Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6, 8411-8420
2024
Publisher: Learning Gate
DOI: 10.55214/25768484.v8i6.3812

Integration of augmented reality technology to enhance English speaking skills for tourism industry employees in Sumbawa regency

Umar[1*], Yuliadi[2], Muhammad Hidayatullah[3]
[1]English Language and Culture Study Program, Faculty of Psychology, and Humaniora, Sumbawa University of Technology, West Nusa Tenggara, Indonesia; umar@uts.ac.id (U.).
[2]Computer Science Study Program, Faculty System of Engineering, Sumbawa University of Technology, West Nusa Tenggara, Indonesia; yuliadi@uts.ac.id (Y.).
[3]Electrical Engineering Program Study, Faculty System of Engineering, Sumbawa University of Technology, West Nusa Tenggara, Indonesia; muhammad.hidayatullah@uts.ac.id (M.H.).

Abstract: The integration of Augmented Reality (AR) technology into language learning has gained attention due to its potential to enhance speaking skills in practical contexts like the tourism industry. This study examines the long-term effectiveness of AR in improving English speaking skills fluency, accuracy, pronunciation, and grammar among tourism employees in Sumbawa Regency. The researchers developed VirtuoBot, an AR-based learning platform designed to simulate real-world interactions through interactive dialogues. A mixed-methods approach was used to assess the impact of AR-based language training on speaking proficiency. 90 participants from four major tourist sites took part in pre-and post-tests, supplemented by qualitative interviews. Results showed significant improvements in fluency, accuracy, pronunciation, and grammar after the AR intervention. Challenges like limited access to AR technology and workforce readiness were also noted. This study suggests that AR, through VirtuoBot, is a promising tool for enhancing English speaking skills in tourism, contributing to better service quality. Further research is recommended to address accessibility challenges and optimize AR training methods, ensuring sustainable implementation and broader adoption in tourism sectors of developing regions like Sumbawa.

Keywords: *Augmented reality, English speaking, Language learning, Tourism industry.*

1. Introduction

The tourism industry plays a crucial role in the economic development of many regions worldwide (Lee et al., 2024). In Sumbawa Regency, a region rich in cultural and natural attractions, the tourism sector is a significant contributor to the local economy (Hynes et al., 2024). However, to fully capitalize on the tourism potential, effective speaking skills, particularly in English, are essential for employees in the industry (Saptiany & Putriningsih, 2023). This need stems from the growing number of international tourists who visit the area, necessitating a workforce proficient in English to provide better service and enhance the overall tourist experience.

Despite the importance of English proficiency, many tourism industry employees in Sumbawa Regency face challenges in acquiring and practicing their language skills. Traditional language learning methods often do not provide the immersive and interactive experience necessary for practical language acquisition (Song et al., 2024; Yudintseva, 2024). Consequently, there is a gap between the employees' current English proficiency levels and the required competency to meet the demands of international tourists effectively.

Augmented Reality (AR) technology offers a promising solution to bridge this gap. AR provides an immersive learning environment that can simulate real-life scenarios, allowing employees to practice their English skills in a more engaging and practical manner (Azimova & Solidjonov, 2023). The interactive nature of AR can make language learning more effective by providing instant feedback,

* Correspondence: umar@uts.ac.id

context-rich scenarios, and the ability to visualize complex concepts. This can lead to improved retention and application of language skills in real-world situations.

Several studies have highlighted the benefits of AR in educational settings (Radu & Schneider, 2023; Zuo et al., 2023). AR has been shown to enhance motivation, engagement, and learning outcomes among students (Prasetya et al., 2024). Its application in language learning has demonstrated significant potential in improving vocabulary, pronunciation, and conversational skills. By integrating AR into the training programs for tourism industry employees in Sumbawa Regency, it is possible to create a more effective and enjoyable learning experience that can lead to better English-speaking skills.

The adoption of AR technology in language learning is still in its nascent stages, especially in developing regions like Sumbawa Regency. However, the increasing accessibility of AR tools and the growing body of research supporting their efficacy make this an opportune time to explore their potential (Özçelik et al., 2022). Implementing AR-based language training can not only address the current skill gaps but also position Sumbawa Regency as a forward-thinking region in terms of tourism service quality (Giraldo et al., 2024).

Moreover, improving English speaking skills among tourism employees can have broader socio-economic benefits (Ijabah & Amrullah, 2023). Enhanced speaking can lead to better customer satisfaction, increased tourist spending, and repeat visits. It can also open new employment opportunities for local residents, contributing to overall economic growth and development in the region.

To ensure the success of such an initiative, it is essential to develop a comprehensive AR-based language training program tailored to the specific needs of the tourism industry in Sumbawa Regency. This includes identifying the key language competencies required, designing interactive AR scenarios that reflect common tourist interactions, and providing ongoing support and assessment to monitor progress and effectiveness. Such efforts are expected to significantly enhance English speaking skills, particularly in terms of fluency, accuracy, pronunciation, and grammar, among tourism industry workers in Sumbawa Regency.

Given these concepts and issues, this study focuses on the research questions such as 1) how can AR technology enhance the English-speaking skills of tourism employees in Sumbawa? 2) what challenges are associated with the implementation of AR technology in language training within the tourism sector in Sumbawa?

2. Literature Review

2.1. The Importance of English-Speaking Skills and the Challenges in Learning Them in the Tourism Industry

English speaking skills play a crucial role in the tourism industry (Rao, 2019), particularly in regions that serve as international tourist destinations, such as Sumbawa Regency. As an area rich in cultural and natural attractions, the tourism sector in Sumbawa is one of the main pillars of the local economy. However, despite the great potential to attract international tourists, speaking skills in English pose a significant challenge for many workers in this sector. English is considered a vital tool for providing better service, enhancing the tourist experience, and ultimately improving customer satisfaction and regional revenue (Sermsook et al., 2021).

Despite the pressing need for English proficiency, many workers in the tourism sector in Sumbawa face various challenges in developing their English language skills. Traditional learning methods, such as conventional language classes, often fail to provide an immersive or contextual experience that matches the practical needs of tourism workers (Vu et al., 2021). These methods tend to focus on theory and memorization, which do not offer direct practice in real-life situations frequently encountered by workers. Other challenges include limited free time, lack of access to quality learning materials, and the irrelevance of the learning content to the actual work environment in the tourism industry.

These challenges create a gap between the current level of English proficiency and the competence required to meet the demands of international tourists effectively. If left unaddressed, this gap can hinder the growth of the tourism sector, negatively impact the tourist experience, and limit opportunities for local economic development.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6: 8411-8420, 2024
DOI: 10.55214/25768484.v8i6.3812

2.2. The Role of Augmented Reality in Enhancing English Language Learning in the Tourism Industry

Augmented Reality (AR) has emerged as an innovative solution to address the challenges of language learning, particularly in contexts that necessitate practical and immersive experiences (Majid & Salam, 2021). AR technology enables employees to engage in simulated environments that replicate real-world scenarios, such as interacting with tourists, providing destination information, or resolving routine speaking issues (Bretos et al., 2024). By utilizing AR, learners can practice speaking skills in contexts that are directly relevant, thereby facilitating deeper comprehension and enhancing language retention (Huang et al., 2021a).

Research has consistently demonstrated that AR technology significantly enhances engagement, motivation, and learning outcomes, particularly in vocational education settings. In the domain of language learning, AR offers context-rich scenarios that allow tourism workers to practice the use of vocabulary, pronunciation, and speaking skills in real time (Wenfei et al., 2023). For instance, simulated interactions with international tourists provide learners with experiences that closely mirror real-world situations, yet within a controlled and safe environment that encourages experimentation and provides instant feedback (Chun et al., 2022). Moreover, AR can be employed to visualize complex linguistic concepts, such as idiomatic expressions or specialized terminology frequently encountered in the tourism industry.

The integration of AR into language training for tourism employees in Sumbawa holds the potential to bridge existing language proficiency gaps, while simultaneously serving as an effective strategy to improve the overall quality of service provided to tourists. The application of AR in language instruction also offers trainers the opportunity to design more tailored training programs, utilizing interactive scenarios that reflect the real-world interactions that employees in this sector are likely to encounter (Perry, 2015). This approach may result in more relevant and effective learning experiences compared to traditional language learning methods.

Given the increasing accessibility of AR technology and the growing body of empirical evidence supporting its efficacy, the present moment offers an opportune time to explore AR's potential in overcoming the limitations of language learning, particularly in regions such as Sumbawa. With proper implementation, AR-based training programs can provide a sustainable solution to improving English speaking skills, thereby positively impacting regional economic development and enhancing the competitiveness of tourism destinations.

3. Material and Method

3.1. Materials

VirtuoBot (see Figure 1) is an innovative mobile Augmented Reality (AR) learning platform specifically designed to enhance English language skills through immersive dialog-based interactions, particularly for tourism employees in Sumbawa. Developed meticulously by researchers, the platform is tailored for deployment across four strategically selected tourist sites in Sumbawa, with scenarios adapted to the unique needs and local context of each destination, as well as the characteristics of the tourists visiting these locations.

This platform is purposefully designed and constructed to assist users in improving four key English language competencies: fluency, accuracy, pronunciation, and grammar. Users engage in spontaneous dialogues to enhance fluency, receive immediate feedback to correct errors in language use, and are trained to grasp correct pronunciation in everyday conversations. Additionally, a feature allowing for translation of dialogues between English and Indonesian is provided to reinforce users' comprehension.

Users begin by registering, selecting their area of study, and engaging in interactive dialogues that simulate real-world interactions. These scenarios include providing detailed information about tourist attractions, answering visitor inquiries, and managing routine speaking challenges with greater confidence and efficiency. Throughout each session, users are challenged to respond to dialogues, with feedback provided in the form of scores, repetitions, and time spent. The more frequently users practice, the more points they accumulate, encouraging continuous learning and improvement.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6: 8411-8420, 2024
DOI: 10.55214/25768484.v8i6.3812

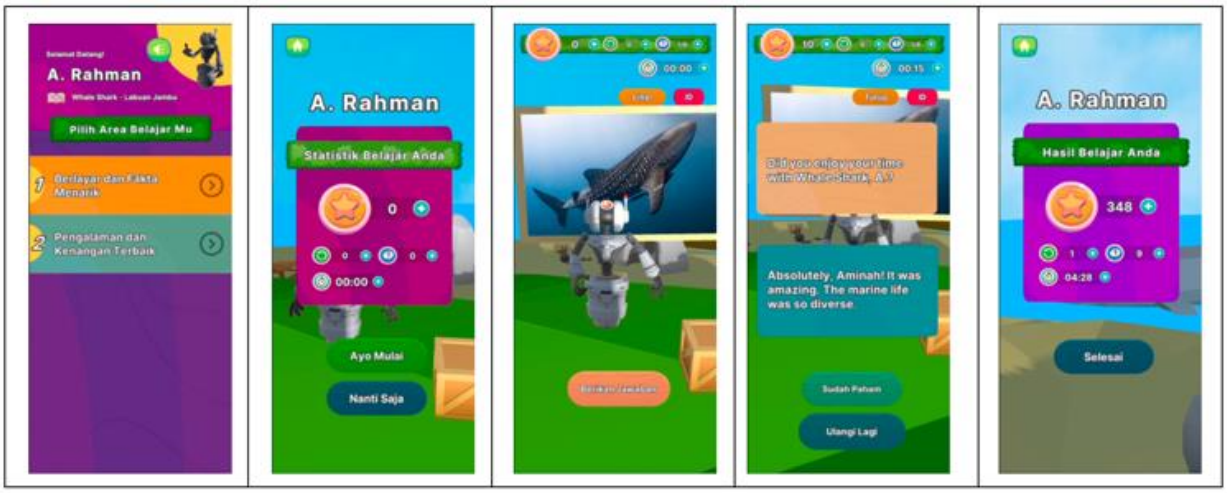

Figure 1.
User interface display of virtuobot for interactive learning.

3.2. Methods

3.2.1. Overview

This study will employ a mixed-method approach, specifically the "Exploratory Sequential Design." In the initial phase, in-depth interviews will be conducted using a qualitative method to gain insights into students' perceptions of the use of augmented reality platforms in enhancing their English language proficiency. The findings from this qualitative data will serve as the basis for developing quantitative questions that will be investigated in the subsequent phase. In the next phase, a quantitative method will be utilized, applying descriptive statistics to assess the extent to which the augmented reality platform improves English speaking skills. Both qualitative and quantitative data will be analyzed together in this mixed-method approach, integrating the in-depth interviews with descriptive statistical results (Nath et al., 2019). The data collection tools will include structured questionnaire sheets and speaking test forms. Through this approach, the study will combine qualitative exploration and quantitative analysis to provide a more comprehensive understanding of the impact of augmented reality platforms on students' English language skills.

3.2.2. Participants

This study reports findings from a mixed-methods approach, combining quantitative and qualitative data, to explore the use of Augmented Reality (AR) technology in enhancing English speaking skills among tourism workers in Sumbawa. The primary data consists of pre-test and post-test results from 90 tourism workers across four major tourist sites in Sumbawa: Whale Shark (Labuan Jambu), Kencana Beach Cottages, Sarcophagus (Batu Tering), and Mata Jitu (Moyo Island). Participants' ages ranged from 20 to 40 years, with a minimum of two years of experience working in the tourism industry. Their English proficiency levels before the AR intervention varied from beginner to intermediate, as measured by pre-test results. Although some participants had previously undergone English training, the majority had never used AR technology in a learning environment. Since many participants were unfamiliar with AR technology, an introductory training session was conducted to familiarize them with the features and application of AR in interactive learning scenarios. Following the AR intervention, participants took a post-test to evaluate improvements in their English-speaking skills, focusing on fluency, accuracy, and confidence. In addition to the quantitative analysis, qualitative interviews were conducted to assess participants' perceptions and the challenges they faced in adopting AR technology in their workplaces. The qualitative data were collected using purposive sampling, with four representatives from each tourist site selected for interviews regarding their experiences with AR technology.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6: 8411-8420, 2024
DOI: 10.55214/25768484.v8i6.3812

3.2.3. Task Description

This study engaged tourism workers in Sumbawa, Indonesia, in a series of assessments to evaluate improvements in their English-speaking skills, facilitated using Augmented Reality (AR) technology. Pre- and post-tests were administered at four key tourism sites: Whale Shark (Labuan Jambu), Kencana Beach Cottages, Sarcophagus (Batu Tering), and Mata Jitu (Moyo Island). The primary focus of the research was to assess participants' speaking proficiency, specifically targeting fluency, accuracy, pronunciation, and grammar. Participants initially undertook a pre-test to gauge their speaking abilities prior to the AR intervention. Subsequently, they were provided with introductory training on AR technology, which was used to simulate real-world scenarios for practicing English speaking. Following this intervention, participants completed a post-test to measure progress in their speaking skills. All assessments were conducted under supervision at scheduled intervals, and the data collected comprised comparisons between the pre- and post-test results. Additionally, qualitative interviews were conducted to explore participants' perceptions of AR technology and its applicability in their work environment.

4.2.4. Data Analysis

This study analyzed the improvement in English speaking skills among tourism employees in Sumbawa following the implementation of Augmented Reality (AR) technology. Both descriptive and inferential statistical methods were employed to assess the enhancement in speaking skills across four tourist destinations: Kencana Beach Cottages, Sarcofagus Batu Tering, Mata Jitu on Moyo Island, and the Whale Shark site at Labuan Jambu. Prior research has shown that AR technology can significantly enhance learner engagement and comprehension in second language acquisition *(Bacca et al., 2014)*. The pre-test results indicated varied scores among employees at each location. At Kencana Beach Cottages, scores ranged from a minimum of 40 to a maximum of 53, while employees at Sarcofagus Batu Tering scored between 34 and 54. Employees from Mata Jitu on Moyo Island showed pre-test scores from 32 to 54, and those at the Whale Shark Labuan Jambu site scored between 33 and 54. These results reflect a relatively low baseline in speaking abilities prior to the AR intervention. Post-test results demonstrated a significant improvement in speaking scores across all locations. At Kencana Beach Cottages, the post-test scores increased, ranging from 58 to 76. Similarly, scores at Sarcofagus Batu Tering improved to a range of 62 to 76. The same upward trend was observed at Mata Jitu on Moyo Island and the Whale Shark Labuan Jambu site, where scores also rose to between 62 and 76. This enhancement in scores aligns with previous findings indicating that AR technology can positively impact language acquisition and speaking performance, as demonstrated in similar studies on AR-based language learning games (Taskiran, 2019). The average pre-test scores at the four locations were as follows: Kencana Beach Cottages (44.27), Sarcofagus Batu Tering (43.12), Mata Jitu on Moyo Island (42.70), and Whale Shark Labuan Jambu (41.20). Following the AR intervention, the post-test averages increased substantially to 68.67, 68.56, 69.60, and 69.77, respectively. The most significant improvement occurred at Whale Shark Labuan Jambu, with a 69.34% increase in average scores. These results further corroborate research by (Tsai, 2020), who found that AR technology could enhance both motivation and language skills. To verify the significance of these improvements, a paired sample T-test was conducted. The results yielded a sig. (2-tailed) value of 0.000 across all locations, indicating statistically significant changes in speaking skills after the AR intervention. Moreover, all computed T values exceeded the critical T table values, confirming the substantial impact of AR on improving the English-speaking abilities of tourism employees. These findings echo those of (Ajit et al., 2020), who demonstrated the efficacy of AR in enhancing student engagement and learning outcomes in educational contexts. Furthermore, a repeated measures ANOVA was used to examine the significance of the differences between pre-test and post-test scores. Mauchly's test of sphericity was employed to ensure the homogeneity of variances across the data sets. The results supported the conclusion that AR technology significantly improved the English-speaking abilities of tourism employees at all four locations. In conclusion, the findings from this study indicate that AR technology can substantially enhance English speaking skills within the tourism sector in Sumbawa. This aligns with existing literature on the benefits of AR in creating interactive and immersive learning environments, allowing learners to practice language skills in realistic contexts *(Salman & Yanpar-Yelken, 2024)*.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6: 8411-8420, 2024
DOI: 10.55214/25768484.v8i6.3812

4. Result and Discussion

4.1. Result

Descriptive statistics were first calculated and presented to answer the study objectives (Mishra et al., 2019). Based on the pre-test result of the speaking test of Kencana Beach Cottages employees, the minimum score was 40, and the maximum score was 53; for the employees of Sarcofagus destination Batu Tering, the minimum score was 34, and the maximum score was 54, the employees of Mata Jitu Moyo Island, the minimum score was 32, and the maximum score was 54. For Whale Shark destination Labuan Jambu employees, the minimum score was 33, and the maximum score was 54. The post-test result of the speaking test of Kencana Beach Cottages employees, the minimum score was 58, and the maximum score was 76; for the employees of Sarcofagus destination Batu Tering, the minimum score was 62, and the maximum score was 76; the employees of Mata Jitu Moyo Island, the minimum score was 62, and the maximum score was 76, and the employees of Whale Shark destination Labuan Jambu, the minimum score was 62, and the maximum score was 76.

Moreover, the pre-test mean score for the staff of Kencana Beach Cottages was 44.27; for the staff of Sarcofagus destination Batu Tering, it was 43.12; for Mata Jitu Moyo Island, it was 42.70; and for the staff of Whale Shark destination Labuan Jambu, it was 41.20. On the post-test, the mean score for the staff of Kencana Beach Cottages was 68.67; for the staff of Sarcofagus destination Batu tearing, it was 68.56; for the staff of Mata Jitu Moyo Island, it was 69.60; and for the staff of Whale Shark destination Labuan Jambu, it was 69.77.

The personnel of Kencana Beach Cottages saw a 55.12% improvement in mean score following the adoption of augmented reality, followed by those of Sarcofagus destination Batu tering (59%), Mata Jitu Moyo Island (63%), and Whale Shark destination Labuan Jambu (69.34%).

To further evaluate these improvements, a T-test statistical analysis was conducted to determine the significance of the changes in English-speaking abilities of tourism employees after utilizing augmented reality technology. The paired sample T-test was selected as it allows researchers to compare differences before and after the intervention, enabling them to assess whether the technology had a significant impact on improving speaking skills (Lestari & Nugraheni, 2022). The results of this analysis provide quantitative evidence supporting the effectiveness of augmented reality in the context of English language learning within the tourism industry.

Based on the data analysis in table 3 below, the result showed that the paired sample t-test of augmented reality found sig. (2-tailed) 0.000, the value T count of augmented reality of Kencana Beach Cottages employees was -17.778, it can be positive meaning 17.778, and the value of mean paired differences was -24.400. Data obtained that sig. (2-tailed) 0.000 < 0.05, and value T count 17.778 > T table 1.761, for the significance level 훼 = 0.05 n = 15. The value T count of augmented reality of Sarcofagus Batu Tering employees was -24.553, it can be positive meaning 24.553, and the value of mean paired differences was -25.440. Data obtained that sig. (2-tailed) 0.000 < 0.05, and value T count 24.553 > T table 1.711, for the significance level 훼 = 0.05 n = 25. The value T count of augmented reality of Mata Jitu Island employees was -20.635, it can be positive meaning 20.635, and the value of mean paired differences was -26.900. Data obtained that sig. (2-tailed) 0.000 < 0.05, and value T count 20.635 > T table 1.729, for the significance level 훼 = 0.05 n = 20. The value T count of augmented reality of Whale Shark employees was -24.290, it can be positive meaning 24.290, and the value of mean paired differences was -28.567. Data obtained that sig. (2-tailed) 0.000 < 0.05, and value T count 24.290 > T table 1.699, for the significance level 훼 = 0.05 n = 30. It concluded that augmented reality was significant for the English-speaking skills of tourism employees in Sumbawa.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6: 8411-8420, 2024
DOI: 10.55214/25768484.v8i6.3812

Table 1.
The result of oral test-pre and post-test.

Kencana beach cottages					
	N	**Minimum**	**Maximum**	**Mean**	**Std. deviation**
Pre-test		40	53	44.27	3.305
Post-test		58	76	68.57	4.562
Valid	15				

Sarcofagus Batu Tering					
	N	Minimum	Maximum	Mean	Std. deviation
Pre-test		34	54	43.12	3.745
Post-test		62	75	68.56	3.98
Valid	25				

Mata Jitu Pulau Moyo					
	N	Minimum	Maximum	Mean	Std. deviation
Pre-test		32	54	42.70	5.017
Post-test		62	76	69.60	3.872
Valid	20				

Whale Shark Labuhan Jambu					
	N	Minimum	Maximum	Mean	Std. deviation
Pre-test		34	54	41.20	4.708
Post-test		62	76	69.77	3.520
Valid	30				

Table 2.
The result of paired samples t-test of oral test.

Location	**Mean difference**	**Std. dev.**	**t-value**	**df**	**Sig. (2-tailed)**
Kencana Beach Cottages	-24.400	5.316	-17.778	14	0.000
Sarcofagus Batu Tering	-25.440	5.181	-24.553	24	0.000
Mata Jitu Moyo Island	-26.900	5.830	-20.635	19	0.000
Whale Shark Labuan Jambu	-28.567	6.442	-24.290	29	0.000

4.2. Discussion

This study aims to explore the effectiveness of Augmented Reality (AR) technology in enhancing English speaking skills among tourism workers in Sumbawa, as well as to examine perceptions and acceptance of this technology through interview analysis. The findings indicate that AR significantly contributes to improving speaking skills, as measured by pre-test and post-test results, while also providing insights into participants' views on the adoption of this technology.

The results show that AR has a substantial impact on various aspects of spoken English, including fluency, accuracy, and confidence in language use. Based on pre-test and post-test data collected from four tourism sites in Sumbawa, there was a significant improvement in post-test scores at all locations following the AR intervention (Table I). The most notable increase was observed at the Whale Shark Labuan Jambu site, where the average score rose by 69.34% after the use of AR. These findings align with previous research, which demonstrates that immersive technologies, such as AR, enhance engagement and understanding in second language learning contexts (Karacan & Akoğlu, 2021; Yeh & Tseng, 2020).

Additionally, statistical analysis using paired sample T-tests (Table II) confirms that the T-values at all tourism sites exceeded the critical T-value, validating the statistical significance of the improvements

in English speaking skills after the AR intervention. This strengthens the evidence that AR can have a positive impact on the development of real-world language skills, particularly in the tourism sector (Huang et al., 2021b; Parmaxi & Demetriou, 2020).

Despite the positive effects of AR, interview analysis on participants' perceptions highlights challenges in its implementation. Some participants expressed concerns about the use of AR, particularly regarding the complexity of the technology and its limited availability in certain locations. These challenges are consistent with previous studies that indicate the adoption of new technologies in the tourism industry is often hindered by limited access and workforce readiness (Alam et al., 2024; Obeidy et al., 2017). In this study, while many participants showed enthusiasm and interest in AR, some reported difficulties in understanding the long-term benefits of the technology.

In line with previous research, participants' positive perceptions of AR were largely driven by the more interactive and immersive learning experience it offered. They noted that the technology helped them understand the material more effectively and allowed them to practice speaking skills in realistic contexts. However, some participants raised concerns about the time required to fully master the technology, indicating a need for more intensive training and ongoing support. This suggests that while AR presents several pedagogical advantages, the role of educators in providing guidance and support remains essential, particularly in bridging the technological gap for learners (Alzahrani, 2020; Khodabande & Mombini, 2024).

Furthermore, these findings underscore the importance of ensuring the sustainable implementation of AR in Sumbawa's tourism sector. Given that AR adoption is still in its early stages, challenges related to the distribution of the technology and workforce readiness need to be addressed. For instance, some participants noted that AR is not yet widely available in Sumbawa, particularly in remote areas, limiting its potential for broader use. Based on the interview analysis, participants also highlighted accessibility challenges, particularly in locations with inadequate digital infrastructure, thereby limiting the effective adoption of AR across different regions. Previous studies have also shown that the success of technology adoption in education heavily depends on accessibility and infrastructure readiness (Chugh et al., 2023; Vishnu et al., 2024). Therefore, more comprehensive training programs and broader technology dissemination should be prioritized to ensure the long-term positive impact of AR in the tourism sector.

Overall, this study provides valuable insights into how AR can be leveraged to enhance English speaking skills in the tourism sector. The findings not only confirm the effectiveness of AR in second language learning but also highlight the challenges of its implementation, particularly in relation to accessibility, participant readiness, and the need for ongoing support. Consequently, further research is required to explore how this technology can be more widely applied and how additional training can improve workforce readiness in the tourism industry.

5. Conclusion

This study assessed the effectiveness of Augmented Reality (AR) technology in enhancing English speaking skills among tourism employees in Sumbawa and identified the challenges associated with its implementation. The findings indicate that AR significantly improves fluency, accuracy, pronunciation, and grammar. This supports previous research demonstrating AR's capability to enhance language learning through real-world simulations. However, challenges in AR implementation, such as the complexity of the technology and limited access to digital infrastructure, were also identified, aligning with findings from prior studies (Gill et al., 2024; Khan et al., 2024). Participants expressed the need for further training to fully leverage AR, highlighting the importance of ongoing technical support.

Additionally, this study has limitations, such as not exploring long-term retention and individual differences in AR effectiveness (Gualtieri et al., 2024). Future research is needed to address accessibility challenges and optimize AR training methods, enabling the technology to play a crucial role in enhancing service quality in the tourism sector in Sumbawa (Calisto & Sarkar, 2024).

Acknowledgment:
This research was funded by the Fundamental Regular Research Grant from the Directorate General of Higher Education (DIKTI), Indonesia, in 2024.

References
[1] Ajit, G., Lucas, T., & Kanyan, R. (2020). *A Systematic Review of Augmented Reality in STEM Education. 38–3*(2). https://doi.org/10.25115/eea.v38i3%20(2).4280

[2] Alam, S. S., Masukujjaman, M., Susmit, S., Susmit, S., & Aziz, H. A. (2024). Augmented reality adoption intention among travel and tour operators in Malaysia: mediation effect of value alignment. *Journal of Tourism Futures*, *10*(2), 185–204. https://doi.org/10.1108/JTF-03-2021-0072

[3] Alzahrani, N. M. (2020). Augmented Reality: A Systematic Review of Its Benefits and Challenges in E-learning Contexts. *Applied Sciences (Switzerland)*, *10*, 1–21. https://doi.org/10.3390/app10165660

[4] Azimova, D., & Solidjonov, D. (2023). Learning English Language as a Second Language with Augmented Reality. *Kokand University Herald*, *1*, 112–115.

[5] Bacca, J., Baldiris, S., Fabregat, R., Graf, S., & Kinshuk. (2014). Augmented Reality Trends in Education: A Systematic Review of Research and Applications. *International Forum of Educational Technology & Society*, *17*. http://www.ifets.info

[6] Bretos, M. A., Ibáñez-Sánchez, S., & Orús, C. (2024). Applying virtual reality and augmented reality to the tourism experience: a comparative literature review. *Spanish Journal of Marketing - ESIC*, *28*, 287–309. https://doi.org/10.1108/SJME-03-2023-0052

[7] Calisto, M. de L., & Sarkar, S. (2024). A systematic review of virtual reality in tourism and hospitality: The known and the paths to follow. *International Journal of Hospitality Management*, *116*, 1–14. https://doi.org/10.1016/j.ijhm.2023.103623

[8] Chugh, R., Turnbull, D., Cowling, M. A., Vanderburg, R., & Vanderburg, M. A. (2023). Implementing educational technology in Higher Education Institutions: A review of technologies, stakeholder perceptions, frameworks and metrics. *Education and Information Technologies*, *28*, 16403–16429. https://doi.org/10.1007/s10639-023-11846-x

[9] Chun, D. M., Karimi, H., & Sañosa, D. J. (2022). Traveling by Headset: Immersive VR for Language Learning. *CALICO Journal*, *39*(2), 129–149. https://doi.org/10.1558/cj.21306

[10] Gill, A., Irwin, D., Towey, D., Zhang, Y., Long, P., Sun, L., Yu, W., & Zheng, Y. (2024). Implementing Universal Design through augmented-reality game-based learning. *Computers & Education: X Reality*, *4*, 2–10. https://doi.org/10.1016/j.cexr.2024.100070

[11] Giraldo, M., Rodríguez, O., Guidice, O.-N. Del, & Betts, M. M. (2024). Facilitators and hinderers for designing augmented reality for ecotourism SME's experiences: A service Design approach. *Heliyon*, *10*, 1–17. https://doi.org/10.1016/j.heliyon.2024.e24124

[12] Gualtieri, L., Öhler, M., Revolti, A., & Dallasega, P. (2024). A visual management and augmented-reality-based training module for the enhancement of short and long-term procedural knowledge retention in complex machinery setup. *Computers and Industrial Engineering*, *196*, 1–14. https://doi.org/10.1016/j.cie.2024.110478

[13] Huang, X., Zou, D., Cheng, G., & Xie, H. (2021a). A systematic review of AR and VR enhanced language learning. *Sustainability*, *13*, 1–28. https://doi.org/10.3390/su13094639

[14] Huang, X., Zou, D., Cheng, G., & Xie, H. (2021b). A Systematic Review of AR and VR Enhanced Language Learning. *Sustainability (Switzerland)*, *13*. https://doi.org/10.3390/su13094639

[15] Hynes, S., Cawley, M., Deely, J., & Norton, D. (2024). Alternative approaches to measuring the value of tourism in marine and coastal areas in ocean economy accounting. *Marine Policy*, *168*, 1–12. https://doi.org/10.1016/j.marpol.2024.106299

[16] Ijabah, N., & Amrullah, Q. L. (2023). Need Analysis of English Tourism: The Evidence from The Employees of Tourism Industry. *Acitya: Journal of Teaching and Education*, *5*(2), 214–226. https://doi.org/10.30650/ajte.v5i2.3590

[17] Karacan, C. G., & Akoğlu, K. (2021). Educational Augmented Reality Technology for Language Learning and Teaching: A Comprehensive Review. *Shanlax International Journal of Education*, *9*(2), 68–79. https://doi.org/10.34293/education.v9i2.3715

[18] Khan, H. U., Ali, Y., Khan, F., & Al-antari, M. A. (2024). A comprehensive study on unraveling the advances of immersive technologies (VR/AR/MR/XR) in the healthcare sector during the COVID-19: Challenges and solutions. *Heliyon*, *10*. https://doi.org/10.1016/j.heliyon.2024.e35037

[19] Khodabande, F., & Mombini, A. (2024). Exploring the effect of augmented reality technology on high school students' vocabulary learning, personality traits, and self-efficacy in flipped and blended classes. *Education and Information Technologies*, *29*.

[20] Lee, L. C., Wang, Y., Zhang, L., Ping, L., Zuo, J., & Zhang, H. (2024). Impact of COVID-19 on the economic loss and resource conservation of China's tourism industry from the supply chain perspective. *Cities*, *144*, 1–12. https://doi.org/10.1016/j.cities.2023.104633

[21] Lestari, S., & Nugraheni, A. S. (2022). The Effect of Google Classroom in Improving Learning Motivation and Critical Thinking Skills of University Students. *AL-ISHLAH: Jurnal Pendidikan*, *14*(1), 61–70. https://doi.org/10.35445/alishlah.v14i1.973

[22] Majid, S. N. A., & Salam, A. R. (2021). A Systematic Review of Augmented Reality Applications in Language Learning. *International Journal of Emerging Technologies in Learning*, *16*(10), 18–34. https://doi.org/10.3991/ijet.v16i10.17273

[23] Mishra, P., Pandey, C. M., Singh, U., Gupta, A., Sahu, C., & Keshri, A. (2019). Descriptive Statistics and Normality Tests for Statistical Data. *Annals of Cardiac Anaesthesia*, *22*(1), 67–72. https://doi.org/10.4103/aca.ACA_157_18

[24] Nath, N. J., Sharma, S., & Shukla, T. (2019). Exploring the Liaising Role of Community Health Workers in the Bordering Region of India-Bangladesh: A Mix-Method Approach Citation Nath NJ. *Online Journal of Health and Allied Sciences*, *19*(1), 1–4.

[25] Obeidy, W. K., Arshad, H., & Huang, J. Y. (2017). An acceptance model for smart glasses based tourism augmented reality. *AIP Conference Proceedings*, *1891*, 1–6. https://doi.org/10.1063/1.5005413

[26] Özçelik, N. P., Ekşi, G. Y., & Baturay, M. H. (2022). Augmented Reality (AR) in Language Learning: A Principled Review of 2017-2021. In *Participatory Educational Research* (Vol. 9, Issue 4, pp. 131–152). Ozgen Korkmaz. https://doi.org/10.17275/per.22.83.9.4

[27] Parmaxi, A., & Demetriou, A. A. (2020). Augmented Reality in Language Learning: A State- of-the-Art Review of 2014-2019. *Journal of Computer Assisted Learning*, *36*(6). https://www.wiley.com/en-us

[28] Perry, B. (2015). Gamifying French Language Learning: A Case Study Examining a Quest-based, Augmented Reality Mobile Learning-tool. *Procedia - Social and Behavioral Sciences*, *174*, 2308–2315. https://doi.org/10.1016/j.sbspro.2015.01.892

[29] Prasetya, F., Fortuna, A., Samala, A. D., Rawas, S., Mystakidis, S., Syahril, Waskito, Primawati, Wulansari, R. E., & Kassymova, G. K. (2024). The impact of augmented reality learning experiences based on the motivational design model: A meta-analysis. *Social Sciences and Humanities Open*, *10*, 1–13. https://doi.org/10.1016/j.ssaho.2024.100926

[30] Radu, I., & Schneider, B. (2023). Designing augmented reality for makerspaces: Guidelines, lessons and mitigation strategies from 5þ years of AR educational projects. *Computers & Education: X Reality*, *2*, 1–12. https://doi.org/10.1016/j.cexr.2023.100026

[31] Rao, P. S. (2019). The role of English as a Global Language. *Research Journal Of English (RJOE)*, *4*(1), 65–79. www.rjoe.org.in

[32] Salman, M., & Yanpar-Yelken, T. (2024). Examining Studies on Improving English Speaking Skills as a Foreign Language: A Meta-Synthesis Study. *OALib*, *11*, 1–16. https://doi.org/10.4236/oalib.1112056

[33] Saptiany, S. G., & Putriningsih, T. S. L. (2023). Navigating the world of tourism: A Literature Review of English Language Proficiency's Influence. *International Conference on Digital Advance Tourism, Management and Technology*, *1*(2), 127–137. https://doi.org/10.56910/ictmt.v1i2.29

[34] Sermsook, K., Nakplad, R., & Jantawong, L. (2021). Problems and Needs Analysis of English for Tourism Industry: A Case of Hotel Staff in Phang Nga Province, Thailand. *Education Quarterly Reviews*, *4*(3). https://doi.org/10.31014/aior.1993.04.03.319

[35] Song, Y., Wu, K., & Ding, J. (2024). Developing an immersive game-based learning platform with generative artificial intelligence and virtual reality technologies – "LearningverseVR." *Computers & Education: X Reality*, *4*, 1–7. https://doi.org/10.1016/j.cexr.2024.100069

[36] Taskiran, A. (2019). The effect of augmented reality games on English as foreign language motivation. *E-Learning and Digital Media*, *16*(2), 122–135. https://doi.org/10.1177/2042753018817541

[37] Tsai, C. C. (2020). The Effects of Augmented Reality to Motivation and Performance in EFL Vocabulary Learning. *International Journal of Instruction*, *13*(4), 987–1000. https://doi.org/10.29333/iji.2020.13460a

[38] Vishnu, S., Tengli, M. B., Ramadas, S., Sathyan, A. R., & Bhatt, A. (2024). Bridging the Divide: Assessing Digital Infrastructure for Higher Education Online Learning. *TechTrends*.

[39] Vu, N. N., Linh, V. T., Van, N. T. T., & Lien, N. T. H. (2021). Effectiveness of Second Life Virtual Learning Environment for Language Training in Hospitality and Tourism. *Advances in Social Science, Education and Humanities Research*, *533*, 19–28.

[40] Wenfei, Z., Rahmat, M. K., Nizar, N. N. M., & Maaruf, S. Z. (2023). Need Analysis Survey of Designing and Developing a Mobile Augmented Reality Application for Tourism English Learning in Higher Vocational Education, China. *International Journal of Academic Research in Progressive Education and Development*, *12*(2), 1133–1147. https://doi.org/10.6007/ijarped/v12-i2/16561

[41] Yeh, H.-C., & Tseng, S.-S. (2020). Enhancing Multimodal Literacy using Augmented Reality. *Language Learning & Technology*, *24*(1), 27–37.

[42] Yudintseva, A. (2024). An exploration of low- and high-immersive virtual reality modalities for willingness to communicate in English as a second language. *Computers & Education: X Reality*, *5*, 1–19. https://doi.org/10.1016/j.cexr.2024.100076

[43] Zuo, T., Birk, M. V., van der Spek, E. D., & Hu, J. (2023). The effect of fantasy on learning and recall of declarative knowledge in AR game-based learning. *Entertainment Computing*, *46*, 1–10. https://doi.org/10.1016/j.entcom.2023.100563.