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Enhancing students' reading comprehension through the Jigsaw method: Evidence from a private senior high school in Palu, Central Sulawesi

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ABSTRACT

The objective of this study was to analyze the effect of the Jigsaw method on improving reading comprehension among tenth-grade students in the context of English as a Foreign Language (EFL) instruction in high schools. The research method employed was a quasi-experimental design, which included pre-tests and post-tests. The study's participants were 52 students who were selected through simple random sampling from a population of 183 tenth-grade students Class XD, consisting of 26 students, served as the experimental group, while Class XC, with 26 students, served as the control group. The results show that the average pre-test score of the experimental group increased significantly from 44.27 to 86.38 after the intervention. In contrast, the average score of the control group showed a marginal increase from 64.23 to 76.69. The analysis results showed a significance value of 0.002 < 0.05, indicating a significant improvement in reading comprehension between the experimental and control groups when using the Jigsaw method. The findings of this study suggest that the Jigsaw method is effective in enhancing students' reading comprehension. This study provides important contributions for teachers and education practitioners in designing collaborative and participatory reading instruction.

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INTRODUCTION

Reading is a complex cognitive process that involves decoding symbols, usually letters and words, to derive meaning and understand written text (Nation, 2019). In other words, reading means extracting the necessary information from text. In simple terms, reading can be defined as understanding or comprehending a particular text (Rayner & Reichle, 2010). It is defined as obtaining meaning from reading (Abidin, 2020). In simple terms, reading can be defined as understanding or comprehending a particular text. This means that the meaning of the reading text does not just lie in the text waiting to be passively observed, but when reading a text, the reader must be actively involved and try to get meaning from the text.

The education curriculum views reading as an important skill that supports the entire learning process. Reading is recognized as a fundamental skill that is important for educational advancement and lifelong learning (Ramalingam et al., 2021). Reading comprehension, which includes the ability to recognize, understand, and analyze texts, is strongly emphasized at every stage of education, from primary education to higher education. Teachers play a crucial role in selecting and implementing appropriate strategies to enhance reading comprehension, taking into account the individual needs and uniqueness of students (Frans et al., 2023).

However, even though reading skills are recognized as important, many students still face obstacles in their efforts to understand English texts. Nurmawati et al. (2021), found that students have difficulty understanding English texts due to insufficient vocabulary. Common issues faced by students include difficulties in understanding texts due to limited reading experience, limited English language proficiency, and low motivation resulting from uninteresting teaching materials or methods. According to Bhandari (2023), common difficulties include limited vocabulary, unfamiliar words, and complex sentence structures. Additionally, Nurmawati et al., (2021) argue that low motivation, uninteresting materials, and inadequate teaching methods also contribute to reading difficulties. Therefore, English learners need to have a strong understanding. They need to practice reading comprehension through story questions. The more students read and understand texts, the better their comprehension will be (Ambrose & Molina, 2010).

The Jigsaw method is one way to activate students' understanding of the reading theory they have learned. According to Mustamir et al., (2023), the application of the Jigsaw method is recommended to optimize student development in English learning, particularly in reading comprehension. Additionally, researchers suggest that addressing text comprehension and enhancing reading motivation can help overcome related difficulties such as grammar and vocabulary (Nurmawati et al., 2021).

One of the most significant obstacles in language learning is reading comprehension (Huyen & Anh, 2022). The use of the Jigsaw method has proven to be effective in overcoming this problem. Various studies have proven its effectiveness in improving reading skills, especially for report texts (Mutaqin & Haryudin, 2020). The use of the Jigsaw method in reading learning can help students understand the content of the text more deeply. Moreover, the Jigsaw method has been proven to significantly improve reading comprehension among students at various levels of education. The Jigsaw method is part of cooperative learning that emphasizes collaboration in small groups (Kusuma, 2018). In this method, each student plays an important role because each is responsible for studying a specific part of the text and then sharing their understanding with other group members. Thus, students not only learn individually but also from their peers. Through discussions among group members, students can clarify difficult parts of the text and build shared meaning. Additionally, this method enhances students' sense of responsibility, communication skills, and confidence in understanding and conveying information from the reading material.

The research problem focuses on investigating how effective the Jigsaw method is in improving students' reading comprehension, as well as whether its positive effects can be observed in report texts and reading instruction in general. The study also considers variations in research design and sample size to determine whether consistent results can be achieved despite methodological differences. Several studies have shown the effectiveness of the Jigsaw method in learning reading. For instance, studies conducted by Mutaqin and Haryudin (2020), and Nurmawati et al. (2021) concluded that the use of the Jigsaw method has proven to be effective in improving students' reading comprehension. All three studies demonstrated positive results, both in the context of descriptive texts and in reading instruction more broadly. Although they employed different sample sizes and research designs, ranging from pre-experimental to quasi-experimental, all of them used pre-tests and post-tests to assess students' learning outcomes. The results consistently revealed significant improvements after the implementation of the Jigsaw method. These findings reinforce that the Jigsaw method is a cooperative learning strategy that can be effectively applied to enhance students' reading comprehension skills.

RESEARCH METHODOLOGY

Research design

In this research, the researchers employed a quantitative research method. The study was conducted using a quasi-experimental research design. According to Creswell and Creswell (2018), quantitative research focuses on collecting and analyzing numerical data to explain phenomena, test hypotheses, and determine relationships among variables. Furthermore, Gay et al. (2012) explains that a quasi-experimental

design involves comparing outcomes between groups when random assignment is not possible. In this study, both a control group and an experimental group were utilized. The experimental group received the treatment, while the control group did not. Both groups underwent a pre-test and a post-test; the pre-test was administered before the treatment, and the post-test was administered afterward to measure the effect of the treatment.

Experimental O_1 X O_2
Control O_3 O_4

Where:
O_1: (Pre-test of the experimental group)
O_2: (Post-test of the control group)
O_3: (Pre-test of the experimental group)
O_4 :(Post-test of the control group)
X: (Treatment)

Research participants

The population for this study included Grade X students at private senior high school Palu. The number of Grade X students at the school is shown in the table below:

Table 1. Class distribution

No	Classes	Students
1	A	30
2	B	29
3	C	26
4	D	26
5	E	25
6	F	20

The researchers used non-probability sampling, specifically cluster random sampling, to select the sample. According to Cousineau (2016), cluster random sampling entails the selection of groups, rather than individual groups from a population, factors that affect statistical analysis and sample size requirements. In this study, the researchers selected two classes of Grade X students from a private senior high school in Palu as samples. One class, X D 04, was selected as the experimental group and the other, X C 03, as the control group.

Technique of data collection

Data collection techniques are ways to obtain the data needed to support this research. Researchers applied pre-test and post-test instruments to collect data. In order to obtain data related to the research, the researchers collected the scoring system for the test and comprehension questions, as seen in Table 2 and Table 3.

Table 2. The scoring system of the test

No	Kinds Of Test	Items	Categories	Score/Item	Maximum Score
1.	Vocabulary	15	Correct Answer	1	15
			Incorrect Answer	0	
2.	Comprehension Question	5	Correct Answer	4	20
			Incorrect Answer	0	
Total					35

Table 3. The scoring rubric of comprehension questions

Explanation	Score
If the answer using correct grammar and correct spelling with correct content	4
If the answer using correct grammar and correct content but with incorrect spelling	3
If the answer using correct content but using incorrect grammar and spelling	2
If the answer using incorrect grammar and incorrect spelling also incorrect content	1
No answer	0

Analytical and Capacity Development Partnership, (2017)

Before the treatment, pre-test was conducted to determine students' mastery of reading comprehension. This can be the initial information about students' reading comprehension mastery before treatment. The results of this test provide researchers with preliminary information about students' reading comprehension. Treatment is a teaching and learning process by using the independent variable which is Jigsaw method. In this section, researchers conducted treatment for six meetings. The material is given based on the tenth-grade syllabus. Students were divided into groups of 3-5 students, and each meeting takes 2x45 minutes. In this study, the researcher used Jigsaw method to develop students reading comprehension, in each meeting, students will be given treatment using Jigsaw method in reading comprehension, especially learning about report text. The treatment procedures are carried out chronologically as seen in Table 4.

Table 4. Teaching procedures for experimental and control group

Meeting	Topic	Experimental Group (Jigsaw Method)	Control Group (Conventional Method)
1st	Report About Technology (Introduction)	The teacher introduces the report texts and explains the learning objectives and materials. The examples of report texts and the structure were provided. Teacher explains the Jigsaw method and group division, and distribute reading texts and assign sections.	The teacher introduces report texts, explaining their structure and language features, before assigning individual reading and vocabulary exercises.

Meeting	Topic	Experimental Group (Jigsaw Method)	Control Group (Conventional Method)
2nd	Report About Technology (Group Discussion)	Students who studied different sections of the text come together to discuss and combine information, summarize main points, and clarify meanings. The teacher facilitates group discussion. They ask students to identify the functions and generic structure, and give an assessment.	The teacher analyses the previous material and leads a class discussion about the report text. They then give the students some comprehension questions.
3rd	Report About Technology (Evaluation)	The teacher reviews previous lessons and gives a short quiz of 5–10 questions. Students discuss answers within their groups before confirming with the teacher, strengthening mutual learning.	The teacher reviews the text material, sets exercises from the textbook and marks the answers.
4th	Report About Technology (Practice Writing)	The teacher reviews the key elements of the report text and provides a model text and assign students to write a short report in groups. Students collaboratively draft a report based on the information shared during their Jigsaw discussions.	The teacher explains the format for writing a report. The students then write short paragraphs individually.
5th	Report About Technology (Presentation and Peer Review)	Each group presents their completed report to the class, representing their shared understanding from the Jigsaw process. The teacher provides feedback and an evaluation rubric, summarizing the group's strengths and weaknesses.	Students read selected report texts aloud, followed by teacher feedback and limited class discussion.
6th	Report About Technology (Post-Test and Reflection)	A post-test on report text comprehension and writing is given. The teacher discusses the overall learning outcomes, provides reinforcement and makes closing remarks.	The teacher administers a post-test and provides closing feedback.

RESULT

The researcher reports the findings of the study and analyzed the data. The data analyzed in this study were the pre-test and post-test results of the experimental and control classes. The pre-test was given before the treatment began and the post-test was given after the treatment was finished at the last meeting.

Before giving treatment, the researcher administered pre-tests to the experimental group and the control group. The difference was that in the control group, researcher did not give any treatment. The control group was taught using traditional methods, without self-assessment activities. The pre-test consisted of 15 multiple-choice questions and 5 content questions, covering material related to report texts. In

presenting the data, the researcher divided it into two parts: the first was the pre-test results for the experimental group, and the second was the pre-test results for the control group. Based on these results, the data can be described in terms of mean, maximum value, minimum value, and standard deviation, all of which were calculated using SPSS 24. The complete results can be seen in the following table:

Table 5. Pre-test results

No	Class	Mean	Minimum	Maximum	Std. Deviation
1	Experimental	44.27	25	60	12.246
2	Control	64.23	20	85	15.557

Based on the table above, the mean pre-test score in the experimental class is 44.27. The maximum score of the experimental group was 60 and the minimum score was 25. Then the standard deviation of the experimental group was 12.246. Meanwhile, the mean score of the control group was 64.23. The maximum score of the control group was 85 and the minimum score was 20. Then the standard deviation of the control group was 15.557. Overall, the control group had a better mean score on the pre-test compared to the experimental group. However, the experimental group showed more variation in their scores, meaning that some individuals performed much better than average, while others performed much worse. These differences in performance and variability may help explain the effects of the different conditions or interventions applied to each group and could be useful for further investigations into the factors that influence student learning outcomes.

Result of post-test experimental and control group

After the treatment in the experimental class, the researchers administered a post-test consisting of 15 multiple-choice questions and 5 essay questions based on the reading material taught, but with different questions from the pre-test. This test focused on understanding report texts to measure students' ability to find main ideas, specific information, word meanings, and draw conclusions. The multiple-choice questions assessed literal and inferential comprehension, while the essay questions measured in-depth comprehension through explanations or summaries of the text. The post-test data from the experimental and control classes were presented in the form of means, maximum and minimum values, and standard deviations calculated using SPSS 24. The complete results can be seen in the following table:

Table 6. Descriptive of post-test

No	Class	Mean	Minimum	Maximum	Std. Deviation
1	Experimental	86.38	55	95	9.609
2	Control	76.69	40	95	10.932

Based on the table above, the average post-test score in the experimental group was 84.38. The maximum score in the experimental group was 95 and the minimum score was 55. The standard deviation of the group was 9.609. Meanwhile, the average score of the control group was 76.69. The maximum post-test score in the control group is 95 and the minimum score is 40. The standard deviation of the control group is 10.932.

Overall, the experimental group performed significantly better than the control group on the post-test, with a higher average score. This suggests that the experimental intervention may have a positive impact on student performance. Furthermore, the higher average score in the experimental group shows that most students in this group showed a significant improvement compared to their pre-test results, while the control group did not make significant progress. The variation in scores in the experimental group further supports the idea that the application of the jigsaw method is effective, as it likely helps more students achieve a higher level of success.

Normality

The normality test is needed to determine whether the data obtained from each learning media in this study are normally distributed or not. If the data is normally distributed, then the data can be processed using t-test statistics. If the data is not normally distributed, one of the approaches commonly used for analysis is a non-parametric statistical test. One method that can be used in this case is the Mann-Whitney U test. The normality test uses the Shapiro-Wilk formula in calculations using the SPSS 24 program. To determine whether the data is normal or not, if the sig value> 0.05 the data is considered normal, and if the sig value is 0.05 the data is considered abnormal. The calculation results obtained are as follows.

Table 7. Test of normality

No	Class	Indicator	Sig.	Normality	
				Yes	No
1	Pre-test Experiment	Sig <0.05	0.004		✓
2	Post-test Experiment	Sig < 0.05	0.000		✓
3	Pre-test Control	Sig > 0.05	0.023	✓	
4	Post-test Control	Sig < 0.05	0.000		✓

Based on the results of the normality test using SPSS 24, it can be seen that the significance value (Sig) for the Pre-experimental Test is 0.004. Because the value of sig. 0.004 < 0.05, the data is not normally distributed. The Sig value for the Post-Experimental Test is 0.000, and since the Sig value is 0.000 < 0.05, the data is not normally distributed. Then, in the control class, the Sig value for the Pre-test is 0.023

> 0.05, so the data is normally distributed. The Sig value for the Control Post-test is 0.000, and since the Sig value is 0.00 < 0.05, the data is not normally distributed.

Homogeneity

After determining the normality of the data, the next test conducted was the homogeneity test. The homogeneity test was used to determine the level of variance similarity between the two groups, namely the experimental group and the control group, in order to accept or reject the hypothesis by comparing the significance of Levene's statistic with 0.05 (sig > 0.05). The results of the homogeneity test can be seen in the following table:

Table 8. Test of homogeneity

No	Class	Indicator	Sig.	Homogeneity	
				Yes	No
1	Pre-test and Post-test of Experiment and Control class	Sig > 0.05	0.012	✓	

Based on the table, it can be seen that the homogeneity test result is 0.012, which is greater than 0.05 (p = 0.012 > 0.05). Therefore, it can be concluded that the two variables are homogeneous.

Result of the hypothesis testing

Nonparametric tests are statistical analysis techniques used to examine differences or relationships between variables without assuming a specific distribution in the data. In this study, the researcher used the Mann-Whitney test for data analysis. The Mann-Whitney test was used to compare two independent groups of ordinal or interval data that were not normally distributed. The results of the Mann-Whitney test can be seen in the following table:

Table 9. Test statistic

No	Class	Indicator	Asymp. Sig. (2-tailed)
1	Pre-test and Post-test of Experiment and Control class	Sig < 0.05	0.002

Based on the results of the 'Test Statistics' in the Mann-Whitney test above, it was found that the Asymp. Sig. Value (2-tailed) was 0.002, which is less than 0.05. Therefore, based on the Mann-Whitney test decision, it can be concluded that the null hypothesis is rejected and the alternative hypothesis is accepted. Thus, it can be stated that there is a difference in learning outcomes between Class C (experimental) and Class D (control). Since there is a significant difference, the research question can also be answered, namely, "There is a significant improvement in the application of

the jigsaw method to enhance reading comprehension among tenth-grade students at one of private senior high school in Palu.

DISCUSSION

Based on the pre-test results, Class C obtained an average score of 44.27, while Class D obtained an average of 64.23, with the maximum scores for both classes ranging from 60 to 85 and the minimum scores ranging from 25 to 20. Because the researcher used total sampling, Class D was designated as the control class and Class C as the experimental class because Class C had a lower initial score. Based on the post-test results, there was a clear difference in the average scores between the two groups. The average post-test score for the experimental group was 86.38, higher than that of the control group, which had an average of 76.69. Statistical descriptions showed a significant difference between the two groups. The maximum score obtained by both classes on the post-test was 95. The improvement in learning outcomes in the experimental group shows that the application of the Jigsaw method can improve students' reading comprehension skills.

Theoretically, the Jigsaw method is effective because it is based on the principle of cooperative learning, where each student is responsible for mastering one part of the material and then teaching it to their friends (Johnson & Johnson, 2009). This process fosters positive interdependence, individual responsibility, and active involvement in learning. According to Slavin (1995), cooperative learning promotes deeper understanding because students reinforce their understanding when explaining concepts to others. Similarly, Aronson (2008), the originator of the Jigsaw method, states that in practice, the Jigsaw method is effective because it changes the classroom atmosphere from being teacher-centered to student-centered.
In practice, the effectiveness of the Jigsaw method in this study was reflected in how students worked together during class. Each student was assigned a specific portion of the reading text to understand and then explain to their group members. Through this process, every participant became both a learner and a teacher, contributing actively to the group's comprehension of the whole text. Students were more engaged and confident when presenting their parts, while those who initially struggled benefited from their peers' explanations. Compared to the control class, where students mainly relied on the teacher's explanation, the experimental class showed stronger collaboration, livelier discussions, and a deeper understanding of the text content.

Previous research by Karunaratne and Navaratne (2023) identified several common challenges in reading comprehension, particularly students' difficulties in understanding reading texts. Problems in understanding reading materials can be addressed using the Jigsaw method. This technique enhances student engagement,

collaboration, and enthusiasm in the learning process (Mutaqin & Haryudin, 2020). In the learning process using the jigsaw method, students work together in small groups to understand specific parts of the text, then take responsibility for explaining the content of their section to other group members. This activity encourages students to read deeply, understand the meaning of the text, and clearly convey information to their peers. Through this process, students actively engage in understanding the content of the reading and provide clarification to one another if there are parts that are not yet understood. Additionally, students learn to identify main ideas, important information, and restate that information in their own words.

The success of this approach is evident in the improvement of students' ability to explain the text's content, answer comprehension questions, and critically discuss the information they have read. Research findings indicate that the jigsaw method not only enhances students' reading comprehension but also strengthens their communication and collaboration skills (Wulandari et al., 2023). However, there are some challenges in implementing this method. First, some students are still confused about their roles in the group because they are not yet accustomed to cooperative learning models. Second, students with low reading abilities require more time to understand their sections before they can explain them to the group. Nevertheless, after several practice sessions, students showed significant improvement in text comprehension, as reflected in higher post-test scores compared to pre-test scores.

The Mann-Whitney analysis showed a Sig. value of 0.002, which is less than 0.05, meaning that the alternative hypothesis (Ha) is accepted. This indicates that there is a significant difference in students' reading comprehension before and after being given treatment using the jigsaw method. Thus, it can be concluded that the use of the Jigsaw method has a significant effect on improving students' reading comprehension in English. Students showed a positive response to this cooperative learning method. They became more active in group discussions, more motivated to read, and able to understand the text content better through the division of roles and responsibilities among group members. Additionally, the Jigsaw method also promotes collaboration, communication, and individual responsibility, which contribute to a deeper understanding. These results are in line with research conducted by Akbar and Suryani (2021), which showed that students in the experimental group who learned using the Jigsaw method had significantly higher reading comprehension scores than the control group who used conventional methods. They also noted that learning with the Jigsaw method helps students build meaning from texts collaboratively and boosts their confidence in understanding readings.

Meanwhile, students in the control group followed a conventional, teacher-centered approach to instruction. Learning activities mainly involved the teacher providing explanations about report text structures, vocabulary lists and grammar exercises, followed by individual reading and comprehension tasks. Students in this group showed some improvement between the pre-test and post-test, but their progress was modest compared to the experimental group. This suggests that, while traditional methods can support surface-level comprehension, they may not encourage interaction, collaboration or deeper engagement with the text sufficiently. The difference in results between the two groups therefore highlights the Jigsaw method's advantage in developing understanding and learner autonomy.

Based on these findings, the researchers linked the results of this study to previous studies by Akbar and Suryani (2021). All of these studies reported that the application of the jigsaw method in learning was able to significantly improve students' reading comprehension. Similarly, in this study, the use of the Jigsaw method was found to improve the reading comprehension of tenth-grade students at private senior high school in Palu.

CONCLUSION

Based on the data and previous discussion, the results of this study indicate that the Jigsaw method is effective in improving the reading comprehension of tenth-grade students at one of private senior high school in Palu. This method encourages students to actively read, understand, and explain text sections to their group members, resulting in more comprehensive understanding compared to conventional methods.

This study contributes to EFL reading instruction by demonstrating that collaborative learning through the Jigsaw method enhances students' engagement and responsibility. Moreover, its effectiveness can be applied across various educational contexts. In practice, EFL teachers can apply the Jigsaw method by dividing reading texts into several sections and assigning each student to study and explain their part. Teachers should also provide clear guidance and gradual familiarization to ensure optimal learning outcomes. Thus, this method helps junior and senior high school teachers create more interactive and effective reading lessons.

SUGGESTION

Based on the findings of this study, it is suggested that students should be more active, responsible, and cooperative during Jigsaw group discussions to optimize their learning outcomes. Teachers are advised to provide structured guidance, clear

instructions, and in-depth feedback throughout the learning process in order to strengthen students' comprehension and participation. Furthermore, future researchers are encouraged to explore the implementation of the Jigsaw method in different types of reading texts and to integrate technological tools to enhance the effectiveness and engagement of reading instruction.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper.

AUTHOR (S) CONTRIBUTION

Tiara Lulu Gifarini served as the lead author, assuming responsibility for the study's design, data collection and processing, analysis, interpretation of results, and funding procurement. Furthermore, she was responsible for drafting the initial manuscript and making revisions based on feedback from her supervisor. Sriati Usman provided guidance, feedback, and direction in designing the research methodology, as well as conducting a critical review and supervising the manuscript to ensure the scientific quality of this work. Mashuri's contributions included providing input and suggestions in the domains of data processing, analysis, and interpretation of results. Additionally, he assisted in reviewing the content of the manuscript and developing more in-depth arguments. In addition, Konder Manurung provided scientific contributions, constructive feedback, and recommendations for enhancing the manuscript's comprehensiveness and readiness for publication in its final stages.

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