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Meta-Analysis of the Relationship Between Mathematics Learning and Cooperative Learning Models with the Object of Elementary School Students

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Abstract

The purpose of this research is to determine the impact of the cooperative learning model on elementary school students' mathematics learning. Meta-analysis is the technique employed. The elementary school sample study, which covered experimental work using cooperative learning methods in math instruction, covered a range of 18 students. A coding sheet that compiles data and journal entries serves as the instrument in use. The average value of the effect, 0.39, falls into the large effect group according to an analysis of the overall effect's magnitude. The analysis's conclusions also demonstrate that the cooperative learning approach has an impact on math instruction at the primary school level.

Keywords: *Meta-Analysis, Cooperative Learning Model, Learning Mathematics, Elementary Students*

INTRODUCTION

Lessons in mathematics play a crucial part in the realm of education. The goals of studying mathematics encompass cognitive, psychomotor, and affective components because mathematics is a fundamental science with fundamental principles that may be applied in daily life (Lia, 2018). Every level of education, from elementary to tertiary, requires students to take mathematics. However, learning mathematics in elementary schools is still considered difficult by students, who find it difficult to communicate their mathematics learning material in everyday life. Communication skills are very important because with them, students can coherently express mathematical ideas to friends, teachers, and others, either orally or in writing, accompanied by empirical explanations (Lia & Sari, 2021). Due to its emphasis on the 4C-based competencies which include critical thinking, teamwork, communication, creativity, and HOTS communication is one of the most crucial things in the twenty-first century. These competencies are intended so that individual students can compete while facing challenges in this global era. So, in order to teach mathematics in a way that prevents students from getting bored with it, an innovative learning paradigm is required (Wahyudi & Hadaming, 2022).

The capacity to reason analytically, which is a component of higher-order thinking skills, is a component of mathematical communication (HOTS). The top three categories of Bloom's taxonomy, known as Higher Order Thinking Skills (HOTS), encompass the capacities for analysis, evaluative thinking, and creative thinking. At the analyzing stage, students are required to be able to analyze problems and find solutions to solve them, so students will automatically be asked to communicate the results they have obtained (Hilk, 2013). Based on that, it is not permissible to override mathematical communication among students. One way that can be done is through giving an evaluation at the end of learning (Deviana, 2017). The outcomes of pupils' mathematical education can be seen by conducting this evaluation in the form of scores or numbers. Learning outcomes are the most important benchmark for determining student learning success, both in terms of changes in behavior and abilities in learning, or learning outcomes, which are student changes caused by learning activities (Murwatiningsih, 2018). These changes are necessary to achieve the desired educational goals. The ability of pupils to grasp a subject after periodically engaging in the learning process in the classroom typically determines learning outcomes. Following the learning process, students complete an evaluation process to determine their level of understanding of the mathematical concepts the teacher has given them. This examination demonstrates that the learning results of students are typically expressed as grades or scores (Afrriyanti, 2018).

A cooperative learning approach is one of the improvements that must be made to mathematics instruction in order to address these issues. This is supported by research done by Slavin between 1972 and 1987, which demonstrates that the cooperative learning model has a favorable impact on students' mathematics learning results in elementary schools and can enhance group work and improve students' knowledge competence is an effective

teaching strategy for increasing student achievement and socialization, as well as actively contributing to creating cooperation when learning and respecting each other's opinions between one member and another. A learning activity known as the cooperative learning model requires groups to collaborate to build concepts, resolve issues, or conduct research. Students are expected to actively seek out knowledge when using the cooperative learning paradigm for learning (Kulik & Chen, 1989).

Cooperative learning, in the opinion of Slavin and Sanjaya, can enhance student learning results while also enhancing social skills, encouraging an acceptance of one's own and other people's weaknesses, and boosting self-esteem (Nugroho et al., 2021). Moreover, cooperative learning can help students realize their demands for critical thinking, problem-solving, and the integration of knowledge and skills. Many researches on the impact of cooperative learning models on students' learning outcomes in mathematics have been conducted, and the findings indicate that these models can enhance learning outcomes in mathematics. But among the numerous research projects that have been conducted utilizing a number of various cooperative learning models (Kadir, 2014).

The researcher made observations about previous studies that were published in scientific journals. From this research, the researchers obtained eighteen research journals that used the cooperative learning model in learning mathematics in elementary schools (Muslina, 2018). This cooperative learning model has many interesting varieties and types, so that it is widely used in learning conducted by teachers in teaching learning in the classroom (Rembulan et al., 2023). When the teacher employs the cooperative learning approach, students actively engage in their education, which helps them comprehend the lessons that are being taught and makes it simple for the teacher to assess each student's level of proficiency. In the form of published publications, data from numerous prior studies in the field of education are widely available. To summarize and re-examine the usefulness of a research theme's results, there is sadly not much study or evaluation of research outcomes. In addition to producing a new hypothesis about the topic being studied, research based on current data can also be used to support the findings of earlier studies. The research approach of meta-analysis might be used for this study (Masitoh & Laksmi, 2009).

Meta-analysis is a statistical technique to find out the results of two or more similar studies in order to obtain a combination of quantitative data. Researchers use meta-analysis, where they look for previous research in the form of journals about cooperative learning models, combine the results of these studies to obtain information, and then analyze the results for the influence of previous research. There are several studies on meta-analysis, who revealed that meta-analysis on the effectiveness of applying a problem-solving approach in learning science and mathematics has a large influence with a high value of influence. The findings of a meta-analysis of 122 studies looking at the impacts of cooperative, competitive, and individualistic learning on student achievement

were previously published. These findings show that cooperative learning might lead to greater productivity and accomplishment than competitive and individualistic learning.

METHODOLOGY

Meta-analysis is the study methodology employed. The population of this study consisted of academic articles published in journals for education examining how the cooperative learning approach affected primary school kids' math learning from 2014 to 2020. Coding data sheets were employed as the research tool. The first step in the research process utilized in this study is to choose the issue or subject to be investigated, which is the impact of the cooperative learning model on math instruction in primary schools. Next, look for journals that address the issue or area of study. Third, focusing research on problems in the form of components of research methodology, reviewing research reports or journals to assess the content's appropriateness with the problems that have been identified, and gathering information required for research. Fourth, based all the data collected, calculate the effect size in each research report. In order to derive conclusions from the meta-analysis research that was conducted, it is important to examine research reports that have been published based on the examination of the methodologies and data analysis used. The effect size analysis technique was employed in this study to analyze the data.

RESULTS AND DISCUSSION

Based on research results, there are several methods of cooperative learning, among them: The technique for learning to find a partner was developed by Lorna Curran. The first step of this method is that the teacher prepares several cards that contain certain concepts or topics. Each student gets one card. Students then look for a partner based on the name of the card they get. Spencer Kagan created Two Stay, Two Stray. In groups of four, students collaborate. A total of two students from each group will visit another group. To share their work and knowledge with their visitors, two students who live in groups are tasked. Two visitors go back to their original groups and talk about the outcomes of their work. The teams compare notes and talk about their research findings. Paired Storytelling: This technique was developed as an interactive approach between students, instructors, and teaching materials. This method involves the teacher paying close attention to the backdrop or schema of the student's experience and assisting the students in bringing these schemas to life so that the lesson material has greater relevance. In this practice, kids are encouraged to grow in their capacity for thought and imagination. Students will be inspired to learn as a result of the outcomes of their ideas. Also, students have numerous opportunities to digest knowledge and develop communication skills while working with peers in a climate of mutual cooperation.

Jingling buttons, each group member has the chance to contribute to this activity and hear the opinions and ideas of their fellow participants. The method also has the benefit of assisting in removing obstacles to equal opportunity that frequently arise in collaborative projects. In many groups, there are often

members who are too dominant, and conversely, there are members who are passive, so they depend too much on other group members. The steps for the activity are as follows: the teacher prepares a small box containing buttons, then before starting the assignment, each student in each group makes two or three buttons, then every student who speaks or issues an opinion must put the button in the middle, then if the button is If the student's possessions run out, he may not speak again until all the buttons his friends have are used up. Then, if the buttons are finished but the task has not been completed, a new agreement is made and the procedure repeats again.

In the activity around the class, each group gets the opportunity to show off the work of other groups. The steps in this activity are students working together as usual, then after each group is finished showing off their work, these results can be displayed in several parts of the class if they are in the form of posters or pictures, and then each group walks around the class and observes the work of other groups. Group teaching and learning techniques can be used in all subjects for all age levels of students. Each participant in a group walking activity has the chance to contribute and hear the opinions and thoughts of others. The steps of the activity are that one student in each group expresses his opinion about the task being done, then another student or member also gives his opinion, and so on. Speaking turns can be carried out in a clockwise direction or from left to right.

The snowball tossing type of cooperative learning technique employs paper question balls that are rolled into balls and then passed around the group in turns. To get assignments from the teacher, pupils are separated into numerous groups, each of which is led by a group leader. Each pupil then writes a question on a piece of paper that is shaped like a ball ("question paper") and passes it to a different pupil. The student who wins the paper toss is required to respond to the questions on their paper. This instructional technique teaches pupils to be more receptive to communications from others and to communicate those messages to a group; it trains students' independence in making questions; it motivates students' confidence in communicating their opinions; it trains cooperation in solving problems in groups; and it trains students' readiness.

The Talking Stick learning paradigm has the advantage of allowing teachers to assess students' readiness, develop their reading and comprehension speed, and challenge them to be prepared in any circumstance. And this model is appropriate for all age groups and educational levels. According to Suprijono, the Talking Stick learning model's benefits include: a) developing students' reading and comprehension skills quickly; b) encouraging students to take an active role in their education; c) students dare to express opinions; d) this learning model makes students cheerful and happy and trains students mentally to be ready in any condition and situation. The scramble method, according to Robert B. Taylor, is a learning method that can increase students' concentration and thinking speed. With this approach, they are required to make rapid guesses at the answers to questions for which the answers are known but the questions' order is still random. In the scramble type cooperative learning paradigm, students are given questions that already have answers but are arranged

randomly. They are then tasked with modifying these answers to make them the right ones. So, it can be stated that the scramble type cooperative learning model is a learning model that entails student engagement in small groups to answer questions that already supply answers but with random configurations by correcting these responses so that they become the correct answers. The scramble-style cooperative learning paradigm can be utilized to boost student engagement, motivation, and enthusiasm in learning mathematics. Indirectly, this model will foster students' interest in mathematics, and in the end, it is hoped that it can also increase students' mathematical knowledge competencies.

The TGT type of cooperative learning approach divides students into study groups of four to six people who are of various racial, gender, and ability types. The TGT cooperative learning approach is unique in that it concludes with a game or competition, which makes it incredibly intriguing. It is believed that by utilizing the TGT kind of cooperative learning model, students would be able to collaborate in teams and establish a touch and habit that will enable them to collaborate effectively or compete in academic competitions. It is envisaged that the teacher will be able to give stimulation for the practice of particular abilities and students will not feel bored with the implementation of the TGT type of cooperative learning model, which can increase student learning results in mathematics. The TTW model, which is constructed through the activities of thinking, speaking, and writing, is a possible learning framework. The stages of the TTW learning model begin with students thinking to process information within themselves through the reading process. Through the reading process, students can communicate ideas by speaking in groups. In this process, students can channel ideas toward one another. The last process in this model is writing to conclude the results of the discussion. In addition, students can also come up with new ideas from the results of other group discussions.

The Team Assisted Individualization learning approach is a form of cooperative learning where students are divided into small, diverse groups of 4-5 persons to tackle challenges. Robert E. Slavin created the team-assisted individualization learning model in his book Cooperative Learning: Theory, Research, and Practice. It explains why individualized learning is important because students come to class with a wide range of knowledge, skills, and motivations. when the instructor instructs several groups. Slavin created the team-assisted individualization learning approach for mathematics, particularly for computational skills. Cooperative learning and individual learning are combined in team-assisted individualization (TAI). This model pays attention to differences in students' initial knowledge to achieve learning achievement. Individual learning is carried out because students enter the classroom with very diverse knowledge, abilities, and motivations. It is likely that some students won't acquire the lesson when it is taught to different groups because they lack the necessary skills. These students won't gain anything from the strategy. The time spent instructing them is a waste of time because other students might even already be familiar with the subject or be able to pick it up quickly. According to this description, what is meant by TAI learning is a learning model that is carried out in groups, but each group member must have prepared material or material

to be discussed in the group according to the theme given by the teacher. Next, following preparation of materials or teaching materials by each group member, the results are presented to the groups for discussion and mutual discussion. All group members are then jointly responsible for the final solution.

CONCLUSION

With an impact size of 0.39, which falls under the big effect category, learning that uses cooperative learning models on the dependent variable as a whole is able to enhance mathematics learning in primary schools in both the experimental class and the control class. This demonstrates that cooperative learning techniques are more productive and ought to be used in elementary school mathematics instruction. This cooperative learning approach can be used as a substitute to enhance math instruction in elementary schools. In comparison to other learning models employed in the control group, the usage of the cooperative learning model in terms of the dependent variable has a stronger influence on being able to increase mathematics learning. According to the results of the data analysis, the cooperative learning model's average large effect on the dependent variable is 0.37, which falls under the large effect category. The first order, which is competency in mathematical knowledge and learning outcomes, and the last order, which is mathematical communication, are the results from highest to lowest dependent variable. The effect of selecting the type of cooperative learning method has been calculated and yields a value of 0.37, falling under the large effect group. Team Assisted Individualize (TAI), Talking Stick, Group Investigation, Scramble Type, Two Stay Two Stray, Snowball Throwing, Make A Match, Team Games Tournament (TGT), Numbered Head Together (NHT), Student Team Achievement Divisions (STAD), Think Pair Share, Think Talk Write, and Think Talk and Write are the results of selecting the type of learning method from highest to lowest. So, learning mathematics that uses cooperative learning methods has a large influence and is able to improve mathematics learning in elementary schools.

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