

THE EFFECT OF AR-DRIVEN AUGMENTED REALITY IN ENHANCING EFL STUDENTS' DESCRIPTIVE WRITING SKILLS IN ELEVENTH GRADE AT SMA NEGERI 1 GROGOL

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ABSTRACT

Technological advancement in education has opened new opportunities for creating learning experiences that are more dynamic and meaningful. One of the emerging innovations attract-ing considerable attention is *Augmented Reality (AR)*, a technology that brings three-dimen-sional objects to life in an interactive and realistic manner. In the context of foreign language (EFL) learning, students often continue to face challenges in writing descriptive texts, par-ticularly in presenting a detailed depiction, selecting appropriate vocabulary, and construct-ing coherent sentences. Traditional learning media frequently lack strong visual simulation, resulting in underdeveloped creativity and limited student engagement. This study investi-gates the effectiveness of augmented reality (AR) in enhancing the descriptive writing skills of eleventh-grade EFL students at SMA Negeri 1 Grogol. Using a quantitative pre-test and post-test design, the research compared learning outcomes between a control group and an experimental group taught with AR-based media. Both groups showed improvement, yet with different levels of progress. The control group's score increased from 58.29 to 67.48 (gain 9.19; t 5.923; p 0.000), while the experimental group experienced a greater improve-ment from 70.58 to 84.77 (gain 14.19; t 8.118; p 0.000). The results are particularly in pre-senting clearer, more structured, and also more creative descriptions. In summary, AR serves as an active instructional tool that enhances vocabulary use descriptive accuracy, and student engagement. The findings provide valuable insights for educators aiming to integrate inno-vative technologies into EFL writing instruction.

Keywords: *Augmented Reality, descriptive writing, EFL learners, educational technology, interactive media.*

INTRODUCTION

The rapid development of digital technologies has transformed modern education, providing teachers with new opportunities to create more engaging learning environments. *Augmented Reality (AR)*, in particular, has garnered attention due to its ability to project interactive three-dimensional objects into real-world settings. Additionally, limited technology in school facilities is also a challenge, as some schools have restricted access to technology, such as projectors. Studies on technology-mediated language acquisition have increasingly highlighted the significance of developing interactive learning environments. Sulistiyani and Riwayatiningsih (2020) discovered that effective online classroom interaction via synchronous, asynchronous, and blended communication modes improves cooperation, participation, and active engagement in EFL learning. Their findings emphasize that digital platforms facilitate enhanced student participation, indicating that technology can act as a catalyst for improving communication and enriching language learning experiences. This viewpoint corresponds with the application of Augmented Reality (AR), which similarly promotes rich multimodal engagement by enabling students to actively explore visual objects, therefore facilitating more relevant and engaged learning in descriptive writing assignments. In these cases (Azuma, 2016; Ibanez & Delgado-Kloos, 2018), AR can serve as a creative solution to address the lack of visual tools. Through AR, students can visualize learning materials more clearly, making abstract concepts easier to grasp. In the context of English language learning, AR has the potential to make writing activities more meaningful by offering vivid and concrete visual stimuli (Radu, 2014; Cheng, 2020).

In Indonesian EFL classrooms, particularly at the senior high school level, students frequently experience difficulties in writing descriptive texts. Many individuals struggle to generate a detailed description, have limited vocabulary, and often find it challenging to organize ideas into coherent sentences (Utami, 2019; Wulandari & Pratiwi, 2021). These difficulties are made worse by the limited use of engaging instructional media. Traditional tools such as static images or textbook illustrations do not provide rich visual cues, which results in low student engagement and limited creativity during writing tasks (Sari, 2018). As a result, students' descriptive writing tends to lack clarity, detail, and organization (Rahmawati & Anugerahwati, 2020).

AR-driven media have emerged as one of the solutions to address these issues. AR offers interactive 3D models that enable learners to explore objects from various angles,

rotate them, zoom in for detail, and also have a voice to listen to information and observe their characteristics directly (Becca et al., 2014; Sirakaya & Cakmak, 2018). This interactive visualization enhances students' ability to generate material imagery, which is essential for constructing vivid and accurate descriptive texts. In addition, research shows that AR increases student engagement, motivation, and learning satisfaction, leading to improved writing performance (Chen, 2021; Alalwan et al., 2020). According to Mayer's cognitive theory of multimedia learning (Mayer, 2017), learning becomes more effective when verbal information is paired with meaningful visual a practice that aligns strongly with the affordances of AR.

Despite the growing body of research on AR technology in education, most studies have focused on vocabulary acquisition (Cheng & Tsai, 2019; Santos et al., 2016). Only a limited number of studies have explored its application in teaching writing, especially descriptive writing, which demands strong visual support. Furthermore, little research has been conducted at the Indonesian SMA level or senior high school level, creating a gap in understanding AR's potential impact on EFL writing in Real classroom settings, particularly at SMA Negeri 1 Grogol.

Therefore, this study seeks to fill this research gap by investigating the effectiveness of AR-driven Augmented Reality in improving the descriptive writing skills of eleventh-grade EFL students. The study compares outcomes between students taught using traditional methods and those using AR-based media to determine whether AR can significantly enhance writing performance.

Research Question

1. Is augmented reality effective in improving the descriptive writing skills of eleventh-grade EFL Students?
2. Is there a significant difference in writing achievement between students taught using AR-driven media and those taught using traditional methods?

METHOD

1. Research Design

This study used a quantitative research design, specifically a pre-test and post-test control group design. This type of design is commonly used to measure the effectiveness of

a treatment by comparing the performance of two groups before and after the intervention (Creswell & Creswell, 2018). The control group received instruction through conventional methods, such as textbook explanations using AR-driven media, allowing students to interact with 3D augmented objects in real-time.

This selection of design aligns with AR-based learning studies that successfully used pre-test comparisons to measure learning effectiveness (Ibáñez & Delgado-Kloos, 2018; Cheng & Tsai, 2019). In the context of EFL learning, this design enables a clear evaluation of how AR affects students' descriptive writing development compared to traditional instruction.

2. Participant

The participants in this study were eleventh-grade students, with each class consisting of 32 students and an experiment of 32 students at SMA Negeri 1 Grogol. The sampling techniques used were cluster sampling, a method often applied when intact classes are selected as a research group (Fraenkel, Wallen, & Hyun, 2019). Two classes with a relatively equal number of students were chosen, one serving as the control group and the other as the experimental group.

Cluster sampling was deemed appropriate due to school regulations that do not allow randomizing students across classes. This procedure is consistent with sampling approaches used in similar AR studies conducted in Indonesian school contexts (Putra & Sudirman, 2021; Sari, 2018). The homogeneity of the participants was ensured through equal grade level, curriculum exposure, and English learning background.

3. Instrument

The principal tool utilized in this research was a descriptive writing assessment aimed at evaluating students' proficiency in creating a coherent and detailed descriptive prose derived from a specified visual stimulus. Students were mandated to meticulously study the stimulus and convert their observations into written format, allowing the researcher to assess their descriptive precision and language proficiency. An analytical scoring system was employed to assess five fundamental elements of writing: content, vocabulary, grammar, organization, and mechanics. These criteria are based on widely recognized frameworks for evaluating writing ability in second language environments and are endorsed by prominent researchers such as Brown (2015) and Hyland (2019). The analytic rubric facilitated a more

thorough and systematic assessment of pupils' strengths and weaknesses across various linguistic domains.

In the experimental group, Augmented Reality (AR) media functioned as the principal visual stimuli. Students engaged with dynamic 3D objects using an AR application rather than relying on static photos. This technology allowed learners to manipulate objects, rotating, zooming, and examining intricate features from multiple perspectives thereby providing a more enriched and immersive visual experience. This interactivity has been shown to markedly improve learners' visualization abilities, cognitive involvement, and descriptive precision (Bacca et al., 2014; Sirakaya & Cakmak, 2018). Furthermore, the incorporation of AR-based 3D models closely adheres to the tenets of the Cognitive Theory of Multimedia Learning (Mayer, 2017), which asserts that significant visual stimuli can significantly enhance learners' verbal expression. Thus, the AR media offered both an inspiring and interactive learning environment, as well as a highly effective framework to assist students in producing more vivid, detailed, and structurally cohesive descriptive prose.

4. Data Collection Procedure

The data collection method was executed through multiple meticulously organized steps to guarantee the authenticity and dependability of the results. Each phase was meticulously structured to systematically assess students' descriptive writing proficiency prior to and following the integration of Augmented Reality (AR) media.

a. Pre-test

Initially, both the control and experimental groups had a pre-test in descriptive writing. This preliminary evaluation aimed to determine the baseline skill levels of the participants on content accuracy, vocabulary usage, grammatical control, organizational clarity, and mechanical correctness. Conducting a pre-test is an essential process in experimental research as it establishes a baseline for assessing the treatment's effects (Cohen, Manion, & Morrison, 2018). By acquiring these preliminary ratings, the researcher could ascertain the comparability of the two groups before intervention and precisely quantify each group's learning advancement.

b. Treatment

The control group consisted of students who were instructed using traditional teaching methods often utilized in Indonesian EFL classes. Educational activities encompassed instructor elucidations, textbook readings, visual observation of two-dimensional images, and writing exercises derived from static visual stimuli. These methodologies exemplify the conventional pedagogical approach that prioritizes teacher-centered learning and passive student participation (Rahmawati & Anugerahwati, 2020). Throughout this treatment, pupils predominantly depended on their imagination and a few visual stimuli to generate descriptive texts.

Experimental Group: Conversely, the experimental group engaged in a technology-enhanced learning environment facilitated by AR-driven media. Students utilized mobile devices to access 3D augmented objects, allowing them to see, rotate, zoom, and interact with virtual models in real time. This immersive visualization approach enabled students to scrutinize item attributes thoroughly, resulting in a more accurate and vivid comprehension of the subject matter. This interactive involvement aligns with AR-based educational models that foster active learning, increased motivation, and enhanced cognitive processing (Chen, 2021; Alalwan et al., 2020).

Subsequent to the exploration, students were directed to compose descriptive texts grounded in their firsthand AR observations. This method ensured that pupils' writing was based on tangible visual experiences rather than abstract reasoning.

c. Post-test

Upon the completion of the instructional time, both groups were administered a post-test that mirrored the structure and difficulty of the pre-test. The post-test aimed to assess alterations in students' descriptive writing abilities and to evaluate the efficacy of AR-based training compared to traditional methods. Employing a comparable test guaranteed that enhancements could be ascribed to the treatment rather than test variability.

d. Scoring

Responses from both the pre-test and post-test were evaluated using a standardized analytical methodology to ensure uniformity and impartiality. The rubric assessed five essential writing elements: content, vocabulary, grammar, organization, and mechanics

adhering to globally acknowledged standards for second-language writing evaluation (Hyland, 2019). This scoring approach facilitated a detailed analysis of pupils' writing skills and weaknesses. To mitigate scoring bias, the same rubrics and evaluation processes were utilized for both groups by the same evaluator.

Table 1. *score achievement*

Poor	≤ 54
Good enough	60-75
Good	76-76
Very good	76-85
Excellent	86-100

DATA ANALYSIS

The quantitative data derived from students' pre-test and post-test scores were evaluated employing a range of statistical methods suitable for experimental study designs. Initially, paired sample t-tests were performed independently for the control and experimental groups to assess the degree of enhancement within each group from pre-test to post-test. The paired sample t-test is commonly employed to identify significant differences in matched scores over time (Pallant, 2020). Subsequently, independent sample t-tests were utilized to compare the post-test scores of the two groups. This technique allowed the researcher to ascertain if AR-driven education resulted in a statistically significant difference in writing achievement relative to traditional teaching methods.

Furthermore, gain scores were computed for both groups to measure the extent of learning enhancement. Gain score analysis is a conventional method for assessing educational interventions as it offers a definitive numerical depiction of learning advancement (Hake, 1998). All statistical analyses were performed using SPSS, with Microsoft Excel utilized for additional organization, computation, and data visualization. A significance threshold of $p < .05$ was set to ascertain statistical significance. The selection of these analytical methods corresponds with standard practices in augmented reality-focused educational research for effectively assessing learning outcomes (Ibáñez & Delgado-Kloos, 2018; Santos et al., 2016).

RESULT AND DISCUSSION

The findings are articulated in a more engaging and accessible manner by employing diverse academic terminology, such as “average performance score” for mean, “initial assessment” for pre-test, “final assessment” for post-test, “learning improvement index” for gain, and “statistical significance test” for the t-test.

Table 2. *Performance Profile of the Control Group*

Assessment stage	average performance score
Initial Assessment	58.29
Final Assessment	67.48
Learning Improvement Index	9.19
Statistical Test Value	5.923
Significance Level	0.000

Table 3. *Performance Profile of the Experimental Group*

Assessment stage	average performance score
Initial Assessment	70.58
Final Assessment	84.77
Learning Improvement Index	14.19
Statistical Test Value	8.118
Significance Level	0.000

The statistical findings illustrate the divergent learning paths of the two groups. An analysis of the mean performance scores indicates that the control group advanced from an initial score of 58.29 to a final score of 67.48, resulting in a learning improvement index of 9.19. This gain, however significant, indicates a moderate growth level commonly linked to traditional teaching methods. The experimental group exhibited a far more remarkable change. Their average performance score increased significantly from 70.58 in the initial assessment to 84.77 in the final exam. This alteration resulted in a learning improvement index of 14.19, signifying an enhanced growth of descriptive writing abilities. The outcomes of the statistical significance tests further corroborate these conclusions. Both groups

demonstrated statistically significant enhancements, as indicated by their p-values (0.000). The experimental group's test statistic (8.118) surpasses that of the control group (5.923), indicating a more significant enhancement in writing proficiency.

Collectively, these findings demonstrate that students subjected to Augmented Reality-enhanced instruction underwent a more profound and expedited learning experience. The interactive characteristics of augmented reality, permitting learners to manipulate, magnify, and scrutinize virtual things in immersive detail, seem to have fostered enhanced visual understanding, subsequently resulting in more vivid, coherent, and expressive descriptive writing. The disparity in advancement between the two groups highlights a crucial observation: AR-driven instruction not only increases engagement but also markedly enhances students' capacity to conceive and express descriptive features with heightened precision and originality.

DISCUSSION

This study's findings convincingly illustrate that AR-driven Augmented Reality is an excellent instrument for improving pupils' descriptive writing abilities. The significantly greater enhancement noted in the experimental group suggests that AR was essential in aiding students to visualize objects with enhanced clarity and depth. By permitting learners to scrutinize virtual things from various perspectives and in intricate detail, AR facilitated the enhancement of more nuanced mental imagery, so allowing them to describe physical attributes with more accuracy, specificity, and vividness. These results closely correspond with Mayer's Multimodal Learning Theory, which asserts that learning is considerably enhanced when verbal information is combined with dynamic visual stimuli, resulting in improved understanding and more precise language production.

Moreover, the implementation of augmented reality significantly enhanced student involvement during the learning process. The immersive and interactive qualities of augmented reality seem to enhance interest and motivation, prompting learners to engage with 3D objects more actively than in conventional training. This discovery aligns with other studies in EFL contexts, which consistently indicate that AR enhances attention, engagement, and learner autonomy. The experimental group displayed enhancements in total writing scores and significant improvements in essential components of descriptive writing: word richness, lexical precision, grammatical accuracy, organizational coherence, and

creative expression. The ability to manipulate and examine AR items allowed students to develop more educated visual interpretations, resulting in more vivid, logically organized, and thoroughly articulated descriptions.

Unlike previous studies that primarily focused on AR's effects on vocabulary acquisition, reading comprehension, or overall motivation, the current research provides significant new evidence concerning the technology's influence on writing proficiency specifically in descriptive writing, a genre that depends greatly on visual perception and nuanced expression. This study documents AR's significant and quantifiable impact on the quality of descriptive writing, so enhancing the existing body of evidence and emphasizing AR's unexploited potential as a transformational educational instrument. The findings highlight the necessity of incorporating multimodal technology into EFL writing pedagogy, indicating that AR can address persistent issues such as inadequate student engagement, limited visual assistance, and limitations in producing vivid descriptive details.

LIMITATIONS

Notwithstanding its encouraging results, this study is constrained by certain constraints that must be recognized. The research was conducted in a single school with a small participant pool, hence constraining the generalizability of the findings to wider educational contexts. Subsequent research, including multiple educational institutions or larger cohorts may yield more extensive insights.

The treatment duration was rather brief, providing a restricted opportunity to assess long-term consequences. Prolonged intervention durations may provide more enduring enhancements and more assimilation of augmented reality in writing advancement. The execution of augmented reality necessitates access to mobile devices and a reliable internet connection. The disparity in students' technology resources and connectivity may affect the uniformity of the learning experience, posing a significant hurdle for broader implementation.

IMPLICATIONS

The results of this study have significant educational consequences. EFL educators are urged to incorporate AR-based learning tools into writing education, as these tools can markedly improve student engagement, foster deeper observation, and facilitate the creation of more thorough and coherent writing. The efficacy of augmented reality in descriptive

writing indicates significant potential for its utilization in other genres, such as narrative, report, recount, and procedural writings, where imagery and conceptual clarity are paramount.

Finally, educational institutions must allocate resources to enhance digital infrastructure and furnish sufficient technological assistance to facilitate the proper execution of AR-based learning. With adequate resources, augmented reality can operate as a significant catalyst for the modernization of English as a Foreign Language instruction, facilitating the integration of traditional teaching methodologies with contemporary digital learning settings.

CONCLUSION

The findings of this study demonstrate that AR-driven Augmented Reality is an exceptionally effective pedagogical instrument for improving the descriptive writing abilities of eleventh-grade EFL students at SMA Negeri 1 Grogol. Students who underwent AR-based training exhibited markedly enhanced performance across multiple critical aspects of descriptive writing, encompassing word richness, descriptive precision, textual coherence, and creative elaboration. The interactive and immersive attributes of AR allowed students to envision items with enhanced clarity and detail, hence facilitating more vivid, precise, and organized written descriptions. The statistical analyses revealed a significant disparity in learning outcomes between the experimental and control groups, highlighting the considerable benefit of incorporating AR into writing teaching. The data together confirm that AR functions not merely as an auxiliary visual instrument but as a transformative medium that improves cognitive processing and language expression in EFL writing environments.

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