



INTEGRATION OF AUGMENTED REALITY (AR) TECHNOLOGY IN ENGLISH SPEAKING LEARNING

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ABSTRACT

This study investigates the effectiveness of Augmented Reality (AR) in improving students' English speaking skills. Employing a quasi-experimental design with a pre-test and post-test control group, the research involved 60 eleventh-grade students at SMA Negeri 3 Pagaralam, divided into experimental and control groups. The experimental group received speaking instruction integrated with AR, while the control group followed conventional methods. Data were collected through speaking tests, questionnaires, and observation sheets. The results show a significant improvement in the experimental group's speaking performance, with a mean gain of 9.52 points, compared to 3.9 points in the control group. The paired sample t-test confirmed a significant difference ($p < 0.05$) in the experimental group's pre- and post-test scores. Moreover, the independent t-test indicated a significant difference in post-test results between both groups. Questionnaire analysis revealed that students responded positively to AR-based learning, noting increased motivation, enjoyment, and confidence. These findings suggest that AR is an effective tool for enhancing speaking skills by providing interactive, contextual, and immersive learning experiences. The study recommends further exploration of AR in other language skills and diverse classroom contexts.

Keywords: *Augmented Reality, Speaking Skill, English Learning, Motivation, Technology in Education*

1. INTRODUCTION

Among the core skills in acquiring the English language, speaking is acknowledged as both vital and particularly difficult, notably in foreign language learning settings. It requires learners not only to master vocabulary and grammar but also to produce language fluently and appropriately in real-time interactions (Jaya et al., 2025b). According to Brown (2019), speaking is an interactive process of constructing meaning that involves producing, receiving, and processing information. However, in many EFL classrooms, speaking is often neglected due to the dominance of teacher-centered approaches and written assessments. This imbalance leads to a gap between students' receptive knowledge and their productive speaking ability

Many Indonesian EFL students find speaking activities intimidating due to a lack of

authentic communication opportunities and a learning environment that does not sufficiently foster oral proficiency. Conventional instructional approaches, including memorization techniques and grammar-based exercises, often emphasize linguistic accuracy more than communicative fluency, which in turn hinders learners' ability to engage in spontaneous spoken interactions (Richards & Schmidt, 2017; Ehsan et al., 2019; Madhavi et al., 2023). Furthermore, speaking anxiety is a common issue among students, caused by fear of making mistakes and being judged by peers. Horwitz et al. (2018) emphasized that foreign language anxiety can severely hinder speaking performance, even among students with adequate linguistic knowledge. These issues highlight the urgent need for innovative approaches that promote a more interactive, meaningful, and supportive speaking environment.

Technological advancements in education offer promising solutions, one of which is Augmented Reality (AR). AR combines virtual content with the real world, giving learners the opportunity to interact with digital objects as they appear in real-time situations. In language education, AR can create immersive and context-rich scenarios that resemble real-life communication, thus enhancing learners' motivation and engagement (Lubis & Wangid, 2019; Williyen et al., 2024). For instance, students can engage in simulated conversations with virtual characters or practice speaking in a variety of situational contexts, such as ordering food or navigating directions. This aligns with constructivist learning principles, where students actively construct knowledge through experiential learning and contextualized interactions (Bahufite et al., 2023).

Despite its growing application, empirical research on the impact of AR specifically on speaking skills remains limited, especially in the Indonesian secondary school setting. Most existing studies have focused on vocabulary learning, reading comprehension, or general motivation, leaving a research gap in the domain of productive oral language skills (Ditania, 2022; Yahya et al., 2019; Jaya et al., 2025a). Furthermore, while the motivational and cognitive benefits of AR have been acknowledged, few studies have examined students' perceptions toward AR-assisted speaking instruction, which is critical for determining the long-term viability of this technology in classrooms. Exploring both the effectiveness and the learner experience will provide a more holistic understanding of AR's role in language education.

Therefore, this study aims to investigate the effectiveness of Augmented Reality in improving students' speaking ability and to explore their perceptions of learning speaking

through AR-based instruction. The research is guided by the following questions: (1) Does the use of AR technology significantly enhance students' speaking skills? and (2) How do students perceive the use of AR in speaking instruction? The findings of this research are expected to contribute to the development of innovative, technology-based EFL pedagogies and offer practical implications for integrating immersive tools like AR into language classrooms.

Research Hypotheses:

H₀ : There is no significant difference in students' speaking ability before and after the use of Augmented Reality (AR).

H₁: The use of Augmented Reality (AR) significantly improves students' speaking ability.

2. LITERATURE REVIEW

2.1 *Speaking Skill*

Speaking is commonly described as the oral, real-time construction of meaning through sound. Bygate (2018) emphasises its auditory motor nature, defining it as the production of speech signals intended to generate verbal responses in a listener. McKay (2018) later refined this view, portraying speaking as "an interactive process of constructing meaning that involves producing, receiving and processing information". Beyond the mechanical act of articulation, speaking is embedded in social context. Brown (2019) argues that form and meaning are shaped by participants' shared background, goals and the physical setting, making speaking inherently situated and co-constructed. Consequently, successful instruction must link language forms to the authentic situations in which learners will use them.

For Indonesian EFL learners, the gap between classroom talk and real-world interaction is acute; students

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often succeed in receptive tasks yet hesitate to speak spontaneously. Goh and Anne (2018) note that explicit planning, rehearsal and reflection cycles are needed to help learners “notice the gap” between current performance and target competence and to transform declarative knowledge into procedural skill.

Researchers generally cluster the sub-skills of speaking into five overlapping components: fluency, accuracy, vocabulary, grammar and pronunciation. Nation and Newton (2020) propose that a balanced oral programme should cycle learners through meaning-focused input, meaning-focused output, language-focused study and fluency development each strand drawing on these components to different degrees.

Fluency and accuracy often operate in creative tension. The fluency strand encourages quick, message-oriented speech with familiar language, whereas the accuracy strand zooms in on precise grammar and lexis. Sherine et al. (2020) stress that fluency activities must be meaning-centred, draw on prior knowledge and use time pressure so that automaticity rather than explicit rule application drives production.

Pronunciation underpins intelligibility, while vocabulary and grammar provide the raw materials and ordering rules for expression. Together, the five components interact dynamically: a breakdown in one (e.g., limited vocabulary) may force slower processing and thus reduce fluency. Instruction therefore needs to integrate them rather than treat them as isolated hurdles.

The most frequently reported barrier is foreign-language anxiety. Horwitz et al. (2018) seminal work shows that fear of negative evaluation and communication apprehension significantly depress oral performance, even among otherwise capable learners. Structural constraints large classes, limited contact hours and assessment

regimes that prioritise written accuracy also curb opportunities for authentic talk. Hughes (2019) add that many teachers lack explicit models for designing task cycles that move students from controlled practice to free interaction, leading to an over-reliance on chorus drills or individual monologues.

Finally, resource scarcity (e.g., technology, quiet spaces, fluent interlocutors) means learners rarely receive immediate, contingent feedback. Addressing these challenges calls for pedagogical innovation—such as immersive technologies—that can scaffold practice, reduce anxiety through simulation and multiply exposure to meaningful interaction.

2.2 *Augmented Reality (AR)*

Xu (2024) foundational survey defines AR systems as those that (1) combine real and virtual content, (2) allow real-time interaction and (3) register both worlds in three-dimensional space. Lubis and Wangid (2019) extends this, framing AR as a subset of mixed reality that enhances face-to-face collaboration by overlaying digital information onto the shared physical workspace.

In educational discourse, Johnson and Johnson (2019) describe AR as a bridge between experiential and symbolic learning, enabling students to manipulate multimodal representations that would otherwise be abstract or invisible. This definition foregrounds AR’s pedagogical, rather than purely technical, affordances. Real-time interaction. Users can touch, rotate or verbally query virtual objects, and see instantaneous system responses essential for maintaining immersion and supporting conversational turn-taking in language tasks.

Three-dimensional visualisation. 3-D models allow learners to perceive spatial relations, body language or cultural artefacts from multiple angles, enriching pragmatic and paralinguistic

awareness. Spatial alignment (registration). Precise tracking ensures that virtual avatars or labels “stick” to their real-world referents. Accurate registration is vital for activities such as situational dialogues in a mapped classroom or cityscape, where positional cues support deictic language (“behind”, “next to”, etc.).

Early classroom trials showed that AR books and tabletop simulations increased motivation and conceptual understanding in science and social studies (Luckin & Holmes, 2016). In language education, commercial products such as Mondly AR let users practise dialogues with life-sized virtual interlocutors, combining speech recognition, visual prompts and immediate corrective feedback.

Google’s AR integrations e.g., Google Lens translation overlays illustrate how incidental language learning can occur as learners explore their surroundings and see real-time annotations. Content-authoring platforms like Zappar and its WebAR toolkits enable teachers to create custom interactive scenes, from vocabulary-labelled classrooms to narrative choose-your-own-adventure tasks, without needing specialist coding skills.

2.3 Technology-Enhanced Language Learning

Computer-Assisted Language Learning (CALL) emerged in the 1960s and is broadly defined as the exploration of computer applications to support language teaching and learning (Amin, 2023). Warschauer and Kern (2017) “integrative CALL” phase added multimedia and Internet connectivity, linking discrete-skill drills to communicative tasks.

Mobile-Assisted Language Learning (MALL) leverages portability; Kukulska-Hulme (2020) defines it as

learning “where device mobility offers specific advantages”, such as situated micro-practice and push-notification reminders. Darsih and Asikin (2020) argues that MALL shifts control of time, place and pace to the learner, fostering autonomy.

The latest wave incorporates AR and Virtual Reality (VR), which Pokrivcakova (2019) position as extending CALL/MALL by embedding learners in multimodal, context-rich environments that blur boundaries between classroom and community.

Mayer’s Cognitive Theory of Multimedia Learning posits that learners construct deeper understanding when words and images are integrated under conditions that manage cognitive load. AR, by superimposing visual scaffolds directly onto physical referents, operationalises Mayer’s spatial contiguity and modality principles in situated language tasks.

Dash (2022) highlight how digital media reshape contexts of expression, enabling multimodal, audience-aware communication and collaborative meaning-making. When learners record, annotate and share AR experiences, they engage in authentic discourse communities that extend beyond the classroom.

By merging CALL/MALL infrastructures with AR interfaces, teachers can orchestrate active, contextual learning cycles: pre-task vocabulary review on mobile apps, in-situ AR role-plays, and post-task reflection through multimedia journals. Such integration addresses the persistent gap between decontextualised practice and real-world speaking performance noted earlier.

3. METHODS

3.1 Research Approach

This study adopts a quantitative approach as it focuses on measuring the

objective effect of Augmented Reality (AR) on students' speaking ability and perceptions. The research utilizes a quasi-experimental method with a pre-test and post-test control group design, following the framework proposed by (Sugiyono, 2021). In this design, two groups an experimental group receiving AR-based instruction and a control group receiving conventional instruction are administered a pre-test before the treatment and a post-test after the intervention. This design allows the researcher to compare learning outcomes while controlling for external variables and identifying causal relationships between AR integration and speaking performance.

3.2 Population and Sample

The population of this study comprises all Grade XI students at SMA Negeri 3 Pagaralam during the 2025/2026 academic year. This group was selected as they have already acquired the foundational knowledge in English and are ready for technology-enhanced instruction. The sample consists of two purposively selected classes from Grade XI, with one class serving as the experimental group and the other as the control group, each containing 30 students (total n = 60). The purposive sampling technique was used to ensure equivalence in academic background between the two groups, based on prior English achievement. This approach increases the validity of the comparison between treatments and minimizes selection bias (Fraenkel et al., 2014).

3.3 Research Instrument

1) Speaking Test

The main instrument is a speaking performance test administered as both pre-test and post-test. The test tasks students to produce a guided monologue for approximately two minutes. Assessment follows a rubric based on

five core aspects: fluency, accuracy, vocabulary, grammar, and pronunciation, adapted from (Brown, 2019). Each performance is recorded and scored independently by two trained raters, with inter-rater reliability calculated using the Intraclass Correlation Coefficient (ICC).

2) Student Perception Questionnaire

A Likert-scale questionnaire was developed to measure students' perceptions of AR-based learning. It consists of 20 items with a 5-point scale ranging from "Strongly Disagree" to "Strongly Agree", covering domains such as motivation, engagement, usability, and perceived effectiveness (Dornyei & Taguchi, 2019). Construct validity is examined via exploratory factor analysis, and reliability is assessed using Cronbach's alpha.

3) Observation Checklist

An observation sheet was used to record students' engagement during learning activities, based on categories such as attention, persistence, verbal participation, and affective response. The instrument is adapted from Van Maanen (2025) engagement framework and is used to triangulate the findings from test scores and questionnaire results.

3.4 Data Collection Techniques

Data collection was conducted through three main methods:

1) Oral Tests (Speaking Performance):

The pre-test was conducted at the beginning of the instructional period (week 0), and the post-test was administered at the end (week 8). Students' speaking performances were recorded using high-quality smartphone audio, and the recordings were scored independently by two raters to ensure objectivity (Mackey & Gass, 2021).

2) Questionnaire Distribution: The perception questionnaires were

administered online via Google Forms or manually, depending on student access. The questionnaire was given after the post-test in week 8.

- 3) Classroom Observation: The researcher or assistant recorded students' behavioral engagement during all learning sessions (eight in total) using a structured checklist. Field notes were also taken to support the interpretation of quantitative results.

3.5 Data Analysis Techniques

- 1) Parametric Assumption Testing
Before analyzing treatment effects, data were tested for normality (using Shapiro-Wilk Test, appropriate for small samples) and homogeneity of variances (using Levene's Test) (Field, 2024).
- 2) Treatment Effect Analysis
 - A paired-sample t-test was used to compare pre- and post-test scores within each group (experimental and control).
 - An independent-sample t-test was conducted to compare the mean difference (gain scores) between the two groups.
 - Cohen's d was calculated to measure effect size, providing insight into the magnitude of the treatment effect (Lakens, 2018).
- 3) Perception Data Analysis
 - Descriptive statistics (mean, standard deviation, frequency, and percentages) were used to interpret students' responses.
 - Categories were interpreted as positive if the mean score ≥ 3.5 (Sugiyono, 2021).
 - A Pearson correlation analysis was conducted to explore the relationship between students' perceptions and their speaking performance gains.

4. RESULTS AND DISCUSSION

This chapter presents the research findings, including the analysis of students' pre-test and post-test speaking scores, as well as their perceptions of learning through Augmented Reality (AR) technology. The data were analyzed both descriptively and inferentially to determine the improvement in students' speaking performance and the significance of the treatment effect. The findings are then discussed in relation to relevant theories and previous research.

4.1 Descriptive Statistics

This section presents the descriptive statistical results of students' speaking scores from both the experimental and control groups, measured before and after the intervention. The purpose of this analysis is to compare the average performance of the two groups and observe any improvements in speaking ability that occurred during the study. The data include mean scores, gain scores, and initial indications of learning differences between groups prior to inferential testing.

- 1) Pre-test & Post-test

Table 1. The improvement of each learner from pre-test to post-test (Control group)

Student	Pre-test	Post-test	Gain
1	64.2	67.1	2.9
2	62.1	65.3	3.2
3	66.0	69.0	3.0
4	63.8	67.4	3.6
5	61.4	65.2	3.8
6	62.5	68.3	5.8
7	63.2	66.8	3.6
8	66.7	71.0	4.3
9	64.3	67.9	3.6
10	60.6	64.0	3.4
11	64.1	66.2	2.1
12	65.0	68.1	3.1
13	63.0	66.5	3.5
14	62.6	65.1	2.5
15	59.3	63.0	3.7

16	60.8	64.4	3.6
17	66.2	69.0	2.8
18	63.5	66.3	2.8
19	61.7	65.0	3.3
20	64.6	67.2	2.6
21	65.3	69.5	4.2
22	62.4	66.0	3.6
23	63.9	67.1	3.2
24	59.8	62.7	2.9
25	60.2	63.6	3.4
26	66.0	69.0	3.0
27	61.3	64.2	2.9
28	63.4	67.8	4.4
29	64.0	67.5	3.5
30	62.5	66.1	3.6
Mean	63.2	67.1	3.9

Table 1 shows the improvement of each student in the control group from pre-test to post-test. The average pre-test score was 63.2, and the average post-test score increased to 67.1, resulting in a mean gain of 3.9 points. Although there was a positive improvement in speaking performance, the increase was relatively modest, indicating that conventional learning methods led to limited progress compared to the experimental group.

Table 2. The improvement of each learner from pre-test to post-test (Experiment group)

Student	Pre-test	Post-test	Gain
1	69.0	76.6	7.6
2	63.9	81.3	17.4
3	70.2	80.1	9.9
4	77.2	83.0	5.8
5	63.1	76.4	13.3
6	63.1	68.2	5.1
7	77.6	88.5	10.9
8	71.1	73.3	2.2
9	61.2	65.9	4.7

10	69.3	80.1	10.8
11	61.3	74.2	13.0
12	61.3	72.0	10.7
13	66.9	76.5	9.6
14	49.7	58.5	8.8
15	51.2	55.3	4.1
16	60.5	67.6	7.1
17	56.9	65.1	8.2
18	67.5	81.7	14.2
19	57.7	69.1	11.4
20	53.7	56.6	2.9
21	76.7	88.0	11.3
22	63.2	71.7	8.5
23	65.5	72.8	7.3
24	53.6	66.0	12.4
25	60.6	74.8	14.2
26	65.9	79.6	13.7
27	55.8	62.4	6.6
28	68.0	76.8	8.8
29	60.2	71.5	11.3
30	62.7	76.6	13.9
Mean	63.5	73	9.5

Table 2 displays the speaking performance of students in the experimental group, assessed through both pre-test and post-test scores following instruction with Augmented Reality (AR) integration. The mean score prior to the intervention was 63.5, which rose to 73.0 after the treatment, reflecting an average improvement of 9.5 points. This notable gain underscores the beneficial influence of AR on learners' oral proficiency. In comparison to the control group, the experimental group demonstrated a substantially greater improvement, implying that AR-supported instruction fostered a more stimulating and effective context for enhancing speaking abilities.

2) Normality and Homogeneity Test

Table 3. Normality Test

One-Sample Kolmogorov-Smirnov Test

		Preexp	Postexp	Precont	Postcont
N		30	30	30	30
Normal Parameters ^{a,b}	Mean	63,4867	73,0067	63,1467	66,5433
	Std. Deviation	7,19577	8,43273	1,96271	2,02938
Most Extreme Differences	Absolute	,091	,096	,064	,075
	Positive	,083	,060	,051	,063
	Negative	-,091	-,096	-,064	-,075
Test Statistic		,091	,096	,064	,075
Asymp. Sig. (2-tailed)		,200 ^{c,d}	,200 ^{c,d}	,200 ^{c,d}	,200 ^{c,d}

a. Test distribution is Normal.
 b. Calculated from data.
 c. Lilliefors Significance Correction.
 d. This is a lower bound of the true significance.

The findings from the One-Sample Kolmogorov-Smirnov test reveal that the pre-test and post-test scores for both the experimental and control groups yielded significance values of 0.200 ($p > 0.05$). These results confirm that the data

conform to a normal distribution, thereby satisfying the assumption of normality. As a result, the use of parametric procedures namely, the paired-sample t-test and the independent-sample t-test is deemed statistically appropriate.

Table 4. Homogeneity Test

Test of Homogeneity of Variances				
Pretest Result	Levene Statistic	df1	df2	Sig.
	22,591	1	58	,158
Posttest Result	Levene Statistic	df1	df2	Sig.
	27,623	1	58	,274

Table 4 displays the outcomes of Levene’s Test assessing the equality of variances for both the pre-test and post-test scores across the experimental and control groups. The obtained significance values were 0.158 for the pre-test and 0.274 for the post-test, both exceeding the conventional threshold of 0.05. These findings suggest that the variance between the two groups is statistically

equivalent in each case. Consequently, the assumption of homogeneity of variance is satisfied, thereby validating the use of parametric statistical methods such as the independent-sample t-test for subsequent analysis.

3) Validity and Reliability

Table 5. Validity Data

Item Questions	Corelation	Description
Q1	0.637	Valid
Q2	0.449	Valid
Q3	0.522	Valid
Q4	0.662	Valid
Q5	0.642	Valid
Q6	0.852	Valid
Q7	0.392	Valid
Q8	0.643	Valid
Q9	0.395	Valid
Q10	0.483	Valid
Q11	0.362	Valid
Q12	0.542	Valid
Q13	0.593	Valid
Q14	0.382	Valid
Q15	0.485	Valid
Q16	0.392	Valid
Q17	0.466	Valid
Q18	0.362	Valid
Q19	0.579	Valid
Q20	0.481	Valid

The item–total correlation analysis shows that all 20 questionnaire items exceed the common validity threshold

of $r > 0.30$. Correlation coefficients range from 0.362 (Item 11 and Item 18) to 0.852 (Item 6), indicating that each

statement has a meaningful positive relationship with the overall scale score. Hence, every item is classified as valid, confirming that the instrument reliably measures the intended construct and can be retained for further analysis.

Table 6. Validity Data

Reliability Statistics	
Cronbach's Alpha	N of Items
,752	20

As reflected in Table 6, the reliability analysis produced a

Cronbach's Alpha coefficient of 0.752 for the 20-item questionnaire. This value surpasses the widely recognized minimum threshold of 0.70, signifying a satisfactory level of internal consistency among the items. Accordingly, the instrument can be regarded as a reliable measure for capturing students' perceptions within the context of this study.

4) Paired Sample and Independent T-Test

Table 7. Paired Sample T-Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pretest - Posttest	-9,520	3,722	,680	-10,910	-8,130	-14,010	29	,000

The analysis using the Paired Samples t-Test revealed a mean score increase of 9.520 between the pre-test and post-test results in the experimental group. The computed t-value was -14.010 with 29 degrees of freedom, and the associated p-value (Sig. 2-tailed) was 0.000, indicating a statistically significant enhancement in students' speaking abilities following the AR-based

intervention ($p < 0.05$). Moreover, the 95% confidence interval for the mean difference, ranging from -10.910 to -8.130, excludes zero, reinforcing that the observed effect is unlikely due to random variation. These findings suggest that the integration of Augmented Reality significantly contributed to the improvement of students' oral performance.

Table 8. Independent T-Test

		Independent Samples Test								
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper	
Result Posttest	Equal variances assumed	27,623	,000	4,082	58	,000	6,463	1,584	3,294	9,633
	Equal variances not assumed			4,082	32,348	,000	6,463	1,584	3,239	9,688

The findings from the independent samples t-test conducted on the post-test data reveal a statistically significant difference in speaking performance between the experimental and control groups. With a p-value of 0.000 ($p < 0.05$), the result confirms that the observed disparity in mean scores is unlikely to have occurred by chance. On average, students in the experimental group outperformed their counterparts by 6.463 points, with the 95% confidence interval for the mean difference ranging from 3.294 to 9.633. These results affirm that the implementation of Augmented Reality (AR) in instruction had a substantial and statistically significant effect on learners' speaking proficiency.

Moreover, the paired samples t-test for the experimental group yielded a significance level of 0.000, which is well below the accepted alpha threshold of 0.05. This outcome demonstrates a significant improvement in students' speaking abilities following the AR-based intervention. Consequently, the null hypothesis (H_0) is rejected in favor of the alternative hypothesis (H_1), confirming that AR technology meaningfully enhances oral language performance. Taken together, these statistical findings underscore the pedagogical potential of AR in fostering speaking skill development in EFL contexts.

Descriptive Analysis

Based on the analysis of the questionnaire results, the majority of students reported feeling more motivated, engaged, and confident when learning speaking skills through the use of Augmented Reality (AR). The interactive and immersive features of AR made the learning experience more enjoyable and realistic, helping students to better visualize context and practice speaking in simulated environments. This positive

perception indicates that AR not only enhances language performance but also fosters a more supportive and stimulating learning atmosphere, which can significantly influence students' attitudes and active participation in speaking activities.

Discussion

The findings of this study demonstrate that the use of Augmented Reality (AR) significantly enhances students' speaking ability, as reflected in the increased post-test scores and positive student perceptions. This result aligns with previous studies suggesting that AR offers context-rich, interactive learning environments that promote language acquisition (Ntumba et al., 2023). By providing real-time visual and auditory stimuli, AR helps reduce speaking anxiety and supports learners in constructing more meaningful communication.

Furthermore, the significant gain in the experimental group compared to the control group reinforces the idea that traditional methods may be less effective in fostering speaking fluency and confidence. According to Xu (2024), AR blends digital information with the real world, allowing learners to interact with virtual objects in real-time, which can simulate authentic communicative scenarios. This immersive experience helps students internalize vocabulary, grammar, and pronunciation more naturally.

In addition, the questionnaire results show that most students felt more motivated and confident during AR-based learning sessions. This is consistent with Williyen et al. (2024), who noted that AR applications in language education contribute to increased student engagement, motivation, and self-efficacy. The positive emotional response plays a crucial role in language learning, as affective factors like enjoyment and

confidence can enhance learners' willingness to communicate (Dornyei & Taguchi, 2019).

In conclusion, the integration of AR in English speaking instruction not only improves students' language proficiency but also enhances their emotional and psychological readiness to engage in communicative tasks. These results support the growing body of literature that advocates for the use of emerging technologies to enrich language learning experiences.

5. CONCLUSION

This study concludes that the use of Augmented Reality (AR) has a significant and positive impact on improving students' English speaking skills. The experimental group, which experienced AR-based learning, showed a substantial increase in post-test scores compared to the control group. Additionally, student responses from the questionnaire revealed that AR fostered greater motivation, confidence, and enthusiasm in learning. The interactive and immersive nature of AR created a more engaging and contextual environment, allowing learners to practice speaking more effectively and meaningfully.

Based on these findings, it is recommended that educators integrate AR technology into English language teaching, particularly in speaking lessons, to enhance learning outcomes. Future research could explore AR's long-term effects on language retention, its application in other language skills (such as listening or writing), or its impact across different educational levels. Furthermore, studies could investigate the combination of AR with other pedagogical models, such as Project-Based Learning or Communicative Language Teaching, to optimize student

engagement and language development in various classroom contexts.

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