JCP Jurnal Cakrawala Pendas
Vol. 11 No. 1, January 2025
DOI: http://dx.doi.org/10.31949/jcp.v11i1.12807
p-ISSN: 2442-7470
e-ISSN: 2579-4442

A COMPARATIVE STUDY ON THE EFFECT OF COOPERATIVE LEARNING MODELS GI, TGT, AND STAD ON ELEMENTARY STUDENTS MATHEMATICAL DISPOSITION

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Abstract
The role of learning models is crucial in achieving educational objectives, particularly in mathematics, which is often perceived as a challenging subject by students. This study examines the comparative effectiveness of learning models in enhancing mathematical disposition while controlling for students' prior knowledge and gender variables. A quasi-experimental pretest-posttest control group design was employed, with the population consisting of elementary schools across Cirebon Regency and a sample of 90 students from three schools. Data collection techniques included a mathematical disposition scale and documentation of students' academic scores. The results indicate that the cooperative learning models GI (Group Investigation), TGT (Teams Games Tournament), and STAD (Student Teams Achievement Division) have varying impacts on students' mathematical disposition. The GI model showed the most significant effect, with an average increase of 7.8%. Students' prior knowledge also played a role, as those with higher initial abilities tended to exhibit better mathematical dispositions. However, no significant differences were found in mathematical disposition between male and female students. This suggests that the GI model can be an effective choice for teachers to foster a positive attitude toward mathematics, especially among students with higher prior knowledge.
Keywords: *Cooperative; Mathematical Disposition; Prior knowledge; Gender*

Abstrak
Model pembelajaran berperan penting dalam mencapai tujuan pembelajaran, khususnya matematika yang sering ditakuti siswa. Penelitian ini membahas perbandingan efektivitas model pembelajaran dalam meningkatkan disposisi matematis dengan mengontrol variabel kemampuan dasar siswa dan gender. Penelitian menggunakan quasi eksperiment pretest-posttest control group design dengan populasi Sekolah Dasar se-Kabupaten Cirebon dan 90 sampel siswa dari tiga SD. Teknik pengambilan data menggunakan skala disposisi matematis dan dokumentasi nilai siswa. Hasil penelitian menunjukkan model pembelajaran kooperatif GI, TGT, dan STAD memiliki pengaruh berbeda terhadap disposisi matematis siswa, dengan model GI memberikan dampak paling signifikan dengan peningkatan rata-rata 7,8%. Kemampuan dasar siswa juga berpengaruh, di mana siswa dengan kemampuan dasar yang tinggi cenderung memiliki sikap matematis yang baik pula. Namun, tidak ditemukan perbedaan sikap matematis yang signifikan antara siswa laki-laki dan perempuan. Artinya, penggunaan model GI dapat menjadi pilihan efektif bagi guru untuk meningkatkan sikap positif siswa terhadap matematika, terutama jika kemampuan dasar yang tinggi.
Kata Kunci: Kooperatif; Disposisi Matematis; Kemampuan Dasar; Gender

Received	: 2024-11-30	Approved	: 2025-01-14
Reviesed	: 2024-12-27	Published	: 2025-01-31

Introduction

According to the Ministry of Education and Culture Regulation No. 22 of 2006 on Content Standards for Mathematics in elementary education, one of the primary goals of mathematics education is to help students appreciate its importance in everyday life. This includes fostering curiosity, attention, interest in learning mathematics, perseverance, and confidence in solving mathematical problems (Verdianingsih, 2017). In the 21st century, numeracy skills, critical thinking, and problem-solving abilities are essential competencies students must develop (Atallah et al., 2021). Additionally, mathematical disposition defined as the habitual inclination and positive attitude toward learning challenges plays a crucial role in determining success in mathematics education (Lin & ChunTai, 2016).

Despite its significance, many students perceive mathematics as intimidating, unenjoyable, or overly challenging. Negative learning experiences often reinforce the misconception that mathematics lacks relevance to daily life (Colgan, 2013; Graven, 2016). Data from the Trends in International Mathematics and Science Study (TIMSS) illustrate Indonesia's consistently low performance in mathematics. For instance, in TIMSS 2015, Indonesia ranked 46th out of 51 participating countries (Retnowati & Ekayanti, 2020), and the country did not participate in TIMSS 2019 or 2023 (Mutakin et al., 2023). These persistent challenges underscore the need for engaging and relevant pedagogical approaches.

Cooperative learning has long been recognized as an effective method to enhance student outcomes across cognitive, affective, and psychomotor domains. This approach facilitates collaborative learning in small groups to achieve shared educational objectives (Davidson et al., 2021). Specific cooperative learning models, such as Group Investigation (GI), Teams Games Tournament (TGT), and Student Teams Achievement Division (STAD), are particularly relevant to mathematics instruction. GI emphasizes student-led exploration of learning materials (Medyasari, L.T., Muhtarom, 2017) , TGT incorporates healthy competition to boost motivation (Satriana et al., 2020), and STAD combines direct instruction with heterogeneous group work (Pei-qi, 2023). These models are chosen for their interactive and enjoyable learning experiences, which are designed to improve students' mathematical disposition.

This study seeks to address gaps in the literature by examining the impact of cooperative learning models on students' mathematical disposition in diverse contexts. While cooperative models such as TGT and Team Assisted Individualization (Wijayanto & Sujadi, 2014), Jigsaw (Munaji, 2019), Think-Talk-Write (Sutiawan et al., 2020), and Double Loop Problem Solving (Khoirunnisa & Rahma, 2023) have been extensively studied, this research focuses on the combination of GI, TGT, and STAD models, which remain underexplored, especially in elementary mathematics education. The study also incorporates students' prior mathematical ability and gender as control variables to ensure precise and focused comparisons of each model's impact on mathematical disposition. Previous studies have highlighted the critical role of initial ability in academic success (Aschbacher et al., 2010; Williams, 2020).

This research is guided by eight hypotheses: (1) significant differences exist in mathematical disposition among the three cooperative learning models (GI, TGT, STAD), controlling for prior knowledge and gender; (2) an interaction exists between learning models and prior knowledge; (3) an interaction exists between learning models and gender; (4) prior knowledge influences mathematical disposition; (5) differences in mathematical disposition exist between male and female students; (6) differences exist between GI and STAD models; (7) differences exist between TGT and STAD models; and (8) differences exist between GI and TGT models. This approach not only evaluates the effectiveness of each cooperative learning model but also provides practical insights for educators in selecting the most suitable approach for elementary mathematics instruction. Furthermore, the study contributes to the development of a mathematical disposition measurement tool that future researchers can utilize to explore similar topics.

Research Methods

This study employed a quantitative approach with a quasi-experimental design, specifically a pretest-posttest control group design, to examine the effects of three cooperative learning models Group Investigation (GI), Student Teams Achievement Division (STAD), and Teams Games Tournament (TGT) on students' mathematical disposition. The research population comprised all public elementary schools in Cirebon Regency, with a two-stage cluster sampling technique used to select the sample. In the first stage, two subdistricts were randomly chosen using the RAND() function in Excel. Subsequently, three elementary schools SDN 2 Penpen, SDN 1 Munjul, and SDN 2 Munjul were randomly selected from these subdistricts to serve as the research sample.

The research process began with the development of a mathematical disposition scale, which was validated for content validity and reliability through input from three experts. The instrument consisted of 23 items that met the content validity criteria, with a range of validity values between 0.75 and 1. Item discrimination indices ranged from 0.333 to 0.669, exceeding the threshold of 0.3 for acceptable discrimination (Azwar, 2009). The reliability of the scale, assessed using Cronbach's alpha, was 0.883, indicating high consistency, as values above 0.7 are considered reliable (Taherdoost, 2016). Collectively, these results confirmed the scale's suitability for use in this study. Following instrument validation, teaching modules for each cooperative learning model were developed and implemented in classrooms. Each student group was treated according to the assigned cooperative learning model, namely GI, STAD, or TGT.

Data were collected using the mathematical disposition scale during the pretest and posttest phases. Differences between pretest and posttest scores were analyzed using Analysis of Covariance (ANCOVA), which evaluates the treatment effects while controlling for potential confounding variables. Before conducting the analysis, ANCOVA assumptions including normality, homogeneity, linearity, heteroscedasticity, and homogeneity of regression coefficients were tested to ensure the data met the required conditions. Post hoc analysis was then conducted using the Bonferroni method to identify significant differences between groups. This comprehensive analysis provided in-depth insights into the effectiveness of each cooperative learning model in enhancing students' mathematical disposition

Result and Discussion

The data analysis was conducted to determine the differences among the three cooperative learning models (Group Investigation, TGT, and STAD) in their effectiveness at enhancing students' mathematical dispositions. The sample consists of 42 male and 48 female students from the entire group. For more details, refer to the diagram below.

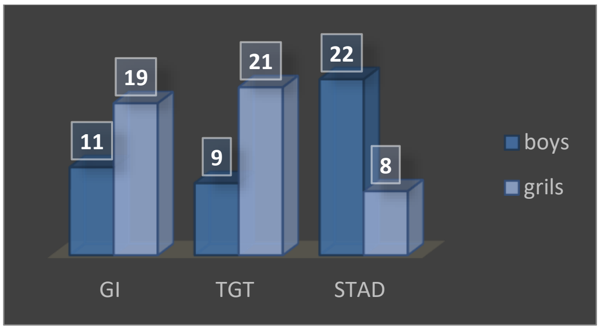

Figure 1. Gender Demographics

Based on the diagram above, the Group Investigation (GI) learning model shows that the number of male students participating in the experiment is almost equal to that of female students, with 19 female and 11 male students. However, in the Team Games Tournament (TGT) learning model, there are more female students, with 21 female students compared to 9 male students. On the other hand, the Student Teams Achievement Divisions (STAD) learning model has a higher number of male students, totaling 22, whereas there are only eight female students.

Table 1. Statistic Descriptive

Descriptive	Learning Model GI	Learning Model TGT	Learning Model STAD
Minimum Pretest	37	44	37
Maximum Pretest	77	70	76
Standard Deviation of Pretest	11.066	7.351	10.018
Mean Pretest Score	57.63	57.3	61.77
Minimum Posttest	43	44	41
Maximum Posttest	77	74	77
Standard Deviation of post-test	8.693	7.795	8.833
Mean Posttest	60.22	58.1	58.1
Minimum Difference	-7	-6	-9
Maximum Difference	25	12	15
Standard Deviation of Difference	6.246	3.919	5.699
Mean Difference	4,13	1,87	1
Minimum Percentage Increase	-10	-9	-13
Maximum Percentage Increase	51	20	28
Mean Percentage Increase	7.8	3.1	2.13
Standard Deviation of Percentage Increases	12.13	6.541	9.954

Based on the statistical analysis provided, it is evident that the cooperative learning model known as GI demonstrated the most substantial improvement compared to other models. Specifically, students participating in the GI model experienced a notable 7.8% increase in their scores, significantly higher than the 3.1% observed in the TGT model and the smallest increase of 2.13% in the STAD model. Moreover, the mean score for students in the GI group was 60.22, which surpassed the scores of 58.1 and 58.1 achieved by students in the TGT and STAD groups, respectively. The average difference in scores within the GI group was notably higher at 4.13, indicating more significant variability in student performance within this model compared to the TGT (1.87) and STAD (1) models. Standard deviations further supported these findings, with values of 6.246 for GI, 3.919 for TGT, and 5.699 for STAD, suggesting varying levels of dispersion in scores within each group. Overall, these results underscore the effectiveness of the GI cooperative learning model in achieving higher academic outcomes compared to its counterparts. Before proceeding with hypothesis testing, it would be essential to ensure that the assumptions underlying the statistical tests, such as normality and homogeneity of variances, are adequately met to ensure the validity of the conclusions drawn from the analysis.

Table 2. Normality Test

One-Sample Kolmogorov-Smirnov Test	
	Residual for Disposition
N	90
Asymp. Sig. (2-tailed)	.314

The residuals of the posttest-pretest score difference were subjected to the normality test. Asymp was the outcome of calculating the residuals of the differences between the pretest and post-test scores in SPSS using the Kolmogorov-Smirnov Test. A significance level of 0.314 > 0.05 was determined using a two-tailed test. All signs point to an adequately distributed set of data.

Table 3. Homogeneity Test

Levene's Test of Equality of Error Variances			
Dependent Variable: Different Score Mathematical Dispositions			
F	df1	df2	Sig.
.746	2	87	.477
a. Design: Intercept + Group + Prior Knowledge			

The homogeneity test examined the remaining values of the disparity between the group's performance and initial capacities. With SPSS's Levene test for variance homogeneity, the p-value is 0.477 > 0.05. According to this finding, if the group variances are comparable, then the data variances are homogenous.

Table 4. Linearity Test
`ANOVA Table

			Sum of Squares		Mean Square	F	Sig.
Mathematical Dispositions * Prior Knowledge	Between Groups	(Combined)	1.318.417	6	36.623	1.430	116
		Linearity	248.865		248.865	9.716	003
		Deviation from Linearity	1.069.552	5	30.559	1.193	276
	Within Groups		1.357.583	3	25.615		
	Total		2.676.000	9			

Checking for a linear connection between students' baseline skills (covariate) and the difference in posttest-pretest scores is the goal of the covariate linearity test. The statistical analysis showed a significant linear association with a Linearity p-value of 0.003 < 0.05. Furthermore, there is no significant departure from linearity, as indicated by the departure from Linearity p-value = 0.276 > 0.05. These results show a direct correlation between the students' pre-and post-test scores and their innate skills.

Table 5. Heteroskedasticity Test

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.475	3.319		2.554	.012
	Lncov	-1.818	.856	-.221	-2.124	.036

Finding out if the residuals exhibit heteroscedasticity is the goal of the homoscedasticity test. The data display indications of heteroscedasticity, and the assumption of homoscedasticity is not satisfied, as the test results revealed a p-value = 0.036 < 0.05. Nonetheless, prior studies have shown that data accuracy is unaffected by heteroscedasticity in ANCOVA (Gill et al., 2018). Once the following conditions are met, hypothesis testing can begin: the data are homogeneous and distributed normally; the covariate has a linear relationship with the dependent variable; the residuals show heteroscedasticity, but it does not significantly affect the analysis; and the covariate is homogeneous. Next, we will apply the ANCOVA test to see if the three cooperative learning models, GI, TGT, and STAD, affect students' mathematical dispositions differently.

Table 6. Homogeneity of Regression Coefficients Test

Tests of Between-Subjects Effects						
Dependent Variable: Mathematical Dispositions						
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	709.888[a]	8	88.736	3.656	.001	.265
Intercept	59.568	1	59.568	2.454	.121	.029
Group	125.506	2	62.753	2.585	.082	.060
Gender	21.179	1	21.179	.873	.353	.011
Group * Gender	112.933	2	56.467	2.326	.104	.054
Prior Knowledge	15.715	1	15.715	.647	.423	.008
Group * Prior knowledge	75.126	2	37.563	1.548	.219	.037
Error	1.966.112	81	24.273			
Total	3.166.000	90				
Corrected Total	2.676.000	89				

The univariate analysis evaluated whether the learning model interacts with students' prior knowledge. The results showed an $F(2,81) = 1.548$, a partial eta-squared $\mu p^2 = 0.037$, and a p-value = 0.219 > 0,05. This suggests that no significant connection exists between the learning model employed and the student's existing knowledge. Consequently, we accept H_0 and reject the alternative hypothesis that H_2 posited a meaningful interaction. The results indicate that the effectiveness of the three cooperative models in enhancing mathematical dispositions is not dependent on students' prior knowledge levels. This finding aligns with previous studies showing that substantial prior knowledge does not significantly interact with the instructional model (Romadon et al., 2022).

Furthermore, we examined whether gender interacts with the learning model. According to the table, the analysis produced a partial eta-squared a $\mu p^2 = 0.054$, an $F(2,81) = 2.326$, and a p-value = 0.104 > 0.05. This indicates no significant interaction between gender and the learning model. Thus, we again accept the null hypothesis H_0 and reject hypothesis H_3, suggesting a gender-specific interaction with the learning model. This aligns with existing literature suggesting that learning strategies are not gender-dependent but rather influenced by the design of activities and social contexts (MZ, 2013). Other studies have found that gender stereotypes in mathematics do not significantly affect learning outcomes when the classroom environment is inclusive (Nurdiansyah et al., 2021). Therefore, teachers are encouraged to create collaborative learning environments that respect diversity and avoid gender bias.

In summary, these findings indicate that the impact of the learning model does not significantly differ based on students' prior knowledge or gender. The learning models seem to work independently of these factors affecting students' performance.

Table 7. Hypothesis Test

Tests of Between-Subjects Effects

Dependent Variable: Mathematical Dispositions

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	416.065[a]	4	104.016	3.912	.006	.155
Intercept	287.618	1	287.618	10.818	.001	.113
Group	167.198	2	83.599	3.144	.048	.069
Gender	19.349	1	19.349	.728	.396	.008
Prior knowledge	144.994	1	144.994	5.453	.022	.060
Error	2.259.935	85	26.587			
Total	3.166.000	90				
Corrected Total	2.676.000	89				

The statistical analysis reveals a significant difference between the three cooperative learning models, GI, TGT, and STAD, regarding their impact on students' mathematical disposition. This is evidenced by a p-value = 0.048 < 0.05, an F-value (2,85) = 3.144, and a μp^2 = 0.069. These results suggest that the type of cooperative learning model used notably affects how students develop their mathematical thinking and attitudes. Therefore, we reject H_0 and accept the alternative H_1, which asserts a significant difference among the models.

The analysis also shows that students' prior knowledge significantly impacts their mathematical disposition. With a p-value = 0.022 < 0.05 threshold, coupled with an F-value (1,85) = 5.453 and a μp^2 = 0.060, it is clear that students who start with different levels of prior knowledge exhibit various levels of mathematical disposition. Consequently, we reject H_0 and accept H_4, which posits that prior knowledge significantly influences students' mathematical inclination. Students with higher levels of prior knowledge tend to develop stronger positive mathematical dispositions. A higher level of mathematical disposition correlates with improved academic achievement (Zulkarnain & Septhiani, 2024), as it fosters confidence in understanding new material. Teachers can leverage diagnostic tests or preliminary discussions to assess students' prior knowledge before introducing new lessons. This approach enables teachers to design instruction that strengthens students' foundational knowledge prior to presenting more complex concepts (Riyani & Purnamasari, 2024). This finding supports the constructivist theory, which asserts that effective learning occurs when students can construct new knowledge based on their prior understanding (Casfian et al., 2024).

Regarding the influence of gender on mathematical disposition, the analysis indicates no significant difference between male and female students. The p-value = 0.396 > 0.05 threshold, with an F-value (1,85) = 0.728 and a μp^2 = 0.008. These results imply that gender does not significantly affect students' mathematical disposition. Therefore, we accept H_0 and reject H_5, which suggests a gender-based difference. This result aligns with previous studies indicating that dispositions toward mathematics are more influenced by teacher attitudes, learning environments, and student expectations rather than biological or gender-related factors. Other studies have also shown that gender does not affect students' mathematical communication skills (Hodiyanto, 2017). In practice, teachers should create an environment that encourages active participation from all students, regardless of gender, to foster positive mathematical dispositions. Positive feedback and heterogeneous group-based learning can help establish an inclusive classroom atmosphere that encourages all students to develop a positive attitude toward mathematics.

Given the significant differences observed among the three learning models in enhancing students' mathematical disposition, a post hoc analysis with the Bonferroni correction was conducted to explore these differences further. This additional analysis helps pinpoint the discrepancies between the GI, TGT, and STAD models, providing deeper insights into their comparative effectiveness.

Table 10. Post-Hoc Analysis Using Bonferroni Method

Dependent Variable: Mathematical Dispositions

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig. [b]	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
GI	TGT	1.473	1.366	.852	-1.864	4.810
	STAD	3.541*	1.415	.043	.086	6.996
TGT	GI	-1.473	1.366	.852	-4.810	1.864
	STAD	2.068	1.415	.443	-1.388	5.524
STAD	GI	-3.541*	1.415	.043	-6.996	-.086
	TGT	-2.068	1.415	.443	-5.524	1.388

These findings about the models are derived from the post hoc analysis that used the Bonferroni correction:

1. Comparison Between GI and STAD:

   The p-value of 0.043 < 0.05 was seen while comparing the Group Investigation (GI) and the Student Teams-Achievement Divisions (STAD) models. This shows that the two models are quite different from one another. As a result, we support H_6 and reject H_0, indicating that the GI and STAD models influence students' mathematical inclination in various ways.
2. Comparison Between STAD and TGT:

   There is a statistically significant difference between the STAD and TGT models p-value = 0.443 > 0.05. So, it seems that these two learning models are similar. We conclude that the STAD and TGT models have identical effects on students' mathematical disposition, thereby rejecting H_7 and accepting H_0.
3. Comparison Between GI and TGT:

   A p-value of 0.852 > 0.05 was obtained by comparing the GI and TGT models. To put it another way, these two models are identical. Since the GI and TGT models have the same influence on students' mathematical disposition, we may reject H_8 and accept H_0. In summary, the Bonferroni post-hoc test reveals that while the GI and STAD models differ significantly in their impact on students' mathematical disposition, the STAD and TGT models and the GI and TGT models do not show significant differences.

In contrast, significant differences were observed among the Group Investigation (GI), Teams Games Tournaments (TGT), and Student Teams-Achievement Divisions (STAD) models in influencing students' mathematical dispositions. The GI model demonstrated superior effectiveness in enhancing students' mathematical dispositions compared to the STAD model. This aligns with prior research indicating that the GI model allows students to investigate new concepts in depth, motivating them to engage in critical thinking (Yusa, 2023). In practice, the GI model is particularly effective for mathematics topics that require deep exploration, while STAD and TGT are better suited for competitive learning or reinforcement of basic skills.

Overall, these findings offer significant implications for teaching practices. Teachers are encouraged to prioritize the GI model to support inquiry-based learning and enhance students' mathematical dispositions, particularly for topics requiring deeper understanding. The STAD and TGT models can be selectively employed to achieve competitive goals or for skill-based learning. Moreover, recognizing the impact of students' prior knowledge can assist teachers in designing instructional models that meet the individual needs of learners.

Conclusions

This study compares the effects of three cooperative learning models Group Investigation (GI), Teams Games Tournaments (TGT), and Student Teams Achievement Divisions (STAD) on students' mathematical disposition. The findings indicate that the GI model resulted in the most significant improvement in mathematical disposition, with an average increase of 7.8%, compared to 3.1% for TGT and 2.13% for STAD. Students taught using the GI approach also achieved the highest average score in mathematical disposition, reaching 60.22. Further data analysis revealed no significant interaction between the learning model and students' prior knowledge or gender. This suggests that the GI, TGT, and STAD models are effective in improving students' mathematical disposition regardless of their prior knowledge or gender. However, students' prior knowledge was found to significantly influence their mathematical disposition, supporting previous findings that highlight the relationship between mathematical disposition and cognitive skills. Additionally, no significant differences were observed in mathematical disposition between male and female students. Post-hoc tests demonstrated that the GI model was significantly more effective than the STAD model in enhancing mathematical disposition. However, no significant differences were found between GI and TGT or between STAD and TGT. This suggests that GI and TGT have nearly equivalent effectiveness, while STAD tends to be less effective compared to the other two models.

The limitations of this study include the relatively short time frame for measuring students' mathematical disposition, which does not reflect long-term development. Furthermore, other factors such as students' learning styles or teachers' competence in implementing the learning models were not explored in depth, and the study did not examine the impact of students' prior knowledge on the three cooperative learning models in detail. The researchers recommend that future studies investigate other cooperative models or address these limitations, for example, by developing more comprehensive didactic designs to optimize the use of these three learning models.

References

Aschbacher, P. R., Li, E., & Roth, E. J. (2010). Is science me? High school students' identities, participation and aspirations in science, engineering, and medicine. *Journal of Research in Science Teaching*, *47*(5), 564–582. https://doi.org/10.1002/tea.20353

Atallah, F., Bryant, S. L., & Dada, R. (2021). A research framework for studying conceptions and dispositions of mathematics: A dialogue to help students learn. *Research in Highher Education Journal*, *7*, 1–8.

Azwar, S. (2009). Efek seleksi aitem berdasar daya diskriminasi terhadap reliabilitas skor tes. *Buletin Psikologi*, *17*(1), 28–32.

Casfian, F., Fadhillah, F., Septiaranny, J. W., Nugraha, M. A., & Fuadin, A. (2024). Efektivitas Pembelajaran Berbasis Teori Kontruktivisme Melalui Media E-Learning. *Pediaqu : Jurnal Pendidikan Sosial Dan Humaniora*, *3*(2), 636–648. http://repo.iain-tulungagung.ac.id/5510/5/BAB 2.pdf

Colgan, L. (2013). What works? Research into Practice. *Student Achievement Division*, *14*(June), 1–4. http://www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/ESL_math.pdf

Graven, M. (2016). Strengthening maths learning dispositions through ‘math clubs.’ *South African Journal of Childhood Education*, *5*(3). https://doi.org/10.4102/sajce.v5i3.342

Hodiyanto, H. (2017). Pengaruh model pembelajaran problem solving terhadap kemampuan komunikasi matematis ditinjau dari gender. *Jurnal Riset Pendidikan Matematika*, *4*(2), 219. https://doi.org/10.21831/jrpm.v4i2.15770

Khoirunnisa, R. A., & Rahma, N. A. (2023). Pengaruh Model Pembelajaran Kooperatif Tipe Double Loop Problem Solving terhadap Kemampuan Penalaran Adaptif dan Disposisi Matematis pada Materi Trigonometri. *Jurnal Tadris Matematika*, *6*(2), 311–322. https://doi.org/10.21274/jtm.2023.6.2.311-322

Lin, S.-W., & ChunTai, W. (2016). A Longitudinal Study for Types and Changes of Students’ Mathematical Disposition. *Universal Journal of Educational Research*, *4*(8), 1903–1911. https://doi.org/10.13189/ujer.2016.040821

Medyasari, L.T., Muhtarom, & S. (2017). Efektivitas Model Pembelajaran Group Investigation Berbantuan Kartu Soal. *Aksioma*, *8*(1), 65–75.

Munaji. (2019). Penerapan Model Pembelajaran Kooperatif Tipe Jigsaw untuk Meningkatkan Disposisi Matematis Siswa. *AKSIOMA: Jurnal Matematika Dan Pendidikan Matematika*, *10*(2), 215–231.

MZ, Z. A. (2013). Perspektif Gender Dalam Pembelajaran Matematika. *Marwah: Jurnal Perempuan, Agama Dan Jender*, *12*(1), 15. https://doi.org/10.24014/marwah.v12i1.511

Nurdiansyah, N. M., Arief, A., Hudriyah, H., & Hadawiyah, R. (2021). Model Collaborative Learning Inklusif Gender. *Marwah: Jurnal Perempuan, Agama Dan Jender*, *20*(2), 110. https://doi.org/10.24014/marwah.v20i2.10685

Pei-qi, L. (2023). Student Teams Achievement Division (STAD) and Teams-Games-Tournaments (TGT) in Cooperative Learning
 <div>
 </div> *Education Journal*, *12*(5), 231–234. https://doi.org/10.11648/j.edu.20231205.16

Retnowati, P., & Ekayanti, A. (2020). Think Talk Write Sebagai Upaya Meningkatkan Komunikasi Matematis Siswa. *Sigma*, *6*(1), 17–25.

Riyani, S. R., & Purnamasari, V. (2024). Analisis Upaya Guru Dalam Meningkatkan

Kemampuan Literasi Dan Numerasi Peserta Didik Di Sd Negeri Gemah. *Islamika: Jurnal Keislaman Da Ilmu Pendidikan*, *6*(4), 1793–1807.

Romadon, K., Malahati, F., Iskandar, R., & Ramadhan, W. (2022). Pengaruh Model Pembelajaran dan Kemampuan Awal terhadap Prestasi Belajar Matematika di Sekolah Dasar. *JMPM: Jurnal Matematika Dan Pendidikan Matematika*, *7*(2), 139–150. https://doi.org/10.26594/jmpm.v7i2.3307

Satriana, M., Aminuddin, Salamah, U., Sari, D. M., Herawaty, Sagita, A. D. N., Abubakar, A., & Kasbonati. (2020). *The Effects of Team Games Tournament Smart Cards Method to the Handwashing Knowledge with Soap Among 5–6 Years Old Preschoolers*. *432*(Esic 2019), 72–74. https://doi.org/10.2991/assehr.k.200417.016

Sutiawan, H., Suyono, & Wiraningsih, E. D. (2020). Pengaruh model pembelajaran kooperatif think talk write terhadap kemampuan komunikasi dan disposisi matematis ditinjau dari kemampuan awal matematika siswa. *Jurnal Penelitian Pembelajaran Matematika*, *13*(1), 33–46.

Taherdoost, H. (2016). Validity and Reliability of the Research Instrument; How to Test the Validation of a Questionnaire/Survey in a Research. *International Journal of Academic Research in Management (IJARM)*, *5*(3). https://ssrn.com/abstract=3205040

Verdianingsih, E. (2017). Self-Esteem Dalam Pembelajaran Matematika. *Eduscope*, *03*(02), 1–9.

Wijayanto, K. A., & Sujadi, I. (2014). Eksperimentasi Model Pembelajaran Kooperatif Teams Games Tournament (TGT) dan Team Assisted Individualization (TAI) Pada Materi KPK Dan FPB Matematika Siswa Kelas V SD Negeri Se-Kecamatan Purwodadi. *Jurnal Elektronik Pembelajaran Matematika*, *2*(1), 67–76.

Williams, K. L. (2020). Contextualizing Math-Related Strengths and Math Achievement: Positive Math Orientations, Social Supports and the Moderating Effects of Prior Math Knowledge. *Journal for STEM Education Research*, *3*(3), 317–342. https://doi.org/10.1007/s41979-020-00033-z

Yusa, I. M. D. (2023). Model Pembelajaran Kooperatif Group Investigation dengan Penilaian Peta Konsep untuk Meningkatkan Keterampilan Berpikir Dasar dan Kritis Siswa. *Journal of Education Action Research*, *7*(3), 358–367. https://doi.org/10.23887/jear.v7i3.64698

Zenal Mutakin, T., Tola, B., & Hayat, B. (2023). Analisis Kemampuan Siswa Sekolah Dasar Dalam Menyelesaikan Soal Matematika Menggunakan Framwork TIMSS 2019. *Prosiding Diskusi Panel Nasional Pendidikan Matematiika*, 225–236.

Zulkarnain, I., & Septhiani, S. (2024). Pengaruh Disposisi Matematis dan Resiliensi Matematis terhadap Prestasi Belajar Siswa. *Prosiding Diskusi Panel Nasional Pendidikan Matematika*, 683–692.