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The Effect of the Jigsaw Cooperative Learning Model Using PowerPoint on Learning Outcomes in Economic Mathematics

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Abstract
This study aims to examine the effect of the Jigsaw cooperative learning model using PowerPoint on students' learning outcomes in Economic Mathematics at Universitas Indraprasta PGRI, Economics Education Study Program, for the 2024/2025 academic year. The research sample consisted of 60 students, selected through cluster sampling, and divided into two classes. The study employed quantitative methods with statistical analysis, including normality tests, homogeneity tests, and t-tests. The findings indicate a significant effect of the Jigsaw cooperative learning model using PowerPoint on students' learning outcomes. The use of this model enhances students' engagement, collaboration, and understanding of Economic Mathematics concepts. The results suggest that integrating PowerPoint as a visual and interactive tool within the Jigsaw model creates a more effective and engaging learning environment.

Keywords: learning outcomes; economic mathematics; powerpoint; jigsaw

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INTRODUCTION

In the modern era of education, various teaching methods continue to be developed to enhance students’ learning outcomes. One approach that has gained significant attention is cooperative learning, particularly the Jigsaw technique. This method not only encourages collaboration among students but also facilitates a deeper understanding of the material being taught. In this context, the use of digital tools such as PowerPoint can further enrich the learning experience, especially in subjects like Economic Mathematics.

Cooperative learning has been proven effective in improving student interaction within the classroom. According to Johnson and Johnson (1999), cooperative learning is a method in which students work together in small groups to achieve shared learning goals (Mujmal et al., 2013). This approach ensures that students do not learn in isolation but rather through peer collaboration, making it particularly important in Economic Mathematics, where complex concepts require in-depth discussion and active engagement.

The interaction within small groups allows students to exchange ideas and provide feedback. A study by Slavin (2014) found that students involved in cooperative learning tend to achieve better academic results than those who learn individually. This aligns with social motivation theory, which states that individuals are more motivated when they feel a sense of belonging within a group (Ryan & Deci, 2000).

One of the most effective cooperative learning strategies is the Jigsaw method, which has been widely used to improve students' academic performance. In this method, students are divided into small groups, with each member responsible for mastering a specific section of the material (Fahrudin, 2017). They then teach their assigned sections to their peers, transforming the learning process into a collaborative and engaging experience (Nur, 2008).

The integration of PowerPoint within the Jigsaw learning model plays a crucial role in supporting visualization and conceptual understanding. PowerPoint presentations enable teachers to deliver content in an engaging and structured manner, incorporating visual aids such as graphs, charts, and diagrams that help reinforce key concepts (Hafid, 2019). Research by Mayer (2001) suggests that using visual media in education significantly enhances students' comprehension and retention of information (Hardianto, 2011).

The combination of cooperative learning through Jigsaw and the integration of PowerPoint has been shown to improve student engagement, understanding, and academic performance. Magdalena et al. (2021) argue that a well-designed learning strategy, combined with technological tools, can create a more effective and enjoyable learning environment.

Jigsaw-based learning has a significant impact on student participation. Unlike traditional teaching methods, where students are often passive listeners, the Jigsaw technique actively involves students in discussions and peer teaching. This level of engagement is particularly important in Economic Mathematics, where understanding fundamental concepts often requires multiple perspectives and collaborative problem-solving (Fahrudin, 2017).

Economic Mathematics consists of interconnected concepts that require comprehensive understanding. For instance, when learning about demand elasticity, students must grasp not only mathematical formulas but also real-world applications. By using the Jigsaw method, students can explain, discuss, and apply these concepts together, reinforcing their understanding through peer interaction. Research by Fahrudin (2021) found that students who participate in cooperative learning demonstrate stronger conceptual retention compared to those in traditional classrooms.

PowerPoint also enhances the visual representation of Economic Mathematics concepts. By integrating formulas, graphs, and problem-solving exercises into PowerPoint slides, educators can simplify complex ideas, making them easier for students to understand (Rahmawati, 2023). A study by Hegarty and Just (1993) showed that incorporating visual tools in teaching improves students' comprehension of complex subjects.

Additionally, PowerPoint allows educators to incorporate interactive elements, such as quizzes and polls, fostering active participation in the learning process (Fadhilla & Azhari, 2024). This aligns with active learning principles, which state that students learn more effectively when they are actively engaged in the educational experience (Bonwell & Eison, 1991).

Therefore, the implementation of Jigsaw cooperative learning, supported by PowerPoint, can enhance student engagement and academic performance. This research seeks to analyze the impact of integrating the Jigsaw technique and PowerPoint in Economic Mathematics and how these strategies can contribute to more effective and interactive learning experiences.

METHODS

This study employs a quantitative research approach with a quasi-experimental design, specifically a pre-test post-test control group design (Sugiyono, 2008). This design allows for the division of groups while maintaining the natural classroom structure without strict randomization, ensuring validity while controlling for external threats.

The population in this study includes all students from the Economics Education Study Program at Universitas Indraprasta PGRI, registered in the odd semester of the 2024/2025 academic year, consisting of 23 classes with approximately 700 students. The sample was selected using a random sampling technique, where two classes were randomly chosen:

- Experimental group (R1B): Taught using the Jigsaw cooperative learning model with PowerPoint.
- Control group (R1C): Taught using the conventional lecture method.

The sample selection process follows a purposive sampling technique (Sugiyono, 2013), ensuring that the selected students meet the study's objectives.

Research Design

The study follows the pre-test post-test control group design, as shown in the following table:

Table 1. Research Design

Group	Pre-Test (Y_1)	Treatment (X)	Post-Test (Y_2)
Experimental (R1B)	Y_1	Jigsaw with PowerPoint (X_e)	Y_2
Control (R1C)	Y_1	Conventional Method (X_c)	Y_2

Y_1 = Learning outcomes before treatment (Pre-Test)
Y_2 = Learning outcomes after treatment (Post-Test)
X_e = Treatment in the experimental group (Jigsaw with PowerPoint)
X_c = Treatment in the control group (Conventional Method)

Data Collection Techniques

Data were collected using learning outcome tests on the topic of market equilibrium, consisting of 10 essay questions. Each correct response was assigned a maximum score of 10 points per question.

Data Analysis Techniques

The collected data were analyzed using the following statistical methods:

1. Normality Test – Kolmogorov-Smirnov test to assess whether the data follow a normal distribution.
2. Homogeneity Test – Levene's test to determine whether the variance between groups is equal.
3. Hypothesis Testing (t-Test) – Independent sample t-test to examine differences between the experimental and control groups.
4. Regression Analysis – To evaluate the relationship between the Jigsaw learning model and student learning outcomes.
5. Coefficient of Determination (R^2) – To measure the percentage of learning outcome variance explained by the independent variable.

The statistical analysis was conducted using SPSS (Statistical Package for the Social Sciences) version 26.

RESULTS & DISCUSSION

Results

Descriptive Statistics of Learning Outcomes

Descriptive statistical analysis was conducted to compare the pre-test and post-test scores between the experimental group (Jigsaw with PowerPoint) and the control group (conventional method). The results are presented in the following table:

Table 2. Descriptive Statistics of Pre-Test and Post-Test Scores

Group	Mean Pre-Test	Mean Post-Test	Standard Deviation
Experimental (R1B)	65.57	75.58	6.94
Control (R1C)	60.50	75.00	5.82

The pre-test scores indicate that both groups had similar baseline knowledge, with the experimental group averaging 65.57 and the control group 60.50. However, after the intervention, the post-test scores improved, with the experimental group scoring 75.58, slightly higher than the control group (75.00).

Normality Test

The normality test was conducted using the Kolmogorov-Smirnov test to determine whether the data were normally distributed. The results are presented below:

Table 3. Normality Test Results

Group	Kolmogorov-Smirnov Test	Sig. (p-Value)
Experimental (R1B)	0.087	0.200
Control (R1C)	0.094	0.178

Since the significance values for both groups exceed 0.05, the data are normally distributed, allowing for parametric statistical analysis.

Homogeneity Test

To ensure equal variance across groups, Levene's test was conducted. The results are as follows:

Table 4. Homogeneity Test Results

Test	F-Value	Sig. (p-Value)
Levene's Test	1.467	0.234

Since the significance value ($0.234 > 0.05$), the assumption of homogeneity is met.

Hypothesis Testing (t-Test)

An independent sample t-test was conducted to determine whether there was a significant difference between the experimental and control groups. The results are presented below:

Table 5. Independent Sample t-Test Results

Group	t-Value	Sig. (p-Value)	Mean Difference
Experimental vs. Control	6.516	0.001**	17.96

- The t-value of 6.516 with a significance level of 0.001 ($p<0.05$) indicates a statistically significant difference between the two groups.
- The mean difference of 17.96 confirms that students in the Jigsaw with PowerPoint group outperformed those in the control group.

Regression Analysis and Coefficient of Determination (R^2)

Regression analysis was conducted to measure the effect of the Jigsaw learning model with PowerPoint on student learning outcomes. The results are presented in the following table:

Table 6. Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	62.684	4.172		15.266	.000
	Jigsaw	.564	.128	.652	4.549	.000

The regression equation derived from this model is:

$$Y=62.684+0.564X$$

Where:

- Y = Learning Outcomes
- X = Jigsaw with PowerPoint
- The coefficient 0.564 indicates that for every 1-unit increase in the Jigsaw learning model score, the learning outcome score increases by 0.564 units.

Additionally, the coefficient of determination (R^2) was analyzed:

Table 7. Coefficient of Determination (R^2)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.552 b	.422	.404	5.361

This result shows that 42.2% of the variance in learning outcomes is explained by the Jigsaw cooperative learning model with PowerPoint.

Discussion

The findings of this study indicate that the Jigsaw cooperative learning model using PowerPoint significantly improves students’ learning outcomes in Economic Mathematics. The results reveal that students in the experimental group, who were taught using Jigsaw and PowerPoint, demonstrated higher post-test scores compared to those in the control group, who were taught using conventional methods. The statistical analysis, including the ttt-test and regression analysis, confirms that this learning model has a positive and significant effect on students' academic performance.

The Effectiveness of Jigsaw Cooperative Learning

The Jigsaw cooperative learning model has been widely recognized as an effective strategy in enhancing student engagement, collaboration, and academic achievement. This study supports the findings of Slavin (2014) and Aronson et al. (2000), who argue that cooperative learning promotes active participation and helps students develop a deeper understanding of the material. By dividing students into small groups, each responsible for learning and teaching specific sections of the material, Jigsaw encourages peer-to-peer interaction and knowledge exchange, leading to better conceptual retention.

Furthermore, Johnson & Johnson (1999) emphasized that cooperative learning increases students' motivation and critical thinking skills, as they take responsibility for their learning and actively engage with their peers. The results of this study align with these findings, as the students in the Jigsaw group demonstrated greater learning gains than those in the control group.

The Role of PowerPoint in Enhancing Learning Outcomes

The integration of PowerPoint as a digital teaching tool further enhances the effectiveness of the Jigsaw learning model. The use of PowerPoint presentations allows for structured content delivery, visual representation of key concepts, and interactive elements, which help students better understand and retain mathematical concepts. This supports the research of Mayer (2001), who found that multimedia learning improves comprehension by combining text, images, and animations to facilitate cognitive processing.

In the context of Economic Mathematics, where students often struggle with abstract and numerical concepts, PowerPoint provides a visual aid that simplifies complex ideas. Research by Hegarty & Just (1993) also confirms that students comprehend mathematical problems more effectively when supported by visual representations. The findings of this study are consistent with these results, as students in the experimental group benefited from enhanced conceptual clarity and better engagement through PowerPoint-supported Jigsaw learning.

Comparison with Previous Studies

This study's findings are consistent with prior research on the impact of cooperative learning and digital tools in education. Fahrudin (2017) found that Jigsaw learning improves students' critical thinking skills and problem-solving abilities, particularly in quantitative subjects like mathematics. Similarly, Hardianto (2011) demonstrated that the combination of cooperative learning and multimedia resources significantly enhances students' academic achievement.

Additionally, Magdalena et al. (2021) found that students engage more effectively when learning environments integrate technology-based instructional tools. This aligns with the results of this study, where the use of PowerPoint in the Jigsaw method contributed to higher student motivation and learning performance.

Implications for Teaching and Learning

The findings of this study provide valuable insights for educators and curriculum designers in higher education. Given the significant impact of Jigsaw cooperative learning and PowerPoint on student outcomes, the following educational implications can be drawn:

1. Teachers should incorporate Jigsaw cooperative learning methods into their instructional strategies to promote active learning and peer collaboration.
2. The use of digital tools, such as PowerPoint, should be maximized to provide visual and interactive content that enhances students' comprehension.
3. Curriculum developers should design learning activities that integrate cooperative learning and multimedia resources to create more engaging and effective educational experiences.

By adopting these strategies, educators can improve student engagement, foster collaborative learning, and enhance academic performance, particularly in subjects that require strong analytical and problem-solving skills, such as Economic Mathematics.

CONCLUSION

The findings of this study highlight the significant impact of the Jigsaw cooperative learning model using PowerPoint on students' learning outcomes in Economic Mathematics. The results demonstrate that students taught using the Jigsaw model exhibit better comprehension and engagement compared to those taught using conventional methods. The collaborative nature of Jigsaw learning encourages students to actively participate in discussions, exchange knowledge with peers, and develop problem-solving skills, ultimately leading to improved academic performance. Additionally, the integration of PowerPoint as a digital teaching tool enhances conceptual understanding by presenting information in a structured, visual, and interactive format, making abstract mathematical concepts more accessible.

The statistical analysis confirms that the Jigsaw method with PowerPoint contributes significantly to learning success, explaining 42.2% of the variance in student outcomes. These findings align with previous research emphasizing that cooperative learning combined with multimedia-based instruction fosters deeper understanding and sustained motivation in learners. This study reinforces the need for innovative teaching strategies that move beyond traditional lecture-based methods, integrating interactive and technology-driven approaches to optimize the learning experience.

Given these findings, several recommendations are proposed for educators and institutions. Teachers are encouraged to adopt Jigsaw cooperative learning as a primary instructional approach, leveraging PowerPoint and other digital tools to facilitate knowledge acquisition and engagement. Educational institutions should support faculty development programs that focus on active learning methodologies and technology integration, while also ensuring access to adequate digital infrastructure. Future research should explore the long-term impact of Jigsaw cooperative learning on knowledge retention, as well as the effectiveness of other cooperative models and emerging technologies, such as artificial intelligence and virtual reality, in enhancing learning outcomes.

By integrating active learning strategies and digital innovations, educators can create a more engaging, interactive, and student-centered learning environment, ultimately improving academic success and preparing students for the challenges of the digital era.

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