CHAPTER 3
METHODOLOGY

This chapter begins by outlining the research design for the study. The study's participants, factors, and research instruments are then explained. The construction and assessment of research tools are described. Finally, methods for gathering data and data analysis are provided.

3.1 Research Design

The present study adopted a mixed methods research design, specifically employing an explanatory sequential approach. A quasi-experimental design with a single-group pretest-posttest structure - commonly categorized as a pre-experimental design (Reichardt, 2019) - was used to examine the impact of AR technology on students' speaking performance and perceptions. In this design, the independent variable was the AR-integrated instructional intervention developed by the researcher. The dependent variables included students' English speaking performance, their acceptance of AR technology (in terms of readiness and willingness), and their perceptions of the AR-based lessons. Aligned with the explanatory mixed methods model, quantitative data were collected first, followed by qualitative data to deepen and interpret the initial findings (Creswell, 2014). As illustrated in Figure 3, the research followed a single-group pretest-posttest structure, where students first completed a readiness and willingness questionnaire (Q1) before the intervention, and a perception questionnaire (Q2) after the AR-based instructional phase. These instruments were integrated into the quasi-experimental design to capture participants' attitudes, beliefs, and levels of preparedness for engaging with AR in language learning.

The study was conducted for a single academic semester (9 weeks), during which students participated in AR-enhanced learning activities centered around English for Tourism and Hospitality. The instructor functioned primarily as a facilitator, supporting student-centered, immersive learning experiences. The initial questionnaire (Q1) was used to assess students' readiness and willingness to adopt AR, consistent with the survey model recommended for identifying learner characteristics such as attitudes and skills (Fraenkel & Wallen, 2006; Demirel, 2008). Following the intervention, the second questionnaire (Q2) gathered insights into students' perceptions of AR-integrated lessons. As Creswell (2009) notes, the explanatory sequential design allows for

"quantitative statistical results followed by qualitative quotes that support or disconfirm the quantitative results" (p. 213). The research design, as visualized in Figure 3.1, was carefully constructed to address the study's objectives and research questions through the integration of both quantitative and qualitative phases.

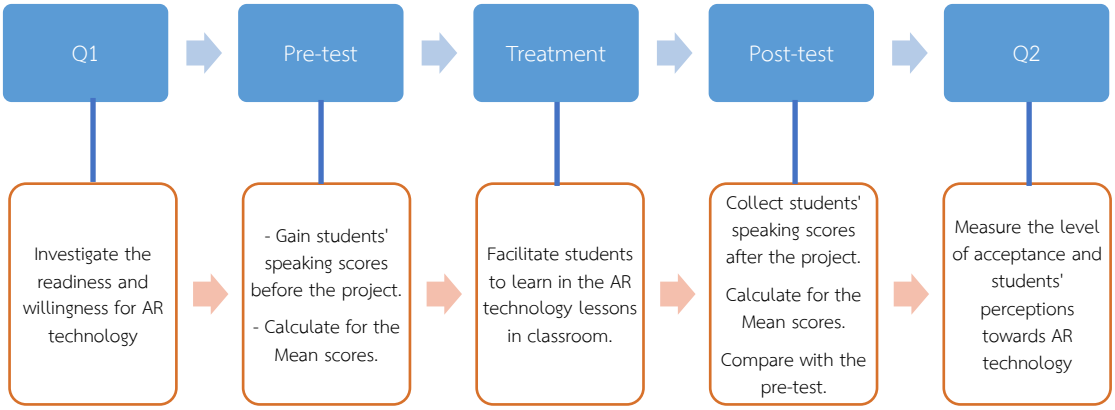

Figure 3.1 Single group pre-test, post-test Research Design (quasi-experimental) (Gay et al. (1981))

3.1.1 Rationale for the Research Design

The research design selected for this study encompasses a quasi-experimental, one-group pre-test and post-test methodology, which is particularly appropriate for investigating the effects of AR technology lessons on EFL undergraduate students' speaking skills within an elective English for Specific Purposes (ESP) course focusing on Tourism and Hospitality. The justification for this approach is underpinned by several critical considerations:

Firstly, the pre-experimental design aids in causal inference by enabling the exploration of the potential effects of AR technology lessons as an intervention on students' speaking skills. The implementation of a pre-test establishes an initial benchmark of the students' speaking proficiency before any intervention, while a subsequent post-test assesses any changes following the intervention. The comparative analysis of pre-test and post-test outcomes facilitates the establishment of a causal relationship between AR technology lessons and enhancements in speaking skills. Secondly, employing a single-group design ensures a controlled environment, crucial for assessing the effects of AR technology lessons on the EFL undergraduate students' speaking skills in English for Tourism and Hospitality. This design is particularly advantageous when exploring the implications of a novel technology such as AR, as it limits the confounding variables that might emerge from the presence of multiple treatment groups. Thirdly, the novelty of AR technology in educational settings offers

a unique opportunity for pioneering research. The chosen pre-experimental design allows for an in-depth examination of the technology's specific effects on speaking skills, which is vital for educational entities considering AR integration into their curricula. Additionally, situating the study within an ESP course tailored specifically for Tourism and Hospitality students enhances the specificity of the research. ESP courses are designed to cater to the precise needs of learners, and examining the effects of AR technology lessons on speaking skills within this specialized domain corresponds well with the principles of ESP education. Moreover, the longitudinal aspect of the pre-test and post-test design provides a framework for capturing the evolution of participants' speaking skills over time. This method is invaluable for evaluating the durability of any improvements observed and for determining whether the employment of AR technology contributes to sustained skill enhancement. The focus on speaking skills also correlates directly with the practical demands of English proficiency required in the Tourism and Hospitality Industry. Demonstrating the effects of AR technology lessons in improving these skills carries significant practical implications for boosting students' employability in their chosen field. From an ethical standpoint, the one-group design is advantageous as it avoids the ethical dilemmas that might arise from denying a control group access to a potentially beneficial educational intervention, thus preventing the withholding of educational opportunities. Lastly, considering the innovative nature of AR technology and its potential transformative impact, a pre-experimental design is often more feasible and appropriate for initial explorations. This approach acts as a foundational step for future research, which may evolve into more sophisticated experimental designs as the technology's effects are more comprehensively understood and its application becomes more widespread. This comprehensive approach to research design is essential for addressing the nuances of integrating AR technology into language learning, thereby contributing valuable insights into its potential educational benefits and practical applications in specific fields like Tourism and Hospitality (Choueiry, 2021).

In conclusion, the chosen research design-a quasi-experimental, one-group pre-test and post-test approach-offers a sound basis for investigating the effects of AR technology lessons on students' speaking skills in English for Tourism and Hospitality. This design aligns with scientific rigor, ethical considerations, and the practical demands of the educational and vocational landscape, ultimately contributing valuable insights to both the field of English language education and the integration of emerging AR technology.

3.2 Research Procedures and Conceptual Framework

This study employed the Technology Acceptance Model (TAM) as a theoretical framework to evaluate the impact of augmented reality (AR) technology on an English for Tourism and Hospitality course, which was conducted over nine weeks. TAM, which examines the factors influencing individuals' acceptance and use of technology, provides a comprehensive lens through which to analyze the adoption of AR and its implications for educational outcomes. By focusing on the core constructs of perceived usefulness, perceived ease of use, and perceived enjoyment, the study seeks to explore how AR-integrated lessons affect students' engagement, motivation, and language proficiency. The proposed research procedures and conceptual framework (Figures 3.2 and 3.3) outline a systematic methodology for analyzing these relationships, thereby contributing to a deeper understanding of the pedagogical effectiveness and user acceptance of AR-enhanced learning environments in higher education contexts.

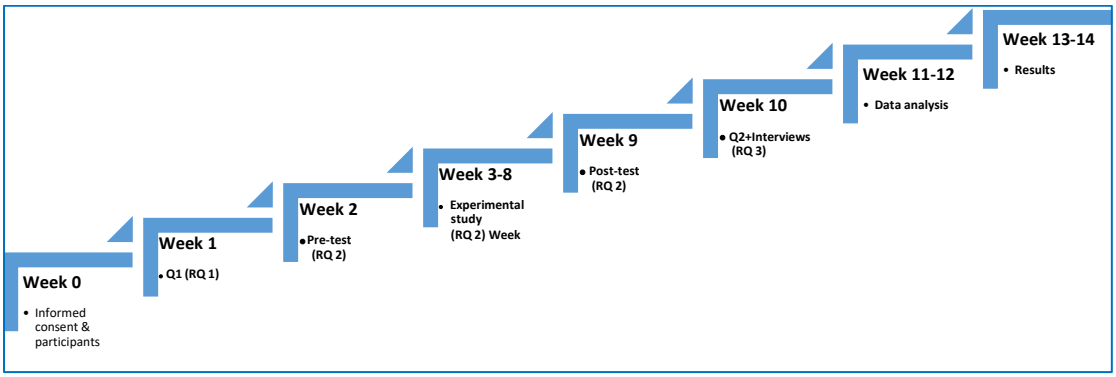

Figure 3.2 Proposed Research Procedures

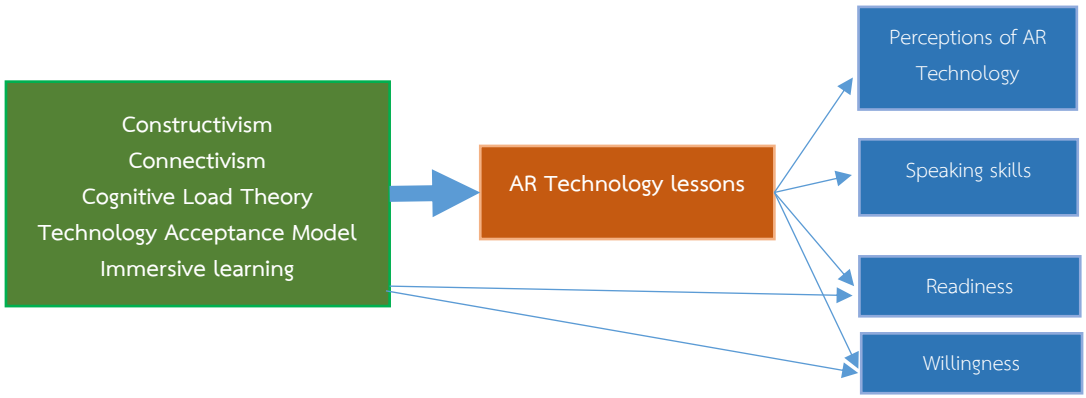

Figure 3.3 Proposed Conceptual Framework

The conceptual framework guiding this study integrates several theoretical perspectives and models to comprehensively investigate the impact of AR technology on Vietnamese EFL undergraduate students' speaking skills in the context of English for Tourism and Hospitality. This framework draws on constructivism, cognitive load theory, connectivism, and the technology acceptance model to provide a multi-faceted approach to understanding and enhancing language learning outcomes through AR technology.

Firstly, constructivism serves as the foundation for designing AR-based tasks that emphasize active learning and knowledge construction. By engaging students in realistic and contextually relevant scenarios, AR technology fosters deeper understanding and retention of language skills. This approach aligns with the constructivist view that learners construct knowledge through meaningful interactions with their environment. Secondly, Cognitive Load Theory (CLT) is employed to optimize the design of AR applications, ensuring that they manage cognitive load effectively. By integrating visual and auditory information, AR reduces extraneous cognitive load, allowing students to focus on essential language constructs and their practical application. This theory supports the goal of enhancing learning efficiency and effectiveness in AR-enhanced environments. Thirdly, connectivism highlights the importance of networked learning in the digital age. AR technology facilitates connections between learners and diverse information sources, promoting collaborative and interactive learning experiences. This theoretical perspective underscores the role of digital networks in developing language skills and supports the creation of a connected and interactive learning environment. Lastly, the Technology Acceptance Model (TAM) provides a framework for assessing students' acceptance of AR technology. By examining perceived usefulness and ease of use, the model helps identify factors that influence students' readiness and willingness to adopt AR for language learning. Understanding these factors is crucial for the successful implementation and sustained use of AR-based lessons.

The framework focuses on speaking skills and students’ perceptions of AR technology, addressing the core research questions related to the improvement of speaking abilities and learners’ subjective experiences. It also considers willingness and readiness as key variables, evaluating the practical feasibility and acceptance of AR technology in educational settings. This conceptual framework offers a robust foundation for exploring the potential of AR technology to enhance speaking skills in Vietnamese EFL students. It guides the design, implementation, and analysis of AR-based interventions, providing valuable insights for educators and curriculum designers

seeking innovative methods to improve language proficiency in the tourism and hospitality sector.

3.3 Research participants

3.3.1 Research participants for the pilot study

The participants in this study were selected through purposive and convenience sampling methods. Purposive sampling was employed to ensure that the research participants were those who had engaged in AR technology lessons, as this was essential for meeting the research objectives (Fraenkel & Wallen, 2006). Additionally, convenience sampling was used to include participants who were readily available and accessible through the researcher's connections. To mitigate any potential coercion, a third party unrelated to the course's instruction collected signed consent forms from participants. These consent forms were sealed in envelopes corresponding to each course section and were not opened until after the final grades had been submitted. This process ensured that participants felt no undue pressure to participate in the study. Once the course grades were finalized, data from consenting participants were collected and analyzed.

The study population comprised of 125 second- and third-year university students enrolled in the English for Tourism and Hospitality elective course during the 2024 academic year at the School of Foreign Languages, University of Economics Ho Chi Minh City, Vietnam. These students, familiar with university life and motivated to enhance their English language skills for future career opportunities, chose to participate in this course. As members of the tech-savvy Generation Z, they were particularly enthusiastic about engaging with AR technology, which is widely promoted and demonstrated at their university. Nonprobability sampling techniques, specifically purposive and convenience sampling, were employed to select the study sample. These methods are often used when randomization is impractical, such as in studies involving large populations, or when resources and time are limited. Purposive sampling, also known as judgmental sampling, involves selecting individuals based on specific characteristics that align with the research goals (Johnson & Christensen, 2012). This method focuses on identifying and choosing participants who can provide the most relevant information to address the research questions. Despite its subjective nature, purposive sampling is valuable in achieving the research objectives when the entire population cannot be feasibly included. Convenience sampling, on the other hand, involves selecting participants who are easily accessible to the researcher. This method is cost-effective and straightforward, although it may introduce biases due to

the non-random nature of participant selection (Dörnyei, 2007). Convenience sampling operates on the assumption that the characteristics of the accessible population are representative of the broader target population, ensuring that the findings remain generalizable (Given L. M., 2008).

The 82 participants in this study, who are university students enrolled in an English for Tourism and Hospitality course, exhibit language proficiency levels ranging from A2 to B1 according to the Common European Framework of Reference for Languages (CEFR). At the A2 level, students can understand and use basic phrases and expressions, engage in simple conversations on familiar topics, and describe aspects of their background and immediate environment. Those at the B1 level demonstrate an ability to handle more complex interactions, including expressing opinions, describing experiences, and dealing with most situations likely to arise while traveling in an English-speaking context. Typically, this elective course consists of two classes, each with thirty to forty students, offered during the last trimester of the academic year. These students were voluntary participants, well-acquainted with AR technology, and had ample opportunities to practice their EFL speaking skills in AR-based classroom activities. Following the completion of the project, ten participants were chosen through purposive sampling for semi-structured interviews to provide deeper insights and better address the research questions.

Table 3.1 Demographic Information of the Participants

Variable	Groups	N	%
Gender	Male	57	69.5
	Female	25	30.5
	Total	**82**	**100**

Table 3.1 presents the demographic information of the participants in terms of gender distribution. The table shows that out of a total of 82 participants, 57 are male, which constitutes 69.5% of the sample population. In contrast, 25 participants are female, making up 30.5% of the sample. This data indicates a predominance of male participants in the study, with males comprising more than twice the number of females. The total number of participants is evenly accounted for, summing up to 100%, thereby providing a clear overview of the gender composition within the study group.

3.3.2 Research participants for the main study

In this study, purposive and convenience sampling methods were employed to recruit 40 participants for the main study and 10 for the semi-structured interviews.

The purposive sampling approach was used to ensure participants had actively engaged in AR-supported classroom activities, which was essential for capturing insights aligned with the study's objectives (Fraenkel & Wallen, 2006). Convenience sampling was used to select students who were readily available and willing to participate, reflecting typical cohort characteristics in elective courses such as English for Tourism and Hospitality (ETH) at UEH. Additionally, convenience sampling was utilized to recruit participants who were readily accessible within the study's scope. This method allowed for efficient participant selection while maintaining the feasibility of data collection (Dörnyei, 2007). Demographic data indicated a relatively balanced gender ratio (42.5% male, 57.5% female), and although specific information about disabilities was not formally recorded, students requiring additional support were included in the classroom setting as per inclusive teaching practices followed by the university. Data reporting was conducted with meticulous attention to consistency across demographic tables, survey statistics, and speaking performance scores. The focus group interview questions were developed by the researcher to explore students' experiences with AR-enhanced instruction and were validated through expert reviews using the Index of Item Objective Congruence (IOC), with an average IOC score of 1.00. The questions were pilot-tested with non-participant students to assess functionality and appropriateness, and subsequently revised. Participants for the interviews were purposefully selected to reflect a range of engagement levels - both highly active and more passive learners - thus allowing for diverse viewpoints and ensuring that challenges encountered during the AR integration were equally represented. This approach contributed to a comprehensive understanding of learners' readiness, willingness, and perceptions, reinforcing the methodological rigor and the credibility of the study's findings.

To uphold ethical research practices and mitigate potential coercion, participant consent was obtained through a third party who was unaffiliated with the course's instruction. Signed consent forms were sealed and securely stored until after the final course grades had been submitted, ensuring that participants felt no obligation to partake in the study due to their academic standing. This process safeguarded the voluntary nature of participation, aligning with ethical considerations in educational research (Given, 2008). Once the grading process was completed, only data from consenting participants were included in the study. The population from which the study sample was drawn consisted of 40 second- and third-year university students enrolled in the English for Tourism and Hospitality elective course at the School of Foreign Languages, University of Economics Ho Chi Minh City (UEH), Vietnam,

during the 2024 academic year. These students, who had actively chosen this course to improve their English communication skills for professional and academic purposes, represented a cohort that was particularly suited to AR-based learning interventions. As digital natives belonging to Generation Z, they were accustomed to interactive and technology-enhanced learning environments and exhibited enthusiasm for adopting AR technology in education. A total of 40 participants were selected for the main study, with an effort to maintain a representative balance in gender distribution and academic levels. Nonprobability sampling techniques, specifically purposive and convenience sampling, ensured that the selected sample included students who had actively engaged with AR-integrated speaking activities and who could provide relevant insights into their experiences, learning progress, and technological adaptation. This approach aligns with the educational research principles that emphasize participant selection based on their direct involvement with the studied phenomenon (Johnson & Christensen, 2012).

The language proficiency of the participants ranged from A2 to B1, as defined by the Common European Framework of Reference for Languages (CEFR). At the A2 level, students demonstrated the ability to understand basic phrases, engage in structured conversations, and describe familiar topics, whereas B1-level students were capable of handling more complex discussions, expressing opinions, and responding to communicative tasks that required greater fluency. This variation in proficiency levels allowed for an in-depth exploration of how AR technology supports learners across different stages of English language acquisition. The elective course typically consists of two class sections, each comprising approximately 30 to 40 students, and is offered during the final trimester of the academic year. All participants were voluntary enrollees, and their exposure to AR-assisted learning activities enabled them to actively engage in English-speaking practice within an interactive, immersive classroom environment. Through the use of AR-enhanced simulations, role-playing exercises, and real-world scenarios tailored to the tourism and hospitality industry, these students gained firsthand experience in communicative English for professional contexts. Following the completion of the AR-based instructional period, ten participants were purposefully selected for semi-structured interviews, aiming to gather in-depth qualitative insights into their learning experiences, perceptions, and challenges with AR-integrated speaking lessons. The combination of quantitative assessments (pre-test and post-test performance evaluations) and qualitative data (focus group interviews) provided a comprehensive understanding of the impact of AR on English language learning outcomes.

Table 3.2 presents the demographic composition of the 40 participants who took part in the main study, illustrating a balanced distribution of male (42.5%) and female (57.5%) students. This gender distribution ensures that the study's findings encompass diverse learner perspectives, making them more representative of the broader student population engaged in ESP instruction, particularly within the tourism and hospitality sector.

Table 3.2 Demographic Information of the Participants in the Main Study

Variable	Groups	N	%
Gender	Male	17	42.5
	Female	23	57.5
Total		**40**	**100**

The demographic composition of the 40 participants in the main study reflects a representative mix of male and female students, ensuring that the findings are inclusive of diverse learner perspectives. The proportion of male and female participants was carefully considered to enhance the generalizability of the results, while still maintaining the practical constraints of participant availability and willingness to engage in AR-enhanced learning activities. Their selection was based on engagement with AR technology, motivation to improve English-speaking skills, and availability for participation. The purposive and convenience sampling methods ensured that participants had substantial exposure to AR-integrated instruction, making them well-positioned to contribute meaningful insights into the study’s research questions. The CEFR proficiency levels (A2-B1) provided a valuable framework for analyzing language development across different learner proficiencies, while the focus group interviews complemented the quantitative findings by capturing students’ perceptions and experiences in depth. The inclusion of a diverse cohort of participants who actively interacted with AR-supported learning materials enhances the validity and reliability of this research, providing critical insights into the effectiveness of AR in developing English-speaking skills in an ESP context.

3.4 Researcher’s Roles and Responsibilities

In this study, the researcher assumes multiple critical roles to ensure the effective integration and evaluation of AR technology in enhancing students' speaking skills in English for Tourism and Hospitality. As the teacher of the class, the researcher is responsible for designing and delivering the instructional content, incorporating AR-based activities tailored to meet the educational objectives. In the role of facilitator,

the researcher guides and supports students in navigating the AR tools, fostering an engaging and interactive learning environment that encourages active participation and collaboration. As an observer, the researcher systematically monitors and documents the students' interactions with the AR technology, their engagement levels, and their progress in developing speaking skills. This comprehensive involvement enables the researcher to gather nuanced insights into the effectiveness of AR-enhanced instruction and its impact on student learning outcomes.

3.5 Research Variables

According to Arikunto (2010), the variable that has an impact is referred to as the independent variable (X), and the variable that was affected is referred to as the dependent variable (Y). The application of the AR technology (X) was the study's independent variable, while speaking skills and the student's level of acceptance of the AR technology (Y) were its dependent variables. This research employed a quasi-experimental design within an explanatory sequential mixed-methods framework to examine the integration of augmented reality (AR) technology in an English for Tourism and Hospitality (ETH) course. The independent variable in this study was the AR-integrated instructional intervention, while the dependent variables included students' English-speaking performance, their readiness and willingness to adopt AR technology, and their perceptions of the AR-based lessons. Speaking skills were operationalized through four IELTS rubric-based dimensions: fluency and coherence, lexical resource, pronunciation, and grammatical range and accuracy. Additionally, readiness and willingness to adopt AR were assessed using pre- and post-intervention questionnaires adapted from established TAM and UTAUT frameworks. These included constructs such as perceived usefulness, ease of use, and intention to continue using AR. Perception of the AR learning experience was captured through both post-surveys and qualitative focus group interviews, which further enriched the study's interpretative depth. By aligning these variables with the theoretical underpinnings of TAM, cognitive load theory, and constructivist learning, the study systematically evaluated how AR technology influenced not only measurable language performance outcomes but also learners' psychological and experiential engagement with educational technology

3.6 Research Instruments

The research instruments employed in this study constitute a comprehensive framework designed to gather robust data on the effects of AR technology on the speaking skills of Vietnamese EFL undergraduate students in the context of English for

Tourism and Hospitality. This investigation utilized a mixed-methods approach, combining both quantitative and qualitative tools to ensure a holistic understanding of the phenomena under study. The primary instruments included pre- and post-intervention questionnaires, pre- and post-speaking tests, and focus group interviews. These instruments were meticulously selected and developed to align with the research objectives and to address the core research questions regarding students' acceptance, readiness, willingness, and perceptions of AR technology. The questionnaires aimed to quantitatively measure the students' attitudes and perceptions towards AR technology, capturing data on their initial readiness and subsequent changes post-intervention. The speaking tests provided quantitative data on the improvement in students' speaking skills, serving as a direct measure of the intervention's effectiveness. Additionally, focus group interviews offered qualitative insights, enabling an in-depth exploration of students' experiences and the contextual factors influencing their learning outcomes. Together, these instruments formed an integrated methodological framework that facilitated a detailed analysis of AR technology's effects on the students' language learning, especially speaking skills, in a specialized context of ETH.

3.6.1 The Questionnaire to Assess the Acceptance Levels of AR Technology, in Terms of Readiness and Willingness

This instrument was used to assess the acceptance levels, in terms of readiness and willingness of the students towards AR technology. It was delivered to the participants in the beginning of the study as the pre-intervention questionnaire. This questionnaire was adapted from Davis (1989) in Cabero-Almenara et al. (2019) and Fauzi et al. (2019). In this study, the readiness and willingness questionnaire was designed to assess students' access to technology, attitudes towards AR, and prior exposure to AR technologies. The primary goal was to establish a baseline understanding of students' familiarity and comfort with integrating AR into their language learning curriculum. This instrument aimed to gather detailed responses on students' technological competencies, enabling a detailed analysis of their readiness and willingness for AR-enhanced educational experiences. Similarly, Fauzi et al.'s readiness assessment questionnaire focused on evaluating students' preparedness for AR integration, emphasizing logistical and awareness-related factors. It measured the availability of technological resources and students' basic knowledge of AR, assessing the practical feasibility of implementing AR in their educational context.

This study's questionnaire also included items investigating students' perceptions of AR's potential benefits and challenges, providing a comprehensive

understanding of their initial attitudes. In contrast, Fauzi et al.'s assessment concentrated more on practical aspects of technology readiness, evaluating students' access to necessary technological tools and baseline awareness of AR to identify potential barriers to adoption. Their readiness questions ensured that students possessed the fundamental technological capabilities required for effective engagement with AR applications. In short, this study adopted a holistic perspective on readiness and willingness, integrating both affective and logistical dimensions to offer a broader understanding of students' readiness to adopt AR. Meanwhile, Fauzi et al. provided valuable insights into the practical feasibility of AR implementation, highlighting the importance of technological resources.

There were 25 items in total, and they were divided into the following categories: Perceived Usefulness (4 items), Perceived Ease of Use (3 items), Perceived Enjoyment (3 items), Attitudes and Acceptance towards its Usage (15 items), and Intention to Use (2 items). This questionnaire focused on students' acceptance to the AR technology and asked them to rank the usefulness of AR technology for teaching and learning during English for Tourism and Hospitality. The questions were presented in the form of a Likert scale, with responses ranging from 1 for Strongly Disagree to 5 for Strongly Agree. This study's methodology was modeled after those of Trifonova et al. (2006) and Corbeil & Valdes-Corbeil (2007).

To ensure the reliability and accuracy of the questionnaires, several validation steps were undertaken. The questionnaires were available in both Vietnamese and English to accommodate all participants comfortably. The back-translation technique recommended by Brislin (1970) was employed to maintain the consistency of the questionnaire items across languages. This technique helped in verifying that the translation did not alter the meaning of the questions, thus ensuring that responses would be influenced purely by the participants' true perceptions and not by linguistic discrepancies. Furthermore, a pilot test was conducted with a group of 20 students to assess the internal consistency of the survey items. The Cronbach's Alpha values obtained from this pilot test exceeded the 0.7 threshold, indicating satisfactory internal consistency as outlined by Hair et al. (2019). This pilot testing not only underscored the reliability of the constructs but also helped in refining the instruments to better capture the intended data. In addition to statistical validation, the content validity of the questionnaire was rigorously evaluated by a panel of five experts specializing in instructional technology and English language teaching. Their extensive experience and academic expertise facilitated a critical review of the questionnaire items. All items were rated above 0.7, which means minor modifications

were made to enhance the clarity and relevance of the questions, further solidifying the questionnaire's content validity as per the recommendations of Artino et al. (2014). (See Appendix A)

Through these comprehensive validation procedures, the questionnaires were meticulously crafted and refined to ensure that they effectively measure the intended variables and provide reliable, valid data for analyzing the impact of AR technology on language learning in the context of Tourism and Hospitality education. This methodological rigor supports the study's aim to produce scientifically valid findings that can contribute to the broader academic discourse on the use of innovative technologies in educational settings.

3.6.2 The Questionnaire to Explore Students' Perceptions of Using AR Technology Lessons

This questionnaire was given to the students and served as the data collection tool for the study's last stage. There were three parts in this post-intervention questionnaire. The first part of the questionnaire was used to gather information and determine the student's demographics. Students were just asked about their age, gender, academic year, and basic understanding of AR in the questionnaires. The questions in the second and third parts of this questionnaire were adapted from Fauzi et al. (2019) and were presented in the form of a Likert scale, with responses ranging from 1 for Strongly Disagree to 5 for Strongly Agree. The second part consisted of 12 questions meant to gauge each student's readiness for AR technology, as well as their knowledge and expertise with the technology. The third part comprised 13 items to assess students' opinions towards AR technology lessons. The questions were modified to be about AR technology lessons in the teaching and learning in English for Tourism and Hospitality.

The questionnaire in the current study tailored its questionnaire to evaluate the acceptance and perceived effectiveness of AR technology in enhancing language skills among Vietnamese EFL students. This instrument focused on specific dimensions such as engagement, ease of use, and the overall utility of AR in language learning. Questions were designed to capture subjective experiences, emphasizing the interactive and immersive aspects of AR technology in improving speaking skills. In contrast, the questionnaire in Fauzi et al.'s study, situated in construction technology education, used a broader scope in its questionnaire. It assessed students' attitudes toward the practical application of AR, focusing on its usefulness in visualizing and understanding complex construction concepts. The questions aimed to gauge the perceived benefits of AR in enhancing cognitive learning outcomes and meeting

students' technological expectations. The questionnaire in the current study was specifically tailored to the context of language learning, emphasizing engagement and skill enhancement, whereas Ahmad Fauzi et al.'s questionnaire focused on the practical and cognitive benefits of AR in technical education. These changes reflect the unique objectives and contexts of the study, providing valuable insights into student perceptions of AR technology.

To ensure the validity and reliability of the second questionnaire, several rigorous validation steps were undertaken, similarly to the first questionnaire's process. First, the questionnaire was designed to be available in both Vietnamese and English to accommodate all participants comfortably. The back-translation technique, recommended by Brislin (1970), was employed to maintain consistency across languages. This method ensured that the translation did not alter the meaning of the questions, thus guaranteeing that responses reflected the participants' true perceptions rather than linguistic discrepancies. Second, a pilot test was conducted with a sample of 20 students to assess the internal consistency of the survey items. The Cronbach's Alpha values obtained from this pilot test exceeded the 0.7 threshold, indicating satisfactory internal consistency as outlined by Hair et al. (2019). This pilot testing not only confirmed the reliability of the constructs but also provided insights for refining the questionnaire to better capture the intended data. In addition to statistical validation, the content validity of the questionnaire was rigorously evaluated by a panel of five experts specializing in instructional technology and English language teaching. Their extensive experience and academic expertise facilitated a thorough review of the questionnaire items. All items received ratings above 0.7, prompting minor modifications to enhance clarity and relevance. These adjustments further solidified the content validity of the questionnaire, aligning with the recommendations of Artino et al. (2014). The comprehensive validation process ensured that the second questionnaire was a reliable and accurate tool for capturing students' perceptions of AR technology in the educational context. (See Appendix B)

3.6.3 The Speaking Pre- and Post- Tests

The effects of AR technology on Vietnamese EFL undergraduate students were evaluated in the study's second phase. To find out if AR technology may improve students' speaking skills, a single group, pre-test, and post-test research design was used. According to Sugiyono (2014), the pretest in this one-group pretest-posttest design enabled the researcher to assess the treatment with greater accuracy. This research instrument's primary objective was to assess AR technology lessons' effects on the speaking skills of students enrolled in an English for Tourism and Hospitality

course. The assessment tool involved conducting a pre-test and a post-test using the format of the International English Language Testing System (IELTS) Speaking test. In order to assess students' speaking skills, Mock IELTS Speaking tests were applied. The IELTS test consists of four portions: Speaking, Listening, Reading, and Writing. The IELTS speaking test is conducted as an oral interview in a natural setting in order to account for interaction. The speaking portion is conducted face-to-face with a certified examiner in 11 to 14 minutes, in contrast to other sections that are either computer-delivered or paper-based. Results are then given on a scale from 1 to 9 in full and half bands. Candidates must demonstrate integrated speaking skills on the IELTS speaking exam using the four criteria of fluency and coherence, lexical resource, grammatical range and accuracy, and pronunciation. The IELTS speaking exam is often trustworthy and precise. The exam is legitimate, specifically in terms of face validity and content validity. The brief complementation of three portions that are communicatively unrelated to academic subjects makes the exam content-reliable (Li, 2019). In Vietnam, 98 universities accept the IELTS certificate as one of the prioritized methods of admission. (Hà, 2023). This tendency has increased the focus on teaching IELTS speaking skills in Vietnam, along with the globalization of education and a rising need for proficient English-speaking abilities in the labor sector in particular (Bachman, 1990).

The researcher created a set of 10 mock IELTS Speaking tests, with topics related to Tourism and Hospitality, to serve the pre-and post-tests (See Appendix C). These tests were explicitly designed to assess the speaking skills of students, both before and after their engagement with AR technology lessons. The meticulous process of creating and validating these tests was integral to ensuring their effectiveness as reliable research instruments. The initial phase of test creation involved an in-depth analysis of the communicative requirements and situational contexts pertinent to the tourism and hospitality industry. This analysis was supported by consultations with industry experts and a review of relevant literature, which helped in identifying key language functions and terminologies essential for professionals in this field. Each test was crafted to mimic realistic scenarios that a professional might encounter, such as interacting with international clients, handling reservations, and resolving complaints, thereby embedding practical relevance into the assessment. Next, ensuring the content validity of these mock tests was a paramount concern. To address this, the tests were scrutinized by a panel comprising seasoned IELTS instructors and tourism professionals, who evaluated the tests' alignment with both the IELTS speaking standards and the specific linguistic needs of the hospitality industry. Their expertise was crucial in refining the test content, ensuring that it accurately reflected the

language proficiency levels expected and the practical challenges faced within the industry. Following expert review, the tests were subjected to pilot testing with a cohort of students not involved in the main study. This pilot phase was instrumental in identifying any operational flaws or ambiguities in the tests. Feedback from these pilot participants provided invaluable insights, leading to further refinements of the test prompts and administration procedures to enhance clarity and ensure an equitable assessment environment. Another vital aspect of the validation process involved the training and calibration of raters. Raters were extensively trained using the IELTS Band Descriptors (See Appendix D) to ensure a uniform understanding and application of the scoring criteria, with a particular emphasis on aspects such as fluency, coherence, lexical resource, grammatical accuracy, and pronunciation. This training included scoring practice sessions using diverse response samples to build consistency and reliability in their evaluations. Inter-rater reliability was rigorously assessed by having multiple raters independently score the same responses and analyzing the consistency of their scoring to minimize subjectivity and bias. The standardization of the testing process was meticulously maintained across both the pre-test and post-test phases. By employing the same scoring rubrics and procedures in both assessments, the study ensured a reliable basis for comparing the linguistic progress of students, thereby accurately gauging the educational impact of AR technology lessons. Through these comprehensive validation efforts, the set of 10 mock IELTS Speaking tests was tailored to not only meet the specific needs of students in the Tourism and Hospitality sector but also to uphold stringent academic and methodological standards.

During the pre-test phase, students were presented with three distinct IELTS-like speaking tasks that are closely related to the Tourism and Hospitality industry. These tasks encompassed a range of speaking skills, such as information delivery, opinion expression, and scenario discussion. Each student responded to these tasks individually, and their responses were recorded for later evaluation. Qualified and trained raters, well-versed in the IELTS Speaking Band Descriptors, then evaluated the recorded pre-test responses. These evaluators assessed various aspects of the students' speaking skills, including fluency, coherence, lexical resources, grammatical range, pronunciation, and interactive communication.

Following the pre-test, students engaged in a 9-week ESP course with AR-based classroom activities related to Tourism and Hospitality. This phase aimed to enhance their speaking skills through practical application within the industry context. Upon completion of the course, a post-test was conducted using a different set of

three IELTS-like speaking tasks that mirror the pre-test tasks in terms of complexity and skill coverage. Similar to the pre-test, students individually responded to these tasks, and their responses were recorded. The recorded post-test responses were again evaluated by the trained raters using the IELTS Speaking Band Descriptors, maintaining the same evaluation criteria used in the pre-test. This dual-phase assessment approach allowed a comparative analysis of the students' speaking proficiency before and after the intervention of AR technology in their language learning.

This research instrument offered several advantages, including the use of a standardized and recognized assessment like the IELTS Speaking test, objective scoring through trained raters and established criteria, and the ability to quantify the improvements attributed to the intervention of AR technology in an ESP course. To ensure the validity and effectiveness of the speaking pre- and post-tests, a comprehensive approach was adopted, encompassing several key areas including rater training, task relevance, ethical considerations, and pilot testing. The primary objective of these tests was to assess the impact of AR technology on the speaking skills of Vietnamese EFL undergraduate students enrolled in an English for Tourism and Hospitality course. The assessment was conducted using a pre-test and post-test format modeled on the International English Language Testing System (IELTS) Speaking test, a well-established and reliable tool in language proficiency evaluation.

The process of creating these mock IELTS Speaking tests involved an in-depth analysis of the communicative requirements and situational contexts pertinent to the tourism and hospitality industry. This analysis was supported by consultations with industry experts and a review of relevant literature, which helped in identifying key language functions and terminologies essential for professionals in this field. Each test was crafted to mimic realistic scenarios, such as interacting with international clients, organizing events, and developing sustainable tourism, embedding practical relevance into the assessment. Ensuring the content validity of these mock tests was a paramount concern. The tests were checked by a panel of seasoned IELTS instructors and tourism professionals, who evaluated their alignment with both IELTS speaking standards and the specific linguistic needs of the hospitality industry. Their expertise was crucial in refining the test content to accurately reflect the expected language proficiency levels and the practical challenges faced within the industry. Following this expert review, the tests underwent pilot testing with a cohort of students not involved in the main study. This pilot phase was instrumental in identifying any operational flaws or ambiguities in the tests. Feedback from these pilot participants provided invaluable insights, leading to further refinements of the test prompts and

administration procedures to enhance clarity and ensure an equitable assessment environment. Another vital aspect of the validation process involved the training and calibration of raters. Raters were extensively trained using the IELTS Band Descriptors to ensure a uniform understanding and application of the scoring criteria. This training included scoring practice sessions using diverse response samples to build consistency and reliability in their evaluations. Inter-rater reliability was rigorously assessed by having multiple raters independently score the same responses and analyzing the consistency of their scoring to minimize subjectivity and bias. Ethical considerations were also thoroughly addressed. Participants were fully informed about the study's purpose, procedures, and potential impacts, and their consent was obtained prior to participation. Confidentiality of the participants' responses was strictly maintained, and all data was anonymized to protect their identities. The standardization of the testing process was maintained across both the pre-test and post-test phases. By employing the same scoring rubrics and procedures in both assessments, the study ensured a reliable basis for comparing the linguistic progress of students, thereby accurately gauging the educational impact of AR technology lessons. This dual-phase assessment approach allowed for a comparative analysis of the students' speaking proficiency before and after the intervention of AR technology in their language learning. Through rigorous validation efforts, including expert reviews, pilot testing, rater training, and ethical considerations, the set of 10 mock IELTS Speaking tests was tailored to meet the specific needs of students in the Tourism and Hospitality sector. These measures ensured the reliability and accuracy of the tests, thereby providing a robust framework for evaluating the impact of AR technology on students' speaking skills.

3.6.4 The Focus Group Interviews

A focus group interview is a qualitative research method used to gather in-depth insights into participants' attitudes, perceptions, and experiences on a specific topic. This method involves a small group of people, typically ranging from 6 to 12 participants, who engage in a guided discussion led by a moderator. The interaction among participants in a focus group setting can generate rich data, as individuals can express their views in their own words and react to the opinions of others (Krueger & Casey, 2015). Focus group interviews are particularly valuable in exploring complex behaviors and motivations, as they provide a platform for participants to discuss and clarify their thoughts, thus yielding a deeper understanding of the subject matter (Morgan, 1997). Additionally, the dynamic nature of group discussions can uncover aspects of a topic that might not emerge through individual interviews or surveys, making focus groups a powerful tool for exploratory research.

The data gathered for the study from a single source did not provide enough support for the conclusions to be drawn. Interviews were done to go deeper and uncover additional information in order to triangulate the study's findings (Nunan, 2002; Wilkinson & Birmingham, 2003). According to Johnson and Christensen (2012), the interview was used to gather detailed information on the participants' opinions, knowledge, and emotions about a subject. Additionally, a researcher was able to grasp another person's perspective and obtain access to their inner world through interviews (Patton, 1987). Interviews were employed in phenomenological, phenomenographic, or ethnographic research to elucidate the significance of important themes in the respondents' lives from their own points of view (Ayres, 2008). Focus groups, which were specifically selected groups of people whose opinions were analyzed in facilitated or unfacilitated talks to ascertain the answers that might be anticipated from a broader population, were one such instance (David, 1996). Focus groups were used to gather information through lively, well-facilitated conversations. A group chat was used in this type of qualitative study to encourage participants to provide information about their thoughts, opinions, beliefs, and attitudes. For compelling and authoritative replies, researchers carefully chose the focus group participants (Bloor, 2001). In an interactive group format, questions were posed and participants were allowed to converse with other group members. The researcher both recorded and took notes of the important information gleaned from the group throughout this procedure. Interviews were done in the students' native Vietnamese language for ease of comprehension and convenience. The interview questions were tested with students who weren't in the experiment group for internal consistent reliability by experts for the index of item objective congruence (IOC) analysis. In order to do this, a set of interview questions was created that contained both general and particular answers for the participants who were questioned. The purpose of the first section of the interview guide was to gather demographic and other crucial data that would be used to enhance the information from the interview and survey. This information contained, among other things, name, age, offenses, prior offenses, and educational background. The remaining questions and suggestions in the interview guide were created to keep the conversation centered on the issues associated with the study's goals. Despite having a list of questions, the researcher adopted a flexible strategy. Even while each participant was subjected to a set of "compulsory" questions, the interviewer was free to focus only on whatever pertinent or interesting topics at hand. In reality, during the interviews, many of the list's questions were addressed naturally throughout the conversation, allowing for a casual and conversational tone. The 6 semi-structured

focus group interview questions in this study were developed by the researcher to explore students' perceptions towards the use and experience of AR technology lessons in their ETH course. The 10 participants were randomly selected by the convenience and purposive sampling methods. The researcher intended to include participants in 2 groups, one from the most active participants in the projects, and one from the most passive participants, who might have more challenges during the project. The purpose was to explore the diverse perspectives of different experienced participants. From the contact lists of participants, who agreed to join the research study and the personal observation notes of the researcher, he sent out formal invitations for them to join the semi-structured interviews on a voluntary basis. Statements of guarantee for their benefits, privacy and anonymity were attached to encourage their participation in the required quota of the research.

The validity of the 6 semi-instructed interview questions was checked and verified using the Index of Item Objective Congruence (IOC) by three scholars in the field of English Language Teaching, the average IOC score from the experts was 1.00, which means the validation of the instrument was good enough to proceed (See Appendix E). The following steps were used in creating interview questions. First, the content validity of each of the interview-guided questions was assessed by professionals. If the IOC is between 0.5 and 1.0, it is legitimate; otherwise, it is invalid. Following the results of the IOC investigation, the researcher amended the items whose IOC values fall between 0.5 and 1.0 and eliminated the items whose IOC values fall below 0.5. A focus group of four students who did not take part in the experiment was used to test the interview questions to make sure they were valid. This step was conducted in order to: a) determine whether the interview questions functioned properly; b) determine whether there is anything wrong with the question items, interview procedure (including other factors like timing, recording, or any other technical problems that may occur in the actual data collection); and c) determine whether the student oral interviews would be effective and serve the goals of the research (Intaraprasert, 2000). According to the students' replies from the field study, the guided interview questions might function properly and effectively to further the goals of the study.

Following Table 3.3 is the list of the semi-structured interview questions:

Table 3.3 Focus group interviews questions

No.	Questions
1	Can you describe your overall experience with the AR technology in this English for Tourism and Hospitality course?
2	Do you feel comfortable with the AR technology? How & why?
3	How does the Halo AR app help improve your English speaking skills in the context of Tourism and Hospitality?
4	Could you provide specific examples of how AR technology enhanced your language learning experience?
5	How did you overcome the challenges, and did they impact your language learning outcomes?
6	How do you perceive the potential application of AR technology in real-life Tourism and Hospitality contexts after completing this course?

3.6.5 Instructional Instruments

In the research thesis examining the integration of AR technology into English language teaching, particularly focusing on the use of the Halo AR app for the English for Tourism and Hospitality course, several instructional instruments have been designed to optimize the educational impact and facilitate the effective use of AR technology. These instruments include detailed lesson plans incorporating AR technology, specific instructions for AR activities, and a comprehensive user guideline for the Halo AR app.

3.6.5.1 AR Technology Lessons Designed by the Researcher

The lessons developed for this thesis are crafted to integrate AR technology seamlessly into the curriculum of the ETH course. Each lesson begins with clear learning objectives aligned with the overall course goals, emphasizing essential language skills needed in tourism and hospitality contexts. These skills include specific vocabulary relevant to tourism settings and practical communication abilities crucial for interacting in these environments. The AR components are embedded in the lessons to enhance the learning experience by providing immersive, interactive scenarios that replicate real-world situations. For example, a typical lesson might involve students using the Halo AR app to engage in a simulated conversation set in a tourist destination, enabling them to practice language skills in a dynamic and contextualized setting (see Appendix G). This approach not only aims to improve linguistic competence but also to foster essential soft skills such as cultural awareness and customer service, which are vital in the tourism and hospitality industry. To ensure the AR technology's effectiveness, each lesson includes pre-activity and post-activity assessments. These assessments are designed to measure learning outcomes,

providing a clear indication of how well the students have grasped the language skills and concepts presented in the lesson. This structured approach ensures that the integration of AR technology is not merely an add-on but a fundamental component that enhances educational objectives. Overall, the AR technology lessons in this thesis are designed to create a comprehensive, engaging, and effective learning environment. By leveraging the immersive capabilities of AR, these lessons provide students with opportunities to apply their language skills in realistic and practical contexts, preparing them for real-world challenges in the tourism and hospitality sector. This innovative approach aligns with contemporary educational practices, advocating for the use of advanced technologies to enhance the learning experience and meet the needs of modern learners.

3.6.5.2 Instructions for AR Activities with the Halo AR App

Instructions for AR activities are detailed and tailored to guide students through each session effectively. These instructions serve as a roadmap for students to navigate the AR experiences, ensuring that they understand how to interact with the technology to maximize their learning. For instance, instructions might detail how students should activate AR simulations, interact with virtual elements, and complete specific tasks designed to practice language skills. Moreover, these instructions include troubleshooting tips to help students manage common technical issues independently, fostering a smoother learning experience. Safety guidelines are also provided to ensure that students use the AR technology in a manner that is secure and conducive to learning, emphasizing the importance of proper handling and ergonomics to avoid physical strain.

3.6.5.3 Rubrics for the Speaking Pre-test and Post-test

In the current study, the assessment of students' speaking skills was rigorously conducted through pre-tests and post-tests, both utilizing the IELTS Speaking Test rubrics to ensure a standardized and comprehensive evaluation. These rubrics assess four key areas: Fluency and Coherence, Lexical Resource, Grammatical Range and Accuracy, and Pronunciation, each rated on a scale from 1 to 9, with detailed descriptors outlining the proficiency levels for each band. The speaking pre-test was administered at the beginning of the course to establish a baseline measurement of the students' initial speaking abilities. In this phase, the evaluation focused on fluency and coherence, measuring the students' ability to speak smoothly without undue hesitation, self-correction, or repetition. Higher bands indicate more natural and coherent speech with appropriate use of cohesive devices. Lexical resource is another critical area, where the range and accuracy of vocabulary used by the students are

assessed. Higher scores are awarded for the use of a wide range of vocabulary with precision and flexibility, including idiomatic expressions and less common terms. The grammatical range and accuracy criterion evaluates the variety and correctness of grammatical structures employed by the students, with higher bands reflecting the use of complex structures with minimal errors, akin to native speaker proficiency. Lastly, pronunciation is assessed for clarity and accuracy, including intonation, stress, and the use of pronunciation features, with higher scores given for clear, natural, and effortless pronunciation.

At the end of the course, the speaking post-test was conducted to measure improvements in the students' speaking skills following the integration of AR technology into the curriculum. The same IELTS Speaking Test rubrics were applied to ensure consistency in evaluation. The post-test examined enhancements in the students' ability to speak fluently and coherently, noting any reduction in hesitations and more effective use of discourse markers. Additionally, the lexical resource criterion in the post-test measures any advancements in the range and accuracy of vocabulary used by students, focusing on improvements in their ability to use precise and varied language appropriate to tourism and hospitality contexts. The grammatical range and accuracy assessment during the post-test evaluates improvements in the complexity and correctness of grammatical structures, looking for a reduction in errors and more frequent use of complex sentences. Pronunciation in the post-test is evaluated for improvements in clarity and accuracy, with a focus on more natural intonation and stress patterns, making speech easier to understand. By employing the IELTS Speaking Test rubrics, the study ensures a rigorous and standardized assessment of students' speaking skills. This approach allows for a detailed comparison of pre-test and post-test results, providing clear evidence of the impact of AR technology on the development of speaking proficiency in English for Tourism and Hospitality. The consistency and comprehensiveness of the assessment method underscore the validity of the findings, demonstrating the effectiveness of AR technology in enhancing language learning outcomes.

3.6.5.5 Validation of Instructional Research Instruments

The validation process incorporated feedback from two experts - one specializing in information technology and the other in English Language Teaching (ELT) - as well as from a group of ten students who participated in the pilot testing of the AR applications. The engagement of two experts with specialized knowledge in their respective fields ensured a robust evaluation of both the technical functionality and educational effectiveness of the AR tools. The IT expert assessed the technical aspects

of the AR software, including its stability, user interface design, and compatibility with various devices, which are critical to ensuring a smooth and effective user experience. On the other hand, the ELT expert focused on the pedagogical integration of the AR technology, evaluating whether the instructional content was pedagogically sound and aligned with the learning objectives of the English for Tourism and Hospitality course. This dual-expertise approach facilitated a comprehensive assessment, ensuring that both the technological and educational aspects of the AR applications were thoroughly vetted and optimized. Additionally, pilot testing played a crucial role in the validation process. Ten students from the target demographic were selected to use the AR applications under controlled conditions. These students were tasked with engaging with the AR tools as they would in an actual learning scenario, thereby providing real-time data on the usability and educational impact of the technology. Their interactions were monitored, and detailed feedback was collected to gauge their experiences. This feedback encompassed a range of elements from navigational ease within the app to the relevance and clarity of the instructional content delivered via AR. Moreover, the feedback from both the experts and the student participants was meticulously analyzed to identify any recurring issues or notable strengths. This analysis involved categorizing the feedback into themes such as usability, engagement, learning effectiveness, and technical stability. Insights gained from this process were invaluable; they highlighted critical areas for improvement such as the need for more intuitive navigation controls, better error handling and recovery in the software, and enhancements to the instructional design to make the AR scenarios more engaging and educationally valuable. Finally, the iterative process of refinement that followed was driven by the specific details unearthed from the feedback analysis. Modifications were made to the AR applications to address the identified issues. For example, improvements were implemented in the user interface to make it more user-friendly based on the IT expert’s recommendations and user feedback. Similarly, content enhancements were carried out to align the AR scenarios more closely with the ELT expert's suggestions, ensuring that the educational content was both contextually relevant and pedagogically effective.

This thorough and methodical validation process, involving experts and end-users alike, underscored the commitment to ensuring that the AR tools used in the thesis were not only technologically robust but also pedagogically sound. By meticulously analyzing and utilizing the feedback from these key stakeholders, the study was able to significantly enhance the reliability and educational efficacy of the

AR applications, paving the way for a more effective integration of AR technology into English language teaching for Tourism and Hospitality.

3.7 Data Collection

To comprehensively evaluate the integration of AR technology in an English for Tourism and Hospitality (ETH) course, this study employed a mixed-methods data collection approach. Both quantitative and qualitative data were gathered to examine students' acceptance of AR technology and its impact on their learning outcomes, particularly in terms of language proficiency, engagement, and motivation. Quantitative data were obtained through two structured questionnaires and a set of pre- and post-speaking tests, which enabled the measurement of students' perceptions and language development before and after the intervention. Complementing this, qualitative insights were collected through focus group interviews, offering a nuanced understanding of students' lived experiences with AR-based learning. Together, these data collection methods provided a rich, triangulated perspective on the pedagogical effectiveness and user acceptance of AR technology in the context of higher education language instruction.

3.7.1 Quantitative Data

In this study, quantitative data collection was designed and implemented through 2 questionnaires (Questionnaire 1 and Questionnaire 2) to assess two critical aspects of adopting AR technology in language learning among students enrolled in English for Tourism and Hospitality course at a university in Ho Chi Minh City.

3.7.1.1 Questionnaire 1

The data collection for the first questionnaire was designed to assess students' initial readiness and willingness to adopt AR technology for language learning in the English for Tourism and Hospitality course. Conducted at the beginning of the course, the questionnaire focused on gauging students' general attitudes towards using technological tools in education, their prior exposure to AR technology, and their perceptions regarding the potential benefits and challenges of using AR in their language studies. This instrument utilized Likert scale items, allowing students to express their agreement or disagreement with various statements, with the scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The questionnaire included 25 items divided into categories such as Perceived Usefulness, Perceived Ease of Use, Perceived Enjoyment, Attitudes and Acceptance towards Usage, and Intention to Use. The recruitment process for participants involved initial communication via email, detailing the purpose and significance of the study, and including an informed consent

form outlining the objectives, confidentiality measures, and the voluntary nature of participation. The administration of the questionnaire was conducted electronically, enhancing the speed of distribution and collection while supporting the anonymity and confidentiality of students' responses.

Ethical guidelines were rigorously followed throughout the research process. Both questionnaires received approval from the university's research ethics board, ensuring adherence to ethical standards. Data were securely handled with electronic storage on protected university servers accessible only to the researcher, safeguarding the privacy of the participants and ensuring the integrity of the data. Upon completion, responses were meticulously organized, reviewed for accuracy, and cleaned to eliminate any outliers or inconsistencies. Statistical analyses, including descriptive statistics and correlation analysis, were conducted using the collected data. These analyses provided insights into participants' perceptions and offered a thorough understanding of the factors influencing their readiness and willingness to adopt AR technology in language learning. The comprehensive data collection and analysis approach ensured the reliability and validity of the findings, contributing valuable insights to the broader academic discourse on the use of innovative technologies in educational settings.

3.7.1.2 Questionnaire 2

After integrating AR technology into the course, the Questionnaire 2 was administered towards the end of the course to measure the acceptance of AR technology among students following their direct engagement with the tools. This questionnaire assessed aspects such as the enhancement of learning engagement, the perceived ease of use of the technology, and its overall utility in their language learning process. Similarly, it employed a Likert scale format to facilitate the quantification of students' responses, ensuring consistency in data collection methods across both tests.

The participant recruitment process was conducted through initial email communication, targeting students enrolled in the course. This email provided comprehensive information about the study's purpose and importance, accompanied by an informed consent form that explained the study's objectives, confidentiality protocols, and the voluntary nature of participation. The questionnaires were distributed and collected electronically, which expedited the process and ensured the anonymity and confidentiality of the respondents. Throughout the research, stringent ethical standards were maintained. Both questionnaires were approved by the university's research ethics board, affirming adherence to ethical guidelines. Data were securely managed, stored electronically on protected university servers accessible

exclusively to the researcher, thereby ensuring participant privacy and data integrity. Upon receiving the responses, the data were meticulously organized, validated for accuracy, and cleansed to remove any anomalies or inconsistencies.

3.7.1.3 Pre- and Post- Tests of Speaking Skills

To capture a comprehensive understanding of the effects of AR technology on students' speaking skills, both a pre-test and a post-test were administered, offering a baseline for comparison. For the pre-test, students were examined in speaking topics closely aligned with the field of Tourism and Hospitality. These speaking topics were designed by the researcher and were structured to simulate real-world scenarios, such as providing a virtual tour of a tourist destination or narrating a unique dining experience at a hotel or restaurant. To ensure consistency and objectivity, these tasks closely resembled the speaking section of the International English Language Testing System (IELTS) examination. Participants' performances were captured through audio or video recordings, preserving the authenticity of their responses. Following the intervention of AR technology in the ESP course, which spanned a period of 9 weeks during the English for Tourism and Hospitality class, the post-test speaking assessment was conducted. The tasks remained aligned with the initial pre-test in content, enabling a direct comparison of participants' spoken proficiency before and after the intervention. These tasks sought to gauge not only the enhancement of language skills but also the potential integration of augmented reality technology in shaping their presentations. A team of 2 trained raters, who were experienced ELT teachers and IELTS teachers and trainers, well-versed in evaluating spoken English proficiency, were engaged to assess the recorded responses. The 2 raters employed a standardized rubric encompassing criteria like fluency and coherence, lexical resource, pronunciation, and grammatical range and accuracy. This approach ensured that the assessment remained unbiased and consistent across all participants. The use of a mock IELTS Speaking test framework lent an established benchmark for evaluation, further enhancing the reliability of the assessment process. Upon completion of the assessment phase, the pre-test and post-test results were meticulously compared and analyzed to determine the extent to which the AR technology had impacted the students' speaking skills. The analysis aimed to unveil any significant differences, improvements, or trends in their linguistic competence throughout the intervention.

3.7.2 Qualitative Data

The qualitative data of the study was collected from the Focus group interviews. Upon completion of the research, the focus group interviews were

conducted as a methodical and insightful exploration of students' perceptions, experiences, and feedback concerning the AR technology lessons in the context of English for Tourism and Hospitality course. To assemble the most relevant and representative participants, careful consideration was given to the selection criteria. Those actively engaged in the AR-based classroom activities were chosen, ensuring their firsthand experience with the subject matter. The Focus group interview was conducted in Vietnamese as the participants' mother tongue, which would enhance the comfort of the interviews and the diversity of language proficiency expressions. The familiarity with AR technology was also prioritized, fostering a comprehensive range of perspectives. Also, those passively or extremely quiet in class were invited. This was to explore deeper the challenges and difficulties the students might have in the ETH course with AR technology lessons. Invitations were extended through email and class announcements, clearly outlining the purpose of the focus group and the commitment involved. The scheduling of focus group sessions was orchestrated with participants' schedules in mind. A conducive physical setting was arranged, fostering an environment conducive to candid discussions. The discussions commenced with an introduction to the researcher's role and the session's purpose, followed by the establishment of ground rules for respectful dialogue. Guided by a comprehensive interview guide, the discussions were initiated with open-ended questions aimed at unearthing participants' thoughts and experiences with AR technology lessons. The researcher skillfully facilitated the conversation, ensuring all participants had the chance to contribute and engage with one another. As the discussions unfolded, the exploration of attitudes, experiences, challenges, and suggestions was marked by rich interactions and candid expressions. The audio recordings were employed, with participants' consent, to capture the nuances of the discussions. At the same time, meticulous notes were taken to document key points, significant interactions, and any non-verbal cues, enriching the subsequent analysis. These sessions provided a platform for students to share their experiences, voice their concerns, and suggest improvements, thereby offering an invaluable perspective on AR technology lessons. The recordings were transcribed verbatim, then were translated into English for the subsequent analysis. The translation was sent to two experts in ELT at a university to check for content validity and reliability. The analysis of the scripts unveiled recurring themes, patterns, and insights drawn from the participants' perspectives. These thematic insights were then interpreted in the context of the research questions, painting a comprehensive picture of how students perceived and experienced AR technology lessons in the ETH course.

3.8 Data Analysis

To systematically evaluate the effectiveness and acceptance of augmented reality (AR) technology in the English for Tourism and Hospitality (ETH) course, a rigorous and multifaceted data analysis approach was employed. This section outlines the analytical procedures undertaken to interpret both quantitative and qualitative data collected throughout the study. Quantitative data from questionnaires and speaking tests were analyzed using established statistical methods, including descriptive statistics, reliability testing, correlation analysis, and paired t-tests, to examine patterns, relationships, and changes in students' perceptions and language proficiency. In parallel, qualitative data from focus group interviews were subjected to thematic analysis, guided by the framework of Braun and Clarke (2012), and supported by NVivo software to identify recurring themes and insights. Together, these analytical methods provided a comprehensive understanding of students' experiences, engagement, and linguistic development in AR-enhanced learning environments. The integration of both data types allowed for triangulation, enriching the validity and depth of the findings and contributing to a holistic exploration of AR technology's pedagogical impact.

3.8.1 The Quantitative Data

3.8.1.1 Questionnaires

The data analysis process in this research study was structured to interpret the quantitative data collected through the two questionnaires, aimed at assessing the adoption and acceptance of AR technology in language learning. This process, conducted using IBM SPSS Statistics version 20, entailed a series of well-defined steps designed to ensure a comprehensive and accurate analysis.

Initially, the analysis began with extensive data handling and preparation. All collected data were reviewed for completeness, accuracy, and consistency. During this phase, any inconsistencies or missing data points were meticulously corrected through established data cleaning techniques. This initial preparation was critical as it ensured that the data were reliable, forming a solid foundation for the subsequent statistical analysis. Following this preparatory phase, descriptive statistical analysis was employed to summarize the fundamental characteristics of the data. This involved calculating means, standard deviations, and generating frequency distributions for each item on the questionnaires. The use of descriptive statistics provided an initial overview of the participants' demographic attributes and responses, which was instrumental in establishing an understanding of the data distribution and enabling deeper analytical insights in subsequent stages.

To verify the internal consistency of the survey instruments, reliability testing was performed by calculating Cronbach's Alpha coefficients for each section of the questionnaires. A Cronbach's Alpha value exceeding 0.7, which aligns with the standards suggested by Hair et al. (2019), indicated satisfactory reliability. This step was essential to confirm that the items within each construct consistently measured the same underlying concept, thereby validating the reliability of the survey tools used in the study. Additionally, correlation analysis was conducted to explore the relationships between various constructs, such as students' readiness and willingness to adopt AR, their acceptance of the technology post-intervention, and other demographic variables. This analysis provided insights into how different variables interrelated and influenced students' perceptions and acceptance of AR technology in their language learning process.

The culmination of these analytical efforts was a comprehensive presentation of the results, which included detailed tables, figures, and statistical outputs. This presentation ensured that the findings were clearly articulated and easily interpretable, effectively linking the analytical outcomes back to the study's research objectives and theoretical underpinnings. In the final stage, the discussion of the findings integrated these statistical results into a broader context, relating them back to the existing literature and theoretical frameworks. This discussion addressed the implications of the findings, highlighting how the study contributes to the field of educational technology and English language teaching. It also explored practical applications of AR technology in educational settings, discussed the limitations of the current study, and suggested potential directions for future research.

Through this rigorous and methodical approach to data analysis, the research not only transformed raw data into meaningful insights but also provided a robust foundation for understanding the impact of AR technology on language learning. This enriched the academic discourse surrounding educational technologies and offered practical insights for enhancing language instruction through innovative technological solutions.

3.8.1.2 Pre- and Post- Speaking Tests

The process of data analysis commenced with the calculation of the average speaking scores for each participant at both the pre-test and post-test stages. The researcher employed statistical methods, notably paired t-tests, to discern any significant discrepancies between the scores at these two intervals. This phase of analysis was critical in gauging the effects of AR technology on the speaking skills of the students.

The methodology for data analysis was systematically executed through several detailed steps. Initially, in the pre-processing of data, the researcher ensured that all recorded responses were correctly organized and labeled, facilitating straightforward referencing. Each student's responses from the pre-test and post-test were meticulously paired to enable accurate comparisons. Subsequently, during the score calculation phase, the IELTS Speaking Band Descriptors were utilized as a scoring rubric. Trained raters, proficient in these descriptors, assessed each response on criteria such as fluency, coherence, lexical resource, grammatical range, pronunciation, and interactive communication. The average scores from the pre-test and post-test for each student were then calculated, providing a clear measure of their speaking proficiency prior to and following the intervention. A comparative analysis was conducted using the paired t-test to evaluate the data and determine the effects of AR technology on the students' speaking skills. This statistical approach was pivotal in establishing whether the differences observed between the pre-test and post-test scores were statistically significant.

The interpretation of the results followed, where the outcomes of the statistical tests were analyzed. A statistically significant increase in the post-test scores relative to the pre-test scores would suggest positive effects of the AR technology on the students' speaking skills. Conversely, a lack of significant difference would indicate that the intervention did not markedly enhance speaking skills. Additionally, a contextual interpretation of the qualitative aspects of the speaking responses was performed. This analysis aimed to identify prevailing trends in areas of improvement or challenges, offering deeper insights into the specific facets of speaking skills affected by AR technology lessons.

The final stage encompassed discussion and conclusion, where the implications of the findings were deliberated concerning the research questions and objectives. This comprehensive evaluation helped to conclude the effects of AR technology on the students' speaking skills within the English for Tourism and Hospitality course, providing substantive evidence and insights derived from the conducted analysis.

3.8.2 Qualitative Data

In the qualitative analysis of the data gathered from the focus group interviews with participants from the ESP class, a comprehensive approach was employed, starting with the meticulous transcription of audio recordings. These transcriptions transformed the verbal exchanges into written text, which facilitated a structured and thorough analysis (See Appendix I). Following the guidelines set by

Braun and Clarke (2012), the process involved six steps of thematic analysis: immersing in the data, writing code, looking for themes, evaluating promising themes, defining and labeling themes, and ultimately delivering the report. This method ensured that every nuanced expression, hesitation, and emphasis was accurately captured, pivotal for interpreting the data's depth and breadth.

The initial phase of Data Familiarization involved extensive engagement with the interview data. This was achieved by listening to audio recordings, reading the transcribed texts, and noting significant emerging patterns related to the implementation of AR technology in English language teaching. This deep immersion allowed the researcher to form preliminary interpretations and understandings, setting the stage for the subsequent coding process. Using NVivo 14, a qualitative data analysis software recommended by Creswell (2017) for enhancing the reliability of research findings, the Initial Coding stage was executed. This involved systematically identifying significant segments within the data and assigning descriptive codes such as "Benefits of AR technology" and "Challenges in implementation." Next, during the Open Coding phase, the data was dissected into smaller segments to generate initial concepts, crucial for allowing the emergence of new insights without preconceived notions. This structured approach facilitated the organization of data for deeper analysis, and a coding structure was developed to reflect the topics discussed in the focus groups. The subsequent Theme Development phase involved identifying themes that represented patterns or recurrent concepts across the focus groups, encapsulating the essence of the participants' experiences, perceptions, and attitudes regarding AR technology. Rigorous documentation was maintained to ensure transparency while forming these themes. The process then moved to Data Mapping and Validation, involving the creation of a visual map or table displaying the relationships between codes, sub-themes, and overarching themes. This facilitated a clearer understanding of the hierarchical structure of the data analysis. Additionally, member checking was considered to validate the interpretations of participants’ statements, enhancing the validity of the findings. Inter-rater reliability was ensured with the assistance of two colleagues from the School of Foreign Languages at UEH. Both the researcher and the colleagues independently coded a subset of the data, and the agreement between their codes was calculated using analysis software tools, thus bolstering the reliability of the analysis. In the Refining Themes phase, based on discussions with colleagues and reflections on the data, the researcher refined and revised the themes to ensure they accurately captured the nuances of participants' responses and aligned with the research questions. Throughout the analysis, the inclusion of direct quotations from

participants, referred to as exemplars, illustrated the identified themes. These exemplars provided robust evidence supporting the findings and allowed readers to engage directly with participants' voices. After analyzing the data and generating themes, Member Checking was conducted by returning to the participants with the findings. This step provided them an opportunity to confirm or challenge the interpretations drawn from their responses, thereby contributing to the validity of the analysis. Finally, the Integration with Literature connected the themes and findings to relevant theoretical frameworks and existing literature, strengthening the validity of the analysis by contextualizing the findings within a broader academic discourse. This final document presented a narrative that not only conveyed the analytical outcomes but also provided a compelling argument for the broader application and potential of AR technology in educational settings.

3.9 Ethical Considerations

In the study exploring the use of AR technology in English language teaching for Tourism and Hospitality students at the University of Economics Ho Chi Minh City, Vietnam, a rigorous ethical framework is crucial to ensure the protection of participants and the integrity of the research process. This framework encompasses several comprehensive steps, meticulously designed to address ethical concerns across various research instruments including surveys, classroom activities, speaking tests, and focus group interviews.

The process begins with a detailed informed consent procedure, ensuring that all participants are thoroughly briefed about the purpose of the research, the extent of their involvement, potential risks, and benefits. This is critical to ensure that participation is voluntary and informed. The consent forms are collected by an independent third party who is not involved in the course's instruction or assessment, to prevent any potential coercion (See Appendix H). These forms are stored in sealed envelopes and only accessed after final course grades are submitted, thereby safeguarding participants from any undue pressure or conflict of interest. Secondly, to maintain confidentiality and anonymity, all participant data are anonymized using pseudonyms or identification numbers. Strict data protection measures are enforced, with digital data encrypted and physical data securely stored in locked facilities, accessible only to the research team. This not only protects sensitive information but also aligns with data protection laws and regulations. Additionally, the ethical considerations extend to minimizing potential harm to participants. The research design includes specific measures to ensure that participation does not cause

psychological or emotional distress. Participants have the right to omit any survey questions or withdraw from activities they find uncomfortable. Support such as contact information for psychological services are provided, underscoring the commitment to participant welfare. Next, cultural sensitivity is another pillar of the ethical approach, especially given the cultural context of Vietnam. All research materials and procedures are carefully crafted to respect and reflect local customs and values. This ensures that the research is both relevant and respectful, fostering an environment of trust and engagement between researchers and participants. The integrity of data handling is ensured by NVivo software, which supports the systematic organization and analysis of qualitative data. This software aids in accurately identifying and synthesizing themes from the data, enhancing the reliability and transparency of the findings. Additionally, all data collected through surveys, tests, and activities are rigorously checked for accuracy and integrity, with strict protocols in place to prevent data manipulation. Before the start of the study, the research protocol is reviewed and approved by the university's ethical review board. This review verifies that the research conforms to international ethical standards, providing an additional layer of oversight. The study is also subject to ongoing ethical monitoring, which allows for the addressing of any new ethical concerns that may arise during the research. Finally, after the completion of the research activities, a debriefing session is conducted with participants. This session is designed to explain the findings and discuss the implications of the results, enhancing participants' understanding of the research and reinforcing the transparency of the process. This debriefing is essential not only for participant closure but also for affirming the ethical commitment to transparency and education in research practices. In short, this comprehensive ethical framework underscores the commitment to conducting the research responsibly, ensuring that the study not only yields insightful findings but also adheres to the highest standards of ethical research practice.

3.10 Findings from the Pilot Study

This part presents the initial findings from a pilot study conducted as part of a research project, which aimed to evaluate the integration of AR technology in language learning, specifically within the context of English for Tourism and Hospitality. The study spanned a period of four weeks and involved evening classes at a tertiary institution in Ho Chi Minh City, Vietnam. A total of 82 participants, who are students in English for Tourism and Hospitality were engaged in the project.

The core activity of the pilot study required the students to learn lessons in English for Tourism and Hospitality with AR technology, using the Halo AR platform. This task

was designed not only to enhance their English speaking skills but also to explore their readiness and willingness to adopt innovative technologies in educational settings. The use of AR technology, particularly in language learning for specific purposes such as Tourism and Hospitality, presents unique opportunities for interactive and immersive learning experiences. Therefore, this pilot study sought to shed light on the potential of AR technology to enhance linguistic competencies and to gauge student engagement and perception towards such technologies in an educational framework.

The findings from this pilot study are pivotal for understanding the initial levels of acceptance of AR technology among Vietnamese EFL students. The Likert scale (Table 3.4) was used to analyze the questionnaire in order to assess the degree to which the study's objectives have been met. Five-point Likert scale instruments are more stable in usage, according to Mohamed Najib (2001).

Table 3.4 Likert scale (Mohamed Najib, 2001)

Rating	Scale
Strongly Disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly Agree	5

The statistical package for the social system (SPSS version 20) program was used to examine the gathered data. Statistical analysis is the kind of quantitative analysis that is applied. For this investigation, descriptive statistics were used as the split statistical analysis. Descriptive statistics were used to examine the mean score for the degree of student acceptance of the perceived utility, perceived ease of use, and attitude toward technology. The data from the Likert scale questionnaire items was analyzed by the researcher using the mean score. The mean range level interpretation that yields low, medium, and high results is displayed in Table 3.5.

Table 3.5 Interpretation of the mean range level (Abdul Ghafar, 2013)

Mean value	Interpretation level
3.68 - 5.00	High
2.34 - 3.67	Medium
1.00 - 2.33	Low

3.10.1 Students' Readiness and Willingness for the AR Technology

The survey's high participation rate, 100% consent, signifies a profound engagement level among the students and underscores the data's reliability.

Such a high rate of consent also mirrors a potentially elevated interest in technological innovations, particularly in educational domains. The respondents predominantly comprised undergraduate language students, suggesting that the findings are particularly relevant to the context of language learning. Although specific gender distribution was not detailed, understanding this aspect could yield insights into possible differential attitudes towards technology across gender lines, which could be explored in further studies.

Table 3.6 Pre-Questionnaire Descriptive Statistics of the Main Study

Dimension		Items	Statements	Mean	SD	Level
Students' readiness to AR technology	Access to Technology	Q1	I have access to a smartphone.	4.622	0.513	High
		Q2	I have internet access on my smartphone.	4.561	0.650	High
		Q3	I usually surf the web using my smartphone.	4.476	0.671	High
		Q4	I depend on the university's Wi-Fi to access the internet.	3.207	1.074	Medium
		Q5	I have internet access when I'm outside the university.	4.134	0.940	High
		Q6	I subscribe to a personal internet plan on my smartphone.	3.707	1.083	High
	Attitudes Towards AR in Learning	Q7	I have knowledge regarding Augmented Reality (AR) technology.	3.037	0.823	Medium
		Q8	I have heard of learning using AR technology.	3.573	0.917	Medium
		Q9	Learning using AR technology is of interest to me.	3.585	0.845	Medium
		Q10	I would like to learn this course with AR technology.	3.695	0.765	High
		Q11	Learning using Mobile AR application will be interesting.	3.817	0.669	High
	Learning Capability with Mobile AR application	Q12	I am capable of using Mobile AR application in learning.	3.500	0.790	Medium
		Q13	Training is needed to understand how to use Mobile AR application in learning.	4.280	0.672	High
		Q14	I can understand better when learning using Mobile AR application.	3.671	0.686	Medium
		Q15	I can visualize better when learning using Mobile AR application.	3.890	0.685	High
		Q16	I can learn independently using Mobile AR application.	3.415	0.800	Medium
		Q17	I can learn with my classmates using Mobile AR application.	3.902	0.601	High
		Q18	The classroom activity will be more active with Mobile AR application.	3.890	0.754	High
		Q19	I will be excited to learn using AR technology.	3.854	0.862	High
Students' expectancy to AR technology in Learning	Perceived Benefits of AR in Learning	Q20	Learning using AR technology will be beneficial.	4.110	0.667	High
		Q21	I believe that AR-enhanced learning experiences will make the learning process more engaging and enjoyable.	4.049	0.701	High
		Q22	Learning using AR technology will improve the interactive level between peers and lecturers.	3.878	0.760	High
		Q23	Learning with AR technology will significantly enhance my understanding of ESP concepts.	3.805	0.728	High
		Q24	I think that AR technology can improve my problem-solving skills within ESP contexts.	3.671	0.686	Medium
		Q25	I expect that integrating AR technology into the curriculum will enhance the overall quality of education.	3.890	0.629	High
		Q26	I believe that AR technology can provide me with a more personalized and tailored learning experience.	3.829	0.625	High

In the examination of the pre-questionnaire descriptive statistics from Table 3.6, the data presented from 82 participants indicates a comprehensive engagement with the survey, as evidenced by the absence of missing values. This completeness is crucial for ensuring the reliability of the analysis. The responses, which range from 1 (strong disagreement) to 5 (strong agreement), reveal significant insights into the perceptions and acceptance levels of AR technology among EFL learners in Vietnam.

The analysis of central tendency and dispersion in the responses shows that the mean values across the questions predominantly lie between 3.5 and 4.5, suggesting a generally positive disposition towards AR technology. The perception of AR technology among students was significantly positive, with mean responses ranging between 3.5 and 4.5 on a 5-point scale. Such findings suggest that most students recognize the potential benefits of AR in enhancing their language learning experiences. This positive perception likely stems from the immersive and interactive nature of AR, which is corroborated by existing literature indicating that immersive technologies can substantially enrich learning processes. Notably, the responses indicated a divergence in opinions regarding the ease of use of AR technology, as evidenced by the variability in responses (standard deviations around 1) for questions pertaining to this aspect. This suggests a split in the student body concerning AR technology's user-friendliness, possibly reflecting a disparity in prior technological exposure and proficiency among the students.

Firstly, about students' readiness for AR technology, the data under this theme suggests a high level of accessibility to the necessary technological tools among students. Items Q1 through Q3 indicate robust access to smartphones and the internet, with high mean scores (Q1: 4.622, Q2: 4.561, Q3: 4.476), demonstrating that most students are well-equipped technologically to engage with AR applications. However, Q4, which received a medium mean score of 3.207, reveals a reliance on university-provided Wi-Fi, highlighting a potential area of concern for off-campus learning where such access might not be available. Conversely, items Q5 and Q6 suggest a high degree of internet accessibility outside the university context (Q5: 4.134, Q6: 3.707), which is crucial for AR learning experiences that students might engage in outside traditional classroom settings.

Secondly, the theme of attitudes towards AR in learning reveals a moderate to high interest and willingness among students to engage with AR technology in their learning processes. While baseline awareness and interest in AR, as indicated by Q7 (3.037) and Q8 (3.573), are in the medium range, the inclination

towards using AR for learning specific courses (Q9: 3.585, Q10: 3.695) shifts slightly higher. Particularly, Q11, with a mean score of 3.817, suggests that the prospect of learning using mobile AR applications is perceived positively, pointing to a significant curiosity and openness among students towards integrating AR into their learning.

Thirdly, about learning capability with mobile AR applications, the responses reflect a blend of confidence and perceived need for additional support when using Mobile AR applications. Students express a medium level of confidence in their ability to use AR for learning autonomously (Q12: 3.500, Q16: 3.415). However, they recognize the need for training (Q13: 4.280), which scores highly, indicating an awareness of the potential complexities involved in using AR effectively. The perceived enhancements to learning experiences through AR-such as improved understanding (Q14: 3.671), better visualization (Q15: 3.890), and more active classroom activities (Q18: 3.890)-are recognized positively. This suggests that while students are cautiously optimistic about their capabilities, they acknowledge the benefits that AR can bring to their educational experiences.

Finally, the theme of students' willingness to AR technology in learning captures the anticipations regarding the impact of AR on educational outcomes. Overall, the responses are highly positive, with students recognizing the multifaceted benefits of AR in learning. Items such as Q20 and Q21, scoring 4.110 and 4.049 respectively, reflect high expectations for the benefits of AR in making learning more engaging and enjoyable. Similarly, enhancements in interactive levels between peers and lecturers (Q22: 3.878), and significant improvements in understanding course-specific concepts (Q23: 3.805), are anticipated. The medium scores for improving problem-solving skills within ESP contexts (Q24: 3.671) suggest some reservations about the extent to which AR can influence cognitive skills. Nevertheless, the overall high scores on items like Q25 (3.890) and Q26 (3.829) underscore a strong belief that AR can personalize and enhance the quality of education.

The general inclination towards positive scores indicates a readiness among the surveyed cohort to embrace AR technologies, potentially motivated by the innovative features and the interactive modalities that AR can introduce into traditional learning landscapes. However, the mixed responses and particularly the lower scores in certain areas call for a more nuanced approach to the integration of AR in language learning. These findings suggest that while there is an evident enthusiasm for AR, there are also clear challenges that need to be addressed. These include enhancing the user-friendliness of AR applications and ensuring that these technologies are effectively integrated into existing curricular frameworks. In short, the descriptive analysis of the

pre-questionnaire data provides a foundational understanding of the current perceptions of AR technology among EFL learners in Vietnam. While the overall positive response bodes well for the future integration of AR in educational settings, the noted areas of concern highlight the critical need for targeted interventions. Addressing these concerns would be essential for optimizing the educational impact of AR technology and for ensuring its successful adoption in language learning contexts. This nuanced understanding of learner attitudes towards AR would guide the effective implementation and potentially transformative impact of AR technologies in enhancing English language education.

The perceptions toward AR technology revealed a generally favorable inclination, with many students affirming that AR could make learning more engaging and enjoyable. Such attitudes are likely influenced by the novelty and interactive elements of AR, which have the potential to transform conventional learning settings into dynamic and stimulating environments. This aligns with scholarly evidence, such as Suksan et al. (2022), who noted enhanced motivation and engagement among students utilizing interactive educational technologies. Despite some reservations linked to the ease of use, there was a pronounced readiness among students to adopt AR in their educational endeavors. Over half of the respondents expressed a willingness to utilize AR more extensively, a readiness possibly spurred by optimistic expectations regarding the technology's impact on their educational outcomes.

The findings from this survey underscore a robust readiness among students to incorporate AR technology into their educational practices, primarily driven by its perceived benefits in enhancing learning engagement and effectiveness. Nonetheless, the mixed responses concerning ease of use highlight a critical area for development. While AR is viewed positively, its broader acceptance and integration may hinge on addressing these usability concerns effectively.

3.10.2 Students' Level of Acceptance of the AR Technology

The post-questionnaire descriptive statistics were derived from the responses of 82 participants, all complete, offering a comprehensive understanding of student perceptions toward the adoption of AR technology in educational settings. This analysis was structured around various dimensions: Perceived Usefulness, Perceived Ease of Use, Perceived Enjoyment, Attitudes and Acceptance towards AR, and Intention to Use. According to Abdul Ghafar's (2013) interpretation of mean ranges, the results predominantly indicate a spectrum of medium to high acceptance levels

for AR, suggesting a strong inclination among language learners towards embracing this technology.

Table 3.7 Post Questionnaire Descriptive Statistics of the Main Study

Dimension	Items	Statements	Mean	SD	Level
Perceived Usefulness	P1	The use of this AR system can enhance my learning and performance in this course.	3.768	0.690	High
	P2	Implementing the AR system during classes can enhance my understanding of complex concepts.	3.817	0.591	High
	P3	I believe the AR system is a valuable tool for learning.	3.927	0.681	High
	P4	My academic performance can improve through the use of AR technology.	3.720	0.758	High
Perceived Ease of Use	P5	I find the AR system is easy to navigate and operate.	3.549	0.877	Medium
	P6	Learning how to use the AR system presents no difficulties for me.	3.402	0.901	Medium
	P7	Instructions for using the AR system are clear and comprehensible.	3.720	0.758	High
Perceived Enjoyment	P8	Using the AR system is an enjoyable experience.	3.951	0.768	High
	P9	I derive satisfaction from using the AR system.	3.671	0.817	Medium
	P10	I believe that the AR system combines learning and enjoyment effectively.	3.805	0.728	High
Attitudes and acceptance to AR	P11	The integration of AR technology in learning makes the educational experience more engaging.	3.866	0.662	High
	P12	I did not experience boredom while using the AR system.	3.646	0.776	Medium
	P13	I support the idea of utilizing AR systems in the classroom setting.	3.793	0.828	High
	P14	I am enthusiastic about embracing new technology.	3.829	0.750	High
	P15	AR technology enhances the achievement of course learning objectives.	3.817	0.818	High
	P16	I feel at ease when using AR for learning in this course.	3.573	0.738	Medium
	P17	AR technology promotes more active classroom participation.	3.793	0.766	High
	P18	Group work becomes more intriguing when augmented by AR.	3.732	0.610	High
	P19	Learning through AR offers flexibility during the learning process.	3.732	0.771	High
	P20	AR technology is beneficial for enhancing the course content.	3.854	0.687	High
	P21	AR aids in visualizing course elements effectively.	3.780	0.685	High
	P22	AR enhances the understanding of sequential processes in tourism and hospitality.	3.793	0.582	High
	P23	I would recommend AR technology to my peers for learning in this course.	3.720	0.742	High
Intention to use	P24	In the future, I am inclined to use AR systems if the opportunity arises.	3.768	0.790	High
	P25	I am interested in using AR systems to study other subjects.	3.756	0.794	High

Within the dimension of Perceived Usefulness, the acceptance levels were consistently high, with mean scores ranging from 3.720 to 3.927. This indicates that students perceive AR as a significant enhancer of learning and performance. Statements such as "The use of this AR system can enhance my learning and performance in this course" and "I believe the AR system is a valuable tool for learning" received high mean scores, underlining the students' recognition of AR's potential benefits. Such perceptions are vital as they underscore the belief in AR as a transformative educational tool, capable of improving both understanding and academic performance through its integration.

However, certain aspects under the Perceived Ease of Use and some elements of Perceived Enjoyment demonstrated medium levels of acceptance, notably items that addressed the usability of the AR system. For instance, items P5 and P6, which assessed the ease of navigating and learning to use the AR system,

scored 3.549 and 3.402, respectively. These scores suggest that while many students find AR systems manageable, a significant portion encounters difficulties with initial usability. This variability is further evidenced in the enjoyment dimension, where satisfaction derived from using the AR system, as indicated by item P9, scored a medium level. Such findings highlight the need for enhanced focus on usability and user experience in the design and implementation of AR technologies to ensure they meet diverse learner needs and preferences.

The data also reveals significant variability in student responses, especially in items that recorded medium acceptance levels. The standard deviations for items such as P6 (0.901) suggest a broad range of experiences and perceptions among students, possibly reflecting a divide in technological proficiency or differing levels of prior exposure to similar technologies. This variability indicates that while AR is generally well-received, there are underlying challenges that could affect its broader acceptance and effectiveness, including the clarity of instructions, the ease of use, and the initial learning curve associated with adopting new technologies.

Items P11 through P23 are focused on attitudes towards AR technology and its perceived impact on the learning environment. Starting with item P11, which assessed the engaging nature of AR in learning, it recorded a high mean score of 3.866 with a relatively low standard deviation of 0.662. This suggests a strong consensus among students that AR technology makes the educational experience more engaging, indicating a positive reception towards interactive learning modalities.

The response to item P12, which evaluated boredom levels while using AR, presented a medium acceptance level with a mean of 3.646 and a standard deviation of 0.776. This medium score implies that while many students found AR engaging, there remains a segment that did not perceive a significant reduction in boredom, highlighting an area where AR implementation could be optimized to capture and maintain student interest more effectively.

Items P13 and P14, reflecting support for AR use in classrooms and enthusiasm for new technologies, respectively, scored high with means of 3.793 and 3.829. These results underscore a generally positive attitude towards the integration of innovative technologies in educational settings, suggesting that students are open to and supportive of incorporating such tools into their learning processes. Regarding the perceived effectiveness of AR in enhancing learning outcomes, item P15 reported a high mean score of 3.817. This indicates that students recognize the value of AR in achieving course learning objectives, reinforcing the idea that AR can be a potent tool for academic enhancement.

Items P16 to P23 further explored various aspects of AR's role in active learning, group work, flexibility, content enhancement, and visualization. For instance, items P16 and P17, which looked at ease of use in learning contexts and promotion of active participation, respectively, both showed high acceptance, suggesting that AR facilitates a more dynamic and participatory learning environment. Similarly, items P18 to P23 consistently registered high scores, emphasizing the benefits of AR in making group work intriguing, offering flexibility, enhancing course content, aiding in visualization, and improving understanding of complex processes. These findings collectively suggest that AR is perceived as beneficial across multiple facets of learning.

The Intention to Use dimension, encompassed by items P24 and P25, explores future use intentions of AR technology. Both items showed high acceptance with scores of 3.768 and 3.756 respectively, indicating a strong inclination among students to continue using AR systems in their future educational pursuits, not only within their current study area but also in other subjects. This reflects a broader acceptance and a positive forward-looking attitude towards AR technology, suggesting its potential for widespread application across different educational fields.

While the data demonstrates a general recognition of the substantial benefits that AR can offer in enhancing educational experiences, achieving broader acceptance and optimizing the educational impact of AR require a multifaceted approach. This approach should address enhancing the usability of AR systems, tailoring AR experiences to accommodate varying levels of user familiarity, and ensuring that the benefits of AR are effectively communicated and demonstrated to all students. These efforts are crucial for maximizing the potential of AR technologies to revolutionize educational practices and outcomes, facilitating a more engaging and effective learning environment.

3.10.3 Students' Test Scores on their Speaking Skills

In the transition from survey participation to speaking test involvement within the study, a noticeable reduction in participant numbers was observed, decreasing from an initial count of 82 survey respondents to 68 participants in the speaking tests. This shift can be attributed to a variety of factors, each contributing to the overall attrition rate in a distinct manner.

Initially, logistical constraints significantly impacted participant availability for the speaking tests. Unlike the survey, which could be completed online at any convenient time, the speaking tests required participants to attend scheduled sessions, either virtually or in person. Five participants were unable to find a suitable

time slot within the testing schedule, leading to their withdrawal from this phase of the study. Additionally, the requirement for access to specific technology or transportation to a testing location deterred a further 4 participants, who cited inability to meet these logistical demands as their reason for non-participation.

Participant attrition also occurred voluntarily, with 3 respondents choosing to withdraw from the study after the survey phase. These participants indicated that time commitments or a perceived lack of relevance of the study to their immediate academic or personal goals were their primary reasons for discontinuation. This type of attrition is common in studies requiring multiple interactions over time, where initial interest does not always sustain through more demanding phases of the research. Ethical considerations and the need for additional consent for the speaking tests further reduced the cohort size. The speaking tests involved recording participants' responses, which necessitated explicit consent for audio recording and potential future use of these recordings in research outputs. This requirement led to 2 participants deciding not to continue, due to discomfort with the digital recording of their personal data. In the end, 68 students agreed to join both pre-test and post-test, which qualified the data validity of the study.

Table 3.8 Paired Samples T-Test of the Pilot Study

							95% CI for Cohen's d	
Measure 1	Measure 2	t	df	p	Cohen's d	SE Cohen's d	Lower	Upper
Pre-test_Score	- Post-test_Score	-8.297	67	< .001	-1.006	0.192	-1.296	-0.711

Note. Student's t-test.

Table 3.9 Assumption Checks of the Pilot Study

Test of Normality (Shapiro-Wilk)			
		W	p
Pre-test_Score	- Post-test_Score	0.908	< .001

Note. Significant results suggest a deviation from normality.

Table 3.10 Descriptives Statistics of the Pilot Study

	N	Mean	SD	SE	Coefficient of variation
Pre-test_Score	68	5.419	0.736	0.089	0.136
Post-test_Score	68	6.324	0.657	0.080	0.104

The results from the paired samples t-test on the students' speaking scores before and after the introduction of AR technology provide a compelling statistical endorsement of its effectiveness in enhancing language learning capabilities.

The analysis focused on comparing the pre-test and post-test scores to assess the impact of AR interventions on students' speaking proficiency.

The statistical outcomes indicate a significant difference between the pre-test and post-test scores, as demonstrated by a t-value of -8.297 with 67 degrees of freedom, yielding a p-value less than .001. This p-value significantly undercuts the conventional alpha level of 0.05, suggesting a very strong statistical rejection of the null hypothesis that there would be no difference in means between the two measures. The negative sign of the t-value reflects a decrease in the pre-test scores compared to the post-test scores, indicating an improvement in speaking skills following the intervention.

The mean difference between the pre-test and post-test scores was -0.904, with a standard error of the difference being 0.109. This mean difference is not only statistically significant but also indicates a substantial improvement in performance, which can be considered educationally meaningful. The improvement suggests that AR technology has a pronounced effect on enhancing the speaking skills of students, likely due to the immersive and interactive experiences that AR can provide, making language learning more engaging and effective.

Moreover, the effect size, measured by Cohen's d, was -1.006 with a standard error of 0.192. An effect size around 1.0 is typically interpreted as a large effect according to Cohen's benchmarks. This large effect size further underscores the efficacy of AR technology in boosting speaking skills. The magnitude of this effect size highlights not only the statistical significance but also the practical significance of the technology's impact, suggesting that AR interventions offer substantial benefits to language learning practices.

The robustness of these findings is critical for educational stakeholders considering the integration of innovative technologies like AR into language learning curricula. The significant improvements observed suggest that AR can be a powerful tool for enhancing speaking proficiency in language learners. However, while the results are promising, the integration of AR should be handled thoughtfully, taking into account the readiness of the educational environment to adopt new technologies, including the necessary training for instructors and the accessibility of the technology for students.

3.10.4 Students' Perceptions toward AR Technology Lessons

In the qualitative analysis of data from focus group interviews with students enrolled in the English for Tourism and Hospitality course, significant themes emerged that underscored the transformative impact of AR technology lessons on

language learning and professional skills development. The interviews provided rich, detailed narratives demonstrating how AR technology promotes enhanced engagement, technological proficiency, professional preparedness, and improved language performance. These themes underscore the transformative impact of AR technology lessons on language learning and professional skills development. The detailed narratives provided by participants reveal how AR technology promotes enhanced engagement through immersive interactivity, supports technological proficiency and adaptive problem-solving, prepares students for professional realities, and facilitates improved language performance through multimodal integration. The themes highlight AR's potential to create engaging, contextually rich learning environments that significantly boost student motivation, interest, and overall educational experience.

One of the predominant themes was enhanced engagement through immersive interactivity. Participants described AR technology as a transformative tool that shifted their learning from traditional methods to dynamic, practical interactions, markedly improving their educational experience. For example, one participant expressed the depth of immersion, noting,

> *"It made learning more interactive and engaging compared to traditional methods. Being able to interact with virtual environments felt like stepping into a new world of learning" (Participant 1).*

Another participant elaborated on the contrast with conventional education methods:

> *"Initially, I was a bit overwhelmed with the technology, but once I got the hang of it, it was really exciting. It's a unique way to learn that captures your interest much more than just reading a textbook" (Participant 2).*

These reflections highlight the profound impact of AR in creating engaging, contextually rich learning environments that significantly enhance student motivation and interest.

Technological proficiency and adaptive problem-solving was another significant theme that surfaced from the discussions. Participants initially encountered challenges with the AR technology, but these were seen as opportunities to develop essential skills. The journey from initial difficulty to proficiency was transformative for the students, as one participant recounted,

> *"Yes, after a few sessions, it became quite intuitive. The hands-on experience helped build my confidence, especially since the interface was user-friendly and the instructions were clear" (Participant 4).*

Another participant discussed how overcoming these challenges enhanced their technical and linguistic capabilities:

> *"At first, figuring out how to effectively use the scanning triggers was tricky. I needed to become more proficient with technology. However, with practice, I became more comfortable, which directly improved my technical and language skills" (Participant 2).*

These accounts underscore the dual benefits of AR technology in facilitating not only language learning but also in enhancing technical acumen and problem-solving skills.

The theme of preparation for professional realities was crucial in the narratives. Participants recognized that the skills developed through AR simulations were directly applicable to their future careers in tourism and hospitality. The realistic simulations provided essential practice in customer service and real-time problem-solving skills. One participant emphasized,

> *"Virtual interaction and real-time problem-solving are key skills for hospitality management, and engaging with AR has prepared me well for these challenges" (Participant 9).*

This comment illustrates the practical relevance of AR technology in preparing students for the demands of the hospitality industry.

Lastly, the discussions detailed how AR technology supported enhanced speaking performance through multimodal integration. The use of multimedia elements within the AR platform was particularly beneficial for language development. A participant highlighted this advantage, saying,

> *"The opportunity to hear native speakers through these audio triggers and then practice with the video examples helped me improve my pronunciation and fluency. It was like having a tutor right there in the moment" (Participant 9).*

Moreover, the collaborative tasks within the AR setting significantly enhanced communicative competence, as another participant noted,

"Using the videos helped me visualize real-life scenarios better. Watching a dialogue between a hotel manager and a guest, and then acting it out, really improved my conversational skills" (Participant 8).

These themes collectively demonstrate the significant impact of AR technology in enhancing the educational experiences of students, with direct citations from participants providing compelling evidence of the benefits of AR in improving engagement, technological skills, professional readiness, and language proficiency. This finding supports the integration of AR into educational curricula and offers insights into its potential to revolutionize traditional teaching methodologies.

In conclusion, the deployment of AR technology lessons within the context of English for Tourism and Hospitality has demonstrated significant benefits in enhancing students' speaking skills, underscoring a substantial transformation in language education. Through the integration of AR, traditional learning paradigms are not only enriched but are also elevated to deliver a more engaging and immersive educational experience. This technological integration facilitates a multifaceted approach to language learning where students engage deeply with multimodal content and participate in collaborative projects that mimic real-world interactions. The qualitative analysis of focus group interviews reveals that AR technology lessons profoundly enrich the learning environment by providing realistic, context-rich scenarios that significantly enhance the students' ability to apply language skills in practical settings. As expressed by the participants, the immersive nature of AR fosters a dynamic learning experience that traditional methods fail to offer, illustrating how AR aids in the seamless integration of theoretical knowledge into practical language use. Moreover, the application of AR in teaching speaking skills is not merely about language acquisition but also about preparing students for the digital demands of contemporary professional environments. The ability to interact effectively using advanced technology in professional settings, as facilitated by AR, is a critical asset that students gain, which enhances their career readiness, particularly in the tourism and hospitality sectors. The enthusiastic testimonials from the participants strongly advocate for the broader integration of AR technology into language education. They not only validate the positive effects of AR in improving language proficiency, especially in speaking skills, but also underscore its transformative potential in educational practices. These findings advocate for a continued exploration and adoption of AR technologies in educational settings, suggesting that AR is not merely an adjunct to traditional learning methods but a pivotal component that redefines the pedagogical

landscape by making language learning more relevant, engaging, and aligned with the needs of the modern workplace.

3.10.5 Problems Encountered in the Pilot Study and Improvement Plans for the Main Study

3.10.5.1 Problems Encountered in the Pilot Study

One of the primary challenges encountered during the pilot study was related to the technological aspects of the AR applications used. Participants reported several technical difficulties, including software instability and interface navigation issues, which hindered their ability to engage seamlessly with the learning activities. These technical issues not only disrupted the learning process but also affected the participants' overall experience and engagement levels. Additionally, the pilot study revealed challenges in maintaining consistent data collection. Variabilities in the administration of surveys and assessments led to inconsistencies in the data gathered, complicating the analysis and interpretation of results. This was further compounded by a lack of standardized training for both participants and the support team involved in data collection, which contributed to the uneven application of the research instruments. Another significant issue identified was the adequacy of the feedback mechanisms within the AR applications. Participants noted that the feedback provided was often delayed or not sufficiently tailored to their individual responses, which diminished the learning experience. This was particularly critical as immediate and contextual feedback is crucial in language learning to correct mistakes and reinforce learning in real-time.

3.10.5.2 Improvement Plans for the Main Study

To address these issues, the main study would incorporate several strategic improvements. Firstly, enhanced technological support would be implemented. This would involve conducting extensive pre-study testing of the AR applications to ensure compatibility and functionality across all devices used by participants. A technical support team would be available during sessions to address any issues promptly, thereby minimizing disruptions to the learning experience. Regarding data collection, the research methodology would be refined to ensure greater standardization across all processes. This would include detailed training sessions for all support team involved in data collection to ensure that surveys and assessments are administered uniformly. Additionally, the research instruments themselves would be reviewed and revised to ensure clarity and ease of understanding for participants, aiming to eliminate ambiguities that could lead to inconsistent data. Furthermore, to continuously monitor and adapt the research process, regular

evaluation meetings would be scheduled throughout the duration of the main study. This adaptive approach would allow for real-time refinements, enhancing the overall quality and effectiveness of the research. The main study would also focus on improving the feedback mechanisms within the AR applications. To achieve this, regular sessions would be scheduled where teachers and peers can provide timely and tailored feedback to participants. This approach ensures that feedback is immediate and contextually relevant, addressing individual learning needs effectively. Teachers would be trained to offer constructive feedback during and after the learning activities, while peer feedback sessions were organized to facilitate collaborative learning and mutual support among participants. By addressing the challenges identified in the pilot study through these comprehensive improvement plans, the main study is poised to more effectively explore the impact of AR technology on language learning.