

Artificial Intelligence-Based Virtual Tour for Vocational High Schools in Tourism Sector in Developing English Language Competence for Guides

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Abstract

This study aims to develop a virtual tour based on artificial intelligence for vocational high school students in the field of tourism in developing English language competencies for guides. This study contributes to the development of innovative technology-based learning media to improve the English language competence of vocational high school students in the field of tourism. This study adopts a design-based research approach utilizing the ADDIE instructional design model (Analysis, Design, Development, Implementation, and Evaluation). The data analysis in this study will employ both qualitative and quantitative methods. The findings of this study indicate a significant improvement in students' English language competence after using the Artificial Intelligence-Based Virtual Tour. The large effect size

(Cohen's $d = 2.14$) further confirms the strong impact of this intervention, demonstrating its effectiveness in improving students' abilities in English communication for guiding. The implementation of Artificial Intelligence (AI)-based Virtual Tour enables interactive simulations that resemble real-life situations in the tourism world, providing direct exposure for students to practice in a professional context. With the automatic evaluation and feedback features of AI, students can improve their language skills effectively, flexibly, and sustainably, making it a relevant approach to developing English language competency in the tourism sector.

Keywords: Virtual tour based on artificial intelligence (AI); tour guide; SMK

Introduction

English language competency for SMK students in the tourism sector, especially tour guides, is very important. Given that English is an international language that can be used by tourists from various countries. (Diarini & Winangun, 2022; Lestari et al., 2022). The main task of a guide by definition is to provide accurate information and directions regarding tourist objects and attractions before and during the tour (Dewi et al., 2019; Wardhani, 2021). This function requires English language competency to facilitate communication with tourists.

To become a professional guide, you must master English, be competent and be able to communicate fluently (Wardhani, 2021; Watkins, 2018). Effective communication can provide tourists with satisfaction and a memorable tourism experience (Nasukah et al., 2020; Weiler & Black, 2015). Communication carried out professionally is considered capable or successful in providing information, education, and satisfaction to tourists. Other research results also state that, in addition to tourist satisfaction that can increase hotel or tourist attraction revenue and income, good English language skills can improve career levels and self-image of tourism service providers (Damayanti, 2019; Nurarafah, 2022).

Having good English language skills provides positive benefits for guides. First, expanding market reach. Expanding market reach is very important for the sustainability of work for guides. With good English communication skills and good service, it can attract more tourists from various countries (Ariyaningsih et al., 2024; Kusuma, 2019). Second, the guide must be able to provide detailed and accurate information. With good English language skills, the guide can provide accurate and detailed explanations of the various tourist destinations visited (Rahmani, 2020; Virgiyanti et al., 2016). This will grow and increase trust and satisfaction for tourists who use guide services. Third, provide excellent service. One of the requirements for providing excellent service to tourists is to master English well. Excellent service is very important for tourists to get an impressive tourism experience, insight into cultural and natural insights, and satisfaction while on vacation. Good English language skills can support the success of a tour (Ariyaningsih et al., 2024; Martriwati et al., 2018).

In the independent curriculum, phase F is intended for grades XI and XII. For vocational high schools, in this phase, students have identified their interests and talents. For the ULW (Tourism Service Business) major, tour guide subject, at the end of phase F (grade XI of vocational high school), students are able to communicate verbally in English at a basic operational level, carry out basic first aid procedures, apply health procedures, work safety, and the environment (Djumanto, 2022; Pratiwi et al., 2023). Students are able to carry out tour guiding and sustainable tourism, provide services for picking up (transfer-in) and dropping off tourists (transfer-out). Students are able to develop and maintain general knowledge required by tour guides, lead and guide tour groups, organize participants during tours, prepare and present tourist information (Mudana et al., 2025; Putra, 2018).

In every element that must be mastered in phase F, students certainly need good and fluent English language competency. From the results of the analysis of value documentation and interviews with SKM teachers teaching ULW majors throughout Bali, students' English language competency for the tour guide subject is still lacking. Students are not yet able to communicate in English well and fluently (Fathimah, 2016; Wicaksono, 2016). This is because students do not yet have adequate English language competency. In addition, students are not confident when communicating in English. Teachers hope that students can communicate in English well and fluently so that later students can become professional guides. Another problem is that students' English vocabulary is still minimal (Alicia, 2016; Fidiyanti, 2020). This results in communication using English during learning or guiding practice not running optimally.

The lack of English language competence possessed by students needs to be addressed specifically, for example by using interesting and interactive learning media that are technology-based. Therefore, it is necessary to develop learning media that are in accordance with English language competencies for guides. This study aims to develop a virtual tour based on artificial intelligence for vocational high school students in the field of tourism in developing English language competencies for guides. This study contributes to the development of innovative technology-based learning media to improve the English language competence of vocational high school students in the field of tourism. By developing a virtual tour based on artificial intelligence, this study offers an interactive solution that can improve English communication skills according to the needs of a tour guide. In addition, the results of this study can be a reference for educators in designing more interesting and effective technology-based learning strategies to improve English language skills in vocational environments.

Literature review

English proficiency for vocational high school students

English proficiency is essential for vocational high school students majoring in Tourism Services Business (ULW), particularly those aspiring to become professional tour guides. As the global tourism industry relies on English as a lingua franca, tour guides must have the ability to communicate effectively with international tourists from various countries (Bayyurt et al., 2014; Bayyurt & Karataş, 2011). A tour guide's main responsibility is to provide accurate and detailed information about tourist attractions, both before and during tours. This task inherently requires strong English language skills to ensure clear communication and effective delivery of information (Liu & Deng, 2017; Wardhani, 2021). Mastering English is not just a job requirement for tour guides, but also a key factor in creating satisfying and memorable experiences for tourists.

Research highlights several advantages of English proficiency for tour guides, beyond facilitating communication. One significant benefit is expanding market reach. Guides who are proficient in English can attract a broader range of international tourists, thereby increasing their potential client base and ensuring long-term career sustainability (Kanoksilapatham & Suranakkharin, 2018; Wardhani, 2021). Additionally, fluency in English allows guides to provide detailed and accurate explanations of tourist destinations, enhancing trust and satisfaction among tourists (Cabrera-Solano, 2020; Hashim & Yunus, 2018). Another key benefit is the ability to deliver excellent service, which is crucial in ensuring tourists have a positive and memorable experience. Good English communication skills enable guides to provide insightful and enjoyable tours, further enhancing tourist satisfaction and enriching their cultural experience (Ibna Seraj & Habil, 2019; Rao, 2019).

Challenges of English proficiency for vocational high school students

Despite the importance of English proficiency, many vocational high school students face significant challenges in mastering the language. Studies indicate that students often lack the vocabulary, fluency, and confidence necessary to communicate effectively in English. This deficit impedes their ability to perform well in both classroom learning and practical tour guiding exercises (Cahyono et al., 2016; Cookson & Stirk, 2019). Teachers also express concern about their students' limited English proficiency, emphasizing the need for improvements in communication skills to meet the standards expected of professional tour guides.

In light of these challenges, there is a growing need to adopt more engaging and interactive learning methods to improve students' English language competence. Technology-based, interactive learning media are seen as a potential solution to make English learning more effective and engaging for vocational students (Dzihnie & Gozali, 2023). Research suggests that multimedia and digital learning tools can significantly enhance students' language acquisition and boost their confidence in using English in real-world contexts (Bai, 2020; Taylor et al., 2015).

Within the framework of Indonesia's independent curriculum, phase F focuses on preparing vocational students for industry-specific roles. By the end of this phase, students majoring in Tourism Services Business are expected to demonstrate basic operational proficiency in English, including the ability to perform various tasks required of professional tour guides, such as leading groups and presenting information in English (Cookson & Stirk, 2019; Fu et al., 2019). However, many students struggle to meet these expectations, highlighting the need for targeted interventions to enhance their English proficiency.

Artificial intelligence-based virtual tour

The integration of Artificial Intelligence (AI) into virtual tour technologies has revolutionized the way users experience digital tourism and education. AI-powered virtual tours utilize machine learning, natural language processing (NLP), and computer vision to enhance user interaction, improve personalization, and provide real-time assistance (Sharma, 2019). These systems are commonly used in tourism, education, and cultural heritage sectors to offer immersive and interactive experiences (Prasasti, 2019). Artificial Intelligence enhances virtual tours by enabling dynamic and adaptive features. AI algorithms analyze user behavior and preferences to offer personalized recommendations, automated translations, and interactive chatbots for real-time queries. Additionally, AI-powered image recognition allows for the identification of landmarks, artifacts, and historical sites, enriching the user's learning experience (Yang, 2022).

In the tourism industry, AI-powered virtual tours help travelers explore destinations remotely with an immersive experience, enabling decision-making before actual visits (Enggrita et al., 2022). AI-driven voice assistants and virtual guides provide real-time narration and contextual information, creating an engaging experience for users. In the educational sector, AI-based virtual tours have been incorporated into curricula to enhance experiential learning. Studies show that AI-enhanced virtual environments support language learning, cultural awareness, and historical education. Virtual tours can simulate real-world interactions, allowing students to practice language skills in authentic contexts (Karuović et al., 2021).

Research method

Participants

The participants in this study comprised English teacher and practitioners who are directly involved in teaching English for the Tour Guiding Course at vocational schools offering tourism

programs. These individuals were chosen because of their critical role in designing and implementing English language instruction tailored to the tourism industry. Their experiences, insights, and expertise are invaluable in understanding the current state of English learning for tourism and identifying areas for improvement. The participants represent diverse perspectives, considering factors such as school location, available resources, and specific tourism-related course requirements.

The implementation phase of this study also involved 40 vocational high school (SMK) students as participants. These students engaged with the AI-based virtual tour to assess its effectiveness in enhancing their English language competencies for guiding. Their participation provided valuable insights into the usability, engagement levels, and learning outcomes associated with the virtual tour experience.

Research design

This study adopts a design-based research approach utilizing the ADDIE instructional design model (Analysis, Design, Development, Implementation, and Evaluation) to systematically develop and evaluate an Artificial Intelligence-Based Virtual Tour for vocational high schools in the tourism sector (Aldoobie, 2015). The analysis phase involves conducting a needs assessment through interviews with vocational school teachers and students to identify gaps in English language learning for guiding. Additionally, existing learning materials are examined, and consultations with tourism professionals ensure that the content aligns with real-world industry demands.

In the design phase, learning objectives are formulated based on the required competencies for tour guides, and content is developed to integrate real-life guiding scenarios into AI-powered simulations. The instructional flow is outlined through a storyboard, and a user-friendly interface is designed. Key AI features, such as speech recognition, interactive chatbot responses, and automated feedback mechanisms, are also determined at this stage. Following this, the development phase focuses on creating the virtual tour platform, integrating AI tools for speech assessment and real-time conversation practice. A prototype is developed and tested with a small group of teachers and students to refine its usability and effectiveness before wider implementation.

During the implementation phase, the AI-based virtual tour is introduced to vocational high school students specializing in tourism. Training sessions are conducted for both teachers and students on how to use the platform, followed by pilot testing with 40 students. Their interactions with the virtual tour are observed and documented to assess engagement levels and learning outcomes. Finally, in the evaluation phase, the effectiveness of the AI-based virtual tour is assessed through a pre-test and post-test analysis to measure improvements in students' English competencies. Additionally, feedback from students and teachers is gathered to evaluate usability and instructional effectiveness. Based on the findings, necessary revisions and refinements are made to enhance the platform further.

The expected outcome of this study is the development of an interactive AI-based virtual tour that enhances students' English communication skills for guiding. This technology-driven learning tool aims to increase student engagement and motivation through immersive experiences while ensuring that English language instruction aligns with the competencies required in the tourism industry. The systematic approach provided by the ADDIE model ensures that the learning media is not only pedagogically sound but also adaptable for future improvements.

Instrument

Several instruments were used at different stages of this study. In the analysis phase, interviews were conducted to assess the existing conditions and identify students' needs. During the development phase, expert validation was carried out using questionnaires for media and content experts. Finally, in the implementation phase, a limited trial was conducted using pre-test and post-test instruments to measure learning outcomes. The interview grid is shown in Table 1.

Table 1. Interview grid

Aspect	Indicator
Instructional Media	Purpose of Media Use
	Suitability to learning objectives
	Suitability to student characteristics
	Type of media
English language competence	Barriers to media use
	Pronunciation
	Grammar
	Vocabulary or diction
	Fluency

In this study, the questionnaire was used as an evaluation instrument in the development stage to test the feasibility of the Artificial Intelligence-Based Virtual Tour learning media. The evaluation was carried out by two groups of experts, namely media experts who assessed the design and appearance aspects of the media, and material experts who assessed the quality of the learning content in the media.

Table 2. Expert instrument grid

Aspect	Indicator	Statement	Scale
Desain Media	Interface appearance	The virtual tour interface is attractive and user-friendly	Likert 1-5
	Navigation	The navigation in the learning media is easy for users to understand	Likert 1-5
	AI interaction	The AI in this media can interact well and is responsive to users	Likert 1-5
	Multimedia quality	The quality of images, sound, and animation in the virtual tour supports a good learning experience	Likert 1-5
	Accessibility	This media can be accessed well on various devices (laptops, smartphones, tablets)	Likert 1-5
	System performance	The loading speed and system performance in the virtual tour run well	Likert 1-5
	Display aesthetics	The combination of colors, text, and visual elements is comfortable to look at and not confusing	Likert 1-5
	Interactivity	User interaction with AI in this media is interesting and supports learning	Likert 1-5
	Presentation structure	This media has a systematic structure and is in accordance with the learning flow	Likert 1-5
	Virtual tour realism	The system in the AI-based virtual tour can provide a realistic experience in tour guiding	Likert 1-5

Aspect	Indicator	Statement	Scale
Material Quality	Material suitability	The material in the virtual tour is in accordance with the English language competency needs of tour guides	Likert 1-5
	Content relevance	The content in this media is relevant to the world of work in the tourism industry	Likert 1-5
	AI feedback	AI provides feedback that helps in developing students' speaking skills	Likert 1-5
	Language difficulty level	The language used in this media is in accordance with the level of understanding of vocational high school students	Likert 1-5
	Conceptual understanding	The material in the virtual tour helps improve students' understanding of the context of tourism in English	Likert 1-5
	Scenario suitability	The scenarios used in the AI-based virtual tour are in accordance with real situations in the world of tourism	Likert 1-5
	Learning interactivity	AI-based virtual tours provide an interactive and interesting learning experience	Likert 1-5
	Increased self-confidence	This media can increase students' confidence in speaking English	Likert 1-5
	Error correction	The AI in this media is able to recognize students' language errors and provide appropriate corrections	Likert 1-5
Learning contextualization	This media provides an opportunity for students to learn English in more real and contextual situations	Likert 1-5	

Moreover, the next instrument blueprint ensures that the pre-test and post-test effectively assess listening, reading, speaking, and writing skills in a tourism-related context, providing reliable data on the impact of AI-based virtual tours on students' English language competence.

Table 3. Pretest – posttest instrument grid

Competency	Indicator	Cognitive Level (Bloom's Taxonomy)	Question Type	Number of Questions	Score
Listening Comprehension	Understanding the main idea in a conversation between a tour guide and a tourist	Understanding (C2)	Multiple Choice	5 questions	25
Listening Comprehension	Identifying specific details in a tourism-related conversation	Applying (C3)	Multiple Choice	5 questions	25
Reading Comprehension	Understanding a descriptive text about a tourist attraction	Understanding (C2)	Multiple Choice	3 questions	15
Reading Comprehension	Summarizing key information from a tourism text	Analyzing (C4)	Short Answer	2 questions	10
Speaking	Describing a tourist attraction using appropriate vocabulary	Applying (C3)	Oral Test (Descriptive Speaking Task)	1 task	15
Writing	Writing a tour guide script based on a given image of a tourist attraction	Creating (C6)	Written Test (Short)	1 task	10

Data analysis

The data analysis in this study will employ both qualitative and quantitative methods to assess the effectiveness of the Artificial Intelligence-Based Virtual Tour in enhancing students' English language competence for guiding. The qualitative analysis will be conducted during the needs analysis and expert validation stages, while the quantitative analysis will be applied to measure the impact of the developed learning media.

In the qualitative analysis, data collected from interviews with teachers, students, and tourism practitioners during the needs analysis phase will be analyzed using thematic analysis. This method involves identifying recurring themes and patterns related to learning needs, challenges, and opportunities in integrating AI-based virtual tours into English learning. Additionally, expert validation data gathered through questionnaires will be analyzed using descriptive qualitative techniques, summarizing expert opinions on the content, usability, and effectiveness of the developed learning media.

For the quantitative analysis, data from the pre-test and post-test conducted during the implementation phase will be analyzed using descriptive and inferential statistical methods. Descriptive statistics, including mean, standard deviation, and percentage, will be used to summarize students' performance before and after using the AI-based virtual tour. To determine whether the improvement in students' English language competence is statistically significant, a paired sample t-test will be applied. This test will compare pre-test and post-test scores to evaluate the effectiveness of the intervention. Furthermore, data from the expert validation questionnaire will be analyzed using Likert scale scoring, where mean scores will indicate the overall quality and feasibility of the learning media. By combining qualitative and quantitative analysis, this study aims to provide a comprehensive understanding of how Artificial Intelligence-Based Virtual Tours can support vocational high school students in developing their English language competence for guiding.

Results

Analysis stage

The results of interviews conducted to explore the conditions of English learning for tour guides are shown as follows :

Aspect: Instructional media

“The primary purpose of using media in my classes is to make the material more engaging and accessible for students. For example, I use videos to illustrate real-life scenarios in guiding tours.”
(Teacher 3)

“Media helps in providing a practical context for students. For instance, I often use audio recordings to train students' listening and pronunciation skills.” (Teacher 6)

The interviews indicate that instructional media is perceived as essential in making English lessons more engaging and practical. Media such as videos and audio recordings are valued for contextualizing learning materials in real-life tourism scenarios. This demonstrates a strong

awareness among instructors of the role media plays in bridging theoretical knowledge with practical application.

“The media I use, such as tourism videos, align well with the objectives of teaching English for specific purposes, especially for guiding tours.” (Teacher 5)

“While media like PowerPoint presentations are helpful, sometimes they lack interactivity, which limits their effectiveness in achieving the learning objectives.” (Teacher 4)

Media selection aligns well with learning objectives, particularly in addressing the specific demands of English for tourism. However, there is room for improvement in ensuring interactivity and adaptability, as some tools may not fully engage students or meet all instructional goals. This suggests a need for more dynamic and student-centered media tools.

“The students are generally tech-savvy, so using mobile apps or online platforms suits them well.” (Teacher 2)

“Some students struggle with advanced media tools, so I try to balance high-tech and low-tech media to cater to different levels of proficiency.” (Teacher 7)

While many students are adept at using technology, instructors face challenges in catering to varying levels of technological proficiency. The balance between high-tech and low-tech media reflects a thoughtful approach to inclusivity, but it also underscores the need for tailored strategies to address the digital divide.

“I frequently use videos, audio recordings, and slideshows. Occasionally, I incorporate role-play activities that require minimal technology but still engage the students.” (Teacher 4)

“Interactive platforms like Kahoot and Google Classroom are my go-to tools for quizzes and assignments.” (Teacher 3)

A variety of media is employed, ranging from videos and slideshows to interactive platforms. This diversity supports different learning styles and needs. However, the reliance on simple tools like PowerPoint indicates that more innovative approaches, such as augmented reality or AI-driven platforms, could be explored for greater impact.

“The biggest challenge is the lack of adequate infrastructure, such as unreliable internet connectivity in some areas.” (Teacher 4)

“Students’ lack of familiarity with certain tools can hinder effective implementation. Training is sometimes needed but not always feasible.” (Teacher 2)

Infrastructural challenges, such as unreliable internet, and limited student familiarity with advanced tools are significant barriers. These issues highlight the importance of improving technical support, providing training, and ensuring equitable access to resources to optimize media use in teaching.

Aspect: English language competence

“Most students can imitate pronunciation quite well after listening to audio or watching videos. However, consistency is an issue.” (Teacher 7)

“Some students still struggle with sounds like /θ/ and /ð/, which are uncommon in their native language.”(Teacher 8)

Students show promise in mimicking correct pronunciation, particularly when exposed to audio and visual aids. However, maintaining consistency in pronunciation remains a challenge. This suggests a need for regular practice and more targeted phonetic training to address specific problem areas like unfamiliar sounds (/θ/ and /ð/).

“Grammar errors are frequent, particularly in sentence structure. I focus on correcting these errors during role-playing activities.”(Teacher 2)

“Students often mix tenses when narrating a story or describing a place, which can confuse the listener.”(Teacher 8)

Frequent grammatical errors, especially in sentence structure and tense usage, point to gaps in foundational language skills. These issues are particularly problematic in contexts where clear communication is critical, such as guiding tours. Focused instruction on grammar rules and practical application in speaking activities is recommended.

“Students have a limited vocabulary related to tourism. I provide them with vocabulary lists, but they need more practice to use them correctly.”(Teacher 10)

“Their choice of words sometimes lacks precision, which affects the quality of their communication.”(Teacher 9)

Limited vocabulary hampers students’ ability to express themselves precisely, affecting their overall communication effectiveness. This highlights the need for integrated vocabulary-building exercises that encourage not only memorization but also contextual usage in conversations and written tasks.

Design stage

In learning the subject of "Tour Guide," one of the main challenges faced by students is the effective mastery of English language skills, especially in the context of the tourism industry. This challenge includes the ability to speak well and correctly, including pronunciation, grammar, vocabulary, and fluency. Limited interaction with native English speakers, lack of exposure to real tourism situations, and conventional and less interactive learning methods often hinder the development of students' language skills.

As a solution to this problem, the integration of Artificial Intelligence (AI)-based Virtual Tour technology is an innovative and practical approach. This technology allows students to experience a virtual tour simulation guided by AI. In this virtual environment, students can get hands-on experience that is close to the real situation of providing tour guiding services, but in a safer and more controlled atmosphere. This AI-Based Virtual Tour provides the following

advantages: 1. Interactive Exposure: Students can interact directly with AI that can provide real-time feedback on pronunciation, grammar, vocabulary, and fluency. 2. Real Situation Simulation: Virtual tours present world tourist destinations that can be explored virtually, allowing students to practice the English language skills required by a tour guide. 3. Independent and Flexible Learning: AI technology allows students to learn anytime and anywhere, so that English learning is no longer limited to classroom time. 4. Automatic Evaluation and Feedback: AI can conduct direct assessments and provide suggestions for improvement, allowing students to immediately correct errors in pronunciation, grammar, and fluency (Martín-Gutiérrez et al., 2017; Taufiq et al., 2019).

Virtual tours refer to the use of digital technology to create a visual simulation of a real location or environment, where users can virtually explore the place. In the context of education, virtual tours are used as a learning tool that provides a simulated experience that resembles real-world conditions. This technology is particularly useful in tour guide training, where students can practice their skills in a safe, interactive, simulated context. Artificial Intelligence (AI) is a field of computer science concerned with the development of machines or programs that can perform tasks that would normally require human intelligence, such as speech recognition, natural language processing, learning, and decision-making. In the context of language learning, AI acts as an interactive tutor that can provide personalized feedback to students based on their performance in using the language. AI is also able to automatically analyze student errors and provide appropriate recommendations for improving their skills.

Artificial intelligence (AI) based virtual tour is a combination of virtual tour technology with artificial intelligence that presents an interactive and personalized learning experience in a tour simulation. This technology allows students to learn the English language skills required by a tour guide in a more interesting, interactive, and realistic way. AI acts as a tutor who not only guides the tour but also provides language evaluation, including pronunciation, grammar, vocabulary, and fluency of students in speaking. The concept of an Artificial Intelligence (AI) based virtual tour is shown in Figure 1.

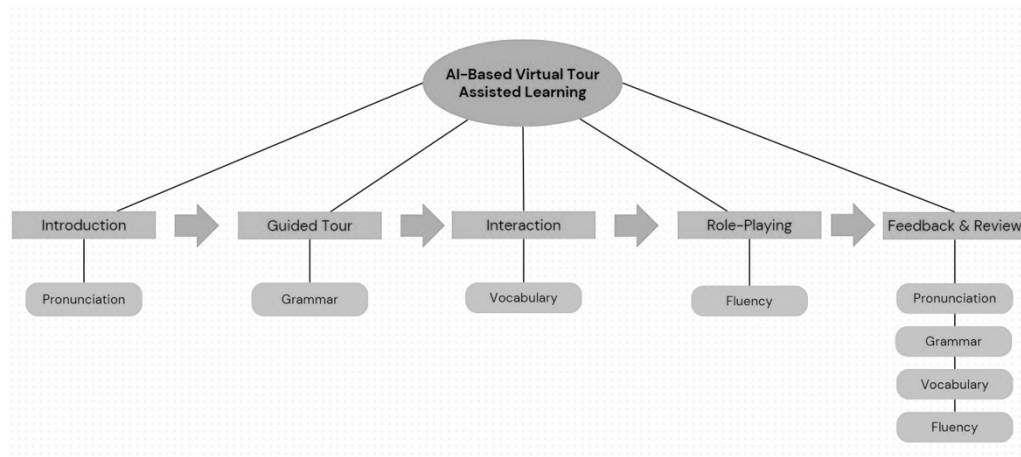


Figure 1. Virtual tour concept based on artificial intelligence (AI)

The use of AI-based virtual tours in the learning of the "Tour Guide" subject provides students with the opportunity to engage in much-needed English language practice in the tourism context without requiring physical presence at the actual tourist location. This approach is very effective in improving students' language skills, as they can directly practice English in situations that are relevant to the tourism industry, while getting relevant feedback from AI. The syntax that

describes the description of AI-based virtual tour learning activities to improve tourism English competence is shown in Table 4.

Table 4. AI-based virtual tour learning syntax

Stage	AI Based Virtual Tour Activity	Indicator	Learning Activity Description
Introduction	AI provides an introduction and context regarding the tourist location to be visited.	Pronunciation	AI models the pronunciation of tourism-related words (e.g., “tourist attraction,” “destination”). Students repeat and imitate.
Guided Tour	AI guides students on virtual tours of various tourist destinations, featuring visual descriptions and narration.	Grammar	AI provides descriptions of places using proper grammar (e.g., correct tense usage). Students identify grammatical patterns.
Interaction	AI asks interactive questions about tourist attractions and asks students to answer verbally.	Vocabulary/diction	AI provides English keywords relevant to the tourism industry. Students use the vocabulary in their responses.
Role-Playing	Students play the role of tour guides and re-explain the destinations they have visited virtually.	Fluency	Students practice speaking fluently using tourism language to describe destinations without long pauses or repeated errors.
Feedback & Review	AI provides immediate feedback based on student performance in pronunciation, grammar, vocabulary, and fluency.	Pronunciation, Grammar, Vocabulary, Fluency	AI evaluates students’ pronunciation, grammar correction, proper vocabulary usage, and fluency. Students improve based on feedback.

Table 4 summarizes the use of AI in the context of virtual tours to improve students’ English skills in tourism, with a focus on pronunciation, grammar, vocabulary, and fluency.

Development stage

After the analysis phase, the design and development of the virtual tour application integrated AI-driven interactive features, such as automated tour guide simulations, voice recognition for pronunciation practice, and real-time language feedback. The virtual tour content was designed to reflect real-world tourism scenarios, allowing students to experience immersive learning environments that simulate guiding tourists in various destinations. The developed product was then validated through expert review before being implemented in the classroom. The prototype of product is show in Figure 2.



Figure 2. Prototype of product

The developed virtual tour learning media underwent expert validation by two media experts and two content experts to ensure its effectiveness, usability, and alignment with the targeted English language competencies for tour guides. The validation was conducted using a questionnaire-based Likert scale assessment covering aspects such as content accuracy, technological feasibility, interactivity, user-friendliness, and pedagogical effectiveness.

Table 5. Expert validation results

Aspect	Indicator	Media Expert Score	Content Expert Score	Average Score	Category
Visual Design	Interface layout, attractiveness, and clarity	4.5	4.4	4.45	Very Good
Ease of Use	Navigation and accessibility for students	4.7	4.5	4.6	Very Good
Technological Functionality	AI response accuracy and system reliability	4.6	4.5	4.55	Very Good
Content Accuracy	Relevance and correctness of language content	4.5	4.6	4.55	Very Good
Engagement	Interactivity and ability to motivate learning	4.4	4.4	4.4	Very Good
Alignment with Competencies	Suitability for guiding skills development	4.6	4.7	4.65	Very Good

The expert validation results confirm that the Artificial Intelligence-Based Virtual Tour meets high-quality standards in all evaluated aspects. The highest-rated criteria include Alignment with Competencies (4.65) and Ease of Use (4.6), indicating that the virtual tour is well-suited for guiding skills development and provides an accessible learning experience for students. Technological Functionality (4.55) and Content Accuracy (4.55) also received high scores, demonstrating reliable AI performance and relevant language content. Overall, with all scores in the "Very Good" category, the results indicate that the AI-Based Virtual Tour is effectively designed, user-friendly, and pedagogically appropriate for improving English communication skills in the tourism sector.

Based on expert feedback, minor revisions were made, including enhancing the AI-driven language feedback system, refining the voice recognition feature for pronunciation assessment, and improving the clarity of instructional guidelines. These modifications aimed to further optimize the learning experience before the implementation phase in vocational high schools. The results from the development and expert validation stages confirm that the Artificial Intelligence-

Based Virtual Tour is a feasible, interactive, and effective learning tool for enhancing students' English language competence in the tourism sector.

Implementation and evaluation stage

The implementation phase aimed to assess the effectiveness of the Artificial Intelligence-Based Virtual Tour in enhancing students' English language competence in the tourism sector. To evaluate the impact of the developed learning media, a pre-test and post-test design was conducted with 40 vocational high school students majoring in tourism. The pre-test was administered before students used the virtual tour, while the post-test was given after the implementation to measure learning improvement. The data collected from both tests were analyzed using SPSS, employing descriptive statistics, a paired sample t-test, and effect size (Cohen's *d*) to determine whether the virtual tour significantly enhanced students' English competence. The following section presents the statistical results obtained from the analysis. The result of descriptive statistic is show in Table 6.

Table 6. Descriptive statistics of pre-test and post-test

N	Mean	Std. Deviation	Minimum	Maximum
Pre-Test	40	62.45	7.83	50
Post-Test	40	78.25	6.94	65

The results of the statistical analysis indicate a significant improvement in students' English language competence after using the Artificial Intelligence-Based Virtual Tour. The average pre-test score was 62.45, with a standard deviation of 7.83, suggesting that students initially had moderate proficiency. After the implementation, the average post-test score increased to 78.25, with a standard deviation of 6.94, demonstrating a considerable improvement.

Table 7. Paired sample t-test

Paired Samples Test	Mean Difference	t-value	df	Sig. (2-tailed)
Pre-Test vs. Post-Test	-15.80	-14.32	39	0.000

The t-value of -14.32 with $df = 39$ indicates a significant difference between the pre-test and post-test scores. This suggests that students' English competence improved after using the Artificial Intelligence-Based Virtual Tour. Furthermore, the Sig. (2-tailed) value of 0.000, which is less than 0.05, confirms that the increase in students' English proficiency is statistically significant. These results provide strong evidence that the implementation of the virtual tour effectively enhances students' language skills in the tourism sector. Cohen's *d* value = 2.14 shows that the implementation of AI-Based Virtual Tour has a very large impact on improving students' English language competence.

Discussion

The industrial revolution 5.0 has a positive impact on the world of education. The most obvious impact is helping teachers and students in the learning process. Learning objectives can be achieved optimally and according to expectations with the help of technology (Hermawan et al., 2020; Sitorus, 2021). Students who are said to be born in generation Z, namely the first generation who since birth until their growth have been familiar with portable digital technology, such as smartphones, social media, and internet access in everyday life. This indicates that students

in this generation are inseparable from the help of technology (Indarta et al., 2021; Puspitarini, 2022). Likewise with learning. This requires teachers to be more responsive to students' interests and needs in learning. Technology can be used in all parts of learning activities. One of them is the use of learning media. From the results of the study it was said that the enthusiasm and attraction of students to learn because of the integration of technology in learning activities (Enggrita et al., 2022). Students will absorb learning materials more easily and quickly with the help of technology-based learning media.

From the results of the needs analysis in four vocational schools in Bali that provide ULW majors, the low English language competency for tour guide subjects is caused by students feeling bored with monotonous learning activities and media. Moreover, when students practice in tourist attractions that are close to their environment. This causes students to feel bored. One of the learning media that can increase engagement by providing a broad and realistic experience for students is using virtual reality (VR) technology (Lan, 2020; Suhendar & Fernando, 2016). VR is an innovation in learning media that utilizes technology that enables students to interact with an environment (real environment or imaginary environment) that is simulated by a computer (computer-simulated environment) (Ariatama et al., 2021; Suhendar & Fernando, 2016). VR is the use of computer simulation to create a three-dimensional virtual world, allowing users to feel as if they are in the real world, and to observe objects and events in three-dimensional space. Virtual reality has proven to be beneficial for students to learn independently (Chang et al., 2022; Terkaj et al., 2024).

The findings of this study indicate a significant improvement in students' English language competence after using the Artificial Intelligence-Based Virtual Tour. The statistical analysis shows that the post-test mean score (78.25) is significantly higher than the pre-test mean score (62.45), with a t-value of -14.32 ($p < 0.05$). This suggests that the integration of AI-based virtual tour technology into English learning for tourism effectively enhances students' language skills. The large effect size (Cohen's $d = 2.14$) further confirms the strong impact of this intervention, demonstrating its effectiveness in improving students' abilities in English communication for guiding. These findings align with previous research emphasizing the potential of technology-enhanced learning in improving language proficiency by providing interactive, immersive, and contextually relevant experiences.

The findings of this study align with previous research highlighting the effectiveness of technology-enhanced language learning in improving students' communication skills. Studies by Rasheed et al. (2020) and Fatimah & Santiana (2017) have demonstrated that AI-based learning tools provide immersive and interactive experiences, allowing students to develop language proficiency in authentic contexts. Similarly, Su et al. (2022) found that virtual reality and AI-integrated simulations significantly enhance learners' engagement and motivation in English for Specific Purposes (ESP) courses. Furthermore, research by Yesilyurt (2023) supports the claim that AI-driven educational technology fosters contextualized learning, helping students practice language skills in realistic professional scenarios. These studies reinforce the argument that AI-Based Virtual Tours can be an effective instructional tool for vocational high school students, particularly in tourism-related English communication.

The results of this study have several educational implications. First, the successful implementation of the AI-Based Virtual Tour highlights the importance of technology-driven learning media in vocational education, particularly in the tourism sector. This approach provides students with authentic language exposure, enabling them to practice communication in realistic scenarios (Checa & Bustillo, 2020; Mak et al., 2011). Second, the findings suggest that AI-driven

tools can be integrated into curricula for English for Specific Purposes (ESP), particularly in vocational high schools, to enhance students' communication skills in real-world settings. Lastly, this study underscores the necessity for educators and policymakers to support the adoption of AI-based learning media to bridge the gap between traditional classroom instruction and industry demands in the tourism sector.

While this study provides valuable insights, it has several limitations. First, the sample size was limited to 40 vocational high school students, which may not fully represent the diversity of learners in the tourism sector. Future research should consider a larger and more varied sample to enhance the generalizability of the findings. Second, the study focused on short-term effects, measuring learning outcomes only after a single implementation phase. Longitudinal studies are recommended to examine the long-term impact of AI-based virtual tours on English language competence. Third, the research primarily relied on pre-test and post-test scores, without in-depth qualitative analysis of students' experiences and engagement with the virtual tour. Future studies could incorporate interviews or focus group discussions to gain deeper insights into students' perceptions, challenges, and learning experiences. Despite these limitations, this study provides strong empirical evidence that AI-based virtual tours can significantly enhance English language learning in vocational education. It is recommended that educators integrate interactive and AI-driven learning tools into their teaching strategies to better prepare students for real-world professional communication in the tourism industry.

Conclusion

The application of Artificial Intelligence (AI)-based Virtual Tour in learning the subject of "Tour Guide" offers an innovative solution to overcome challenges in mastering English language skills, especially in terms of pronunciation, grammar, vocabulary, and fluency. This technology enables interactive simulations that resemble real-life situations in the world of tourism, providing direct exposure for students to practice in a professional context. With the automatic evaluation and feedback features of AI, students can improve their language skills effectively, flexibly, and sustainably, making it a relevant approach to developing English language competency in the field of tourism.

Declaration of conflicting interest

The authors declare that there is no conflict of interest in this work.

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