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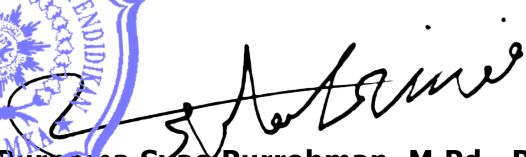
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Purwana Syae Purrohman, M.Pd., Ph.D.



Improving Fiction Reading Comprehension through Metaverse Media-Assisted Reciprocal Teaching in Elementary School

(Peningkatan Pemahaman Membaca Teks Fiksi melalui Model Reciprocal Teaching Berbantuan Media Metaverse di Sekolah Dasar)

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Abstract

Reading comprehension is an essential skill that needs to be developed from the elementary school level, as it enables students to understand information and interpret the meaning of texts. Previous studies have generally examined Reciprocal Teaching strategies and digital learning media separately, while limited research has integrated structured cognitive learning strategies with immersive digital environments in literacy instruction. This study aims to examine the effect of the Reciprocal Teaching model assisted by metaverse media on elementary school students' reading comprehension of fictional texts. This study employed a quantitative quasi-experimental design with a non-equivalent control group. The participants consisted of 58 fifth-grade students divided into an experimental group (29 students) and a control group (29 students). Data were collected through pretests and posttests using a reading comprehension instrument and analyzed using the Wilcoxon Signed-Rank Test and the Mann-Whitney U Test. The findings indicate that students in the experimental group showed greater improvement in reading comprehension than those in the control group, with a large effect size ($r = 0.61$). The integration of Reciprocal Teaching and metaverse media was associated with increased student engagement and more interactive reading activities. However, the findings should be interpreted cautiously due to differences in baseline equivalence between groups. This study contributes to the development of technology-supported literacy learning by integrating cognitive scaffolding strategies with immersive digital environments and provides practical implications for more interactive and student-centered reading instruction in elementary education.

Keywords: Elementary school; Fiction text; Metaverse Media; Reading Comprehension; Reciprocal Teaching

Abstrak

Pemahaman membaca merupakan keterampilan penting yang perlu dikembangkan sejak tingkat sekolah dasar karena membantu siswa memahami informasi dan menafsirkan makna teks. Penelitian sebelumnya umumnya membahas strategi Reciprocal Teaching dan media pembelajaran digital secara terpisah, sementara penelitian yang mengintegrasikan strategi pembelajaran kognitif terstruktur dengan lingkungan digital imersif dalam pembelajaran literasi masih terbatas. Penelitian

ini bertujuan untuk menganalisis pengaruh penggunaan model Reciprocal Teaching berbantuan media metaverse terhadap kemampuan pemahaman membaca teks fiksi siswa sekolah dasar. Penelitian ini menggunakan pendekatan kuantitatif dengan metode kuasi-eksperimental melalui desain kelompok kontrol non-ekuivalen. Subjek penelitian terdiri dari 58 siswa kelas V sekolah dasar yang dibagi menjadi dua kelompok, yaitu kelas eksperimen sebanyak 29 siswa dan kelas kontrol sebanyak 29 siswa. Pengumpulan data dilakukan melalui pretest dan posttest menggunakan instrumen tes pemahaman membaca, kemudian dianalisis menggunakan Uji Wilcoxon Signed-Rank dan Uji Mann-Whitney U. Hasil penelitian menunjukkan bahwa siswa pada kelompok eksperimen mengalami peningkatan kemampuan pemahaman membaca yang lebih tinggi dibandingkan dengan kelompok kontrol dengan nilai ukuran efek yang tergolong kuat ($r = 0,61$). Integrasi model Reciprocal Teaching dan media metaverse juga berkaitan dengan meningkatnya keterlibatan siswa serta terciptanya aktivitas membaca yang lebih interaktif. Namun, hasil penelitian ini perlu diinterpretasikan secara hati-hati karena terdapat perbedaan kesetaraan awal antarkelompok. Penelitian ini memberikan kontribusi terhadap pengembangan pembelajaran literasi berbasis teknologi melalui integrasi strategi scaffolding kognitif dengan lingkungan belajar digital imersif serta memberikan implikasi praktis bagi pembelajaran membaca yang lebih interaktif dan berpusat pada siswa di sekolah dasar.

Kata Kunci: Media Metaverse; Pemahaman Membaca; Reciprocal Teaching; Sekolah Dasar; Teks Fiksi

INTRODUCTION

Reading comprehension is a fundamental skill that must be developed from the elementary school level, as it enables students to acquire information, interpret ideas, and construct knowledge from texts. In the context of Indonesian language learning, as emphasized by Decristan et al. (2024) and Lase et al. (2025), reading comprehension is not only related to decoding written symbols but also to understanding meaning, identifying main ideas, interpreting implicit information, and drawing conclusions from texts. Recent studies such as Khan et al. (2025) also highlight the role of structured reading strategies in improving comprehension, while Al Khateeb and Alotaibi (2024) emphasize the importance of interactive learning environments in supporting students' cognitive development and academic achievement.

However, empirical evidence indicates that students' reading comprehension skills, particularly in understanding fictional texts, remain relatively low. Based on preliminary observations, approximately 60% of fifth-grade students experienced difficulties in identifying main ideas, interpreting implicit meanings, and drawing conclusions from fictional texts. This condition is in line with findings reported by Lase et al. (2025), Hrechka et al. (2022), and Marisol et al. (2025), which show that elementary students often struggle to comprehend texts effectively, especially when dealing with implicit information and narrative structures, suggesting that students tend to rely on surface-level reading rather than constructing deeper meaning from the text. These difficulties are often associated with teacher-centered learning practices that limit students' active engagement in the reading process, which in turn reduces opportunities for students to develop higher-order thinking skills during reading activities.

To address this issue, an interactive and student-centered learning model is needed. One of the models that has been widely recognized for improving reading comprehension is the Reciprocal Teaching model introduced by Palincsar (1984), which emphasizes four main strategies: predicting, questioning, clarifying, and summarizing, enabling students to actively construct meaning through structured interaction and collaborative dialogue. Previous studies, such as those conducted by Ginanjar et al. (2024) and Mariana Dewi et al. (2024), have demonstrated that Reciprocal Teaching

can improve students' reading comprehension and engagement, particularly by facilitating metacognitive processes that help students monitor and regulate their understanding while reading.

In addition to learning models, the integration of technology in education has also been shown to enhance student engagement and learning outcomes. One emerging technology in education is the metaverse, which provides an immersive virtual environment that allows students to interact through digital representations or avatars, as described by Indarta et al. (2022), enabling learners to experience content more interactively and contextually. Furthermore, metaverse-based learning environments offer opportunities to support a deeper understanding of narrative texts, as explained by Sripan and Jeerapattanatorn (2025), who argue that immersive environments can facilitate meaningful learning experiences by connecting abstract concepts with visual and experiential representations, thereby helping students build more concrete mental models of the stories they read.

Although numerous studies have explored the use of reciprocal teaching and digital learning media to improve reading comprehension, previous research, such as Decristan et al. (2024) and Khan et al. (2025), has primarily focused on the effectiveness of structured instructional strategies within conventional or non-immersive learning environments, while studies on digital media, including Al Khateeb and Alotaibi (2024), tend to emphasize general interactive or multimedia platforms rather than fully immersive technologies. As a result, these approaches often remain limited in their ability to fundamentally transform the reading process, as students are still positioned as passive recipients of information rather than active participants in constructing meaning. In particular, conventional digital media are typically restricted to visual or multimedia representations, which may support surface-level comprehension but are less effective in promoting deeper understanding of narrative elements such as plot, character development, and implicit meaning.

In contrast, immersive metaverse environments provide opportunities for students to experience narrative contexts in a more concrete and interactive manner. These environments allow students to engage directly with virtual representations of story elements and participate actively in meaning-making processes. However, despite these potential advantages, the pedagogical integration of immersive metaverse environments with structured reading strategies remains underexplored, especially in elementary education contexts, where students require both cognitive scaffolding and concrete learning experiences. This gap highlights the need for an instructional approach that not only supports structured comprehension strategies but also leverages immersive technology to transform abstract reading processes into meaningful and interactive learning experiences.

Despite the growing body of research on Reciprocal Teaching and digital learning media, studies that integrate Reciprocal Teaching with immersive metaverse environments in the context of elementary school reading comprehension remain limited, highlighting a critical gap in the literature regarding how immersive virtual environments can support collaborative reading strategies and enhance students' comprehension of fictional texts. Most previous studies have focused either on conventional instructional strategies or on general digital media, without examining how immersive environments can transform abstract reading processes into more concrete and meaningful learning experiences for elementary students. This condition suggests the

need for a learning approach that not only supports comprehension strategies but also provides concrete and immersive learning experiences for elementary students.

This study offers a novel framework integrating reciprocal teaching and immersive metaverse environments by proposing a pedagogical model that transforms abstract reading processes into interactive and experiential learning experiences. This framework integrates instructional strategies with digital technology to support collaborative meaning-making, active student engagement, and deeper comprehension of fictional texts in elementary education. Unlike previous studies that examine reciprocal teaching or digital media separately, this study provides a conceptual contribution by demonstrating how immersive environments can operationalize reciprocal teaching strategies within a concrete and interactive learning context.

Furthermore, this study highlights the role of metaverse technology in facilitating collaborative learning through interactive and multimodal environments, enabling students to engage in discussion and exploration within a shared virtual space that promotes active participation and reduces learning barriers. This integration not only enhances student engagement but also introduces a new pedagogical perspective in reading instruction, shifting reading from a passive activity into an active process of constructing meaning through immersive and collaborative experiences.

Therefore, this study aims to examine the effectiveness of the Reciprocal Teaching model assisted by metaverse media in improving students' reading comprehension of fictional texts in elementary school, with a particular focus on how this integrated approach supports deeper comprehension and active meaning-making during the reading process.

RESEARCH METHOD

This study employed a quantitative approach using a quasi-experimental design to examine the effectiveness of the Reciprocal Teaching model assisted by metaverse media on students' reading comprehension. A quantitative approach is commonly used to analyze numerical data and test hypotheses in educational research (Sugiyono, 2013). A quasi-experimental design was selected because the study involved intact classroom groups, allowing the research to be conducted in a natural educational setting without altering existing class structures.

The research design applied was a non-equivalent control group design involving an experimental group and a control group. This design made it possible to compare learning outcomes between groups without individual randomization, while still examining the effect of the instructional treatment. The experimental group was taught using the Reciprocal Teaching model assisted by metaverse-based media, whereas the control group followed conventional learning practices.

The participants of this study were fifth-grade students from a public elementary school in Depok City during the 2025/2026 academic year. The total number of participants was 58 students, consisting of 29 students in the experimental group and 29 students in the control group. The students were generally aged between 11-12 years and came from relatively similar socio-educational backgrounds, which helped reduce potential variation between groups.

The sampling technique used in this study was cluster random sampling, in which intact classes were selected as research samples. From the four available fifth-grade classes, two classes consisting of an equal number of students (29 students each) were randomly assigned as the experimental and control groups to support more balanced group comparisons during the study. Another class was used for instrument testing, while one remaining class was not included in the research sample. This technique was chosen to maintain the natural classroom setting without disrupting the existing class structure. At the time of group selection, there was no prior information regarding differences in students' initial reading comprehension abilities between the selected groups.

This study involved two variables: an independent variable and a dependent variable. The independent variable was the implementation of the Reciprocal Teaching model assisted by metaverse media, while the dependent variable was students' reading comprehension skills in fictional texts. The research instrument was a multiple-choice test consisting of 20 items developed based on reading comprehension indicators, including identifying main ideas, interpreting implicit information, determining cause-and-effect relationships, and drawing conclusions. Content validity was established through expert judgment using a validation sheet consisting of six indicators assessed on a five-point scale. The validation result reached 76.67%, indicating that the instrument was categorized as valid and appropriate for use in the study. Construct validity was tested using the Pearson product-moment correlation on students outside the research sample. The results showed that 15 items were valid, while 5 items were excluded for not meeting the validity criteria. Reliability testing was conducted on the 15 valid items using Cronbach's Alpha, resulting in a coefficient of 0.769, which indicates a good level of internal consistency.

Data collection was carried out through pretest and posttest procedures. Before the treatment, both groups were given a pretest to measure students' initial reading comprehension abilities. The treatment was conducted in two instructional sessions. In the experimental group, the Reciprocal Teaching model assisted by metaverse media was implemented through the stages of predicting, questioning, clarifying, and summarizing. Meanwhile, the control group received conventional reading instruction without the use of metaverse media. After the treatment, both groups were given a posttest to measure students' reading comprehension improvement. To minimize the influence of external variables, both groups were taught using the same learning objectives, instructional materials, and time allocation. The primary difference between the groups was the instructional approach applied during the learning process. This procedure was intended to maintain comparable learning conditions between the experimental and control groups throughout the study.

Data analysis techniques included descriptive and inferential statistics. A normality test using the Shapiro-Wilk method showed that the data were not normally distributed ($p < 0.05$), indicating that nonparametric statistical tests were more appropriate. The Wilcoxon Signed Rank Test was used to analyze differences within groups, while the Mann-Whitney U Test was used to compare differences between groups. These statistical tests were selected based on the non-normal distribution of the data and were considered appropriate for examining differences within and between groups.

RESULTS

This section presents the results of the quantitative data analysis obtained through a quasi-experimental design using a non-equivalent control group design. The data analyzed consist of pretest and posttest scores of students' reading comprehension in the experimental and control groups. The analysis consisted of descriptive statistics, normality testing, initial equivalence testing, improvement analysis within groups, comparison between groups, and effect size calculation to examine the strength of the relationship between the learning model and students' reading comprehension.

Descriptive Statistics

Descriptive statistical analysis was conducted to provide an overview of students' reading comprehension scores in the experimental and control groups before and after the treatment. The analysis included the mean, standard deviation, minimum, and maximum values of the pretest and posttest results.

Table 1. Descriptive Statistics of Pretest and Posttest

Experimental Group					Control Group				
Variable	Mean	SD	Min	Max	Variable	Mean	SD	Min	Max
Pretest	69.38	8.926	53	80	Pretest	62.07	6.886	53	73
Posttest	89.86	8.547	73	100	Posttest	77.83	6.882	66	93

The results indicate that both groups experienced an improvement in reading comprehension after the learning process. In the experimental group, the mean score increased from 69.38 in the pretest to 89.86 in the posttest. Meanwhile, in the control group, the mean score increased from 62.07 in the pretest to 77.83 in the posttest.

Based on the comparison of mean scores, the increase in the experimental group was higher than that in the control group, suggesting that the applied learning model may be associated with greater improvement in students' reading comprehension.

Normality Test

The distribution of the research data was examined using a normality test applied to the pretest and posttest scores of both groups. In this study, the Shapiro-Wilk test was used because it is suitable for small sample sizes and can accurately detect deviations from a normal distribution.

Table 2. Normality Test Results

Variable	Group	Sig.	Description
Pretest	Experimental	0.006	Not Normal
Pretest	Control	<0.001	Not Normal
Posttest	Experimental	0.006	Not Normal
Posttest	Control	0.021	Not Normal

The results showed that the significance value for the experimental group in the pretest was 0.006, while for the control group it was < 0.001 . In the posttest, the significance value for the experimental group was 0.006, and for the control group was 0.021. Since all significance values are below 0.05 ($p < 0.05$), it can be concluded that the data are not normally distributed.

Therefore, further data analysis was conducted using nonparametric statistical tests. The Wilcoxon Signed-Rank Test was used to analyze improvements within each group, while the Mann-Whitney U Test was applied to compare differences between the experimental and control groups.

Initial Equivalence Test

An initial equivalence test was conducted to examine the students' baseline reading comprehension abilities in the experimental and control groups before the treatment. The Mann-Whitney U Test was used because the pretest data were not normally distributed.

Table 3. Initial Equivalence Test Results

Statistics	Value
Mann-Whitney U	221.000
Z	-3.812
Sig. (2-tailed)	0.001

The test results showed a U-value of 221.000 with a significance level of 0.001 ($p < 0.05$), indicating a significant difference in pretest scores between the experimental and control groups. This suggests that the initial abilities of the two groups were not fully equivalent.

This condition is common in quasi-experimental studies that involve intact classroom groups rather than individual random assignment. Therefore, the subsequent analysis focused on examining improvements within each group as well as comparing posttest results to better understand the effect of the learning treatment.

Reading Comprehension Skill Improvement Test

An analysis of students' reading comprehension improvement was conducted to examine changes before and after the learning process in each group. The analysis aimed to identify the extent to which the learning treatment was associated with students' comprehension

of fictional texts. Because the data were not normally distributed, the Wilcoxon Signed-Rank Test was used to examine differences between pretest and posttest scores within each group.

Table 4. Wilcoxon Test Results – Experimental Group

Statistics	Value
Positive Ranks	29
Negative Ranks	0
Z	-4.870
Sig. (2-tailed)	<0.001

Table 5. Wilcoxon Test Results – Control Group

Statistics	Value
Positive Ranks	29
Negative Ranks	0
Z	-4.799
Sig. (2-tailed)	<0.001

The results of the Wilcoxon Signed-Rank Test for the experimental group show a Z-value of -4.870 with a significance level of < 0.001 ($p < 0.05$), indicating a significant improvement in students' reading comprehension after learning using the Reciprocal Teaching model assisted by metaverse media. This is further supported by the presence of 29 positive ranks and no negative ranks, indicating that all students experienced an increase in scores from pretest to posttest.

Similarly, the Wilcoxon test results for the control group also show a significant improvement, with a Z-value of -4.799 and a significance level of < 0.001 ($p < 0.05$). However, the magnitude of improvement observed in the experimental group was greater than that of the control group. These findings suggest that the implementation of the Reciprocal Teaching model assisted by metaverse media may contribute more effectively to students' comprehension of fictional texts compared to conventional learning.

Testing Differences in Posttest Results Between Groups

The difference in posttest results between the experimental and control groups was analyzed to determine whether there was a difference in students' reading comprehension after the learning process. The Mann-Whitney U Test was used because the data were not normally distributed, and the test is suitable for comparing two independent groups.

Table 6. Mann–Whitney Posttest Results

Statistics	Value
Mann-Whitney U	127.500

Z	-4.646
Sig. (2-tailed)	<0.001
Mean Rank Experiment	39.60
Mean Rank Control	19.40

The results of the Mann-Whitney test show a U-value of 127.500, a Z-value of -4.646, and a significance level of < 0.001 ($p < 0.05$). These findings indicate a significant difference in students' reading comprehension between the experimental and control groups after the learning process.

In addition, the mean rank of the experimental group (39.60) was higher than that of the control group (19.40). This suggests that students who participated in learning using the Reciprocal Teaching model assisted by metaverse media tended to achieve higher reading comprehension scores compared to those who experienced conventional learning.

The results suggest that the use of the Reciprocal Teaching model assisted by metaverse media may be associated with better reading comprehension outcomes compared to conventional instruction.

Effect Size

Effect size analysis was conducted to determine the magnitude of the relationship between the learning treatment and the improvement in students' reading comprehension. The effect size was calculated using the Z values obtained from the Wilcoxon and Mann-Whitney tests and the corresponding sample sizes. For the Wilcoxon test, the sample size (N) refers to the number of paired observations within each group ($n = 29$), while for the Mann-Whitney test, it refers to the total number of participants across both groups ($n = 58$).

Table 7. Effect Size

Test	Z	N	r	Interpretation
Wilcoxon Experiment	-4.870	29	0.904	Large effect
Wilcoxon Control	-4.799	29	0.891	Large effect
Mann-Whitney Posttest	-4.646	58	0.610	Large effect

The effect size analysis yielded values of 0.90 for the experimental group, 0.89 for the control group, and 0.61 for the Mann-Whitney posttest comparison. Based on Cohen's criteria, these values fall into the large effect size category.

The results suggest a strong relationship between the implemented learning model and students' reading comprehension outcomes. However, these findings should be considered in light of the initial differences between the experimental and control groups.

DISCUSSION

The results of this study indicate that the application of the Reciprocal Teaching model assisted by metaverse media significantly improves students' reading comprehension of fictional texts. This improvement can be explained by the active cognitive engagement involved in the reading process, as emphasized by Decristan et al. (2024) and Lase et al. (2025), as students are not merely receiving information but are actively constructing meaning through interaction with the text. In this context, reading comprehension involves higher-order cognitive processes such as identifying main ideas, interpreting implicit meanings, and drawing conclusions, which according to Hrechka et al. (2022) and Marisol et al. (2025) require structured instructional support. This evidence highlights the importance of appropriate learning strategies in facilitating deeper comprehension.

The improvement in reading comprehension found in this study can be explained through the characteristics of the Reciprocal Teaching model, which emphasizes active student involvement through predicting, questioning, clarifying, and summarizing. These strategies function as scaffolding mechanisms that guide students in regulating their understanding and constructing meaning during the reading process, as supported by previous studies (Anggraini et al., 2023; Ginanjar et al., 2024; Kamala et al., 2024; Mariana Dewi et al., 2024; Wargadinata et al., 2023), enabling learning to become more meaningful as students actively construct knowledge. The results are consistent with previous studies (Khan et al., 2025; Mafarja et al., 2023; Wahyudi & Rozimela, 2024), which reported that Reciprocal Teaching enhances both reading comprehension and metacognitive awareness, suggesting that the model not only improves learning outcomes but also strengthens the learning process itself.

In addition, the Reciprocal Teaching strategy contributes to increased student engagement in the reading process because students are actively involved in questioning and clarifying information. Previous studies suggest that active questioning and clarification strategies support more systematic comprehension processes and help students understand texts more effectively through interaction and collaboration (Hidayatullah H, 2025; Kula, 2021; Sagala, 2025; Suroso et al., 2025; Tantowie et al., 2022), thereby encouraging students to participate more actively in the reading process.



Figure 1. Implementation of Reciprocal Teaching in the experimental class

In addition to instructional strategies, the use of learning media also plays a crucial role in improving reading comprehension because visual and contextual media help students connect abstract textual information with concrete representations, as explained by previous studies (Aida et al., 2025; Febri Arianti & Hasanudin, 2020; Febriana Sukma et al., 2025; Subarkah, 2025), allowing students to more easily understand plot and narrative elements. This is consistent with findings from previous studies (Hurin Nuri Asyifa, 2025; Ika Sari & Kamsiyati, 2023; Pebriyani et al., 2021), which indicate that engaging media reduces cognitive load and facilitates comprehension, underscoring the role of instructional media as an important supporting factor in reading activities.

In this study, metaverse media provides a more interactive and immersive learning experience in which students can explore virtual learning environments and engage actively in the learning process. Previous studies indicate that immersive learning environments increase student engagement and understanding, making learning more contextual and meaningful (Das et al., 2024; Indarta et al., 2022; Pradana & Elisa, 2023; Sripa & Jeerapattanatorn, 2025). Previous studies also support these results by showing that metaverse-based learning enhances experiential learning and allows students to construct knowledge through immersive interaction (Gurkan, 2025; Latino et al., 2024; Mercan & Varol Selçuk, 2024; Sharma et al., 2025; Usfandi Haryaka & Warman, 2024), thereby encouraging students to participate more actively in the learning process. The effectiveness of metaverse in this study can thus be explained by its ability to integrate cognitive and experiential learning processes.



Figure 2. Learning activities using metaverse media

The use of digital technology in learning also contributes to increased student motivation and participation. Jones (2025) explains that interactive learning environments encourage active engagement, while previous studies (Amaliah et al., 2021; Ulfa Afifa Widyastuti, 2025; Wibowo et al., 2026) show that digital literacy supports students in processing information more effectively, suggesting that technology integration not only improves comprehension but also develops students' learning skills.

Furthermore, previous studies indicate that digital learning environments enhance engagement and comprehension. Studies by Hidayat et al. (2024), Kurnia and Nur (2024), Madale et al. (2025), and Peterson et al. (2025) highlight that technology-based and socially interactive learning environments help students overcome difficulties in reading comprehension. The results are also consistent with broader research demonstrating the effectiveness of technology-supported learning.

The effect size analysis indicates a strong relationship between the implemented learning approach and students' reading comprehension outcomes. This finding suggests that the integration of Reciprocal Teaching and metaverse media contributes meaningfully to students' learning processes. However, this finding should be interpreted cautiously, as the magnitude of the effect may be influenced by differences in students' initial abilities, learning conditions, and contextual factors within the classroom setting. Therefore, a large effect size should not be interpreted as absolute evidence of treatment effectiveness, but rather as an indication of a strong association within the specific research context.

The results of the initial equivalence test showed a significant difference in pretest scores ($p = 0.001$), indicating that the experimental and control groups were not fully equivalent at baseline. This condition may have influenced the observed improvement in students' reading comprehension and should therefore be considered when interpreting the findings. Nevertheless, the experimental group demonstrated a substantially greater increase in reading comprehension scores compared to the control group, suggesting that the learning treatment may still have contributed meaningfully to students' reading comprehension improvement despite the initial group differences. Future studies are recommended to apply statistical controls, such as ANCOVA or gain score analysis, to minimize potential bias and provide more accurate estimates of treatment effects.

In addition, this study is limited to the use of fictional texts at the elementary school level, which may restrict the generalizability of the findings to other types of texts or educational contexts. Further research is therefore needed to examine the effectiveness of this approach across different text genres, such as expository or informational texts, as well as at different educational levels, in order to obtain a more comprehensive understanding of its applicability.

CONCLUSION

This study demonstrates that the Reciprocal Teaching model assisted by metaverse media improves elementary school students' reading comprehension of fictional texts. The findings suggest that the integration of structured reading strategies and immersive digital environments supports students' active engagement and facilitates deeper comprehension processes. Therefore, the combination of Reciprocal Teaching and metaverse media can be considered an effective and innovative approach to reading instruction in elementary education.

The findings of this study imply that teachers can integrate Reciprocal Teaching and metaverse media into classroom instruction to create more interactive, student-centered, and engaging learning environments. The implementation of predicting, questioning, clarifying, and summarizing strategies may help students participate more actively in the reading process and improve their comprehension skills.

This study contributes to the theoretical understanding of reading comprehension by supporting the view that active cognitive engagement, scaffolding strategies, and immersive learning environments play important roles in facilitating deeper comprehension processes. The findings also reinforce previous theories related to Reciprocal Teaching, metacognitive learning, and experiential learning in literacy instruction.

The integration of metaverse media in this study demonstrates the potential of immersive digital technology to support contextual and meaningful literacy learning. In addition to improving reading comprehension, metaverse-based learning environments may also contribute to the development of students' digital literacy and active participation in technology-supported learning processes.

However, the findings of this study should be interpreted within the context of the research limitations. Future studies are recommended to examine the application of this approach across different text genres, educational levels, and broader learning contexts to obtain a more comprehensive understanding of its effectiveness in literacy education. Future research is also recommended to apply a true experimental design with more equivalent participant groups in order to strengthen internal validity. In addition, further studies may integrate more advanced AI-supported or metaverse-based learning technologies and conduct longitudinal analyses to explore the long-term effects of immersive literacy learning on students' reading comprehension development.

SCIENTIFIC CONTRIBUTION

This study contributes scientifically to the development of literacy learning in elementary education through the integration of Reciprocal Teaching strategies and metaverse-based media in teaching reading comprehension of fictional texts. The primary scientific contribution of this study lies in connecting cognitive learning approaches that emphasize students' metacognitive activities with immersive digital learning environments. These environments enable students to construct meaning in a more active, contextual, and interactive manner. Therefore, this study positions technology not merely as a supporting instructional tool but as an integral component of the meaning-making process in reading activities.

In addition, this study strengthens the development of technology-supported literacy research by demonstrating that the combination of cognitive scaffolding and immersive learning experiences has the potential to enhance student engagement, higher-order thinking processes, and deeper reading comprehension. These findings expand the theoretical perspective on reading comprehension instruction in the digital era, particularly in elementary education contexts, which have largely been dominated by conventional instructional approaches or non-immersive digital media.

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