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The Effect of Augmented Reality (AR) Media on Improving The Speaking Skills of Elementary School Students

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A B S T R A C T

Speaking skills are among the essential language competencies that elementary school students must master. However, the initial level of fifth grade students at Majasem 2 Public Elementary School indicates that their speaking skills are still relatively low, with an average score of 41.75 on the pretest. Students still struggle to pronounce words correctly, use appropriate intonation, choose suitable vocabulary, speak fluently, and express their ideas and opinions confidently during the learning process. This study aims to determine the effect of using Augmented Reality (AR) media on improving the oral skills of fifth grade students at Majasem 2 Public Elementary School. This study employs a quantitative approach using a pre-experimental method and a "One-Group Pre-Test/Post-Test" research design. The sample consisted of 20 students selected through purposive sampling. Data were collected through oral expression tests, observations, and documents. The research instruments met the criteria for validity and reliability (Cronbach's alpha coefficient = 0.873). Data analysis was conducted using the Shapiro-Wilk normality test, the Wilcoxon signed-rank test, and N-Gain analysis, using IBM SPSS software version 25. The results showed a significant difference between pre-test and post-test scores (asymptotic significance = 0.000 < 0.05). Furthermore, the average N-Gain score of 0.6781 fell into the "moderate" category. Thus, Augmented Reality (AR) media has a positive impact on improving the speaking skills of elementary school students.

1. Introduction

The teaching of Indonesian in elementary school aims to help students develop their ability to communicate effectively and efficiently, both orally and in writing. In Indonesian language learning, there are four language competencies that students must master: listening, speaking, reading, and writing (Mulyadi, 2023). Speaking is one of the competencies that plays a crucial role in the communication process.

This competency refers to the ability to express thoughts, ideas, feelings, and information to others through clear and easily understood spoken language. This competency is essential because students are expected to actively interact, engage in discussions, and express their opinions throughout the learning process. However, the speaking skills of elementary school students remain an issue that requires special attention. The results of a study (Elfrisca et al., 2023) show that the speaking skills of fifth grade elementary school students are still in the "satisfactory" category. This low level of speaking proficiency is caused by various factors, such as a lack of self confidence, shyness, limited experience speaking in public, and a lack of teaching materials that encourage students to communicate actively.

The use of innovative instructional media plays a crucial role in creating an active, engaging, and relevant learning process. Instructional media not only serve as tools to assist teachers in delivering content but also stimulate students attention, interest, and motivation, while helping them better understand the material being studied. Therefore, teachers must continue to develop creative instructional media tailored to students characteristics so that learning objectives can be optimally achieved (Tussifa et al., 2021). According to research findings (Nurjanah et al., 2025) rapid technological advancements have given digital media an increasingly important role in the world of education. The use of digital learning media provides teachers with the opportunity to create learning processes that are more innovative, interactive, and tailored to students needs. Digital media can increase students interest, attention, and engagement in learning, thereby making the learning process more active and meaningful. This situation demonstrates that the use of technology in learning is one way to improve the quality of the teaching and learning process.

Advances in educational technology have given rise to various innovations in learning aids that can be used to increase student engagement in the learning process. Technology has transformed the world of education, particularly the learning process in elementary schools. Technological media can make learning more interactive, creative, and innovative, thereby increasing student motivation and engagement throughout the learning process. Therefore, teachers must be able to select and develop digital learning media that are tailored to students' needs (Jannah & Rahayu, 2024) One rapidly evolving technology is Augmented Reality (AR). Augmented reality is a technology that integrates 2D and 3D virtual objects into the real environment in real time, thereby creating a more interactive and engaging learning experience (Rinaldi et al., 2024) The use of Augmented Reality (AR) in the learning process allows students to enjoy a more concrete learning experience thanks to the visualization of objects that are engaging and easy to understand.

In the context of language learning, the use of Augmented Reality (AR) offers the potential to improve students' speaking skills. Research (Oktaviana et al., 2024) indicates that AR technology can boost students' speaking confidence by providing a safe, interactive learning environment that fosters creativity in language use. Furthermore, visual elements presented via AR can help students better grasp the learning context, thereby facilitating their ability to describe, explain, and express

their opinions orally. The use of Augmented Reality (AR) in teaching not only makes lessons more engaging but also helps students better understand concepts through interactive 3D visualizations of objects. These features allow students to have a more meaningful learning experience, thereby facilitating their understanding of the material. This is in line with a study (Sudarno et al., 2025), which shows that Augmented Reality (AR) based teaching materials using the Assemblr Edu platform have received excellent validation results from experts in the field and media specialists, as well as very positive feedback from students, making them suitable for use in elementary education.

From a theoretical perspective, the use of Augmented Reality (AR) in learning can be explained through the cognitive theory of multimedia learning proposed by Mayer (2009). This theory explains that learning becomes more effective when students process information simultaneously through visual and verbal channels. In a learning context that uses Augmented Reality (AR), students gain learning experiences through the visualization of 3D objects combined with verbal information, which helps them develop a deeper understanding of the material. This understanding helps students organize concepts, explain what they see, and express their opinions orally. Therefore, the improvement in oral skills through the use of Augmented Reality (AR) media is driven by higher learning motivation as well as cognitive processes that support material comprehension and oral language production.

Based on the results of preliminary observations conducted at Majasem 2 Public Elementary School, it appears that the students oral skills have not developed optimally, as some of them seem to lack confidence when asked to speak in front of the class, speak in a soft voice, are unable to construct sentences fluently, and do not actively participate in discussions or question and answer sessions. Furthermore, the teaching materials used are still dominated by textbooks and lecture based methods, which do not provide students with sufficient opportunities to actively practice speaking. This situation highlights the need for more innovative and interactive teaching materials to improve students speaking skills.

Based on the above discussion, this study aims to determine the effect of using Augmented Reality (AR) media on improving the speaking skills of fifth-grade students at Majasem 2 Public Elementary School in the Indonesian Language subject. Research (Khusnunnisa et al., 2025) shows that interactive multimedia supported by Augmented Reality (AR) can improve the quality of learning by presenting content that is more engaging, interactive, and easier for students to understand. Furthermore, a study by (Masrukhin et al., 2024) also indicates that Augmented Reality (AR) based learning media can increase student engagement through more engaging and interactive visual presentations. These findings align with research conducted by (Oktaviana et al., 2024), which demonstrates that augmented reality technology can improve speaking skills through more interactive and contextual learning. Furthermore, a study by (Novi Maulidia et al., 2025) examined the use of Augmented Reality (AR) media in teaching speaking skills to students. Although both studies showed positive results, their research focused on different contexts and educational levels. To date, no study has specifically

examined the impact of Augmented Reality (AR) media on the speaking skills of elementary school students.

2. Methodology

This study employs a quantitative approach with a pre-experimental design. A pre-experimental design is a form of experimental research aimed at determining the effect of a specific treatment on certain variables by observing a single research group (Putra et al., 2025). The specific design utilized is the One-Group Pretest-Posttest Design, which involves a single sample group that undergoes an initial test (pretest), receives a treatment specifically the use of Augmented Reality (AR) media in Indonesian language instruction and subsequently takes a final test (posttest) to assess changes in students' speaking skills following the treatment.

Although a One-Group Pretest-Posttest Design allows researchers to observe changes in students oral skills before and after the intervention, this model has limitations because it does not include a control group. Therefore, it is impossible to eliminate all influences from other factors, such as student development, learning experiences outside the intervention, and effects related to repeated measurements also known as the test retest effect. Consequently, the results of this study are interpreted as an indication of improved oral skills following the implementation of Augmented Reality (AR) media, while taking into account the limitations of the research design used. The one-group pretest-posttest research design used in this study is presented in Table 1.

Table 1. One Grup Pretest-Posttest Design

Pretest	**Treatment**	***Posttest***
O_1	X	O_2

Information:
O_1 = pretest students' speaking skills before the treatment
X = learning using Augmented Reality (AR)
O_2 = posttest students' speaking skills after the treatment

This study was conducted at SD Negeri Majasem 2 school, located in the city of Cirebon, West Java. The research focused on fifth grade students during the 2025/2026 academic year. The study population comprised all 178 students at SD Negeri Majasem 2. The sample consisted of 20 fifth grade students, selected using the purposive sampling technique. According to (Memon et al., 2025), purposive sampling is a technique based on specific criteria aligned with the research objectives. The independent variable in this study is the Augmented Reality (AR) medium, while the dependent variable is the students oral proficiency. The research instruments used included an observation checklist and an oral expression test. Oral proficiency was assessed based on five indicators pronunciation, intonation, vocabulary, fluency, and content comprehension. Prior to their use in the study, these instruments underwent a validation process to verify their suitability. Data collection began with a preliminary test designed to assess the students initial oral

proficiency. Next, the students participated in Indonesian language lessons focused on procedural texts, utilizing Augmented Reality (AR) technology via the Assemblr Edu app. The app was used to display 3D objects related to the lesson material, allowing students to observe these objects concretely before reporting their observations orally. This intervention was conducted in a single session lasting 2 x 35 minutes, in accordance with the Indonesian language curriculum for fifth grade elementary school students. After the learning activity was completed, the students took a final test to evaluate the development of their oral skills following the use of Augmented Reality (AR) technology. In addition to this test, research data was also collected through observations and documents.

The research data were analyzed using IBM SPSS software (version 25). The analysis commenced with the verification of the measurement instrument's validity and reliability. Next, a normality test (Shapiro-Wilk test) was conducted to determine the data distribution. If the data were normally distributed (Sig. > 0.05), a parametric test was used to test the hypothesis conversely, if not (Sig. < 0.05), a non parametric test specifically the Wilcoxon Signed Rank test was employed. Finally, the N-Gain test was used to evaluate the magnitude of the improvement in students' oral proficiency following the Augmented Reality (AR) based intervention.

3. Results and Discussion

This study employs a quantitative approach using a pre-experimental method to determine the effect of using Augmented Reality (AR) media on the speaking skills of fifth grade students in the Indonesian language subject at SD Negeri Majasem 2. The study involved 20 fifth grade students selected through purposive sampling. Data were collected via speaking skill tests administered before the intervention (pretest) and after the intervention (posttest), supplemented by observations and document analysis. The collected data were analyzed using the Shapiro-Wilk normality test, the Wilcoxon Signed Rank test, and the N-Gain test with the aid of IBM SPSS software version 25. The results of the data analysis are presented below. Before the research was conducted, the oral proficiency assessment instrument underwent a trial involving 20 students. The instrument was developed based on five indicators of oral competence pronunciation, intonation, vocabulary, fluency, and content comprehension. The trial results were then analyzed using validity and reliability tests to determine the instrument's suitability for use in the research data collection phase. The results of the instrument validity test are presented in Table 2.

Table 2. Validity test results

No.	Indicator	r count (Person correlation)	Sig.	Information
1.	pronunciation	0,797	0,000	Valid
2.	Intonation	0.941	0,000	Valid
3.	Vocabulary	0,658	0,002	Valid
4.	fluency	0,892	0,000	Valid
5.	Comprehension of content	0,836	0,000	Valid

The speaking skill instrument used in this study comprises five indicators pronunciation, intonation, vocabulary, fluency, and content comprehension. Validity test results indicate that all indicators have a calculated r-value greater than the r-table value (0.444) and a significance value of less than 0.05 therefore, all indicators are deemed valid. To ensure that the instruments used have a good level of consistency, reliability tests were conducted. The results of these reliability tests are presented in Table 3.

Table 3. Reliability test results

Cronbach's Alpha	N of Items
0.873	5

After all indicators were confirmed to be valid, a reliability test using Cronbach's Alpha was conducted to determine the instrument's level of consistency. The reliability test results showed that the instrument had a Cronbach's Alpha value of 0.873. As this value exceeds 0.70, the instrument is considered reliable and suitable for use in the study. After the validity and reliability of the research instrument were established, the next step was to analyze the students' pretest and posttest results. To provide an initial overview of the research findings, Table 4 presents descriptive statistics, including sample size, lowest score, highest score, mean, and standard deviation.

Table 4. Descriptive Statistics for Pretest and Posttest

Variabel	N	Minimum	Maksimum	Mean	Std. Deviation
Pretest	20	25	65	41,75	13,79
Posttest	20	60	95	79,75	12,08

The descriptive statistics in Table 4 show that the students mean score on the pretest was 41.75, with a minimum score of 25, a maximum score of 65, and a standard deviation of 13.79. The students average score on the post-test increased to 79.75, with a lowest score of 60, a highest score of 95, and a standard deviation of 12.08. This average increase of 38.00 points indicates an improvement in the students oral skills. Next, a normality test and a hypothesis test using the Wilcoxon signed-rank test were conducted to determine whether this increase was statistically significant. These descriptive statistics provide an initial overview of the improvement in the students' speaking skills. The analysis then continued with a normality test specifically, the Shapiro-Wilk test to determine the most appropriate hypothesis testing technique. The results of the normality test are presented in Table 5.

Table 5. Normality test results Shapiro-Wilk

	Shapiro-Wilk		
Statistic	df	Sig.	Statistic
Pretest	.901	20	.043
Posttest	.876	20	.015

Based on the normality test results, the significance values obtained were 0.043 for the pretest and 0.015 for the posttest. Since both significance values were less than

0.05, the data were not normally. Therefore, hypothesis testing was continued using the Wilcoxon signed-rank test, a nonparametric statistical test whose results are presented in Table 6.

Table 6. Wilcoxon Signed-Rank Test Results

		N	Mean Rank	Sum of Ranks
posttest - pretest	Negative Ranks	0[a]	.00	.00
	Positive Ranks	20[b]	10.50	210.00
	Ties	0[c]		
	Total	20		

Next, the statistical values from the Wilcoxon Signed-Rank Test, including the Z-value and Asymp. Sig. (2-tailed), are presented in Table 7.

Table 7. Statistical Results Wilcoxon Signed Rank Test

	posttest - pretest
Z	-3.949[b]
Asymp. Sig. (2-tailed)	.000

Based on the Wilcoxon test results, the Asymp. Sig. (2-tailed) value was 0.000 (< 0.05) therefore, H_0 was rejected and H_1 was accepted. Thus, the use of Augmented Reality media has an effect on students speaking skills. To determine the magnitude of the treatment effect, the effect size was calculated using the formula $r = Z/\sqrt{N}$. Based on a Z-value of -3.949 and a sample size of N = 20, the effect size was estimated to be 0.883. According to Cohen's criteria, this value falls into the "large" category. These results indicate that the use of Augmented Reality (AR) media not only produces a statistically significant difference but also has a tangible impact on improving students speaking skills. In addition to demonstrating the magnitude of the treatment's effect, this study also analyzed the extent of improvement in students' speaking skills using the N-Gain test. The results of the N-Gain analysis are presented in Table 8.

Table 8. N-Gain test result

	N	Minimum	Maximum	Mean	Std. Deviation
NGain	20	.46	.88	.6781	.14282
Valid N (listwise)	20				

Based on the N-Gain test results, an average value of 0.6781 was obtained, falling into the moderate category. These results indicate that the use of Augmented Reality (AR) media is capable of improving students' speaking skills at a moderate level. Research findings indicate that the use of Augmented Reality (AR) media positively influenced the improvement of speaking skills among fifth grade students at SD Negeri Majasem 2. Prior to the intervention, the students' speaking abilities were considered low. This was evident from pretest results showing that many students struggled with accurate pronunciation, appropriate intonation, varied vocabulary selection, fluency, and comprehension of the material. These findings were further supported by initial observations revealing that students tended to be passive and lacked confidence when speaking in front of the class additionally, instruction was dominated by textbooks and lecture based methods, thereby limiting opportunities

for students to practice. Improvements in pronunciation, intonation, vocabulary, fluency, and content comprehension demonstrate that speaking skills develop through repeated practice within communicative learning environments. Instruction that provides students with opportunities to express their opinions and interact actively has been shown to enhance the speaking abilities of elementary school students (Fawaid, 2024).

During the learning process that utilized Augmented Reality (AR) technology, the students demonstrated positive progress. Based on the learning activity reports, the students appeared more enthusiastic when observing 3D objects displayed through AR. In addition, they were also more active in discussing with their classmates, more willing to express their opinions, and more confident when presenting their observations in front of the class. These activities allow students to practice their oral communication skills in real-world learning situations. This finding aligns with a study (Rahayu et al., 2019), which shows that communication skills are not innate abilities but must be acquired and practiced through direct interaction so that individuals can build more effective communicative relationships. In this study, these opportunities were facilitated by the use of Augmented Reality (AR) media, which presented engaging 3D visualizations of various objects, thereby helping students understand procedural texts more concretely. A better understanding of the material allows students to convey information more easily, express their opinions, and explain their observations verbally. Thus, the use of Augmented Reality (AR) creates a learning environment that is more interactive, more communicative, and student centered.

The use of interactive learning media provides students with the opportunity to actively engage in the learning process. Through activities such as observing, discussing, and sharing their observations, students gain a more meaningful learning experience, allowing their speaking skills to develop gradually. This demonstrates that students' active engagement during the learning process is one of the factors that supports the improvement of speaking skills (Fitri et al., 2026). Documentation of students learning activities during the implementation of Augmented Reality (AR) media is presented in Figure 1.

Figure 1. Documentation of Learning Activities Using Augmented Reality (AR) Media

As shown in Figure 1, students actively participated in the learning process using Augmented Reality (AR) media through observing, discussing, and presenting

learning outcomes. This increase in learning activity aligns with the view (Rinaldi et al., 2024) that Augmented Reality (AR) technology can integrate virtual objects into the real environment, thereby creating a more interactive and engaging learning experience. Through 3D objects, students gain a more concrete learning experience, making it easier for them to understand the learning material in a more tangible way, which in turn motivates them to actively participate in learning activities.

The research results show an improvement in speaking skills following the use of Augmented Reality (AR) media. This improvement is clearly evident across all assessment indicators pronunciation, intonation, vocabulary, fluency, and content comprehension. These five indicators demonstrate that Indonesian language learning focuses not only on mastery of the subject matter but also on the development of students language skills. Indonesian language learning in elementary school encompasses four language skills listening, speaking, reading, and writing. These four skills are interrelated and need to be developed in an integrated manner through a learning process that provides opportunities for students to participate actively (Hastuti et al., 2024). As a result, students become more confident in conveying ideas, concepts, and information orally.

This study is based on the results of the Wilcoxon signed-rank test, with a p-value of 0.000, which indicates a significant difference in students' oral skills before and after the use of augmented reality media. In line with (Nurhikma., 2026) study, the results of the Wilcoxon test which showed a significant difference between pre-test and post-test scores indicate that learning that actively engages students has a positive impact on the development of speaking skills. Additionally, the N-Gain results, which fall into the "moderate" category, suggest that Augmented Reality (AR) media enables a fairly effective improvement in students' speaking skills. However, the N-Gain results classified as "moderate" indicate that the improvement in speaking skills has not yet reached the "high" category. This is likely due to the relatively short duration of the intervention conducted in a single session with a total duration of 2 × 25 minutes which limited students' opportunities to practice speaking using augmented reality media. Oral skills are abilities that develop through continuous practice and require sufficient time for students to improve their fluency, vocabulary mastery, and confidence when communicating. Therefore, if augmented reality media were used more intensively over several sessions, students' oral skills could potentially reach a higher category.

The results of this study are consistent with the findings of another study (Zahro et al., 2024), which showed that the use of Augmented Reality (AR) media can increase student activity and engagement during the learning process this increased participation provides students with many opportunities to interact, express their opinions, and communicate more actively about what they have learned. These results indicate that the characteristics of Augmented Reality (AR) which enable the presentation of realistic and interactive visualizations of objects can create a more engaging learning environment, thereby encouraging students to participate in learning activities with greater confidence. In this study, the increase in student engagement was evident in their enthusiasm while observing objects using Augmented Reality (AR), discussing with classmates, and verbally sharing their

observations during Indonesian language lessons. These activities provided students with opportunities to practice pronunciation, intonation, vocabulary selection, speaking fluency, and comprehension of the material more effectively. Therefore, the results of this study once again confirm that the interactive nature of Augmented Reality (AR) not only strengthens student engagement during the learning process but also contributes to the improvement of their oral skills.

The conclusions of this study are supported by the findings of a study (Khaira et al., 2025) showing that the use of Augmented Reality (AR) media has a positive impact on the creative thinking skills of elementary school students. Although the variables examined differ, these results indicate that Augmented Reality (AR) media can create a more interactive learning experience and increase student engagement during the learning process. According to (Hanni & Yulianto, 2025) in addition to increasing student engagement, the use of engaging instructional media also provides students with opportunities to develop oral skills through communication activities carried out throughout the learning process. Various studies indicate that the use of instructional media tailored to the characteristics of elementary school students can improve both their motivation to learn and their speaking skills. This conclusion aligns with the findings of this study, as the use of Augmented Reality (AR) media strengthens students' oral skills through activities such as observing 3D objects, participating in discussions, and presenting their observations orally.

The findings of this study are consistent with those of another study (Oktaviana et al., 2024) which showed that the use of Augmented Reality (AR) can improve students' oral skills through a more engaging, interactive, and contextual learning process. Research (Novi Maulidia et al., 2025) also indicates that Augmented Reality (AR) based media offers a learning experience that has the potential to increase student engagement in their learning process, which has a positive impact on their speaking skills. Furthermore, (Setyawan, 2019) explains that the use of Augmented Reality (AR) based learning media can boost learning motivation and create a more meaningful learning experience, as students can observe objects directly through 3D visualizations.

This study is also supported by (Jannah et al., 2025), who developed an Augmented Reality (AR) based storybook as a learning medium. That study showed that Augmented Reality (AR) can create a more engaging and interactive learning experience and was very well received by students. Although this study focuses on increasing interest in reading, the characteristics of Augmented Reality (AR) which enables the presentation of interactive visualizations also contribute to increasing student engagement during the learning process. This conclusion is consistent with the results of this study, in which the use of Augmented Reality (AR) provides students with the opportunity to observe objects more actively, express their opinions, and develop their oral skills during the learning process.

The use of instructional media that allows students to practice expressing their opinions orally offers a more meaningful learning experience compared to teacher centered instruction. In this study, Augmented Reality (AR) media enabled students to observe 3D objects, discuss them with classmates, and report their observations

orally. This series of activities helps students better understand the material while simultaneously developing their speaking skills through active language use. Therefore, interactive learning media is an effective alternative for improving elementary school students' speaking skills, as it creates a learning experience that is more engaging, participatory, and student centered (Pramono et al., 2023).

Based on the overall results of this study, it is clear that the use of technology based learning media in Indonesian language instruction is a form of innovation with the potential to improve the quality of the learning process. The use of digital media offers a learning experience that is more engaging, interactive, and in line with technological advancements in education. Therefore, the use of Augmented Reality (AR) media in this study represents a digital media alternative with the potential to support Indonesian language learning, particularly in improving the speaking skills of elementary school students (Nurhabibah et al., 2021).

4. Conclusion

Based on the results of this study, it can be concluded that the use of augmented reality (AR) has a positive impact on improving the speaking skills of fifth grade students at Majasem 2 Public Elementary School. The use of Augmented Reality (AR) enables a more interactive, engaging, and student centered learning process, thereby encouraging students to participate more actively in oral activities. Thanks to 3D visualizations, students can understand the material more concretely and have a more meaningful learning experience.

Improvements in speaking skills were clearly evident in terms of pronunciation, intonation, vocabulary, fluency, and comprehension. In addition, throughout the learning process, the students demonstrated greater enthusiasm, confidence, and courage in expressing their ideas and opinions orally. Thus, Augmented Reality (AR) can serve as an alternative medium in Indonesian language instruction to improve the speaking skills of elementary school students.

The results of this study indicate that the use of Augmented Reality (AR) can serve as an alternative learning medium for Indonesian language classes in elementary school, particularly in lessons aimed at developing students speaking skills. The use of Augmented Reality (AR) can help teachers create learning experiences that are more interactive, contextual, and student centered, thereby encouraging students to express themselves more actively, participate in discussions, and verbally share their observations. However, this study has several limitations, including a relatively small sample size, the use of a One-Group Pretest–Posttest Design without a control group, and the fact that the intervention was conducted in only one session. Therefore, it is recommended that future researchers expand the sample size, conduct studies over a longer period, and test the effectiveness of Augmented Reality (AR) media on other language competencies, such as listening comprehension, reading, or writing.

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