of the Effect Size : (Suharsimi Arikunto, 2018)

Tabel 3. Criteria for Effect Size Interpretation

Effect Size Coefficient	Description
ES < 0.2	Low
0.2 ≤ ES < 0.8	Medium
ES ≥ 0.8	High

Tabel 4. Scoring Guidelines for the Mathematical Conceptual Understanding Test

Level of Understanding	Description	Score
Not Understanding	Does not answer or only repeats the question	0
Misconception	Unable to restate the concept	1
Partial Misconception	Able to restate the concept (provides some correct information) but still contains many conceptual errors in the explanation	2
Partial Understanding	Able to restate the concept (includes at least one concept) but the explanation is not yet accurate or complete	3
Full Understanding	Able to restate a concept accurately and completely	4

The ideal score is 44 because each item in the conceptual understanding instrument has a maximum score of 4, as outlined in the scoring guidelines for conceptual understanding (Siti Mawaddah et al., 2016). Each item is assessed based on levels of understanding: the “not understanding” category is given a score of 0, “misconception” a score of 1, “partial misconception” a score of 2, “partial understanding” a score of 3, and “complete understanding” a score of 4. Since each item carries a maximum score of 4 and the instrument consists of 11 items, the ideal score is obtained by multiplying 11 by 4. Thus, a total score of 44 represents the ideal score for the conceptual understanding test.

3. RESULTS

Description of Pre Treatment Data

This study involved two classes, namely class VIII-D as the experimental class (cooperative learning using the Make A Match type assisted by the Wingeom application) and class VIII-C as the control class (conventional learning). To ensure that both classes had the same initial mathematical ability, a test of mean equality was conducted.

Normality testing was performed using the Liliefors test for both classes with the following data:

Table 5. Normality Test Results Before the Study

Class	Sample Size	Significance Level	L_{count}	L_{table}	Conclusion
VIII-C	36	0,05	0,122	0,147	Normal
VIII-D	36	0,05	0,107	0,147	Normal

For the homogeneity test of the two variances between class VIII-C and class VIII-D, Fisher's test was used, with the following results:

Table 6. Homogeneity Test Results Before the Study

Class	Sample Size	Variance	*F*		Conclusion
			Count	Table	
VIII-C	36	15,705	1,156	1,757	Homogen
VIII-D	36	14,604			

Based on the results of the prerequisite tests including the normality and homogeneity tests it is concluded that both classes have normally distributed data and are homogeneous. Therefore, the research hypothesis can be tested using the t-test.

Table 7. t-Test Results Before the Study

t-test		Conclusion
t_{count}	t_{table}	
$-0,093$	1,668	H_0 is accepted

Based on the data in table 5, the absolute value of the calculated t was compared with the t-table. Since $|t_{count}| < t_{table}$ the conclusion is that H_0 is accepted. Therefore, there is no difference in the students' initial abilities between class VIII-C and class VIII-D at SMP Negeri 25 Kota Tangerang. As a result, these findings justify the selection of the classes using the cluster random sampling technique, in which class VIII-D was assigned as the experimental class and class VIII-C as the control class.

Description of Post Treatment Data

From the research data on students' mathematical conceptual understanding in the experimental class, the following results were obtained:

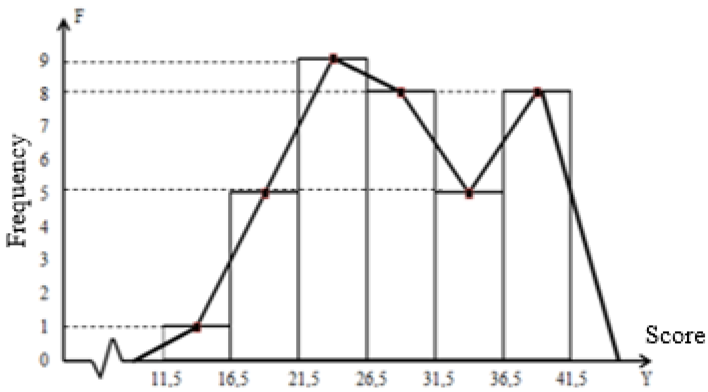

Figure 1. Histogram and Polygon of Mathematical Conceptual Understanding Ability in the Experimental Class

From Figure 1, the results of students' mathematical conceptual understanding taught through the Make A Match cooperative learning model assisted by the Wingeom software show that most students obtained scores of 21,5–26,5, totaling 9 students or 25%. The highest score range, 36,5–41,5, was achieved by 8 students or 22,22%, while the lowest score range, 11,5–16,5, was obtained by 1 student or 2,78%.

From the data on students' mathematical conceptual understanding in the control class, the following results were obtained:

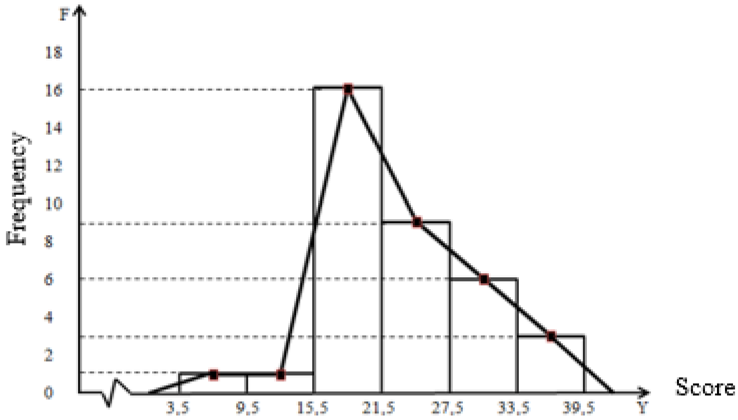

Figure 2. Histogram and Polygon of Mathematical Conceptual Understanding Ability in the Control Class

From Figure 2, the results of students' mathematical conceptual understanding who were not taught using the Make A Match cooperative learning model show that most students obtained mathematics scores of 15,5–21,5, totaling 16 students or 44,44%. The highest score range, 33,5–39,5, was achieved by 3 students or 8,33%, while the lowest score range, 3,5–9,5, was obtained by 1 student or 2,78%.

Based on the indicators of conceptual understanding, the average percentage scores in the experimental and control classes can be seen from the percentage values of students' mathematical conceptual understanding as follows:

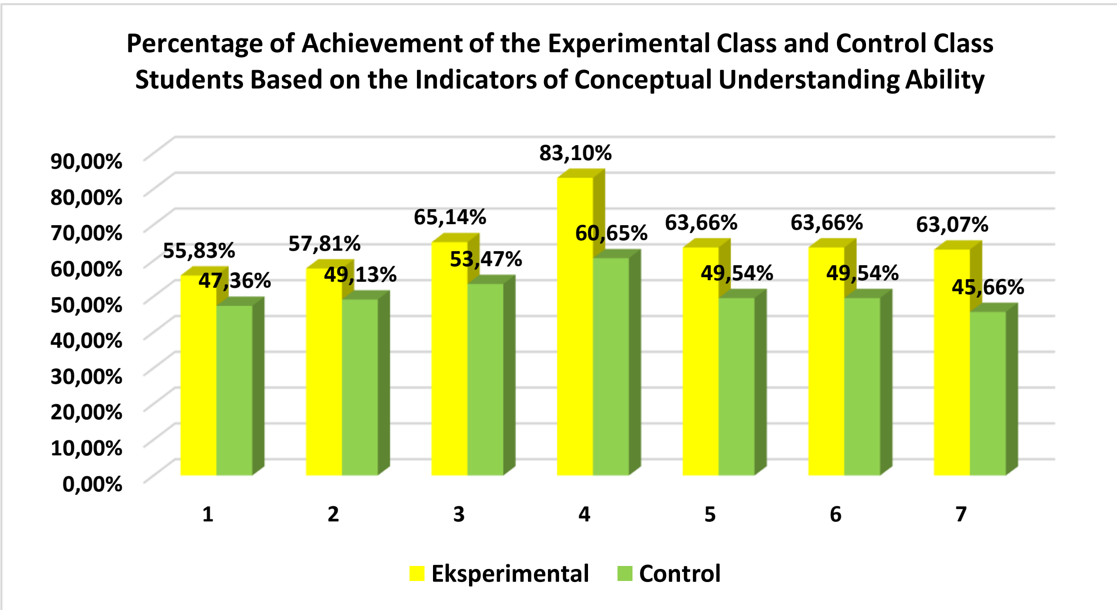

Figure 3. Percentage Chart of Mathematical Conceptual Understanding Indicators for Students in the Experimental and Control Classes

Based on Figure 3, the average score of students' mathematical conceptual understanding in the experimental class is higher than that of the control class. The highest percentage for both classes appears in the indicator *presenting concepts in* *mathematical representations*. The lowest percentage is found in the indicator *restating a concept*.

After identifying the difference in students' mathematical conceptual understanding between those taught using the Make A Match cooperative learning model assisted by the Wingeom software and those who were not, the next step is to determine how much influence the Make A Match model assisted by Wingeom has on students' conceptual understanding.

From the research data, the average scores and standard deviations of students' mathematical conceptual understanding taught using the Make A Match cooperative learning model assisted by the Wingeom software are presented in the following table:

Table 8. Mean and Standard Deviation of the Experimental and Control Classes

Class	Number of Students	Mean	Standard Devision
Eksperimental	36	28,78	7,132
Control	36	22,69	6,811

To determine whether the difference in mean scores was caused by the difference in treatment or merely occurred by chance, further analysis was required. Based on the results of the prerequisite tests, which included the homogeneity test and the normality test, it was found that both classes were normally distributed and homogeneous. Therefore, the research hypothesis could be tested using the t-test. The statistical hypotheses are as follows:

$$H_0 : \mu_1 \leq \mu_2$$
$$H_1 : \mu_1 > \mu_2$$

Description :

μ_1 : The mean score of students' mathematical conceptual understanding taught using the *make a match* learning model assisted by Wingeom software.

μ_2 : The mean score of students' mathematical conceptual understanding taught without using the *make a match* learning model assisted by Wingeom software.

Table 9. t-Test Results

t-Test		**Conclusion**
t_{count}	t_{table}	
3,701	1,668	Reject H_0

Based on the data presented in Table 7, the value of $t_{count} > t_{table}$indicates that the research hypothesis (H_1) is accepted and the null hypothesis (H_0) is rejected. Thus, these results indicate that there is a difference in students' mathematical conceptual understanding between those who were taught using the Make A Match cooperative learning model assisted by the Wingeom software and those who were not, at SMP Negeri 25 Kota Tangerang.

After identifying that a difference exists in students' mathematical conceptual understanding between those taught using the Make A Match cooperative learning model assisted by Wingeom and those taught without it, the next step is to determine the extent of the influence of this learning model on students' conceptual understanding.

Table 10. Effect Size Test Results

Class	Average Score	*Effect Size Score*	Criteria
Eksperimental	28,778	0,893	High
Control	22,694		

Based on the effect size calculation, a value of 0.893 was obtained, which falls into the high category. The effect size calculation yielded a value of 0,893. This value falls into the high category based on Cohen's criteria, indicating a large difference between the experimental and control groups. The achievement of students in the experimental and control classes based on the indicators of mathematical conceptual understanding was measured using test items that consisted of seven conceptual understanding indicators.

Table 11. Percentage of Indicator 1-7 of Students' Mathematical Conceptual Understanding in the Experimental and Control Classes

No	Indicator of Mathematical Conceptual Understanding	Item No.	Eksperimenal	Control
1	Restating a Concept	1a 1b 2a 2b 2c	55,83%	47,36%
2	Classifying objects based on specific characteristics according to the concept	1b 2a 2b 2c	57,81%	49,13
3	Providing examples and non-examples of a concept	1b 2a 2b 2c 5b	65,14%	53,47%
4	Presenting concepts in various forms of representation	5a 5b 5c	83,10%	60,65%
5	Developing necessary or sufficient conditions of a concept	3 4 6	63,66%	49,54%
6	Using, utilizing, and selecting certain procedures or operations	3 4 6	63,66%	49,54%
7	Applying concepts or algorithms to problem-solving	3 4 5c 6	63,02%	45,66%

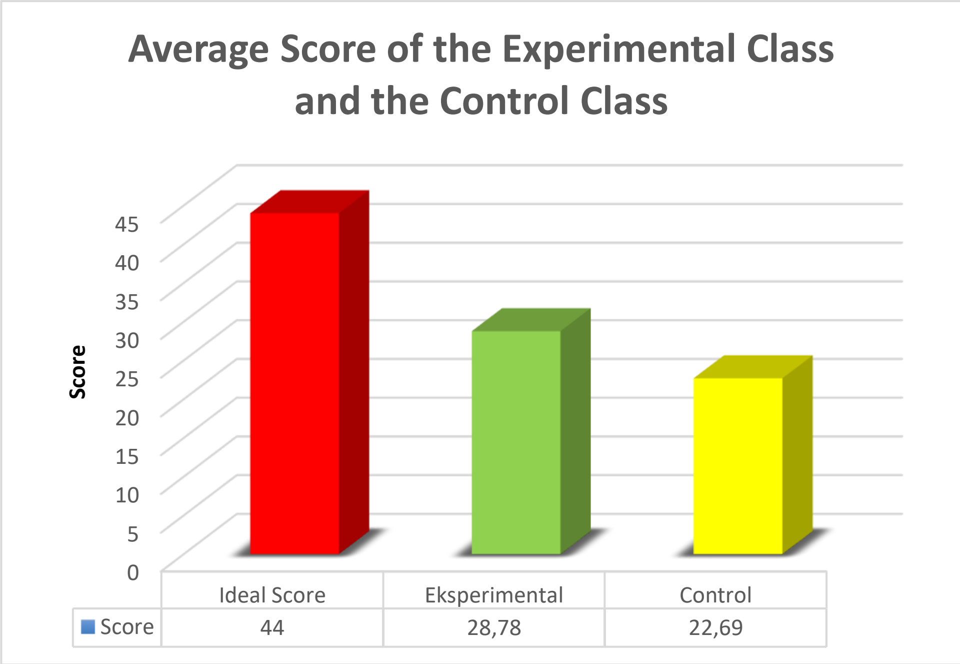

Figure 4. Comparative Diagram of Students' Mathematical Concept Understanding Mean Scores

The findings indicate a significant difference between the experimental and control groups, with the experimental class achieving a higher mean score of mathematical concept understanding (28.78) compared to the control class (22,69). The t_{test} yielded $t_{count} = 3{,}701 > t_{table} = 1{,}668$ ($\alpha = 0{,}05$), showing a statistically significant difference. Furthermore, the effect size calculation resulted in a value of 0,893.

4. DISCUSSION

Theoretically, these outcomes align with constructivist principles, which emphasize that meaningful learning occurs when students actively construct knowledge through visual experiences and social interaction (NCTM, 2014; (Aida dkk., 2017)). Wingeom supports this process by enabling dynamic visualization of abstract circle concepts, allowing students to better grasp relationships among geometric elements. Simultaneously, Make A Match activities reinforce conceptual repetition in an enjoyable collaborative environment, thereby improving retention and motivation (Kencanawaty, 2016; Luh Putu Merta Ari & Made Citra Wibawa, 2019).

This research strengthens previous findings that highlight the effectiveness of cooperative learning in enhancing mathematical understanding (Ngilawajan, 2019; Purnono, 2021; Saparwadi, 2015) and the role of technology-based media in supporting concept comprehension (Saputri dkk., 2018; Sumilat, 2018). However, its contribution lies in integrating the Make A Match cooperative model with Wingeom an approach that has received limited attention in earlier studies.

Several factors support these results: (1) Wingeom's dynamic visualization enhances students' mathematical representation skills, (2) Make A Match promotes active engagement and peer interaction, and (3) a more enjoyable learning atmosphere reduces students' mathematics anxiety. Nevertheless, this study has limitations, including time constraints during the Make A Match activities and reliance on teachers' proficiency in operating Wingeom.

The implications highlight the importance of integrating ICT based tools with cooperative learning models. Theoretically, this study enriches the discourse on the effectiveness of socially oriented constructivist learning. Practically, its findings provide a valuable reference for mathematics teachers in designing more interactive and effective learning strategies. Therefore, future research is explicitly recommended to expand the scope of this study to other mathematical topics, such as three-dimensional geometry, and to involve a broader student population to validate the generalizability of these findings.

5. CONCLUSION

This study concludes that the use of the Wingeom application within the Make A Match cooperative learning model is proven to be effective in enhancing students' mathematical concept understanding. Statistical analyses revealed a significant difference between the experimental and control groups, accompanied by a high effect size. These findings indicate that the integration of Wingeom and the Make A Match model serves as a viable instructional strategy to address the need for improving the quality of mathematics learning. The results also support the research hypothesis that technology based media, when combined with cooperative learning, can strengthen students' conceptual understanding in a more meaningful way.

Based on the findings, mathematics teachers are encouraged to employ Wingeom as a supporting tool in the implementation of cooperative learning, particularly the Make A Match model, to promote more interactive and effective learning experiences. However, this study acknowledges certain limitations, specifically regarding the time constraints during the implementation of the Make A Match activities and the reliance on the teacher's proficiency in operating the Wingeom software. For future research, it is recommended that this model and media be tested on other mathematical topics such as algebra or trigonometry, as well as across different educational levels, in order to broaden the generalizability of the results. Further studies are also needed to explore the long term impact of using Wingeom on higher order thinking skills and students' positive attitudes toward mathematics.

REFERENCES

Aeni, N., Negeri, S., & Takung, M. (2024). Make a Match Type Cooperative Model as an Effort to Improve Elementary School Students' Learning Outcomes in Islamic Education Learning. Dalam *DARUSSALAM: Scientific Journal of Islamic Education* (Vol. 1, Nomor 2). https://journal.mgedukasia.or.id/index.php/darussalam

Ahmad Budi Sutrisno, A. (2020). Keefektifan Penggunaan Aplikasi Wingeom Dalam Pemaparan Materi Pelajaran Dimensi Tiga. *de Fermat : Jurnal Pendidikan Matematika*.

Aida, N., Kusaeri, K., & Hamdani, S. (2017). Karakteristik Instrumen Penilaian Hasil Belajar Matematika Ranah Kognitif yang Dikembangkan Mengacu pada Model PISA. *Suska Journal of Mathematics Education*, *3*(2), 130. https://doi.org/10.24014/sjme.v3i2.3897

Akmal, N. (2022). Pengaruh Penggunaan Software Wingeom Terhadap Pemahaman Konsep Matematis dan Motivasi Belajar Siswa SMP Negeri 1 Matangkuli. *Suska Journal of Mathematics Education*, *8*(2), 117. https://doi.org/10.24014/sjme.v8i2.16330

Azizah, N., & Irawati, H. (t.t.). *Peran Media Pembelajaran Berbasis TIK dalam Meningkatkan Pembelajaran Matematika di Sekolah Menengah Atas*.

Dewi, F. F., Nasution, N. E. A., & Rizka, C. (2025). The effect of the make a match learning model assisted by picture card media on students' cognitive learning outcomes in the human respiratory system topic. *Inornatus: Biology Education Journal*, *5*(1), 48–63. https://doi.org/10.30862/inornatus.v5i1.833

Kencanawaty, G. (2016). Pengaruh Metode Pembelajaran Kooperatif Dan Minat Belajar Terhadap Kemampuan Berpikir Kritis Matematika Siswa. *Research and Development Journal Of Education*, *2*(2).

Kurniasari, E., Dewi Koeswanti, H., Hoesein Radia, E., Kunci, K., & Belajar, H. (2019). Peningkatan Hasil Belajar Matematika Melalui Model Make A Match Berbantuan Media Konkret Kelas 4 SD. *Teori dan Aplikasi Matematika, Jurnal*, *3*(1), 40–45.

Luh Putu Merta Ari, N., & Made Citra Wibawa, I. (2019). *Pengaruh Model Pembelajaran Make A Match Terhadap Motivasi Belajar Ilmu Pengetahuan Alam*.

Martha Rusmana, I. (2019). *Efektivitas Penggunaan Media Ict Dalam Peningkatan Pemahaman Konsep Matematika*. *Jurnal Formatif 2(3): 198-205*

National Council of Teachers of Mathematics. (2014). *Principles to actions: Ensuring mathematical success for all*.

Ngilawajan, D. A. (2019). The Improving of Students' achievement. *BAREKENG: Jurnal Ilmu Matematika dan Terapan*, *13*(1), 001–008. https://doi.org/10.30598/barekengvol13iss1pp001-008ar667

Organisation for Economic Co-operation and Development. (2022). PISA 2022 results: What students know and can do (Vol. 1). *Paris: OECD Publishing*.

Purba, L. F., & Jailani, J. (2023). Efektivitas pembelajaran kooperatif berbasis pendekatan saintifik ditinjau dari kemampuan berpikir kritis, kolaborasi dan literasi digital. *Aksioma: Jurnal Program Studi Pendidikan Matematika*, *12*(1), 493. https://doi.org/10.24127/ajpm.v12i1.6190

Purnono, C., & Menengah Pertama Negeri Turi, S. (2021). Model Pembelajaran Kooperatif Tipe Make a Match Untuk Meningkatkan Hasil Belajar. *Journal of Education and Religious Studies*, *01*(02). https://doi.org/10.12345/jers/0000

Putrawangsa, S., & Hasanah, U. (2018). *Integrasi Teknologi Digital Dalam Pembelajaran Di Era Industri 4.0 Kajian dari Perspektif Pembelajaran Matematika*. *16*(1).

Rohmaini, L., Nendra, F., & Qiftiyah, M. (2020). *Pengembangan Modul Pembelajaran Matematika Berbasis Etnomatematika Berbantuan Wingeom Berdasarkan Langkah Borg And Gall*. https://jurnal.unigal.ac.id/index.php/teorema/article/view/3649

Saparwadi, L. (2015). *Pengaruh Cooperative Learningtipe Make A Match Terhadap Motivasi Dan Hasil Belajar Matematika Siswa*. *8*(1), 51–65. http://jurnalbeta.ac.id

Saputri, L., Puspita Sari, D., Pendidikan Matematika, J., & Tinggi Keguruan dan Ilmu Pendidikan Budidaya Binjai, S. (2018). Peningkatan Kemampuan Representasi Matematis Melalui Model Pembelajaran Visualization Auditory Kinesthetic (VAK) Berbantuan Wingeom. *Jurnal MathEducation Nusantara*, *1*(1), 75–83. https://jurnal.pascaumnaw.ac.id/index.php/JMN

Sugiyono. (2019). *Metode penelitian pendidikan: Pendekatan kuantitatif, kualitatif, dan R&D* (Alfabeta, Ed.).

Suharsimi Arikunto. (2018). *Prosedur penelitian: Suatu pendekatan praktik (Edisi Revisi)* (Rineka Cipta, Ed.).

Sumilat, J. M. (2018). Pemanfaatan Media Pembelajaran Matematika Interaktif Untuk Meningkatkan Hasil Belajar Siswa Di Sd Negeri 2 Tataaran. *Jurnal Inventa*, *II*(1).