

# Turnitin Meta Analisis Rev 2

*by* Joko Soebagyo

---

**Submission date:** 15-Sep-2023 09:05AM (UTC+0700)

**Submission ID:** 2166507168

**File name:** Joko\_Soebagyo\_Meta\_Analisis\_Rev\_2.docx (354.92K)

**Word count:** 5422

**Character count:** 31285



## Is the Jigsaw Method Still Relevant for Improving Mathematical Skills? Meta-Analysis Study

Joko Soebagyo<sup>(1,\*)</sup>, Samsul Maarif<sup>(2)</sup>, Huri Suhendri<sup>(3)</sup>

<sup>(1,2)</sup> Universitas Muhammadiyah Prof. Dr. Hamka, Jakarta, Indonesia

<sup>(3)</sup> Universitas Indraprasta PGRI, Jakarta, Indonesia

Received:

Revised:

Accepted:

### Abstract

Based on the findings of research that has been done, learning the Jigsaw method also has an influence on the mathematical ability of students but some do not have a significant influence. As a result, meta-analysis research is required to provide thorough and in-depth conclusions about Jigsaw method's applicability to students' mathematical abilities. Comprehensive Meta-Analysis is used to evaluate property values based on comparisons with similar properties in the same area. Data obtained from Publish or Perish with a year level from 2010 to 2023 there are a total of 501 articles with a Google Scholar data base. The total number of eligible journals and will be analyzed is 30 samples with a total of 1252 subjects. The moderator variables in this study consider the country, education level, sample size and publication source. According to the study's findings, the Jigsaw technique had a significant impact on arithmetic ability (P-value 0.05), with an effect size of 1.146 classed as extremely high based on a fixed effect and an error standard of 0.045. The results showed that the Jigsaw method is still relevant to improve students' mathematical skills, especially at the elementary school level. In contrast, The meta-analysis revealed that the Jigsaw method had no effect on pupils' mathematical abilities across country categories.

**Keywords:** Jigsaw methods, mathematical abilities, meta-analysis

<sup>(\*)</sup>

Corresponding Author:

[joko\\_soebagyo@uhamka.ac.id](mailto:joko_soebagyo@uhamka.ac.id) 082112391355.

**How to Cite:** XXXXXX. (2018). XXXX. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, XX (x): x-xx.

## INTRODUCTION

Recognize mathematics as an abstract science that is the basis for achieving other sciences. Mathematics complements all existing sciences ranging from science, technology, art and many others (Kamarullah, 2017). The level of difficulty in mathematics is often used as a benchmark in achieving success. No wonder many of the nation's students are required to be proficient in mathematics. Sometimes the difficulty in solving abstract problems often makes interest in learning decrease so that you are lazy to learn, this is a trigger factor for problems in learning (Siswono, 2014). In mathematics, mathematical ability is not only measured on one ability. Mathematical abilities are grouped into five understandings ranging from mathematical understanding, problem solving, reasoning, connection and communication (Sumarmo, 2012). Mathematics learning must instill rational thinking processes with the laws of mathematical logic to develop thinking processes in solving mathematical problems (Maarif et al., 2018). In understanding logic, of course, requires motivation and good learning and teaching. Not all teaching provided is able to make some students interested in learning. Therefore, as a good teacher, there needs to be variety in providing learning models. This variant is used to ensure the learners grasp the topic and that objectives for learning are achieved. Currently, there are many learning models that are often found, ranging from Problem Based Learning (PBL), Project

Based Learning (PJBL), Realistic Mathematics Education (RME), to Cooperative Learning (CL). The development of technology, a lot of research related to learning. In fact, not a few studies that vary learning with other methods.

Cooperative learning was first studied in 1898 by Roger and Johnson in about 600 experiments. Cooperative learning is learning that creates interaction between group members and teachers try to condition it by motivating students to always develop a sense of mutual need in a team (Jaelani, 2015). Social behavior learning is specifically developed to assist students in collaborating while learning. Cooperative learning is a learning paradigm in which students participate and interact with one another in small groups of four to six persons (Saputra et al., 2017). There are various variations of models that can be used in cooperative learning, namely (1) STAD, (2) Group Investigation, (3) Jigsaw, (4) Think-Pair-Share, (5) Inside-Outside Circle, (6) Make a Match, (7) Listening Team, (8) The Power of Two, and (9) Bamboo Dancing.

Jigsaw is one of the models of cooperative learning. Jigsaw type learning is learning in a learning group where there is interaction between each group member and has responsibility for the material in the group and the ability to master and teach the topic to the other members of the group (Lubis & Harahap, 2016). The initial group and the expert group are displayed in the puzzle cooperative learning paradigm. The origin group, or parent group of students, consists of students from different racial, ethnic, and socioeconomic backgrounds. While the expert group consists of members of different origin groups and is tasked with researching and studying certain subjects while carrying out tasks that will be communicated to members of the origin group. A number of specialists from the initial group have been combined to form the expert group. Being interconnected with each other where each student is able to convey the information needed to their teammates so that the goal in solving problems can be achieved is the key to the success of Jigsaw (Werdiningsih & Mukhlisin, 2021). In this learning students work in a team and are assigned to read and study a subject. Random selection is made for each member of the group who is designated as an expert in a particular field. Furthermore, the experts reported to the group and met with other groups to discuss the material learned then returned to their group to teach the material to their teammates (Widyastuti, 2015). The characteristic of the Jigsaw type that distinguishes it from other types of cooperatives is that there are study groups and specialist groups (Hibattulloh & Sofyan, 2014).

One of the learning models that can promote student activity, involvement, and knowledge of the material is cooperative learning. The Jigsaw cooperative learning model is one example (Nurfitriyanti, 2017). This learning model is possible to be applied to young children, because this type of children is also divided into several heterogeneous groups according to ability and gender, so that group characters are formed into parallels (Poerwati et al., 2020). The Jigsaw cooperative paradigm is intended to improve students' problem-solving and critical thinking abilities because in discussion activities students are grouped into specialist groups and origin teams to solve mathematical problems (Handayani, 2020).

In understanding abstract science, the ability to train critical thinking needs to be taught to students (Sarman & Soebagyo, 2022). Critical thinking is the ability of human thinking that has systematic and logical steps (Saviraningrum & Soebagyo, 2022). Thinking logically means being precise, which is an important skill for life and work to work effectively in all areas of life. The advantage in critical thinking, we can assess the level of thoroughness or truth of the question and without any information it is not easy to express what we want to convey (Zuhasni, 2022). In addition, mathematical creative thinking skills, namely the ability to think based on data and information, are available to find possible answers to such problems from different points of view on problems in each individual where it is more emphasized the suitability of answers and the versatility of answers (Yayuk et al., 2020). That is, creative thinking skills should belong to everyone

(Florentina & Leonard, 2017). No less important, to find relationships from a representation of concepts and procedures, to grasp between mathematical themes and apply mathematical concepts in other fields or daily life, the capacity to make mathematical connections is required (Widarti, 2013).

The Jigsaw method of learning, which is derived from research findings, assists students in understanding the findings they make (Sari & Fitriani, 2018). In other studies there is an influence on the mathematical ability of students but there are also those that do not have a significant influence. Of course, in various studies there are different kinds of conclusions even though the variables studied have similarities. Based on the existing problems, Meta-analysts can provide comprehensive and in-depth conclusions on certain variables or topics that want to be discussed. This study can answer how much influence the Jigsaw method has based on the desired category variables. One of the results of this study is a significant improvement in students' mathematical abilities after attending the Jigsaw method lecture with discussion assessment and based only on the findings of the preliminary and final tests (Edriati et al., 2015).

## METHODS

This study focuses on quantitative data research analysis based on Google Scholar database sources, specifically to investigate *Jigsaw models* with *math ability*. The purpose of this analysis was to identify the magnitude of the influence on the Jigsaw learning method and to investigate the impact of characteristics on mathematical ability in determining the variation in effect size of each available research. Analysis using a meta-analysis approach is used to achieve this purpose. Meta-analysis is used to compare primary study with other scientific advancements in the form of drawing statistical findings in the form of effect size on quantitative data studies based on relevant themes (Rosdiana, 2021). The steps in compiling the meta-analysis, starting from; (1) choose the criteria for the article to be researched, (2) look for literature sources related to relevant research to be used, (3) code the article to be used, (4) conduct analysis and classification, (5) interpret findings based on the article under study (Sukmawati, 2020).

### Literary Search

This research uses the Google Scholar database as a location for document search. Furthermore, the use of Publish or Perish is applied as a reference in downloading studies related to the application of the Jigsaw method by combining keywords into Jigsaw, math ability (Eryanti & Soebagyo, 2021; Haniyah & Soebagyo, 2021; Sarman & Soebagyo, 2022). Seen in Figure 1, it is obtained that the search process for the application of the Jigsaw method on Google Scholar using the PoP application reaches 500 data.

The screenshot shows the Google Scholar search interface. The search terms are 'jigsaw, math ability from 2010 to 2023'. The results table shows 500 papers. Below the search bar, there is a table of search results with columns: Cites, Per year, Rank, Authors, Title, Year, Publication, Publisher, and Type. The first few results are:

Cites	Per year	Rank	Authors	Title	Year	Publication	Publisher	Type
9	3.00	1	N Rambe, E Syahp...	The Effect of the Jigsaw Cooperat...	2020	Research and Critica in ...	pdfs.semanticscholar.org	PDF
41	5.86	2	I Dewi, MS Harahap	... of Geometri Teaching Materials...	2016	Journal of Education and ...	ERIC	
14	2.80	3	S Sumars, D Dhu...	The student's mathematical conc...	2018	Journal of Physics ...	scipience.org	
34	6.80	4	DP Sari, E Syahput...	An analysis of spatial ability and s...	2018	American ...	article.sciencedirect.com	PDF

Figure 1. Google Scholar database search results (Jigsaw, Math ability)

### Literary Inclusion Criteria

Throughout the present investigation, the research that was successfully found using the PoP software was then collated based on the requirements listed following: (1) write keywords using English settings, then retrieve the Google Scholar database at a vulnerable time between 2010-2023, (2) statistical information is used to obtain the effect size value. And journals or study criteria that do not match will be removed from the analysis data, and (3) learning to use a quantitative approach where in quantitative data there must be control groups and experiments. Journals or papers with just a single sample and a qualitative approach will be excluded from the data analysis.

The data screening in this investigation was done using the PRISMA protocols shown in Figure 2.

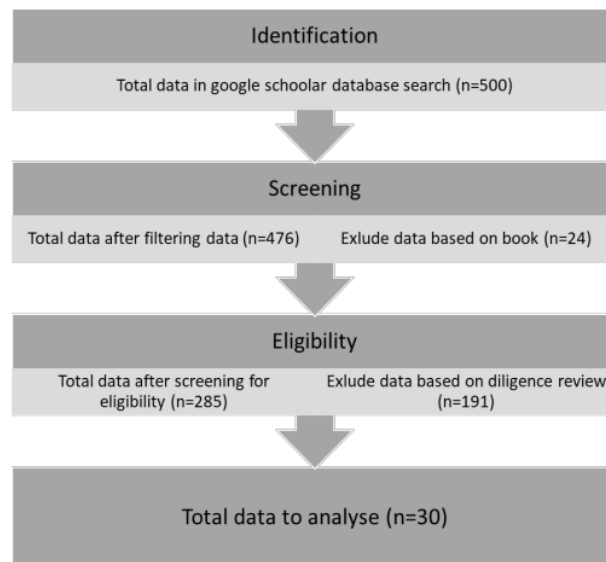


Figure 2. Filter data using PRISMA



### Coding

All studies that match the criteria are coded manually using a detailed coding scheme based on protocols. In this study, the instrument was carried out using the provision of codes (categories). Coding is done to separate individual data information into numerical data. A random sample of 5 valid studies was reproduced and divided among 1 coders to determine reliability. The coder is given a copy of the article, as well as the coding form and protocol. To assess the reliability of these coders, the following formula is employed to calculate percent agreement (PA):

$$PA = \frac{N_A}{N_A + N_P} \times 100\%$$

In this scenario,  $N_A$  represents the total number of agreements, while  $N_P$  represents the entire number of disagreements.

### Statistical Analysis

The data was evaluated with the CMA application, with special attention paid to the effect size, which is defined as the influence of the Jigsaw approach on students' mathematical skills. The Comprehensive Meta-Analysis is beneficial for adjusting the effect size of research, including the overall effect size, P-value, Q-statistic, and truth interval. In addition, the program creates research forest plots and funnel plots. The g Hedges measure was utilized in this analysis, and the size effect was classified as less than 0.2 (negligible), 0.2 to 0.5 (small effect), 0.5 to 0.8 (moderate effect), 0.8 to 1.3 (big effect), and more than 1.3 (very large effect) (Cohen et al., 2007). The random effect technique was chosen as the estimation method since there is no assumption that all research have the same effect. The randomized effect model in this study was selected after a successful heterogeneity test. The p value is used to perform this test. If the p-value is less than 0.05, all studies will be identical, and the null hypothesis and homogeneity will be rejected. The rejection of the null hypothesis suggests that population parameters may not be measured with the same effect size across studies or study groups (Retnawati et al., 2018). There is evidence that different study categories have different effects on study effect sizes.

To avoid misrepresentation of results, publication bias is checked. Publication bias is the likelihood that studies appearing in published literature are considered statistically significant to be published (Cooper et al., 2009). In anticipation, a bias analysis was carried out on the funnel plot to see if the research was free from bias. When the distribution of impact sizes on vertical lines was symmetrical, publication bias was judged strong in this study. However, if the size distribution of the effect is not perfectly symmetrical, it is necessary to use the trim and fill method. If the observed effects and virtual effects generated by randomized effects models are found to be similar, then the study is immune to publication bias.

## RESULTS & DISCUSSION

### Results

#### Literature Search Results

The goal of this study was to determine whether the magnitude of the effect created had an effect on learning the Jigsaw method and mathematical competence based on category variables. Therefore, researchers try to search literature using PoP (Publish or Perish) software by applying several criteria. The first criterion, researchers use vulnerable research time in 2010 – 2023. Furthermore, the second criterion of researchers used the keywords Jigsaw and Math ability, and the maximum number of results was limited to 500

data. From the topics used, 501 articles were collected, with 24 data coming from books and the rest coming from journals, citations and documents.

### **Literature Selection Results**

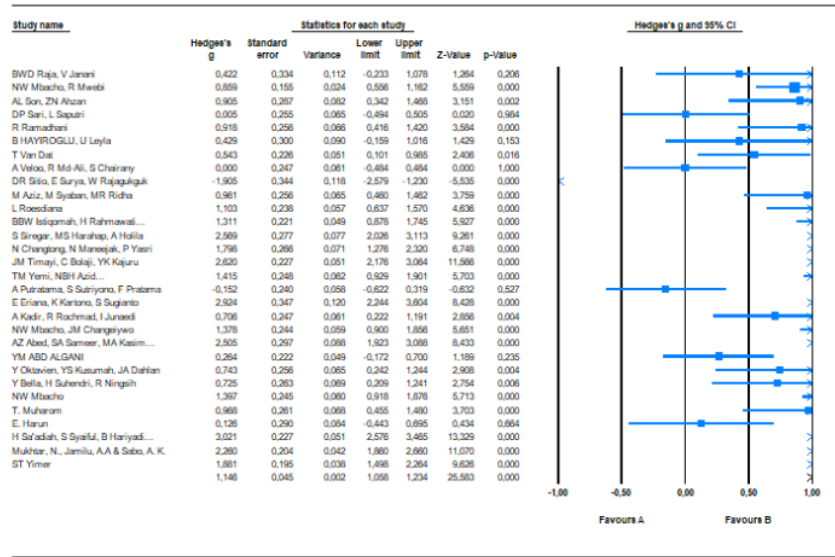
After setting criteria for literature search, the researcher converts the data into excel and eliminates the data in the appropriate journal. First, researchers filter data that is included in journals or articles. Second, researchers use a quantitative approach to collect data that has an experimental class and a control class. Third, researchers collect statistical data such as the number of samples, average values and standard deviations. This statistical data aims to calculate the size of the effect to be studied. Furthermore, screening through the PRISMA method is carried out to ensure the accuracy of the data obtained. Not only that, but researchers must guarantee that the journal's title and theme are consistent with the criteria variables.

### **Results Criteria**

The results of the criteria in this study focused on vulnerable years 2010 - 2023. The selection of criteria on this year's vulnerability was carried out to ensure that the available research is up-to-date. From the results of the criteria that have been filtered, researchers consider choosing research sourced from journals and proceedings. In addition, researchers also obtained various journals from various countries with the same topic, ranging from Asian to Europe: 8 countries. Furthermore, researchers consider the degree of education beginning with (pre-school, elementary, junior high, high school, and university). The many variations that have been studied at this level of education add to the accuracy of a study. Furthermore, researchers also looked at the number of sample sizes in a study and paid attention to whether each of these journals had a control class and an experimental class. The selected research is also equipped with post-test and pre-test data, average values and standard deviations to see the extent of the data spread and whether there are data deviations in the average value.

### **Statistical Analysis Results**

The results of the study here aim to answer the research question. Figure 3 depicts the findings of a meta-analysis of 30 filtered and collected data from Google Scholar. Figure 3 contains the identification of the names of the studies. Furthermore, the magnitude of the effect is shown which contains the results of the intervention. It can be seen that there is 1 data that is less than 0 or under consideration, while the average confidence interval that stretches horizontally or is more than 0 is on the right. This means that the effects of the intervention are beneficial. In addition, figure 3 also shows the heterogeneity of a data to see discrepancies in the source of findings from the study.



Meta Analysis

Figure 3. Research Forest Plot

According to Figure 3, there is an inconsistent response rate. It is clear that the research is likely to be diverse. As a result, it must be statistically examined such that the starting assumptions are consistent with the estimation approach.

Table 1. Meta Results - Analysis according to the Estimation method

Model	N	Hedge's g	Standard error	Test of null		Q	P	Decision
				Z-value	P-value			
Fixed-effects	30	1.146	0.045	25.583	0.000	447.062	0.000	Reject
Random-effects	30	1.095	0.177	6.189	0.000			

Table 1 displays the findings of a meta-analysis of 30 papers from conferences and international journals. Table 1 shows that the P value is 0.05, indicating that each study has a diverse impact size. Therefore, a fixed effect model with a very high effect size of 1.146 was used. Using a null test obtained P less than 0.05 with a fixed effects model. In addition, a z value of 25,583 was obtained indicating that the search results were significant for  $P < 0.05$  (Musna et al., 2021). To put it another way, the Jigsaw-type learning model has a big impact on mathematical ability.



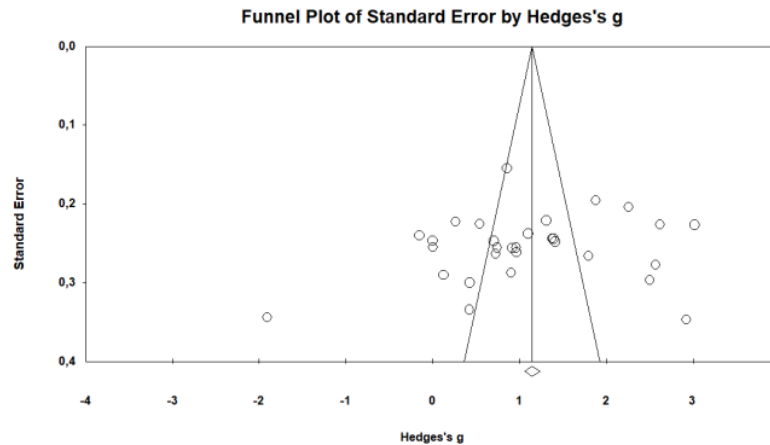


Figure 4. Funnel plot of 30 samples

Then, as shown in Figure 5, we will show a funnel plot with the research spread out and not symmetrical in the funnel, requiring trim and fill to check whether there is a difference with the influence of publication bias.

#### Duval and Tweedie's trim and fill

	Fixed Effects			Random Effects			Q Value
	Studies Trimmed	Point Estimate	Lower Limit	Upper Limit	Point Estimate	Lower Limit	Upper Limit
Observed values		1,14597	1,05817	1,23376	1,09469	0,74799	1,44139
Adjusted values	0	1,14597	1,05817	1,23376	1,09469	0,74799	1,44139

Figure 5. Trim and Fill

The findings of trim and fill indicate that there is no difference or opposite according to the fixed effect model, so no research or study is trimmed or added to this study.. The overall effect size is 1.14597 rounded up to 1.146 is a very high value for an effect size.

Furthermore, in addressing the following question, it is demonstrated that the estimation approach, as previously stated, matches the fixed effect model. This shows that the effect sizes of each study are varied, necessitating a detailed examination of the categorical factors influencing the association between the Jigsaw learning model and mathematical competence. As a result, Table 2 shows the summary results of the category variable analysis.

1

Table 2. Summary of Category Variable Analysis

No	Category Variable	Group	N	Combined Effect Size (Hedge's g)	Test of null (2-Tail)		Heterogeneity			Decision
					Z	P-value	Between-Classes Effect (Q-value)	Df (Q)	P-value	
1	Country	Indonesia	15	0.99	3.439	0.001	0.331	1	0.565	Reject $H_0$
		Overseas	15	1.199	5.412	0				
2	Educational level	University	4	1.172	3.797	0	32.466	4	0	Reject $H_0$
		High School	9	0.942	3.672	0				
		Primary School	15	1.09	3.702	0.000				
		Elementary	1	2.924	8.428	0.000				
		Pre School	1	0.429	1.429	0.153				
3	Sample Size	30 or less	7	0.114	0.361	0.000	12.005	1	0.001	Reject $H_0$
		31 or more	23	1.384	7.51	0.000				
4	Publication Source	Journal	29	0.178	5.919	0.000	19.84	1	0	Reject $H_0$
		Proceeding	1	2.26	11.07	0.000				

### Country

The effect size in Indonesian study was 3,439, whereas the effect size in international research was 5,412. According to the heterogeneity of Q-value = 0.331 and  $p > 0.05$ , studies on the Jigsaw learning model conducted in Indonesia and abroad have no impact on students' mathematical abilities.

### Education Level

According to Table 2, the sample size at the education level is as follows: Pre-school (0.429), Elementary (2,924), Junior High School (1.09), Senior High School (0.942), and University (1,172). Heterogeneity tests yielded Q-value = 32.466 and  $p > 0.05$ , indicating that the application of Jigsaw learning to mathematical abilities was influential at all stages of schooling, from pre-primary to university.

### Sample Size

Based on Table 2. It was shown that a sample size with a group of 30 or less had an effect size of 0.114, while a sample size with a group of 31 or more had an effect size of 1.384. Based on the heterogeneity test, Q-value = 12.005 and  $p < 0.05$ . In this situation, it suggests that the sample size influences Jigsaw technique learning with students' mathematical skills.

### Publication Source

According to the publication source, the effect size of journal research was 0.178, whereas the effect size of proceedings research was 2.26. Judging from the heterogeneity of Q-value = 19.84 and  $p < 0.05$ , the entire paper shows that Jigsaw learning affects students' mathematical abilities.

### Discussion

2

Essentially, the purpose of this study is to determine whether the Jigsaw approach has a significant impact on students' mathematical abilities. Based on the analysis, an effect size of 1,146 was obtained, which shows that this study has a considerable influence. In accordance with the research that has been conducted, there is a possibility that students can contribute to solving problems in group discussions using the Jigsaw learning model, due to its significant influence (Tamur et al., 2021).

The number of subjects studied in this study was 1252 with an average of 69 people. In this case, the effect size of 1,146 shows that the Jigsaw method affects mathematical ability (Cohen et al., 2018). In line with other studies, learning using the Jigsaw method is more fun than ordinary learning because students can find information

from other groups (Wardani, 2015). Next, researchers conducted an analysis based on categorical variables. It can be seen that the amount of the influence in this study is clarified beginning with the level of education, country, sample size, and publication source.

Analysis of country categories found that research in Indonesia and abroad showed no influence between the Jigsaw learning model on mathematical ability. In this study, the number of samples from 30 papers is comparable. This means that in addition to Indonesia, abroad this research has been carried out a lot even not a few who use modifications to the variables studied with the main variable being Jigsaw learning. For example, research (Abed et al., 2020) that predicts Jigsaw-type learning strategies on students' mathematics learning achievement. Furthermore, other data show that the Jigsaw technique of learning geometric information is more effective than the lecture method (Timayi et al., 2015). Another study related to Jigsaw learning in Turkey states that there is an influence on students' abilities in natural science laboratory practice (Karacop, 2017).

Next, analyze category variables related to education level. Judging from the comparison of the magnitude of the effect size between Pre-School: Elementary: Junior High: High School: University (0.429: 2.924: 1.09: 0.942: 1.172) the results show that learning the Jigsaw method has a major effect on the elementary level. The findings also show that learning mathematics using the Jigsaw method is more effective at the elementary level than at other levels. According to research (Sulistiyowati & Astuti, 2020), the Jigsaw method of learning has a high level of cooperation as indicated by post-test and pre-test findings. Although this is a contradiction where learning mathematics using the Jigsaw method at the high school level affects students' mathematical communication skills (Yeubun et al., 2020).

Learning mathematics using the Jigsaw method, as shown in Table 2, also demonstrates that many research samples were collected at the secondary school level. This happens because the level of thinking has entered the formal stage. On the other hand, this learning triggers the psychology of students to be curious about their peers (Utami et al., 2021). In addition to their mathematical abilities, students' mathematical successes have beneficial consequences after the Jigsaw learning approach is implemented (Ribut, 2021). However, other studies on cooperative learning with the type of Think Pair Share aided by comics show that it is no better than not using comics to develop problem-solving skills (Turyanto et al., 2019). However, Pair Check cooperative learning has been shown to improve students' overall cooperative abilities (Wijayanti & Kusdiyanta, 2019).

In this study, sample size was also applied to categorical variables to clarify the size of the effect on the study. The findings showed that (31 or more) had a greater influence than other categories. This study also conducted an analysis of publication sources on categorical variables. Based on the findings, 1 literature was obtained from proceedings and 29 other literature was obtained from journals. These data imply that the study was free of publication bias, which is supported by trim and fill.

Many studies are not taken or do not fall into the required category while examining this research. Such research conducted by (Budiawan & Arsani, 2013) using the same variables but carried out on sports subjects. In addition, there are also some unqualified studies where there is a lack of pretest data as a control study. Of the 500 data collected, only about 30 studies were included in the requirements after several screenings. And obviously, it does not end there; this study needs to be researched further to determine its effectiveness.

## CONCLUSION

This research was conducted by taking articles from proceedings and international journals in the range of 2010 – 2023. A meta-analysis research with 30 samples revealed a fixed effect with an effect size of 1,146, indicating that mastering the Jigsaw technique had a significant impact on students' mathematical abilities. This means that Jigsaw learning is still relevant to improve students' mathematical skills. Furthermore, this study was conducted analysis based on category variables divided into four variables. Based on the analysis of education levels, it was discovered that the degree of the influence varied depending on the study. However, learning using the Jigsaw method is more influential at the elementary level than other levels. In addition, the number of samples in 31 or more has a higher effectiveness and also publication sources based on journals have more significant influence, while analysis in countries does not have an influence on both research from Indonesia and abroad.<sup>16</sup>

In the world of education, the application of the Jigsaw method is quite effective, as evidenced by the findings of several studies, particularly at the elementary level, where students enjoy playing and learning in groups, exchanging information, and working together to find information. This research has limitations because the sample in this study was obtained from Google Scholar using PoP software which means there are still many other research samples that were not carried out because of access or paid constraints. Further research requires good collaboration to review more deeply about this research.

#### CONFLICT OF INTEREST

#### ACKNOWLEDGEMENT

#### REFERENCES

- Abed, A. Z., Sameer, S. A., Kasim, M. A., & Othman, A. T. (2020). Predicting Effect Implementing the Jigsaw Strategy on the Academic Achievement of Students in Mathematics Classes. *International Electronic Journal of Mathematics Education*, 15(1), 1–7. <https://doi.org/10.29333/iejme/5940>
- Budiawan, M., & Arsani, N. L. K. A. (2013). Pengaruh Model Pembelajaran Kooperatif Tipe Jigsaw dan Motivasi Belajar Terhadap Prestasi Belajar Ilmu Fisiologi Olahraga. *Pendidikan Indonesia*, 2(1), 138–144. <https://doi.org/10.3102/0013189X18785613>
- Cohen, L., Manion, L., & Morrison, K. (2007). Book Reviews Research Methods in Education. *The Austr Alian Educational Researcher*, 2, 147–156.
- Cohen, L., Manion, L., & Morrison, K. (2018). Research Methods in Education. In *Jurnal Penelitian Pendidikan Guru Sekolah Dasar* (Vol. 6, Issue August).
- Cooper, H., Hedges, L. V., & Valentine, J. C. (2009). Handbook of Research Synthesis and Meta-Analysis 2nd Edition. In *The Lancet* (Vol. 389, Issue 10082).
- Edriati, S., Anggraini, V., & Siska, M. (2015). Efektivitas Model Jigsaw Disertai Penilaian Diskusi Untuk Meningkatkan Kemampuan Matematis Mahasiswa. *Jurnal Cakrawala Pendidikan*, 2(2), 288–295. <https://doi.org/10.21831/cp.v2i2.4833>
- Eryanti, I., & Soebagyo, J. (2021). Bibliometric Analysis of Blended learning Mathematics in Scientific Publications Indexed by Scopus. *Numerical: Jurnal Matematika Dan Pendidikan Matematika*, 91–102.
- Florentina, N., & Leonard, L. (2017). Pengaruh Model Pembelajaran Kooperatif Terhadap Kemampuan Berpikir Kreatif Matematis Siswa. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, 7(2), 96–106. <https://doi.org/10.30998/formatif.v7i2.1877>
- Handayani, H. (2020). Pengaruh Implementasi Pembelajaran Kooperatif Tipe Jigsaw

- Terhadap Kemampuan Berpikir Kritis Matematis Siswa Sekolah Dasar. *Pendas : Jurnal Ilmiah Pendidikan Dasar*, 5(1), 50–60. <https://doi.org/10.23969/jp.v5i1.1944>
- Haniyah, D., & Soebagyo, J. (2021). Analisis Bibliometrik Terhadap Kemampuan Komunikasi Matematis Dalam Pembelajaran Matematika Berdasarkan Perbedaan Gender berbasis VOSViewer. *Buana Matematika: Jurnal Ilmiah Matematika Dan Pendidikan Matematika*, 11(2), 121–136.
- Hibattulloh, N., & Sofyan, D. (2014). Perbandingan Kemampuan Komunikasi Matematis Siswa Antara Yang Menggunakan Model Pembelajaran Kooperatif Tipe Jigsaw Dengan Konvensional (Studi Quasi Eksperimen di Kelas VII SMP Negeri 2 Bayongbong). *Jurnal Pendidikan Matematika*, 3(3), 169–178.
- Jaelani, A. (2015). Pembelajaran Kooperatif, Sebagai Salah Satu Model Pembelajaran Di Madrasah Ibtidaiyya (MI). *Al Ibtida: Jurnal Pendidikan Guru MI*, 2(1), 1–16. <https://doi.org/10.24235/al.ibtida.snj.v2i1.189>
- Kamarullah, K. (2017). Pendidikan Matematika Di Sekolah Kita. *Al Khawarizmi: Jurnal Pendidikan Dan Pembelajaran Matematika*, 1(1), 21. <https://doi.org/http://dx.doi.org/10.22373/jppm.v1i1.1729>
- Karacop, A. (2017). The Effects of Using Jigsaw Method Based on Cooperative Learning Model in the Undergraduate Science Laboratory Practices. *Universal Journal of Educational Research*, 5(3), 420–434. <https://doi.org/10.13189/ujer.2017.050314>
- Lubis, N. A., & Harahap, H. (2016). Pembelajaran Kooperatif Tipe Jigsaw. *Jurnal As-Salam*, 1(1), 96–102.
- Maarif, S., Wahyudin, W., Noto, M. S., Hidayat, W., & Mulyono, H. (2018). Geometry Exploration Activities Assisted With Dynamic Geometry Software (Dgs) in a Teacher Education Classroom. *Infinity Journal*, 7(2), 133. <https://doi.org/10.22460/infinity.v7i2.p133-146>
- Musna, R. R., Juandi, D., & Jupri, A. (2021). A meta-analysis study of the effect of Problem-Based Learning model on students' mathematical problem solving skills. *Journal of Physics: Conference Series*, 1882(1), 2–8. <https://doi.org/10.1088/1742-6596/1882/1/012090>
- Nurfitriyanti, M. (2017). Pengaruh Model Pembelajaran Kooperatif Tipe Jigsaw Terhadap Hasil Belajar Matematika Ditinjau Dari Kecerdasan Emosional Maya. *Jurnal Formatif*, 7(2), 153–162. <https://doi.org/10.31949/jcp.v8i4.2941>
- Poerwati, C. E., Suryaningsih, N. M. A., & Cahaya, I. M. E. (2020). Model Pembelajaran Kooperatif Tipe Jigsaw II dalam Meningkatkan Kemampuan Matematika Anak. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 5(1), 281. <https://doi.org/10.31004/obsesi.v5i1.496>
- Retnawati, H., Apino, E., Kartianom, Djidu, H., & Anazifa, R. D. (2018). *Pengantar Analisis Meta* (Issue July).
- Ribut, O. Y. P. (2021). Model Pembelajaran Kooperatif Jigsaw Pada Prestasi Matematika Siswa Sekolah Menengah Pertama. *Jurnal Jendela Pendidikan*, 1(02), 61–65. <https://doi.org/10.57008/jjp.v1i02.9>
- Rosdiana, R. (2021). *Studi Meta - Analisis Penggunaan Model Pembelajaran Kooperatif Terhadap Kemampuan Komunikasi Matematis Siswa*.
- Saputra, G. A. A., Agung, A. A. G., & Suwatra, I. W. (2017). Pengembangan Multimedia Interaktif Sebagai Suplemen Pembelajaran Kooperatif Tipe Stad Pada Mata Pelajaran Ips Kelas Viii Smp. *Jurnal Edutech Undiksha*, 05(1), 121–131.
- Sari, S. R., & Fitriani, D. (2018). Meningkatkan Komunikasi Matematis Melalui Model Pembelajaran Kooperatif Tipe Jigsaw. *Journal for Research in Mathematics Learning*, 1(1), 183–188. <https://doi.org/10.30605/pedagogy.v7i1.1801>
- Sarman, S. N., & Soebagyo, J. (2022). Analisis Bibliometrik terhadap Kemampuan Berpikir Kritis Matematika Berdasarkan Pemecahan Masalah Berbasis VOS Viewer.



- Vygotsky: *Jurnal Pendidikan Matematika Dan Matematika*, 4(2), 117–128.
- Saviraningrum, W., & Soebagyo, J. (2022). Analisis Bibliometrik dengan Kata Kunci Mathematical Critical Thinking Student Independent Menggunakan VOSviewer. *JKPM (Jurnal Kajian Pendidikan Matematika)*, 8(1), 1. <https://doi.org/10.30998/jkpm.v8i1.13529>
- Siswono, T. Y. E. (2014). Permasalahan Pembelajaran Matematika dan Upaya Mengatasinya. *FMIPA UNESA*, 1–9.
- Sukmawati, A. (2020). Meta Analisis Model Problem Based Learning Dalam Meningkatkan Kemampuan Berpikir Kritis Pada Pembelajaran Matematika. *Thinking Skills and Creativity Journal*, 3(2), 63–68. <https://doi.org/10.23887/tscj.v3i2.30211>
- Sulistiyowati, D. P., & Astuti, S. (2020). Efektivitas Model Pembelajaran Kooperatif Tipe Jigsaw Dan Student Teams Achievement Divisions (STAD) Ditinjau Dari Keterampilan Kerjasama Pada Mata Pelajaran Matematika Siswa Kelas 5 SD. *Jurnal Karya Pendidikan Matematika*, 7(1), 92. <https://doi.org/10.26714/jkpm.7.1.2020.92-103>
- Sumarmo, U. (2012). Pendidikan Karakter serta Pengembangan Berfikir dan Disposisi Matematik dalam Pembelajaran Matematika. *Seminar Pendidikan Matematika*, 1–26.
- Tamur, M., Subaryo, S., Ramda, A. H., Nurjaman, A., Fedi, S., & Hamu, A. (2021). Pengaruh Pembelajaran Kooperatif Tipe Jigsaw Terhadap Kemampuan Berpikir Kritis Siswa SMP. *Journal of Honai Math*, 4(2), 173–182. <https://doi.org/10.30862/jhm.v4i2.201>
- Timayi, J. M., Bolaji, C., & Kajuru, Y. K. (2015). Effects of Jigsaw IV Cooperative Learning Strategy (J4CLS) on Academic Performance of Secondary School Students in Geometry. *International Journal of Mathematics Trends and Technology*, 28(1), 12–18. <https://doi.org/10.14445/22315373/ijmtt-v28p504>
- Turyanto, T., Agustito, D., & Widodo, S. A. (2019). Think Pair Share With Comic For Mathematical Problem Solving Skills. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, 9(3), 181–190. <https://doi.org/10.30998/formatif.v9i3.3773>
- Utami, P., Kadir, & Herlanti, Y. (2021). Meta-Analisis Pembelajaran Kooperatif di Indonesia. *Jurnal Inovasi Pendidikan IPA*, 7(1), 106–115. <https://doi.org/10.21831/jipi.v7i1.39574>
- Wardani, D. T. (2015). Pengaruh Pembelajaran Kooperatif Tipe STAD (Student Teams Achievement Divisions) Dan Jigsaw Terhadap Prestasi Belajar Ekonomi Ditinjau Dari Motivasi Belajar Siswa Tahun Ajaran 2014/2015. *EQUILIBRIUM: Jurnal Ilmiah Ekonomi Dan Pembelajarannya*, 3(2), 105–111. <https://doi.org/10.25273/equilibrium.v3i2.657>
- Werdiningsih, E., & Mukhlisin, M. I. (2021). Penerapan Model Pembelajaran Kooperatif Tipe Jigsaw di Kelas. *Jurnal Pendidikan Berkarakter*, 4(2), 60–65.
- Widarti, A. (2013). “Kemampuan Koneksi Matematis Dalam Menyelesaikan Masalah Kontekstual Ditinjau dari Kemampuan Matematis Siswa” (jurnal STKIP jombang, 2012). *Jurnal Pendidikan Matematika*, 1(003), 1–2.
- Widyastuti, E. (2015). Peningkatan Kemampuan Pemahaman Konsep Dan Komunikasi Matematis Siswa Dengan Menggunakan Pembelajaran Kooperatif Jigsaw. *Journal of Mathematics Education*, 1(1), 1–14.
- Wijayanti, A., & Kusdiyanta, A. (2019). Cooperative Skills Improvement Through Mind Mapping Assisted Pair Check Peningkatan Keterampilan Kooperatif Melalui Pair Check Berbantuan Mind Mapping. *Jurnal Ilmiah Pendidikan MIPA*, 9(3), 257–266. <https://doi.org/10.30998/formatif.v9i3.2927>
- Yayuk, E., Purwanto, As’Ari, A. R., & Subanji. (2020). Primary School Students’ Creative Thinking Skills in Mathematics Problem Solving. *European Journal of Educational Research*, 9(3), 1281–1295. <https://doi.org/10.12973/eu-jer.9.3.1281>

- Yeubun, I. Z. S., Noornia, A., & Ambarwati, L. (2020). The Effect of Jigsaw Cooperative Learning Methods on Mathematical Communication Ability Viewed Based on Student Personality. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, 9(4), 333–338. <https://doi.org/10.30998/formatif.v9i4.4132>
- Zuhasni, N. (2022). *Penerapan Model Jigsaw untuk Meningkatkan Kemampuan Berpikir Kritis dan Hasil Belajar Siswa Kelas V SDN 2 Celala Aceh Tengah*.

# Turnitin Meta Analysis Rev 2

## ORIGINALITY REPORT

11%

SIMILARITY INDEX

8%

INTERNET SOURCES

8%

PUBLICATIONS

2%

STUDENT PAPERS

## PRIMARY SOURCES

1	Maximus Tamur, Sabina Ndiung, Robert Weinhandl, Tommy Tanu Wijaya, Emilianus Jehadus, Eliterius Sennen. "META-ANALYSIS OF COMPUTER-BASED MATHEMATICS LEARNING IN THE LAST DECADE SCOPUS DATABASE: TRENDS AND IMPLICATIONS", Infinity Journal, 2023 Publication	3%
2	<a href="http://www.researchgate.net">www.researchgate.net</a> Internet Source	1%
3	<a href="http://journal.lppmunindra.ac.id">journal.lppmunindra.ac.id</a> Internet Source	1%
4	<a href="http://repository.unpkediri.ac.id">repository.unpkediri.ac.id</a> Internet Source	1%
5	Submitted to Clayton College & State University Student Paper	1%
6	<a href="http://repository.uhamka.ac.id">repository.uhamka.ac.id</a> Internet Source	1%

7

Yohannes Yohannes, Dadang Juandi, Nana Diana. "The Evaluation of Problem-Based Learning Model Towards High School Students' Critical Thinking Skills: A Meta-Analysis Study in Indonesia", 2020 12th International Conference on Education Technology and Computers, 2020

Publication

<1 %

8

[www.earth-syst-sci-data.net](http://www.earth-syst-sci-data.net)

Internet Source

<1 %

9

Lily Yunita Kusumaningrum, Dasa Ismailmuza, Nurhayadi Nurhayadi. "Application of the Jigsaw Type Cooperative Learning Model to Improve Student Learning Outcomes in the Material of Addition Fraction in Elementary School", Jurnal Riset Pendidikan MIPA, 2022

Publication

<1 %

10

[files.eric.ed.gov](http://files.eric.ed.gov)

Internet Source

<1 %

11

Maximus Tamur, Sabina Ndiung, Adi Nurjaman, Jerito Pereira. "Sejauh Mana Perbedaan Kemampuan Matematis yang diukur Memoderasi Efektivitas Pendekatan Ralistic Mathematics Education: Studi Meta-Analysis", Jurnal Math Educator Nusantara: Wahana Publikasi Karya Tulis Ilmiah di Bidang Pendidikan Matematika, 2021

Publication

<1 %

12	<a href="http://fh.ung.ac.id">fh.ung.ac.id</a> Internet Source	<1 %
13	<a href="http://ojs.unimal.ac.id">ojs.unimal.ac.id</a> Internet Source	<1 %
14	<a href="http://www.jepublichealth.com">www.jepublichealth.com</a> Internet Source	<1 %
15	Qania Agustika Siagian, Darhim Darhim, Dadang Juandi. "The Effect of Cooperative Learning Models on The Students' Mathematical Critical and Creative Thinking Ability: Meta-Analysis Study", Jurnal Cendekia : Jurnal Pendidikan Matematika, 2023 Publication	<1 %
16	<a href="http://ejournal.radenintan.ac.id">ejournal.radenintan.ac.id</a> Internet Source	<1 %
17	<a href="http://etheses.uinmataram.ac.id">etheses.uinmataram.ac.id</a> Internet Source	<1 %
18	<a href="http://journals.ezenwaohaetorc.org">journals.ezenwaohaetorc.org</a> Internet Source	<1 %
19	<a href="http://mgesjournals.com">mgesjournals.com</a> Internet Source	<1 %
20	Rahmah Johar, Arta Maisela, Suhartati Suhartati. "Students' creative thinking skill through realistic mathematics education on straight-line equation", Jurnal Elemen, 2023 Publication	<1 %



---

Exclude quotes      Off

Exclude matches      Off

Exclude bibliography      On