

Problem Solving and Cooperative Learning Model of the Jigsaw Type: IPAS Learning Outcomes in Elementary School

Supiarti¹, Nurhayati Selvi², Syarifah Nur Fajrin³

^{1, 2, 3} Program Studi Pendidikan Guru Sekolah Dasar, Universitas Islam Makassar, Indonesia

Article Info

Article history:

Received October 15, 2025

Accepted December 04, 2025

Published December 27, 2025

Keywords:

Cooperative Jigsaw;
Elementary School;
IPAS Learning Outcomes.
Learning Model;
Problem Solving.

ABSTRACT

The low learning outcomes of Natural and Social Sciences (IPAS) in elementary schools are the main challenge in this study. This study aims to test and compare the effectiveness of the problem-solving learning model and the jigsaw cooperative learning model in improving the learning outcomes of fourth-grade students in Elementary School Inpres Tello Baru II in the 2025/2026 academic year. The research method used is a quantitative approach with a quasi-experimental design (Non-Equivalent Control Group Design) involving 54 students. Data was collected through observation sheets of teacher and student activities and learning outcome tests. The findings indicated that both models significantly improved the quality of teacher instruction and active student participation. Teachers achieved a score of 93.33% in the problem-solving model and a perfect score of 100% in the jigsaw model at the fourth meeting. Student activity also increased drastically, reaching 92.30% in the problem-solving model and 100% in the jigsaw model. Statistically, there is a significant difference in learning outcomes between the experimental and control classes, where the average posttest score of the experimental class (83.93) is much higher than the control class (73.08). The t-test produces a calculated t value (3.004) > t table (2.006), which proves that the use of the problem-solving and jigsaw models has a greater positive impact than the conventional method. This study recommends both models as innovative strategies to address the low learning outcomes of IPAS in elementary schools.

Copyright © 2025 ETDCI.
All rights reserved.

Corresponding Author:

Supiarti,
Program Studi Pendidikan Guru Sekolah Dasar, Universitas Islam Makassar, Indonesia
Email: supiartiati@gmail.com

1. INTRODUCTION

Basic education is a crucial foundation in the formal education structure, determining individual success at the next level. In Indonesia, the curriculum transformation to the Independent Curriculum (Kurikulum Merdeka) brought significant changes, one of which was the merging of science and social sciences into natural and social sciences (IPAS) (Ramadhani, 2023; Surul & Septiliana, 2023). This merger aims to enable students to understand natural and social phenomena holistically, rather than as separate

entities. However, a major challenge arises in its implementation: how can teachers integrate these complex concepts without overwhelming students?

International data, such as PISA (Paris-Isaac International Student Association), often places Indonesian students' scientific literacy skills in need of further evaluation (Putri et al., 2025; Sholikah & Pertiwi, 2021). At the micro level, in elementary schools, the IPAS subject is often considered difficult due to its broad and abstract scope (Ariswari et al., 2024; Komariah et al., 2023). Field observations, particularly at the Elementary School Inpres Tello Baru I, indicate that student learning outcomes have not yet achieved the optimal Learning Objective Achievement Criteria. This is not simply a cognitive issue but rather a symptom of a learning process that fails to tap into students' curiosity.

The primary cause of low learning outcomes is the dominance of passive learning methods (Michel et al., 2009; Terentev et al., 2024; Willett, 2017). Students are often positioned as "empty vessels" receiving lectures from teachers. However, 21st-century skills require students to possess critical thinking, collaboration, communication, and creativity (the 4Cs) (Hasbi et al., 2025; Rahmatiani et al., 2024; Thornhill-Miller et al., 2023). Monotonous learning models don't provide space for students to solve problems or interact intensively with peers, resulting in IPAS material becoming merely short-term memorization that is quickly forgotten (Asyifa et al., 2025; Ratno et al., 2024).

To address this issue, a paradigm shift is needed from teacher-centered learning to student-centered learning. Constructivism theory, pioneered by Piaget and Vygotsky, emphasizes that students construct knowledge through experience and social interaction (Singer, 2022; Zajda, 2021). In this context, the problem-solving and cooperative learning models of the jigsaw type emerge as powerful alternatives.

The problem-solving model trains students to identify problems, gather data, formulate hypotheses, and draw conclusions (Agustina & Efendi, 2025; Damopolii et al., 2018; Tsaniyyati & Andriani, 2024). In IPAS, this model forces students to think like scientists. Students don't simply memorize the water cycle, for example, but are encouraged to explore why flooding occurs in their environment and how to solve it. This creates meaningful learning.

On the other hand, the Jigsaw Cooperative Learning model offers a different classroom dynamic. With a "team of experts" system, each student is responsible for mastering a section of the material and teaching it to other group members (Soedimardjono & Pratiwi, 2021; Sulfemi & Kamalia, 2020). This model is particularly effective for science and social science subjects with broad subchapters (Simanjuntak et al., 2025). Jigsaw not only enhances cognitive aspects but also affective aspects such as empathy, cooperation, and communication skills among students (Jeppu et al., 2023; Nalls & Wickerd, 2023).

Although these two models have been extensively researched separately, there remains debate as to which model is superior in the context of elementary school science and social studies, with diverse student characteristics. Problem-solving emphasizes individual logic and discovery, while Jigsaw emphasizes the distribution of learning load and socialization (Usman et al., 2022). Comparing the two in a single experimental

design in the same setting will provide educational practitioners with a clear picture of which model best suits specific learning outcomes.

Most previous research has focused on science or social studies separately (Hayati et al., 2023; Munawaroh et al., 2022; Suendarti, M., & Virgana, 2022). This study specifically targets IPAS within the Independent Curriculum, where students' cognitive load is higher due to the integration of the two disciplines. This study not only tests one model against the conventional method (lecture) but also conducts a head-to-head comparison between two innovative models (problem-solving vs. jigsaw). This provides theoretical insights into which model has a larger effect size on N-Gain scores. The location of the Elementary School Inpres Tello Baru II provides an empirical overview of the model's effectiveness in public schools with heterogeneous student socioeconomic backgrounds, which often face different resource challenges than elite private schools. Furthermore, the use of N-Gain Score analysis combined with an independent t-test provides precise quantitative evidence of effectiveness, beyond simply looking at the increase in average post-test scores.

Therefore, this study aims to test and compare the effectiveness of the problem-solving learning model and the jigsaw cooperative model in improving the IPAS learning outcomes of elementary school students.

2. METHOD

This study employs a quantitative methodology utilizing an experimental research design. The researcher conducted an experiment with third-grade students to assess the efficacy of problem-solving techniques and the jigsaw cooperative learning model in enhancing the academic performance of fourth-grade students at Elementary School Inpres Tello Baru II. The independent variables are problem solving (X1) and jigsaw-type cooperation (X2), while the dependent variable is (y). The dependent variable is learning outcomes (Y1) in regulated conditions. This study used a pre-experimental design for its experimental investigation. A quasi-experiment is characterized by the non-random assignment of individuals, specifically the control and experimental groups, which are derived from pre-existing classes. The employed design is a non-equivalent control group. In the Nonequivalent Control Group Design, the experimental and control groups are not randomly selected. The design is delineated in Figure 1 and Table 1.

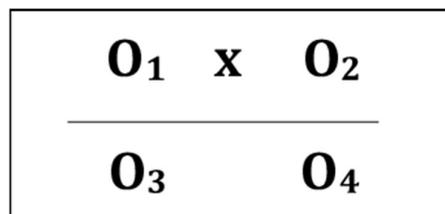


Figure 1. Nonequivalent Control Group Design

Table 1. Nonequivalent Control Group

Class	Pretest	Treatment	Posttest
Experiment	O ¹	X	O ²
Control	O ³	-	O ⁴

This research was conducted at the IV Elementary School Inpres Tello Baru II. This research was conducted on the learning process of fourth-grade students at Elementary School Inpres Tello Baru II. The reason for conducting the research at the school was because the researcher was interested in evaluating the effectiveness of the learning methods used at Elementary School Inpres Tello Baru II. In this study, the sample used was all fourth-grade students at Elementary School Inpres Tello Baru II. There were 28 students in class IV A and 26 in class IV B.

The researcher used a test instrument to determine the level of student knowledge and their learning outcomes after participating in the learning process using the jigsaw-type problem-solving and cooperative learning model. Research instruments are tools used to collect the desired data and information. The instruments used in this study were: Observation Sheet, Test, and Documentation

Data analysis methodologies employ descriptive and inferential statistics. Descriptive data is employed to characterize data by delineating or depicting information pertinent to a specific sample or population of limited size gathered throughout the quantitative research process. This research will examine hypothetical tests utilizing inferential statistics derived from prior data. Fundamental testing will be performed utilizing normalcy and homogeneity assessments. The study data were initially analyzed by precondition tests to ascertain their suitability for analysis. The normality test assesses if the data follows a normal distribution. The Shapiro-Wilk test is referenced in its own context, typically restricted to samples of fewer than 30 to achieve precise outcomes. The Shapiro-Wilk test was employed to assess normality due to the sample size being fewer than 30. The homogeneity test is employed to ascertain whether the data or samples originate from homogeneous variants. A population is considered homogenous if its variance is uniform. The homogeneity test can be conducted utilizing the Levene test with the assistance of SPSS for Windows. The hypothesis posited in this study is contingent upon the outcomes of the data normality test. The results of the data normality test can establish the most suitable testing tool. The hypotheses are to be evaluated.

- 1) H_0 = There is no effect of the Jigsaw-type Problem-Solving and Cooperative Learning Models on improving the learning outcomes of fourth-grade students.
- 2) H_a = There is an effect of the Jigsaw-type Problem-Solving and Cooperative Learning Models on improving the learning outcomes of fourth-grade students.

The testing criteria are: if $t\text{-count} < t\text{-table}$, then H_0 is accepted and H_a is rejected. However, if $t\text{-count} > t\text{-table}$ or $t\text{-count} = t\text{-table}$, then H_0 is rejected and H_a is accepted. The data analysis used in this study is a t-test. A t-test for one sample, also known as a paired-sample t-test, involves the same subjects but receives different treatments. The paired-sample t-test can be performed using SPSS for Windows.

3. RESULTS AND DISCUSSION

Results

This study was carried out at Elementary School Inpres Tello Baru II during the odd semester of the 2025/2026 academic year. The participants in this study were fourth-grade children, comprising a total of 54 individuals, distributed as 26 students in one class and 28 students in another. Prior to initiating the investigation, the investigator meticulously organized all pertinent materials, encompassing instructional modules, inquiries, and media resources. This research will utilize observation sheets and tests as instruments for data collection. In this study, the researcher assumes the role of a teacher. We provide the research outcomes comprehensively.

Observation Results of Teacher Activities

The results of observations of teacher activities in using the Problem Solving learning model can be seen in the following Table 2.

Table 2. Results of Teacher Activity Observations

	Meeting I	Meeting II	Meeting III	Meeting IV	Meeting V
Score/Maximum Score		6/15	12/15	14/15	
Percentage (%)	Pretest	46,66%	80%	93,33%	Posttest
Qualification		Not good	Good	Very Good	

Research on teacher activities in applying the problem-solving learning model showed considerable improvements at each meeting. This observation assessed the teacher's learning management and the learning model's impact on student engagement and understanding. The teacher scored 6 out of 15 in the second meeting, 46.66%, which is low. This indicates that the teacher is using more engaging learning approaches, but she needs to increase her guidance and feedback. The teacher's score rose to 12 out of 15 in the third meeting, with 80% satisfactory. The teacher is becoming better at presenting content, managing time, and helping pupils solve problems. To interest students, the teacher displayed learning films.

In the fourth meeting, the teacher scored 14/15, 93.33%, very good. These results indicate that the teacher uses the problem-solving model well. The teacher delivered the content well and created an engaged learning environment that encouraged students to actively learn. Post-lesson reflection discussion was also well-implemented, allowing students to expand their understanding.

The results of observations of the teacher's activities using the Jigsaw Cooperative Learning Model can be seen in the following Table 3.

Table 3. Teacher's Activities Using the Jigsaw Cooperative Learning Model

	Meeting I	Meeting II	Meeting III	Meeting IV	Meeting V
Score/Maximum Score		7/15	13/15	15/15	
Percentage (%)	Pretest	46,66%	86,66%	100%	Posttest
Qualification		Not good	Good	Very Good	

Research on teacher activities in adopting the Jigsaw Cooperative Learning Model showed considerable improvements at each meeting. This observation examined the teacher's learning management and the Jigsaw Cooperative Learning Model's ability to engage and involve students in subject matter learning.

In the second meeting, the teacher scored 7/15, or 46.66%, which is poor. This suggests that the teacher is using the Jigsaw Model to group students for learning. However, controlling discussion time and giving each group clearer guidelines to encourage active participation need improvement. The teacher's third meeting score was 13/15, or 86.66%, which is acceptable. This indicates that the teacher is getting better at leading study groups, assigning tasks, and managing classroom dynamics. The teacher is also encouraging pupils to help each other understand the content, creating a more collaborative and fun learning atmosphere. In the fourth meeting, the teacher scored 100%, which is outstanding. This indicates that the teacher has mastered Jigsaw Cooperative Learning. Teachers organize lessons well and create lively, supportive learning environments. Each group of students can educate each other enthusiastically as "experts" in certain material. The teacher's and students' reflection at the end of the lesson on the discussion results and learning process went well.

The study found that the problem-solving and jigsaw cooperative learning models improved teacher effectiveness. This learning model promotes instructor abilities, student understanding, and engagement, according to these studies. Therefore, this model is advised for further implementation and development in learning for optimal results.

Student Activity Observation Results

The results of observations of student activities using the Problem-Solving model can be seen in the following Table 4.

Table 4. Results of Student Activity Observations

	Meeting I	Meeting II	Meeting III	Meeting IV	Meeting V
Score/Maximum Score	Pretest	5/13	8/13	12/13	Posttest
Percentage (%)		38,46%	61,53%	92,30%	
Qualification		Pretty Good	Good	Very Good	

Students' involvement, activeness, and knowledge increased significantly from meeting to meeting during the problem-solving learning approach. This observation examined how well the problem-solving approach motivated students to cooperate in groups to solve learning issues. The second meeting had 38.46% of students score 5 out of 13, which is "fair." This shows that kids are actively learning, even while some don't understand problem-solving. Students showed improvements in expressing their thoughts and participating in group discussions, but they still need to improve in responding to instructor questions and presenting their opinions in class.

Students scored 8 out of 13 (61.53%) in the third meeting, which is "good." Students are understanding the problem-solving mental process better. They identified issues, expressed ideas, and offered alternatives more often. Students sharing thoughts and

helping each other understand the content made group conversations more dynamic. Active learning and communication improved as students gained confidence in voicing their thoughts in class.

In the fourth meeting, kids scored 12/13, 92.30%, which is quite good. These results show that pupils solved problems independently and methodically. They had good critical thinking skills, could examine difficulties, and found rational answers. Student clubs were active; members discussed and supported each other. Students also got more comfortable sharing their thoughts with the class and tackling difficult teaching challenges independently.

The results of observations of student activity using the Jigsaw cooperative learning model can be seen in the following Table 5.

Table 5. Student Activity Using the Jigsaw Cooperative Learning Model

	Meeting I	Meeting II	Meeting III	Meeting IV	Meeting V
Score/Maximum Score	Pretest	7/13	9/13	13/13	Posttest
Percentage (%)		53,84%	69,23%	100%	
Qualification		Pretty Good	Good	Very Good	

Student participation, cooperation, and understanding increased significantly from meeting to meeting during Jigsaw Cooperative Learning implementation. This observation examined how the Jigsaw Cooperative Model promoted students' collaboration, knowledge sharing, and understanding through student-centered learning.

The second meeting saw 53.84% of students score 7 out of 13, which is "fair." This suggests that pupils are adapting to cooperative learning, especially group work. Some students are passive and not participating to their full capacity in expert and home groups, but they are learning their jobs. Discussions went well; however, communication and accountability for the material should be improved. Additionally, student scores rose to 9 out of 13 (69.23%) at the third meeting, which is "good." This improvement shows that kids are getting used to jigsaw group work. They participated more in talks, helped each other comprehend, and took responsibility for their group's success. As students explained their sections, group presentations went more smoothly. Student participation increased as the classroom became livelier and more dynamic.

In the fourth meeting, kids achieved 100%, which is quite impressive. These results indicate that pupils really understand the Jigsaw Cooperative Learning Model. They worked well together, communicated eloquently, and understood concepts. Each kid participated in expert and home groups and showed respect and support. Students learned responsibility, cooperation, and independence through dynamic and enjoyable Jigsaw Learning Model exercises. The study found that the problem-solving and jigsaw cooperative learning models increased student participation. These results indicate that this learning style improves student involvement, understanding, and active learning. Thus, this approach should be implemented continuously for optimal learning outcomes.

Pretest of Students' IPAS Learning Outcomes

The research yielded data through tools, enabling the assessment of social studies learning outcomes, reflected in the grades of the fourth-grade students at Elementary School Inpres Tello Baru II. Table 6 presents the pretest and posttest statistics regarding the outcomes of IPAS learning in the specified classes.

Table 6. Pretest Descriptive Test

	Experiment Pretest	Pretest Control
Mean	53.21	41.15
Std. Error of Mean	1.996	1.395
Median	50.00	40.00
Mode	50	40
Std. Deviation	10.560	7.114
Variance	111.5080	50.615
Skewness	-.100	-.171
Std. Error of Skewness	.441	.456
Std. Error of Kurtosis	.858	.887
Range	40	20
Minimum	30	30
Maximum	70	50
Sum	1490	1070

Table 6 displays descriptive statistical analysis of pretest scores in the experimental and control groups. The experimental group has 28 genuine volunteers and the control group 26. The experimental group had a 53.21 mean pretest score, compared to 41.15 for the control group. The experimental group median was 50, the control group mode was 40, and the most often appearing values were 50 and 40, respectively. The experimental group had more value variation than the control group (7.114) due to its larger standard deviation (10.560). The variance was 111.508 for the experiment and 50.615 for the control. A relatively symmetrical data distribution was indicated by both groups' skewness values being close to zero. The experimental and control groups had score ranges of 40 and 20, respectively, with minimum scores of 30 and maximum scores of 70 and 50. Experimental pretest scores were 1490, while control group scores were 1070. Next, Table 7 shows experimental class pretest mastery.

Table 7. Level of Mastery of Pretest Material in Experimental Class

No	Interval	Frequency	Percentage	Learning Outcome Categories
1	0-34	3	10,7%	Very Low
2	35-54	9	32,1%	Low
3	55-64	3	10,7%	Medium
4	65-84	11	39,3%	High
5	85-100	2	7,2%	Very High
	Total	28	100%	

The distribution table of learning outcomes above shows that 28 students have a wide range of learning achievement. Three pupils (10.7%) scored 0–34, which is quite low. Nine students (32.1%) were in the low category with scores of 35–54. Three students (10.7%) scored 55–64 in medium learning objectives. Eleven students, or 39.3%, scored 65–84, suggesting that most pupils grasped the topic. Only two pupils (7.2%) scored

85–100, which was exceptionally high. This data reveals that most students have good learning outcomes, but some require more help.

Table 8. Level of Mastery of Pretest Material in Control Class

No	Interval	Frequency	Percentage	Learning Outcome Categories
1	0-34	12	46,15%	Very Low
2	35-54	13	50,00%	Low
3	55-64	1	3,85%	Medium
4	65-84	0	0%	High
5	85-100	0	0%	Very High
	Total	26	100%	

The learning outcome frequency distribution table above demonstrates that most of the 26 pupils are low and very low. The category of extremely low includes 12 students (46.15%), while the low category includes 13 students (50%). Just one student—3.85%—scored mediocre. None scored high or extremely high with 0%. These data imply that student learning outcomes are still low; hence, learning must be improved to improve student skills.

Results of posttest descriptive statistics for experimental and control groups. The experimental group comprised 28 genuine volunteers and the control group 26. The experimental group's mean posttest score was 83.93, higher than the control group's 73.08, demonstrating stronger learning progress. Most experimental group students scored 80 or 70, according to the median and modes.

The experimental group had slightly more variation across students (7.373 vs. 6.794). The experimental and control groups had similar variances of 54.365 and 46.154. Both groups had low skewness, indicating a symmetrical data distribution. Kurtosis levels also suggested normalcy. Experimental group scores are 30 and control 20; minimum scores are 70 and 60; maximum scores are 100 and 80. Total scores for experimental and control groups are 2350 and 1900, respectively.

Of the 28 pupils in the experimental class, 17 (60.71%) scored very high on the posttest. This shows that most pupils understand and learn well. Additionally, 7 kids (25.00%) are in the high group, showing that some children have good learning results but have not yet reached the top category. Two students (7.14% each) are in the low and medium categories, meaning a small proportion of kids require more help learning. This group has very few low students, showing high intellectual abilities. These statistics show that most students have achieved high to very high learning success, demonstrating the effectiveness of the learning process.

In the control class, 15 students (57.69%) scored low on the post-test. The medium group has 6 pupils (23.18%), and the high category has 9 students (34.62%). Only 5 pupils (19.23%) are very high, while 1 student (3.85%) is very low. These findings reveal that most kids are still low, but some have improved to medium to extremely high. This suggests student learning skills vary, which can help teachers provide better advice and learning methodologies.

Pretest results for the experimental class indicated a Kolmogorov-Smirnov significance value of 0.036 and a Shapiro-Wilk significance value of 0.157. The Kolmogorov-Smirnov value was slightly below 0.05, but the Shapiro-Wilk value was

more than 0.05, indicating normally distributed data. Kolmogorov-Smirnov was 0.003 and Shapiro-Wilk was 0.093 in the control class pretest. The Shapiro-Wilk test shows that the data are regularly distributed because the significance value is greater than 0.05.

In the experimental class posttest, the Kolmogorov-Smirnov significant value was 0.121 and the Shapiro-Wilk significance value was 0.161, both greater than 0.05, indicating normally distributed data. The control class posttest Kolmogorov-Smirnov significance value was 0.046, and Shapiro-Wilk was 0.250. As the Shapiro-Wilk significance value exceeds 0.05, the data are regularly distributed. For all techniques, the significance values (Sig.) were above 0.05: 0.299, 0.393, 0.394, and 0.309. A Sig. value above 0.05 shows no significant variance variation across data sets. These groups' learning result data is homogeneous or has similar variance.

These results show that data homogeneity has been attained, allowing the t-test to be run without breaking statistical assumptions. The study's conclusions are strengthened by this homogeneity, which suggests that treatment-induced score differences are more likely than variance-induced differences. Next, Table 9 shows the T-test (independent sample test) findings.

Table 9. T-Test (Independent Sample Test)

		t-test for Equality of Means				95% Confidence Interval of Difference	
		t	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Learning outcomes	Equal variances assumed	3.0042	.004	11.538	3.794	3.926	19.151
	Equal variances not assumed	3.029	.004	11.538	3.809	3.890	19.187

The t-test for Equality of Means on the learning outcome variable yielded a t value of 3.004 with a degree of freedom (df) of 52 and a significance value (Sig. 2-tailed) of 0.004 under Equal variances. A statistically significant difference in learning outcomes exists between the two groups tested, as the significance value is below the error tolerance limit of 0.05 ($0.004 < 0.05$). This implies that the first and second groups had distinct average learning results. As the t-table value at df 52 with a two-tailed significance level of 0.05 is 2.006, the estimated t is bigger than the t-table ($3.004 > 2.006$). This condition strengthens the rejection of H_0 and acceptance of H_a , indicating a substantial difference between the two groups. One group has higher learning outcomes than the other, as shown by the mean difference value of 11.538. The standard error rate of this mean difference is 3.794, which is adequate for educational research. Additionally, the 95% difference confidence interval is 3.926 to 19.151. The intervals are all positive, indicating that the difference is significant and that the first group learns better than the second. Furthermore, this t-test shows that differing treatments or learning

approaches for the two groups significantly affect student learning outcomes. This difference implies that the study's therapy or learning model directly improved student learning outcomes.

Discussion

The findings of the study at Elementary School Inpres Tello Baru II showed that the implementation of the Problem Solving and Jigsaw Cooperative Learning models significantly improved IPAS learning outcomes, with the experimental class' posttest average reaching 83.93 compared to only 73.08 for the control class. This finding is in line with several previous literature and studies. This study found that the Jigsaw model was able to achieve a 100% teacher mastery level and 100% student activity level at the fourth meeting. This supports Aronson's theory, which states that Jigsaw is effective because it creates positive interdependence where each student becomes an "expert" for their peers (Jeppu et al., 2023; Nalls & Wickerd, 2023; Stanczak et al., 2022). Compared with previous research on cooperative learning, these results confirm that this model is consistently superior in increasing individual responsibility compared to the traditional lecture method that dominated the control class.

The data analysis results show an increase in student activity in the problem-solving model from 38.46% to 92.30%. Students became more independent and methodical in solving problems. These results align with Polya's research on problem-solving steps (Riyadi et al., 2021; Sapri, 2023). This research proves that providing stimulus in the form of "learning films" in the third meeting successfully increased teacher scores to 80% and helped students better identify problems. The use of visual media is an advantage of this finding compared to conventional problem-solving research that relies solely on text or oral narratives.

Transformation of Teacher Instructional Quality

Research shows a significant improvement in teachers' ability to manage learning through two different models: (1) Problem-Solving Model: The teacher began the second meeting with a low score (46.66%) due to a lack of guidance and feedback. However, by the fourth meeting, the score jumped to 93.33% (excellent). This success was driven using film media to engage students and the teacher's ability to create an active and reflective learning environment. (2) Jigsaw Model: The teacher achieved perfect mastery (100%) by the fourth meeting. Initially, the teacher struggled to control the discussion time. Over time, the teacher was able to facilitate students' roles as "experts" who enthusiastically educated each other.

Additionally, in the pretest, most students in the control class were in the "Very Low" (46.15%) and "Low" (50%) categories. After the intervention in the experimental class, 60.71% of students achieved the "Very High" category. This drastic transformation demonstrates that the active learning model can quickly catch up with students' competency gaps compared to conventional methods (Quintero-Angel et al., 2024).

Increased Student Activity and Independence

The implementation of these models directly impacted student engagement, improving it from “Fair” to “Very Good.” (1) Problem-Solving Activity: Students progressed from initially having difficulty responding to questions to being able to solve problems independently and methodically. By the fourth meeting, students demonstrated strong critical thinking skills and were able to determine rational answers to the problems analyzed. (2) Jigsaw Activity: The students went from being passive to taking more responsibility for the group’s success. At the final meeting, students achieved an activity score of 100%, demonstrating a profound understanding of the cooperative model where they respect and support each other in both the “expert” and “home” groups.

Comparative Analysis of Learning Outcomes (IPAS)

Statistical data supports the effectiveness of the intervention. The average posttest score for the experimental class reached 83.93, significantly higher than the control class’s score of 73.08. In the experimental class, most students (60.71%) achieved the “Very High” category. Conversely, in the control class, many students (57.69%) remained in the “Low” category. Additionally, the t-test results indicated that the calculated t-value of 3.004 exceeds the t-table value of 2.006, with a significance level of 0.004, which is less than 0.05. This proves that differences in learning models directly and significantly improve student learning outcomes. These results strengthen previous studies which show that active learning model interventions have a significant effect size impact in basic education ([Patiño et al., 2023](#); [Ting et al., 2023](#)).

The results of this study have important implications for educational practices in elementary schools: Practical implications for teachers are (1) Role Shift: Teachers must transform from information centers to facilitators who are skilled at managing group dynamics and providing constructive feedback. (2) Media Innovation: The successful use of films shows that the integration of visual media is crucial for increasing motivation in problem-solving models. Implications for Students are (1) Character Development: This model not only improves academic grades but also trains soft skills such as responsibility, cooperation, and self-confidence in communication. (2) Thinking Methods: Students are accustomed to thinking systematically and critically in facing problems, not just memorizing material. In addition, for schools, given its effectiveness in increasing engagement and learning outcomes, the problem-solving and jigsaw models are recommended to be implemented sustainably and developed in other subjects in schools.

4. CONCLUSION

The implementation of the problem-solving and jigsaw cooperative learning models effectively improved teachers’ ability to manage the classroom. In the problem-solving model, teachers were able to raise their scores from 46.66% (poor) to 93.33% (excellent) by the fourth meeting. Through excellent management of expert groups and home groups, teachers reached a perfect mastery level of 100% at the fourth meeting of the Jigsaw model. Research has proven that both models significantly enhance student

active participation and independence. The percentage of students who were active in the problem-solving model went from 38.46% to 92.30%. This showed that students were starting to be able to think critically and solve problems in a systematic way. Student activity in the Jigsaw model peaked at a score of 100%, indicating that students have understood their roles in teamwork and individual responsibilities. Furthermore, data analysis showed a significant difference in IPAS learning outcomes between the classes using the innovative model and the control class. The average posttest score for the experimental class was 83.93, while the control class's score was only 73.08. Hypothesis testing using a t-test showed that the calculated t (3.004) was greater than the t -table (2.006), indicating that the use of the problem-solving and jigsaw models significantly had a greater positive impact on student IPAS learning outcomes than conventional methods.

As a recommendation, teachers are advised to continue honing their skills in providing guidance and feedback, especially in the initial stages of implementing the model to avoid student confusion. The use of media such as instructional films has been shown to be effective in increasing interest, so teachers are expected to continue innovating in selecting supporting media. Future researchers can test the effectiveness of this model on other non-academic variables, such as interpersonal communication skills or student self-efficacy, given the strong group dynamics of the Jigsaw model.

REFERENCES

- Agustina, L., & Efendi, R. (2025). Penerapan Model Pembelajaran Problem Solving Berbantuan Digital Mind Mapping untuk Meningkatkan Hasil Belajar dan Keterampilan Berpikir Kritis dalam IPAS: Studi Kasus di Kelas V SD Negeri 004 Tambusai Utara. *Journal of Education Research*, 6(4). <https://doi.org/10.37985/jer.v6i4.2844>
- Ariswari, N., Zulysa, D., & Dhorri, M. (2024). Contextual and project-based learning in IPAS instruction within the Merdeka Curriculum: A case study at MI Al-Azhar Muara Pinang. *HEUTAGOGIA: Journal of Islamic Education*, 5(1), 31-43. <https://doi.org/10.14421/hjie.2025.51-03>
- Asyifa, T. N., Haliza, N., Ferdiansyah, A., & Asniwati, A. (2025). Penerapan Model Pembelajaran Two Stay Two Stray Dalam Pembelajaran IPAS di Kelas V SDN Sungai Miai 1. *Journal of Teaching and Elementary Education*, 1(1), 7-12.
- Damopolii, I., Nunaki, J. H., & Supriyadi, G. (2018). Effect of problem solving learning model on students achievement. *Journal of Education Research and Evaluation*, 2(1). <https://doi.org/10.23887/jere.v2i1.12558>
- Hasbi, M., Sarda, M., & Syafaruddin, B. (2025). Technology and Islamic Perspective: A Study of Ethnomathematics. *Jurnal Riset dan Inovasi Pembelajaran*, 5(3), 1154-1167. <https://doi.org/10.51574/jrip.v5i3.3933>
- Hayati, E. M., Purwanto, A., & Hidayat, D. R. (2023). Analysis of the cooperative learning effectiveness on students' critical thinking skills in science learning for primary students. *Al-Ishlah: Jurnal Pendidikan*, 15(1), 1145-1153. <https://doi.org/10.35445/alishlah.v15i1.994>

- Jeppu, A. K., Kumar, K. A., & Sethi, A. (2023). 'We work together as a group': implications of jigsaw cooperative learning. *BMC medical education*, 23(1), 734. <https://doi.org/10.1186/s12909-023-04734-y>
- Komariah, M., As'ary, M. Y., Hanum, C. B., & Maftuh, B. (2023). IPAS Implementation in Elementary Schools: How Teachers Build Student Understanding. *Edunesia: Jurnal Ilmiah Pendidikan*, 4(3), 1399-1412.
- Michel, N., Cater III, J. J., & Varela, O. (2009). Active versus passive teaching styles: An empirical study of student learning outcomes. *Human resource development quarterly*, 20(4), 397-418. <https://doi.org/10.1002/hrdq.20025>
- Munawaroh, M., Ratnawati, E., Ningsih, T. Z., & Nuryana, N. (2022). Enhancing students' communication skills in social studies learning through cooperative learning. *Ta'dib*, 25(1), 71-82.
- Nalls, A. J., & Wickerd, G. (2023). The jigsaw method: reviving a powerful positive intervention. *Journal of Applied School Psychology*, 39(3), 201-217. <https://doi.org/10.1080/15377903.2022.2124570>
- Patiño, A., Ramírez-Montoya, M. S., & Buenestado-Fernández, M. (2023). Active learning and education 4.0 for complex thinking training: analysis of two case studies in open education. *Smart Learning Environments*, 10(1), 8. <https://doi.org/10.1186/s40561-023-00229-x>
- Putri, P. N., Rachmadiarti, F., Purnomo, T., & Satriawan, M. (2025). Measuring Scientific Literacy of Students' Through Environmental Issues Based on PISA 2025 Science Framework. *Jurnal Penelitian Pendidikan IPA*, 11(3), 44-53. <https://jppipa.unram.ac.id/index.php/jppipa/article/view/10413>
- Quintero-Angel, M., Duque-Nivia, A. A., & Molina-Gómez, C. A. (2024). A teaching strategy based on active learning which promotes strong sustainability that empowers students to have a different type of relationship with the environment. *Environmental Education Research*, 30(4), 560-579. <https://doi.org/10.1080/13504622.2023.2211757>
- Rahmatiani, L., Darmawan, C., & Komalasari, K. (2024). 21st Century Competencies (4C) on Improving Students' Social Skills. *Jurnal Ilmiah Pendidikan Profesi Guru*, 7(2), 382-392. <https://doi.org/10.23887/jippg.v7i2.84876>
- Ramadhani, S. (2023). Implementation Curriculum Merdeka Belajar Learn Science And Social (Ipas) Learning In Elementary School: Perpective Teacher. *Edukasi Islami: Jurnal Pendidikan Islam*, 12(001). <https://doi.org/10.30868/ei.v12i001.5488>
- Ratno, S., Amelia, F. R., Putri, A. S., Fakhrany, I., Lumbantobing, D. W. J., Siregar, H., ... & Salsabila, S. (2024). Analisis Pengaruh Berbagai Macam Model-Model Pembelajaran Kreatif Pada Mata Pelajaran Ipas Di Yayasan Tarbiyah Islamiyah Al-Musthofawiyah. *Jurnal Intelek Insan Cendikia*, 1(9), 6356-6362. <https://jicnusantara.com/index.php/jiic/article/view/1647>
- Riyadi, R., Syarifah, T. J., & Nikmaturohmah, P. (2021). Profile of students' problem-solving skills viewed from Polya's four-steps approach and elementary school students. *European Journal of Educational Research*, 10(4), 1625-1638. <https://doi.org/10.12973/eu-jer.10.4.1625>
- Sapri, H. A. (2023). Analysis of Mathematics Problem Solving Ability Based on Polya Problem Solving Steps. *ETDC: Indonesian Journal of Research and Educational Review*, 2(2), 01-10. <https://doi.org/10.51574/ijrer.v2i2.755>
- Sholikah, L., & Pertiwi, F. N. (2021). Analysis of science literacy ability of junior high school students based on Programme for International Student Assesment (PISA). *INSECTA: Integrative Science Education and Teaching Activity Journal*, 2(1), 95-104. <https://doi.org/10.21154/insecta.v2i1.2922>

- Simanjuntak, R. C., Panjaitan, M. B., & Simarmata, R. K. (2025). Pengaruh Model Pembelajaran Cooperative Learning Tipe Jigsaw Terhadap Hasil Belajar IPAS Siswa Kelas V SD Negeri 091477 Dolok Marlawan. *Innovative: Journal Of Social Science Research*, 5(4), 9559-9570. <http://j-innovative.org/index.php/Innovative/article/view/21123>
- Singer, E. (2022). Piaget and Vygotsky: Powerful inspirators for today's students in early education and developmental psychology. In *Piaget and Vygotsky in XXI century: Discourse in early childhood education* (pp. 129-143). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-031-05747-2_8
- Soedimardjono, F. P., & Pratiwi, P. (2021). Cooperative Learning Model with Jigsaw Type Improves Students' Sciences Process Skills and Learning Outcomes. *JPI (Jurnal Pendidikan Indonesia)*, 10(1), 172-179. <https://doi.org/10.23887/jpi-undiksha.v10i1.25203>
- Stanczak, A., Darnon, C., Robert, A., Demolliens, M., Sanrey, C., Bressoux, P., ... & Butera, F. (2022). Do jigsaw classrooms improve learning outcomes? Five experiments and an internal meta-analysis. *Journal of Educational Psychology*, 114(6), 1461. <https://doi.org/10.1037/edu0000730>
- Suendarti, M., & Virgana, V. (2022). Elevating Natural Science Learning Achievement: Cooperative Learning and Learning Interest. *Journal of Education and Learning (EduLearn)*, 16(1), 114-120. <https://doi.org/10.11591/edulearn.v16i1.20419>
- Sulfemi, W. B., & Kamalia, Y. (2020). Jigsaw Cooperative Learning Model Using Audiovisual Media To Improve Learning Outcomes. *JPSd (Jurnal Pendidikan Sekolah Dasar)*, 6(1), 30-42. <https://jurnal.untirta.ac.id/index.php/jpsd/article/view/4919>
- Surul, R., & Septiliana, L. (2023). Analysis of the implementation of ipas (natural and social sciences) learning in the merdeka curriculum. *Educatio: Journal of Education*, 8(2), 320-328.
- Terentev, E., Shcheglova, I., Federiakin, D., Koreshnikova, Y., & Costley, J. (2024). Active versus Passive Teaching: Students' Perceptions and Thinking Skills. *Вопросы образования*, (3 (1)), 129-150. <https://doi.org/10.17323/vo-2024-16364>
- Ting, F. S., Shroff, R. H., Lam, W. H., Garcia, R. C., Chan, C. L., Tsang, W. K., & Ezeamuzie, N. O. (2023). A Meta-analysis of Studies on the Effects of Active Learning on Asian Students' Performance in Science, Technology, Engineering and Mathematics (STEM) Subjects. *The Asia-Pacific Education Researcher*, 32(3), 379-400. <https://doi.org/10.1007/s40299-022-00661-6>
- Thornhill-Miller, B., Camarda, A., Mercier, M., Burkhardt, J. M., Morisseau, T., Bourgeois-Bougrine, S., ... & Lubart, T. (2023). Creativity, critical thinking, communication, and collaboration: Assessment, certification, and promotion of 21st century skills for the future of work and education. *Journal of Intelligence*, 11(3), 54. <https://doi.org/10.3390/jintelligence11030054>
- Tsaniyyati, L., & Andriani, A. E. (2024). Development of Mobile Learning based on Problem Solving to Improve IPAS Learning Outcomes. *Jurnal Penelitian Pendidikan IPA*, 10(9), 7086-7094. <https://doi.org/10.29303/jppipa.v10i9.7757>
- Usman, M., Degeng, I. N. S., Utaya, S., & Kuswandi, D. (2022). The Influence of JIGSAW Learning Model and Discovery Learning on Learning Discipline and Learning Outcomes. *Pegem Journal of Education and instruction*, 12(2), 166-178. <https://doi.org/10.47750/pegegog.12.02.17>
- Willett, L. R. (2017). Comparing active and passive learning: what does the evidence really say?. *Academic Medicine*, 92(5), 573. <https://doi.org/10.1097/ACM.0000000000001637>

Zajda, J. (2021). Constructivist learning theory and creating effective learning environments. In *Globalisation and education reforms: Creating effective learning environments* (pp. 35-50). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-71575-5_3