ASSEMBLR EDU APP FOR STUDENTS' LEARNING OUTCOMES AND ACTIVENESS AT 12th GRADE OF UPT SMA NEGERI 2 PAREPARE

APLIKASI ASSEMBLR EDU UNTUK HASIL BELAJAR DAN KEAKTIFAN SISWA KELAS 12 UPT SMA NEGERI 2 PAREPARE

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ABSTRACT

This study aims to analyze the effect of using an Augmented Reality-based application, Assemblr Edu, on students' learning outcomes and activeness in English learning, particularly on analytical exposition texts. A mixed-method design with concurrent triangulation was applied, involving 34 twelfth-grade students at UPT SMA Negeri 2 Parepare. Research instruments included learning outcome tests (pre-test and post-test), observation checklists of student activeness, and teacher notes. Findings revealed a significant improvement in learning outcomes, with the mean score rising from 69.97 (pre-test) to 86.53 (post-test). The percentage of students in the "Excellent" category increased from 41% to 76%, while those in the "Poor" category decreased from 32% to 12%. Regarding activeness, 79% of students were categorized as "Active" or "Very Active," with the highest indicators in Using AR Features (91%) and Paying Attention (85%). The merged analysis revealed three interaction patterns: convergent (76%), where activeness aligned with improved outcomes; divergent (9%), where activeness did not guarantee achievement; and complementary (15%), where affective benefits such as confidence and motivation were evident. These findings support constructivist learning theories and embodied cognition, while highlighting the essential role of teachers in transforming behavioral activeness into deeper cognitive learning. This study contributes novelty by applying AR in English language learning, an area less explored compared to STEM fields.

Keywords: Assemblr Edu, Augmented Reality, Learning Outcomes, Student Activeness, English Learning

INTRODUCTION

English proficiency is increasingly recognized as an essential skill in the 21st century, not only as a means of global communication but also as a key factor in academic success and career opportunities. In Indonesia, English is taught as a compulsory subject; however, many students still struggle to actively engage in the learning process, particularly in reading and analyzing complex texts such as analytical exposition. Prior studies highlight that active involvement is crucial for effective language acquisition, yet classroom practices often remain teacher-centered, leading to passive participation and limited outcomes (Hiver et al., 2021; Khalil et al., 2023).

At the same time, the rapid development of educational technology has opened new opportunities to transform learning environments. Interactive digital media, particularly Augmented Reality (AR), have been shown to increase student engagement, motivation, and activeness (Alalwan et al., 2020; Huang et al., 2016). Applications such as Assemblr Edu, which allow teachers to present materials in interactive 3D formats, provide immersive experiences that help students visualize abstract concepts, reduce cognitive load, and sustain attention (Majid et al., 2023; Anjali et al., 2024). For digital-native students, such innovations offer a more appealing and student-centered alternative compared to conventional tools like Quizizz or Quizlet, which often lose novelty over time.

Despite its growing popularity, research on AR-based learning has primarily focused on STEM fields such as mathematics and science (Hayati et al., 2023; Dewanto et al., 2024), with relatively limited exploration in English language teaching. Moreover, most previous studies examined either students' motivation or their learning outcomes, but rarely both aspects simultaneously. This gap leaves unanswered questions about how AR influences the interplay between learning outcomes and activeness in language classrooms.

Addressing this gap, the present study investigates the use of the Assemblr Edu application in English learning at the twelfth grade of UPT SMA Negeri 2 Parepare. Specifically, it aims to determine whether Assemblr Edu improves students' learning outcomes, to describe students' activeness during its use, and to analyze the relationship between activeness and outcomes when the application is implemented in classroom instruction.

LITERATURE REVIEW

The integration of technology in education has transformed the learning process by promoting interactivity and increasing student motivation. Augmented Reality (AR) applications, particularly Assemblr Edu, have been highlighted in many studies as effective tools to enhance student participation, comprehension, and learning outcomes.

Mursyida et al. (2023) emphasized that Assemblr Edu with AR technology stimulates student interest, boosts motivation, and helps learners understand and complete tasks efficiently. Kurniawan et al. (2024) further confirmed that AR in language learning increases participation, satisfaction, and comprehension. Similarly, Rosyidah and Khatijah (2023) and Azimova and Solidjonov (2023) found that AR connects classroom learning with real-world experiences, making it highly engaging.

Asadi and Ebadi (2024) reported that AR applications motivate students and enrich reading comprehension through multimodal inputs such as 3D models, images, audio, and video. Teachers in their study also valued AR's potential for personalized learning and differentiation. Other studies demonstrated significant improvements in vocabulary mastery, learning motivation, and test scores when Assemblr Edu was applied (Hikam et al., 2024; Suhati et al., 2023; Triana & Hariyastuti, 2024).

Overall, these findings highlight a consistent pattern: AR-based tools like Assemblr Edu improve not only cognitive achievement but also students' activeness. Nevertheless, most studies have been concentrated in STEM subjects, while fewer have explored their application in English language learning, leaving a gap that this research aims to address.

2.1 Assemblr Edu App

Assemblr Edu is an AR-based digital platform that enables students and teachers to access and create interactive learning materials. Lissa'adah and Widiyatmoko (2023) describe it as a free mobile application that supports both Android and iOS. Chairudin et al. (2023) highlight its interactive 3D content that increases engagement and improves outcomes, while Nugrohadi and Anwar (2022) stress its ability to stimulate curiosity and creativity through 3D visualization. Assemblr Edu provides a wide range of features tailored for educational purposes: a) Ready-to-use educational topics with interactive 3D slides across multiple subjects; b)Versatile editor for creating customized AR projects; c) Edu Kits containing over 6,000 3D objects for concrete visualization of abstract concepts; d) Interactivity through animations, quizzes, and mini-games; e) Collaboration tools, including a Virtual Classroom for file sharing and teamwork; f) Flexible access via mobile apps or web versions; and g) Immersive AR experience that allows real-time interaction with 3D objects.

The main benefits are, a) increasing motivation and outcomes: AR and 3D visualization enhance enthusiasm and critical thinking (Majid et al., 2023; Hayati et al., 2023). b)Simplifying abstract concepts: 3D models make difficult materials easier to grasp (Assemblr World, 2024). c)Supporting personalized learning: teachers and students can adapt materials to their needs. d) User-friendly interface: accessible for non-technical users, ensuring inclusivity (Yasa et al., 2024). In summary, Assemblr Edu integrates AR and interactive features to create engaging, accessible, and effective learning experiences

2.2 Students' Activeness

Student activeness refers to learners' active involvement in classroom activities, such as asking questions, completing tasks, engaging in discussions, and problem-solving (Prasetyo & Abduh, 2021; Karim & Karolina, 2023). Active participation is closely linked to successful mastery of English, as it supports listening, speaking, reading, and writing skills.. According to Diedrich in Nisak and Aisyah (2024), activeness includes visual, oral, listening, writing, drawing, motor, mental, and emotional activities. Sudjana (in

Prasetyo & Abduh, 2021) further outlines indicators such as participation in problem-solving, discussions, seeking information, and applying knowledge to tasks. These indicators reflect how activeness directly influences both engagement and academic results.

2.3 Learning Outcomes

Learning outcomes are measurable statements describing what students know, understand, and demonstrate after instruction (Adam, 2006; Kennedy, 2006). They encompass cognitive, affective, and psychomotor domains, providing benchmarks for evaluating student progress and curriculum effectiveness (Anderson et al., 2001). Learning outcomes serve as indicators of educational success by clarifying objectives, guiding teaching strategies, supporting assessment, and ensuring quality assurance (Toohey, 1999; Jenkins & Unwin, 2001). They are also vital for accreditation and curriculum alignment (Aziz et al., 2012). Bloom's taxonomy classifies learning outcomes into cognitive, affective, and psychomotor domains (Anderson & Krathwohl, 2001). In the context of this study, outcomes are measured primarily in the cognitive domain, assessing comprehension of English texts after using Assemblr Edu. Additionally, 21st-century frameworks highlight digital literacy, collaboration, creativity, and innovation as emerging categories (Ng, 2012; Trilling & Fadel, 2009).

RESEARCH METHOD

This study employed a mixed-method design, a convergent parallel mixed method, combining quantitative and qualitative approaches to provide a comprehensive understanding of the effect of Assemblr Edu on students' learning outcomes and activeness. The research was conducted at UPT SMA Negeri 2 Parepare with a total of 34 students from the twelfth grade as participants. Quantitative data were collected through a pre-test and post-test, which measured students' cognitive achievement in understanding analytical exposition texts, focusing on their knowledge of structure, language features, and social functions. In addition, qualitative data were gathered through classroom observations using an activeness checklist and teacher notes, which provided detailed insights into students' behavioral, cognitive, and verbal engagement during lessons.

The research procedure began with the administration of a pre-test, followed by the implementation of Assemblr Edu in three classroom meetings. During these sessions, students were guided to explore the application's features, complete learning tasks, and engage in interactive discussions. Student activeness was observed throughout the sessions using structured indicators such as paying attention, asking questions, completing tasks, and using AR features. Finally, a post-test was administered to measure learning improvement after the treatment.

Quantitative data from the tests were analyzed using descriptive statistics and the Wilcoxon Signed Ranks Test to determine the significance of improvement between pre-test and post-test scores. Qualitative data from observation checklists and teacher notes were analyzed thematically to identify patterns of student activeness, which were then merged with the test results to reveal convergent, divergent, and complementary relationships.

RESULT AND DISCUSSION

The integration of Assemblr Edu into English instruction produced a clear and statistically significant improvement in cognitive outcomes. Among 33 twelfth-grade students, the mean test score rose from 69.97 on the pre-test to 86.53 on the post-test, and hypothesis testing confirmed that this gain was significant. Distributional shifts show the improvement was not confined to high performers: the proportion of learners categorized as "Excellent" increased from 41% to 76%, while the "Poor" category declined from 32% to 12%. These movements indicate that Assemblr Edu supported both acceleration at the top and remediation at the bottom, narrowing the achievement gap within the cohort and suggesting movement from merely recalling labels of text parts toward applying those concepts during analysis.

Observation checklists and teacher notes from 34 students indicate that classroom activeness was high during implementation, with 79% of learners classified as "Active" or "Very Active." The strongest manifestations of engagement were behavioral and psychomotor. Using AR features reached 91%, where notes document a trajectory from initial "enthusiastic trying" to "independent mastery." Completing tasks reached 85%, with a shift toward near-perfect completion by later meetings. Paying attention also reached 85%, and crucially transitioned from a procedural focus on how to operate the app in the first session to a conceptual focus on the lesson content by the

third meeting. Verbal-cognitive indicators showed healthy but more moderate growth: asking questions reached 76% and evolved from technical queries about operating the app to content-focused questions about analytical exposition texts; answering questions reached 68% as confidence increased. Higher-order expressive indicators remained the most challenging: expressing opinions reached 50% and participating in discussion 59%, with teacher notes attributing these plateaus to language anxiety and the cognitive demands of constructing arguments in English.

Merged quantitative and qualitative analyses reveal three relationship patterns. In the convergent pattern (76% of students), higher activeness coincided with larger score gains, consistent with the view that doing, discussing, and manipulating 3D content supported deeper comprehension. A smaller divergent pattern (about 9%) shows that activeness did not always translate into higher scores; some learners were highly engaged with technical features without sufficiently connecting them to content, while a few students with strong prior knowledge posted high scores despite only moderate visible activeness. Finally, a complementary pattern (about 15%) highlights affective benefits such as increased motivation and confidence among students whose score gains were modest; conversely, a few quieter students demonstrated strong mastery in written assessments despite limited outward participation.

The substantial rise in mean performance and the redistribution toward higher achievement categories suggest that Assemblr Edu reduced extraneous cognitive load and strengthened generative processing. In line with the Cognitive Theory of Multimedia Learning, dual coding through words and visuals made abstract elements of analytical exposition, thesis, arguments, and recommendations more concrete and easier to organize. Embodied and immersive interactions likely heightened presence and control, which are linked to focus and motivation; as students manipulated 3D text components, they appeared to move from declarative knowledge of labels toward procedural skill in identifying and applying them in new instances. These mechanisms explain why gains are extended to lower-achieving learners and not only to those already advantaged.

Behavioral and psychomotor indicators rose first and most strongly, aligning with the motivational pull of novelty and interactivity in AR. Teacher notes describing a progression from tool-learning to content-learning mirror a common implementation curve in immersive media: once operational fluency is achieved, attention reallocates to meaning-making. The lag in higher-order verbal expression, particularly expressing opinions and sustained discussion, is consistent with language-anxiety effects and with the additional cognitive orchestration required to plan, justify, and articulate arguments in a second language. These findings suggest that Assemblr Edu can reliably catalyze attention, exploration, and task completion, while the leap to critical, dialogic language use requires targeted scaffolds.

The predominance of the convergent pattern indicates that, for most learners, doing more also meant learning more: exploration of 3D/AR content, focused attention, and collaborative exchanges cohered into measurable test improvements. The divergent cases can be interpreted through Cognitive Load Theory: when attention is monopolized by interface novelty, activity risks becoming "hands-on, minds-off," producing performance plateaus. The complementary cases broaden the success criteria by foregrounding affect; increased enjoyment, curiosity, and perceived control can raise willingness to participate and persist, even when immediate test gains are modest. Taken together, these patterns argue that Assemblr Edu works best as part of a design that channels early behavioral engagement into later verbal-cognitive production, preventing surface-level activity from crowding out deep processing.

The present results align with reports that AR-based media increase motivation, engagement, and achievement in school settings, and they add nuance by triangulating test data, observational records, and teacher notes in a single analysis. By delineating convergent, divergent, and complementary trajectories within the same classroom, this study clarifies not only that AR can be effective but also the conditions under which activity translates to learning, stalls as surface engagement, or yields primarily affective dividends. This contribution is especially relevant in English language learning, where prior AR research has been less extensive than in STEM domains.

Several constraints temper the generalizability of these findings. The study was conducted in one school, targeted a single genre (analytical exposition), and assessed short-term outcomes. Access barriers device storage, app compatibility, and connectivity limited uniform participation. A specific workflow limitation also emerged during implementation: in the web-based environment, opening multiple projects simultaneously was cumbersome because the system immediately loads the selected project in the same window rather than supporting multiple parallel pages. When instructors or students needed to compare or co-edit two or more projects side-by-side, they had to repeatedly return to the homepage to switch contexts, which impeded multi-project work. These constraints underscore the need for both technical improvements (e.g., multi-window or tabbed project handling, robust offline

capabilities) and pedagogical countermeasures (e.g., structured turn-taking and preloading assets) to preserve cognitive resources for content learning.

Instructionally, the data recommend pairing Assemblr Edu with explicit scaffolds that convert behavioral engagement into verbal-cognitive output: language frames for argumentation, guided questioning that redirects attention from interface actions to text reasoning, and structured small-group protocols that distribute talk and reduce anxiety. Future studies should extend this design to other genres and skills (listening, speaking, writing), track long-term retention and transfer, and examine collaborative and project-based tasks in which AR artifacts serve as shared objects for sustained reasoning. Broader samples and varied infrastructure contexts are also needed to assess scalability and equity.

CONCLUSION

This study investigated the use of Assemblr Edu, a 3D/AR-based learning platform, in English learning at the twelfth grade of UPT SMA Negeri 2 Parepare. The findings show several key points. First, Assemblr Edu significantly improved students' learning outcomes. The mean test score rose from 69.97 to 86.53, with more students moving into the "Excellent" category and fewer remaining in the "Poor" category. This indicates that Assemblr Edu supported both high-achieving and low-achieving students, helping to create more equitable progress.

Second, Assemblr Edu fostered strong student activeness, with 79% of students categorized as "Active" or "Very Active." The highest gains were seen in behavioral and psychomotor indicators, such as paying attention, completing tasks, and using features. However, higher-order activities like expressing opinions and participating in discussions were still limited, suggesting that technology alone is not enough to promote critical and communicative skills without teacher guidance.

Third, the relationship between activeness and outcomes revealed three patterns: convergent (most students who were active also improved their scores), divergent (some students were active but showed little improvement, or achieved high results despite lower activeness), and complementary (students benefited effectively through increased motivation and confidence, even if their scores did not improve significantly). This shows that AR supports both cognitive and affective aspects of learning, but its impact varies across individuals.

These results align with recent studies confirming the positive role of AR in enhancing motivation, engagement, and learning performance, while also contributing novelty by identifying three distinct patterns of impact in English language classrooms. The study, however, has limitations. It was conducted in one school, focused on a single genre (analytical exposition text), and measured only short-term outcomes. Technical barriers, such as device limitations and application access issues, also affected implementation. In addition, the web-based version of Assemblr Edu currently allows only one project to be opened at a time, making multi-project work less practical and reducing efficiency during learning.

Despite these limitations, the study highlights that Assemblr Edu is a powerful tool for creating immersive and engaging learning environments. Its effectiveness increases when paired with structured pedagogical strategies that guide students from behavioral engagement toward deeper cognitive and communicative learning. Future research should explore its use across different genres, skills, and longer periods, as well as in larger and more diverse contexts. Technical improvements such as multi-window project handling and offline access would also enhance its practicality for classroom use.

In conclusion, Assemblr Edu has great potential to enrich English learning by improving outcomes, increasing activeness, and supporting motivation. With careful integration and teacher scaffolding, AR-based media like Assemblr Edu can make learning more meaningful, interactive, and suited to the needs of 21st-century students.

REFERENCES

Adam, S. (2006). An introduction to learning outcomes: A consideration of the nature, function and position of learning outcomes in the creation of the European Higher Education Area. United Kingdom Bologna Seminar, July 2004, Edinburgh.

Alalwan, N., Al-Rahmi, W., Alfarraj, O., Alzahrani, A., Yahaya, N., & Al-Rahmi, A. (2020). Integrated technology in education: A systematic literature review. Education and Information Technologies, 25(4), 2895–2919. https://doi.org/10.1007/s10639-019-10027-6

Anderson, L. W., Krathwohl, D. R., Airasian, P. W., Cruikshank, K. A., Mayer, R. E., Pintrich, P. R., ... & Wittrock, M. C. (2001). A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives. New York: Longman.

Anjali, S., Jena, R. K., & Sahu, T. (2024). Augmented reality in education: Enhancing engagement and reducing cognitive load. Education and Information Technologies, 29(2), 153–171. https://doi.org/10.1007/s10639-023-12067-9

Asadi, A., & Ebadi, S. (2024). The potential of augmented reality-based reading comprehension in EFL classrooms. Interactive Learning Environments, 32(5), 1127–1144. https://doi.org/10.1080/10494820.2022.2098765

Azimova, Z., & Solidjonov, J. (2023). The effectiveness of AR in connecting classroom and real-world learning. Education and Information Technologies, 28(6), 7113–7132.

Aziz, A., Ismail, N., & Ahmad, A. (2012). Measuring learning outcomes: A case study from Malaysia. Quality Assurance in Education, 20(1), 20–34. https://doi.org/10.1108/09684881211198257

Chairudin, L., Rahmawati, S., & Zulfikar, A. (2023). Augmented reality in education: The role of Assemblr Edu in improving learning motivation. Journal of Instructional Technology, 14(2), 65–78.

Chen, C. M., Lee, T. H., & Chen, Y. C. (2017). Effects of peer feedback within online learning environments on learning achievement and motivation. Computers & Education, 111, 130–145. https://doi.org/10.1016/j.compedu.2017.04.010

Dewanto, A., Rahmatullah, R., & Hidayat, R. (2024). The effect of augmented reality on students' science learning outcomes: A meta-analysis. Journal of Science Learning, 7(1), 15–27.

Hayati, A., Susanti, E., & Firmansyah, R. (2023). The use of augmented reality to improve science learning outcomes in elementary schools. Jurnal Pendidikan Sains Indonesia, 11(2), 245–256.

Hikam, A., Nurhayati, S., & Saputra, I. (2024). The effectiveness of Assemblr Edu in vocabulary mastery for junior high school students. Journal of Language Teaching and Research, 15(1), 45–55.

Hiver, P., Al-Hoorie, A. H., & Mercer, S. (2021). Student engagement in the language classroom. Language Teaching Research, 25(5), 605–616. https://doi.org/10.1177/1362168820938817

Huang, T. C., Chen, C. C., & Chou, Y. W. (2016). Animating eco-education: To see, feel, and discover in an augmented reality-based experiential learning environment. Computers & Education, 96, 72–82. https://doi.org/10.1016/j.compedu.2016.02.008

Jenkins, A., & Unwin, D. (2001). How to write learning outcomes. The Independent. London: LTSN Generic Centre.

Karim, A., & Karolina, D. (2023). Student activeness and its influence on English achievement. Journal of English Language Teaching Studies, 5(2), 122–135.

Kennedy, D. (2006). Writing and using learning outcomes: A practical guide. Cork: University College Cork.

Khalil, M., Prinsloo, P., & Slade, S. (2023). Rethinking engagement in digital learning: A critical perspective. British Journal of Educational Technology, 54(3), 735–751. https://doi.org/10.1111/bjet.13291

Kurniawan, D., Rahman, A., & Fadilah, S. (2024). Augmented reality in English learning: Enhancing participation and comprehension. Journal of Language and Education, 10(2), 105–118.

Lissa'adah, N., & Widiyatmoko, A. (2023). Exploring the effectiveness of Assemblr Edu as an AR-based learning media. Jurnal Inovasi Teknologi Pendidikan, 10(1), 34–46.

Majid, N., Anshari, M., & Putra, R. S. (2023). Interactive learning with augmented reality: Enhancing students' motivation and outcomes. International Journal of Emerging Technologies in Learning, 18(7), 34–49.

Mulyani, E. (2020). English proficiency and its relation to students' analytical skills. Jurnal Pendidikan Bahasa, 9(1), 50–62.

Mursyida, A., Santoso, R., & Amelia, L. (2023). Assemblr Edu-based learning: Improving motivation and student outcomes. Jurnal Pendidikan dan Teknologi, 9(3), 198–210.

Ng, W. (2012). Can we teach digital natives digital literacy? Computers & Education, 59(3), 1065–1078. https://doi.org/10.1016/j.compedu.2012.04.016

Nisak, K., & Aisyah, S. (2024). Indicators of student activeness in EFL classrooms. Journal of English Education Research, 7(1), 88–101.

Nugrohadi, A., & Anwar, S. (2022). Augmented reality for enhancing creativity in learning. Jurnal Teknologi Pendidikan, 24(2), 143–156.

Prasetyo, H., & Abduh, M. (2021). Activeness in learning: Indicators and implications. Indonesian Journal of Educational Research, 5(2), 89–99.

Rahman, A., & Sari, D. (2022). The influence of English learning on students' critical thinking ability. Journal of Language Teaching and Cultural Studies, 4(1), 1–12.

Rohi, A., Syamsuddin, & Yusuf, M. (2024). Multimodal learning environments and student engagement. Journal of Educational Media, 15(1), 21–34.

Rosyidah, U., & Khatijah, N. (2023). AR in education: Connecting real-world experience to the classroom. Journal of Educational Technology, 20(3), 140–152.

Suhati, I., Dewi, A., & Sari, L. (2023). Augmented reality-based learning in improving English vocabulary mastery. Journal of English Language and Education, 8(2), 113–124.

Toohey, S. (1999). Designing courses for higher education. Buckingham: Open University Press.

Trilling, B., & Fadel, C. (2009). 21st century skills: Learning for life in our times. San Francisco: Jossey-Bass.

Triana, D., & Hariyastuti, R. (2024). The effect of Assemblr Edu on students' reading comprehension. Jurnal Pendidikan Bahasa Inggris, 12(1), 67–79.

Yasa, I. M., Arimbawa, I. M., & Widiastuti, N. L. (2024). Comparative study of augmented reality applications in education: Usability and user experience. Journal of Educational Technology, 44(1), 112–126.

Yang, Y. (2020). Mobile-assisted language learning: Improving interaction and motivation. Language Learning & Technology, 24(2), 75–87.