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RESEARCH ARTICLE

The Effect of Collaborative Problem Solving (CPS) Model on Critical Thinking Skills in Mathematics Subjects

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ABSTRACT

The purpose of this study was to determine the effect of Collaborative Problem Solving (CPS) on critical thinking skills in mathematics subjects. The research method used quantitative method with experimental research type (quasi experiment) with research design of nonequivalent pretest posttest group design. The research subjects amounted to 120 students who were divided into experimental groups and control groups. Data collection using tests conducted pretest and posttest. Data analysis used normality test, homogeneity test and independent sample t test. The results of research and discussion, it can be concluded that there is an effect of collaborative problem solving model on critical thinking skills in mathematics subjects. Based on the results of hypothesis testing on the posttest, a significance value> 0.050 is obtained and also the mean difference in the posttest of the experimental group and the control group makes evidence of the difference in the effect of applying the learning model in the two groups. The experimental group used a collaborative problem solving model while the control group used a conventional model. It is hoped that further research can examine the collaborative problem solving model in other subjects, other levels of education, combining with other learning models.

INTRODUCTION

Teachers' job is to help pupils grow so that the quality of education in Indonesia can be raised. Enhancing learning quality is one strategy to raise the standard of education. In the future, teachers will need to be able to design a meaningful and practical learning experience for their students. Since effective student learning requires that they comprehend every subject, the teacher's role in education is crucial. As one of the standards for the success or failure of a lesson is to conduct an assessment (Nursaodah et al., 2022). Teachers are important agents of change, their attitudes towards 21st century teaching can have a direct impact on how they teach in the classroom (Tsourapa, 2018). Teacher attitude acts as an important catalyst for successful teaching (Chun & Abdullah, 2022). Teachers have a major impact on the success of an education system (Toraman & Çakmak, 2020). Teachers are one of the main components of student learning for many education experts (Sarpkaya & Altun, 2021). Teachers can innovate learning so that the quality of education in schools can improve (Cvetković & Stanojević, 2017). Students need to be able to work together, plan, share, discuss, and solve problems. Teachers also need to be able to provide feedback to one another that highlights the value of a design that prioritizes better literacy, discovery, and teamwork (Hills et al., 2020).

In order to successfully navigate the challenges of the fourth industrial revolution in the twenty-first century, students must possess multiliteracy abilities and life competences that support their mental, physical, and intellectual development. Critical thinking, creative thinking, problem solving, reasoning, and decision making are examples of high-level thinking abilities (Dinni, 2018). In order to prepare students for life in the twenty-first century, they need to develop critical thinking skills during their schooling. These five abilities are the foundation that they need to grasp in order to contribute to society. By encouraging students to look for novel approaches when tackling math issues, critical thinking can expand their creative problem-solving possibilities (Su et al., 2016). One of the most important and well-established skills to meet the demands of workers in the 21st century is critical thinking (van Laar et al., 2020). In this era, it is very important to teach and train students' critical thinking skills even since elementary school because there will be differences in the mastery of students who are trained to think critically and those who are not (Lombardi et al., 2022). Critical thinking skills are very important for students because these skills play a role in the development of students' thinking. Critical thinking skills are one of the basic and intellectual needs that must be met by every individual (Aizikovitsh-Udi & Cheng, 2015).

Critical thinking skills are the ability to think wisely and support arguments with sound reasoning and students should have them (Bunt & Gouws, 2020). Because critical thinking offers so many advantages for children's future, it is imperative that students develop these skills during the learning process. By listening to other students speak, evaluating these debates, and choosing the best choices depending on what is said in the dialog, students who use critical thinking skills can interact with other students. Actually, when students talk in class, critical thinking techniques assist them in taking into account every aspect of a successful conversation. Pupils have a thorough understanding of what other pupils are saying and how they wish to interact (Bagheri, 2018). Another advantage is that critical thinking is associated with quality thinking and, when sufficiently developed, aids in knowledge acquisition, improved communication with others, and adept handling of ideas, beliefs, and attitudes by learners (Dehghayedi & Bagheri, 2018). In addition to enhancing students' academic performance, critical thinking helps get them ready for careers as professionals. Students who acquire knowledge and then apply that knowledge to solve problems stand to gain from the development of critical thinking skills (Muhibbuddin et al., 2020).

Students can engage in critical thinking by having a thorough understanding of the issue. Activities in this stage include identifying the assumptions, expected outcomes, and available information and data. Students' critical thinking abilities are further enhanced by formulating questions and making predictions about the responses. You can expect critical inquiries from critical kids. One strategy for enhancing pupils' critical thinking abilities is the use of questions. Students can acquire, evaluate, and synthesize pertinent data to investigate the problem in the following step, which is building solutions. Developing solutions is thought to be a cognitive activity that affects how well kids are literate in higher order thinking

Applying learning models that facilitate as many student-to-student learning interactions as feasible will help students' critical thinking. The collaborative problem solving learning model is one of the instructional strategies that can teach students how to collaborate with their peers to uncover learning resources. This learning paradigm can demonstrate the ability of students to work together in groups to solve challenges. This learning model can be utilized effectively in the learning process to help students achieve the learning objectives and equip them with the skills they need to face the 21st century. Cooperative learning and problem-based learning are the two learning philosophies that are combined, in Nelson's opinion. While both of these lessons are clearly capable of developing a collaborative learning environment, they are not coherent. In order for students to be able to develop their knowledge from their own experiences, learning environments that support natural and effective collaboration are extremely important. In order to meet such needs, a collaborative problem-solving learning model was created, which is based on students' individual learning processes and is influenced by their problem-solving activities (Nahdi, 2017).

There are previous research results showing that the collaborative problem solving model has an effect on mathematical connection skills (Herdian et al., 2015). Improve higher order thinking skills (Nursaodah et al., 2022). Increase learning motivation and problem-solving skills (Atira et al., 2021), (Wardani et al., 2021), (Fadillah et al., 2023). Increase motivation, participation, communication, and cooperation (Nadila & Alwi, 2024). Therefore, the benefits that come from using the collaborative problem solving paradigm are excellent for the process of learning. It is believed that by using the collaborative problem solving learning approach, students will be able to think more critically, comprehend problems more quickly, and come up with the best answers. A critical thinker can think logically from information, gather and evaluate facts, organize knowledge more efficiently and creatively, ask the proper questions, and draw conclusions that can be relied upon

The problem's results indicate that, thus far, students have learned basic mathematics through both content and problem-solving exercises. This is how mathematics is now being learned. Problems with critical thinking abilities might be found in the school's learning environment. Moreover, there is evidence that low motivation may have a detrimental effect on critical thinking abilities, making student motivation another crucial component that requires consideration. Research from the past indicates that some students view mathematics classes as scary and challenging, which is consistent with the results of problems in math classes (Kamarullah, 2017). As a result, students find it difficult to apply the correct formula to the problems that the instructor gives them. To address this, teachers should make math lessons enjoyable for the students. Additional research reveals that teachers frequently face challenges when instructing in the classroom. These challenges are frequently caused by students, as many of them continue to ignore the teacher when they are in front of the class and play with their friends when the teacher begins the lesson (Gultom et al., 2020). According to additional research, some students merely participate in responding problems that come up, while others are passive when doing group projects and remain unproactive when handling learning challenges (Basri et al., 2019). Other findings revealed that students' critical thinking skills were still weak; some students had difficulty expressing arguments during discussions (Saputra et al., 2019). Educators have concerns that today's students tend to give up easily in the face of challenges or problems if they are not equipped with critical thinking skills (Seibert, 2021). Thus, the learning process in the classroom is not conducive and learning objectives are not achieved.

Therefore, the collaborative problem solving learning model needs to be applied to improve students' critical thinking skills, especially in mathematics subjects. In addition, it will produce students who are able to think critically, creatively, productively, learn independently, are responsible, can work together, seek and utilize information, solve problems, and are ready to face changes

LITERATURE REVIEW

The following literature is related to support the research and aims to provide a deeper understanding of the variables used in this study, namely Collaborative Problem Solving (CPS) and critical thinking skills.

Collaborative Problem Solving (CPS)

Dillenbourg defines collaborative problem solving as an activity in which two or more individuals work together toward the common objective of resolving a specific issue (Nahdi, 2017). With the foundational knowledge that each student already possesses, this learning emphasizes collaboration amongst students in problem-solving as the primary means of creating their own knowledge. The idea behind collaborative problem solving is that group learning can address the provided challenges. They are supposed to address the challenges offered, taking into account the diverse understanding and talents of each group member (Herdian et al., 2015). Critical thinking, problem solving, decision making, and teamwork are just a few of the essential abilities that go into collaborative problem solving (Care et al., 2016).

When students work in groups to solve a problem collaboratively, they are engaging in collaborative problem solving. The goal of collaborative problem solving is to solve problems by pooling information, skills, and effort to come up with a solution, as well as by sharing understanding and effort. Collaborative problem solving helps learners to acquire abilities including challenging others' ideas and methods, providing an explanation and justification for their methods, and expanding on previously provided knowledge (Smith, 2023). Learning using two methods is known as collaborative problem solving: problem-based learning as a cognitive talent and collaborative learning as a social skill (Holifah & Harjito, 2023).

The problem-based collaborative learning model is a learning approach that refers to the use of problems as a foundation for training and developing students' ability to solve problems together in a group (Susilowati, 2015). Working together to solve a specific problem is known as collaborative problem solving, and it involves two or more people (Nahdi, 2017), (Jamil et al., 2023). Collaboration is a competency that involves an individual's ability to work well with others to solve problems by sharing the knowledge and work needed to come up with a solution, combining their efforts, knowledge, and skills to get there (A. Graesser et al., 2017). A shared objective requires specific skills like prior knowledge, critical thinking, and effective communication (Kuo et al., 2019). Developing shared knowledge, coordinating or negotiating, and upholding team dynamics are the three fundamental competencies of collaborative problem solving (Sun et al., 2020).

Using the foundational knowledge that each student already possesses, this learning emphasizes the importance of students working together to solve issues in order to create their own knowledge. Students participate in the active learning process and are encouraged to think independently and solve problems as they learn through problem-based collaborative learning, which highlights the realism of the collaborative learning environment. The development of problem-solving abilities as well as the direction of the growth of learners' cooperation and communication abilities are the goals of collaborative problem-based learning.

The six steps to implementing collaborative problem solving are as follows, according to Willihnganz: define the problem, generate all potential solutions, select the best solution out of all the ideas that come to mind and consider any potential repercussions, create a plan based on the selected idea, carry out the plan, and assess the problem solving process (Herdian et al., 2015). The stages of collaborative problem-based learning are as follows, according to Widjajanti: Before learning in groups, students are first given challenging problems to identify and create solutions for. In small groups of four to six people, they clarify their understanding, challenge each other's ideas, form assumptions, select a solution strategy, and solve the problems by arguing with one another. Subsequently, the pupils work independently to solve the teacher's challenges, and they then present their solutions (Nahdi, 2017). The phases of collaborative problem-solving yang lainnya yaitu: orienting, understanding the problem, planning and exploring, implementing, verifying, watching and listening (Salminen-Saari et al., 2021).

Critical Thinking Skills

Among the fundamental elements of thinking skills is the capacity for critical thought. “Kritikos” is Greek for “able to evaluate,” and this is where the term “criticism” originates (Erito et al., 2021). Analyzing, assessing, and synthesizing information is the act of understanding it through critical thinking. In its most basic form, critical thinking happens when someone tries to use creative ideas and analyze, evaluate, interpret, or synthesize data in order to construct an argument, come up with a solution, or infer information or data. Critical thinking is the process of analyzing data, coming up with and organizing ideas, forming and defending beliefs, comparing ideas, drawing conclusions, assessing arguments, and finding solutions to issues (Alidmat & Ayassrah, 2017).

Critical thinking is a basic skill that every individual must have (Özyurt, 2015). Critical thinking is an intellectually rigorous process that uses information generated by or obtained via observation,

experience, reflection, reasoning, or communication to actively and skillfully conceptualize, apply, analyze, synthesize, and evaluate it in order to inform beliefs and behaviors (Ennis, 2018). Critical thinking is the ability to think with deep thought to obtain correct and reliable information (Hidayat et al., 2019). Critical thinking is the cognitive ability and disposition to combine knowledge, reasoning, and cognitive strategies in generalizing, proving, and evaluating situations that are not recognized reflectively (Toheri et al., 2019). Critical thinking is the ability of students to analyze and evaluate information to decide whether the information is reliable so that it can be used to draw valid conclusions (Afifah & Ningrum, 2018). Supported by an explanation of the three critical thinking competencies, namely recognizing assumptions, evaluating arguments, and drawing conclusions (Boa et al., 2018).

Students develop their critical thinking skills in the classroom as they study. It takes critical thought to keep the mind from becoming empty. Because of this, when reading, students should make the most use of their thinking skills to learn new information and evaluate what they've read. One ability that students should acquire while they are learning is critical thinking. Analyzing and evaluating information is a necessary skill for critical thinking (Shaheen, 2016). This critical thinking is the act of interpreting a text (Bobkina & Stefanova, 2016). Students that possess critical thinking skills are better able to handle practical problems, scientific problems, and social issues. Thus, through practice and simulation, these skills can be included into the learning process. These skills help in their decision-making and comprehension of scientific theories and methods (Razak et al., 2021). It takes a constant effort to teach critical thinking skills, particularly in situations where reading and writing are not considered desirable activities in a given community (Suarcaya, 2023). Critical thinking skills are always listed as necessary for being prepared for college and the workplace (Kraisuth & Panjakajornsak, 2017).

Critical thinking steps according to (Changwong et al., 2018) That is: Explain - by clearly defining what you are talking about, what specifically is involved, where it happened, where and under what circumstances. Reflecting - reconsidering a topic in light of new information or new experiences, or considering other points of view. Analyze - examine and then explain how something is, including comparing and contrasting comparing and contrasting different elements and understanding the relationship to your subject/topic. Critiquing - identifying and examining weaknesses in an argument, as well as recognizing its strengths. It is important to think of criticizing as something 'neutral' and not negative. Reasoning - using methods such as cause and effect to demonstrate logical thinking, as well as presenting evidence that refutes or proves an argument. Evaluating - can include commenting on the degree of success and failure of something, or the value of something

The qualities of critical thinkers, according to Facione, include being curious, knowledgeable, able to trust reason, open-minded, adaptable, fair-minded in their assessment, honest despite personal prejudices, and willing to change their minds (Turan et al., 2019). According to other literacies, critical thinking consists of eight key elements: defining issues, evaluating the facts, assessing presumptions and biases, avoiding emotional reasoning, avoiding oversimplification, taking into account alternative interpretations, and accepting ambiguity (Alfira et al., 2022).

METHODS

This research design uses quantitative research with experimental research type. An important characteristic of experimental research is that researchers consciously control and manipulate the conditions that determine the events they are interested in by introducing interventions and measuring the differences produced by those interventions (Alhassan & Osei, 2022). Quantitative research includes experimental research, which has unique qualities of its own, particularly when a control group is involved (Asriningsih et al., 2015). The objective of experimental research is to establish the presence and magnitude of a causal relationship by administering specific treatments to the experimental group and setting up a control for comparison (Akbar et al., 2023). Most of educational experiments are carried out in an effort to develop novel ideas that will raise the

standard of instruction. Consequently, their primary focus is frequently on evaluating the impact of novel teaching resources, media, techniques, or procedures on the academic achievements of students (Arib et al., 2024).

This study used a quasi-experiment and used a nonequivalent pretest-posttest group design. The purpose of the quasi-experiment is to determine if the independent and dependent variables are causally related (Loewen & Plonsky, 2016). In simple terms, this quasi-experimental research leads to testing the independent variable as the influencing variable to the dependent variable as the influenced variable. This nonequivalent pretest-posttest group design empirically assesses differences in the two groups (Gribbons & Herman, 2019), A pretest can be used to test one or both of the divided experimental and control groups, which are groups that naturally gather in places like classrooms rather than at random. One group can then receive treatment under the researcher's supervision, and the other group can be tested again using a posttest after receiving the treatment.

In this design, two groups are given a pretest to determine whether there is a difference between the experimental group and the control group in the initial condition. The posttest results provide a decision on the answer to the existing hypothesis significantly. Pretest and posttest assessments are used to explain the causal relationship between variables (Le et al., 2022), (Jalinus et al., 2023). The advantage of the pretest and posttest research design is the directness of the study, which means that there is a test of the dependent variable before and after the intervention with the independent variable (Stratton, 2019). The following is the description:

Table 1. Research Design

Group	**Pretest**	**Treatment**	**Posttest**
Experiment Class (Collaborative Problem Solving Model)	01	X1	02
Control Class (Conventional Model)	03	X2	04

This research intends to reveal the effect of collaborative problem solving model on critical thinking skills in mathematics subject. The population of this study consisted of students of SMK Negeri 1 Jetis, Mojokerto. The number of research subjects was 120 students. divided into two groups, experimental and control. The experimental group applied the collaboration problem solving model and the control group implemented the conventional model. In carrying out the research, both will be given a pretest and posttest to measure the critical thinking skills of children.

This research procedure is to determine the effect of the collaborative problem solving learning model and the conventional model in the classroom on critical thinking skills in mathematics. Thus, to obtain appropriate data requires accuracy and consistency in data collection. The core data in this research is critical thinking skills. The research data were collected through the following activities: i) Giving a pretest to determine the initial ability of critical thinking skills before treatment; ii) Observing the implementation of the learning model in each group; iii) Giving a posttest of students' responses to their critical thinking skills after learning in a class that uses a collaborative problem solving learning model and the conventional model.

Data collection techniques through tests (pretest-posttest) and observation. Students' critical thinking skills were measured using an essay test consisting of 5 questions. The essay test was developed by the researcher by adjusting the indicators of critical thinking skills, namely focusing questions, analyzing arguments, considering the credibility of the source, compiling and considering induction, identifying terms and considering definitions, and determining an action (Septiany et al., 2024).

The data of this study was analyzed with the help of SPSS application. Normality of the data was assessed through the One-Sample Kolmogorov-Smirnov test, and the Levene test was used to check homogeneity. In addition, the Independent Sample T test was conducted to identify the pretest and posttest scores of critical thinking skills in mathematics subject.

RESULTS

The results of the research findings in the form of results from the pretest and posttest of the two groups are described as follows.

Table 2. Normality Test Results

One-Sample Kolmogorov-Smirnov Test					
		Pretest_Experiment	**Pretest_Control**	**Posttest_Experiment**	**Posttest_Control**
N		60	60	60	60
Normal Parameters	Mean	33.50	32.67	81.33	76.25
	Std. Deviation	6.264	7.449	6.166	7.736
Most Extreme Differences	Absolute	.161	.156	.157	.152
	Positive	.145	.132	.152	.131
	Negative	-.161	-.156	-.157	-.152
Kolmogorov-Smirnov Z		1.249	1.211	1.218	1.181
Asymp. Sig. (2-tailed)		.088	.107	.103	.123

Based on table 2, the normality test results on the experimental group pretest obtained a significance value of 0.88, on the control group pretest obtained a significance value of 0.107. The value on the posttest of the experimental group obtained a significance value of 0.103, on the posttest of the control group obtained a significance value of 0.123. Thus all the results of the normality test on the pretest and posttest of the experimental and control groups above the significance value> 0.05, so the data results of the two groups were declared statistically normally distributed.

The following are the results of the pretest and posttest homogeneity tests for the experimental and control groups:

Table 3. Homogeneity Test Results

Test of Homogeneity of Variances				
	Levene Statistic	**df1**	**df2**	**Sig.**
Pretest	2.844	1	118	.094
Posttest	1.809	1	118	.181

Based on table 3, the results of the homogeneity test on the pretest of the experimental group obtained a value and the control group obtained a significance value of 0.094. The value on the posttest of the experimental group and control group obtained a significance value of 0.181. Thus all the results of the homogeneity test on the pretest and posttest of the experimental and control groups above the significance value> 0.05, so the data results of the two groups are statistically homogeneous.

The following are the results of the pretest and posttest mean for the experimental and control groups:

Table 4. Mean Pretest Posttest

Group Statistics

	Class	N	Mean	Std. Deviation	Std. Error Mean
Pretest	Experiment	60	33.50	6.264	.809
	Control	60	32.67	7.449	.962
Posttest	Experiment	60	81.33	6.166	.796
	Control	60	76.25	7.736	.999

Based on table 4, the mean on the pretest of the experimental group obtained 33.50 and the control group obtained 32.67. The mean on the posttest of the experimental group obtained 81.33, on the posttest of the control group obtained 76.25. Thus, the mean pretest of the two groups is not much different, while the mean on the posttest in the two groups is much different.

The following are the results of the pretest and posttest hypothesis tests for the experimental and control groups:

Table 5. Hypothesis Test Results

Independent Samples Test						
			Pretest		**Posttest**	
			Equal variances assumed	Equal variances not assumed	Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances		F	2.844		1.809	
		Sig.	.094		.181	
t-test for Equality of Means		t	.663	.663	3.980	3.980
		df	118	114.629	118	112.408
		Sig. (2-tailed)	.508	.509	.000	.000
		Mean Difference	.833	.833	5.083	5.083
		Std. Error Difference	1.256	1.256	1.277	1.277
	95% Confidence Interval of the Difference	Lower	-1.655	-1.656	2.554	2.553
		Upper	3.321	3.322	7.613	7.614

Based on table 5, the results of the independent sample t test on the pretest of the experimental group and the control group obtained a significance value of 0.833> 0.050, thus there was no difference in the initial ability of students in the sense that critical thinking skills were not much different. The value on the posttest of the experimental group and the control group obtained a significance value of 0.000 <0.050, thus there was an effect of applying the collaboration problem solving model on problem solving skills in mathematics subjects. In other words, H1 is accepted and H0 is rejected

DISCUSSION

Based on the results of the research, the experimental group and control group data were normally distributed and statistically homogeneous. As based on the independent sample t test on the pretest, it shows that there is no difference in the initial ability of students in the sense that critical thinking skills are not much different. As for the independent sample t test on the posttest, it shows that there

is an effect of applying the collaboration problem solving model on problem solving skills in mathematics subjects.

Reviewing the difference in the mean posttest in the experimental group obtained a number 81.33 higher than the control group 76.25 which was lower. This is because the experimental group implemented a different learning model, namely the collaborative problem solving model, while those implemented in the control group used the usual model. This is the cause of the average difference between the two groups during the research process.

The results of this study are supported by previous research showing that collaborative problem solving is an effective teaching approach to foster students' critical thinking (Xu et al., 2023). Other research results mention that collaborative problem solving strategies are effective in improving critical thinking skills (Winarti et al., 2019). Other research shows that collaborative problem solving using decision-making problems is effective for improving critical thinking skills (Yusal et al., 2021). The collaborative learning model combined with problem solving shows that there is a significant difference in students' critical thinking skills (Habibah et al., 2023).

Several studies have attempted to perform a thorough assessment of the empirical literature on critical thinking from diverse viewpoints. Collaborative problem solving has been widely employed in the practice of teaching critical thinking. Nevertheless, the influence of cooperative problem solving on critical thinking has received minimal consideration (Xu et al., 2023). Consequently, the ideal way to foster and improve critical thinking through cooperative problem solving is to look into how to teach critical thinking. But, this subject has not yet been well investigated, so many teachers are unable to provide critical thinking teaching that is more effective (Leng & Lu, 2021). Additional research findings demonstrate the efficacy of collaborative problem solving with decision-making challenges in enhancing critical thinking abilities (Nisa et al., 2023).

The benefits of collaborative learning problem solving, which emphasize student participation in problem solving as the primary means of building each student's individual knowledge base from the outset, lend weight to this conclusion (Hannania et al., 2022). Students use their cooperation, leadership, communication, and problem-solving abilities to intentionally engage in order to transform the current situation into the intended target state. Students use their cooperation, leadership, communication, and problem-solving abilities to intentionally engage in order to transform the current situation into the intended target state (Oliveri et al., 2017). This collaborative learning in learning helps improve understanding of subject matter, enriches learning experiences, and develops students' social skills and problem-solving abilities (Song, 2018). Collaborative problem solving has been researched as a pedagogical approach to combine learning in educational institutions and student exposure to the world of work. (Jackson, 2018). The following are some reasons why collaborative problem solving is superior to individual problem solving: 1) a more efficient division of labor; 2) solutions that incorporate data from various sources of knowledge, perspectives, and experiences; and 3) the quality of the solution is derived from the ideas of group members (Graesser et al., 2018).

According to Scardamalia & Bereiter, collaborative problem solving can advance individual and organizational knowledge through interactions with colleagues (Halttunen et al., 2023). Collaborative problem solving has benefits related to cognitive learning outcomes, enjoyment, and self-confidence (Lai & Wong, 2022). Cooperative problem solving, as defined by the OECD, is the process of students being able to participate in a learning process with two or more other students in order to solve problems together by working together and sharing understanding. In order to arrive at a problem-solving solution, this approach combines the information and abilities needed (Dewi et al., 2024).

CONCLUSION

Based on the results of the research and discussion, it can be concluded that there is an effect of the collaborative problem solving model on critical thinking skills in mathematics subjects. Based on the results of the independent sample t test on the posttest, the significance value> 0.050 and also the mean difference in the posttest of the experimental group and the control group makes evidence of the difference in the effect of the application of the learning model on the two groups. The experimental group used the collaborative problem solving mode while the control group used the conventional model. It is hoped that further research can examine more deeply the collaborative problem solving model in other subjects, it can also be at the primary, secondary and even tertiary education levels. It can also combine with other learning models, of course, still paying attention to the needs according to the characteristics of the students, the material and the learning objectives to be achieved.

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