Innovative Approach to Teaching EFL through a Game-Based Speaking Mobile Application

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***Abstract*—Despite the growing body of research on mobile game-based applications, there is a notable lack of studies on teacher-developed game-based mobile applications. This study employed a research and development framework to explore the creation and implementation of a teacher-developed mobile game-based application aimed at improving speaking abilities. The study was conducted in three phases: a needs analysis with 287 participants (123 high school and 164 college students), the design and implementation of the application incorporating 21st-century skills, task-based language teaching, mobile-assisted language learning, automatic speech recognition, and game-like elements, and the final implementation with 16 participants (8 high school and 8 college students). Data were collected through surveys (for needs analysis and the Unified Theory of Acceptance and Use of Technology (UTAUT)), pre- and post-speaking tests, and interviews. Analysis methods included descriptive statistics, the Wilcoxon signed-rank test, the Mann-Whitney U-test, and thematic analysis. The findings revealed three significant insights: First, both high school and college students believed in the application's efficacy in enhancing English language proficiency. Second, the SPEAK APP significantly improved speaking abilities, particularly in fluency and pronunciation, for both groups. Third, in-depth interviews highlighted the app's key features and benefits, noting increased student self-confidence and suggesting improvements. Critical features identified included elements that promote critical thinking, enable experience sharing, facilitate English communication, and encourage interactive peer play. While the application was praised for its user-friendliness, concerns regarding the response time and accuracy of the speech recognition feature indicated areas for future refinement to enhance language learning outcomes.**

***Keywords*—mobile-game based applications, gamification, speaking, technology acceptance model**

I. Introduction

The burgeoning field of game-based mobile applications in English as a Foreign Language (EFL) education has prompted a notable shift in pedagogical strategies, integrating both traditional and contemporary teaching methods to enhance linguistic competencies such as vocabulary, pronunciation, reading, writing, and speaking. Research, including a comprehensive scoping review, indicates vocabulary as the primary focus within this inquiry, with significant attention also given to overall language proficiency, pragmatics, grammar, and communicative skills, where digital game-based learning has consistently shown positive effects [1–3]. For instance, an evaluation of the impact of mobile instructional games on university students' language skills revealed improvements across vocabulary, grammar, reading, and writing domains [4]. Despite these advancements, a notable research gap persists in the development and deployment of teacher-designed mobile games that are specifically tailored to the unique linguistic and cultural contexts of EFL learners. These custom-designed applications have the potential to meet specific educational needs more effectively than the prevalent generic mobile applications. Furthermore, integrating 21st-century skills into the design of these game-based mobile applications is crucial. Such integration prepares learners for success in a technologically driven global context by fostering essential skills like critical thinking, creativity, collaboration, communication, and digital literacy, thus enhancing not only language proficiency but also broader cognitive and interpersonal skills essential for today's interconnected world.

The integration of digital technology in education, particularly through mobile-game-based applications, has significantly transformed EFL teaching and learning globally [5]. This transformative shift extends beyond mere tool adoption, fundamentally altering the delivery, engagement, and interaction with educational content. Mobile games, known for their inherent interactivity, provide immersive learning experiences that surpass traditional methods by leveraging the ubiquitous nature of mobile devices to facilitate learning beyond classroom walls, enabling continuous access to educational content [6]. These platforms not only support gamified learning—increasing student motivation and enjoyment—but also provide adaptive experiences tailored to individual needs, including instant feedback and the development of critical thinking skills through structured challenges [7, 8]. While these technologies offer advantages, they also present challenges that require resolution to maximize their potential and minimize their inherent shortcomings [9]. These problems include ensuring their pedagogical validity, getting past technical issues, and bridging the digital divide.

In Thailand, such a trend aligns with national educational priorities under the Thailand 4.0 initiative, launched in 2016. This initiative aims to boost the nation's economy through technological and educational advancements that promote equitable growth and enhance English language proficiency, critical for global economic integration. Despite this, studies such as those by [10, 11] highlight a pressing need in Thailand for improved English-speaking abilities, particularly in the service industry, and point out the potential benefits of incorporating games and real-world scenarios into teaching. Yet, the actual utilization of mobile applications specifically designed for enhancing speaking skills in Thai educational settings, despite widespread smartphone use among students

[12], remains limited, with educators facing challenges in effectively integrating these technologies to motivate and engage students.

However, while mobile applications for language learning are prevalent, there is a notable deficiency in those specifically designed to enhance speaking skills within the Thai context. Movie-based mobile learning applications, for example, have shown potential for improving English-speaking skills by using English audio from movies, but these tools often fail to provide personalized feedback, which is critical for effective language development [13]. A recent prototype developed to aid high school seniors in preparing for a university's English proficiency assessment highlights this shortfall, as it does not offer individualized feedback on speaking skills [14]. These gaps emphasize a broader issue: the lack of robust, evidence-backed mobile applications tailored to the unique needs of Thai EFL learners. To address this, the current study uses a research and development framework to design a mobile-game-based application specifically to boost Thai students' speaking skills. The Unified Technology Acceptance Model (UTAUT) will guide the design of this application, which will integrate 21st-century skills, task-based language teaching (TBLT), mobile-assisted language learning (MALL), and gamification elements. The project will proceed in three phases: needs analysis, application design and development, and implementation, ensuring that it meets the specific needs dictated by the Thai government's educational directives and effectively enhances English-speaking proficiency in an engaging and pedagogically sound manner.

Therefore, this investigation intends to address the following research questions after the implementation phase:

1) In what manner do students assess the efficacy of a teacher-created mobile speaking application grounded in the Unified Technology Acceptance Model (UTAUT)?
2) To what extent does the mobile application developed by the teacher contribute to the enhancement of students' speaking abilities, as evidenced by a comparative analysis of pre- and post-test outcomes?
3) Which specific attributes of speaking applications do students deem pivotal in facilitating the amelioration of their speaking proficiencies?

II. Literature Review

A. Mobile-Game Based Applications in EFL Teaching and Learning

This study critically evaluates the impact of mobile game-based applications on the speaking skills of Thai EFL students, focusing on both commercially available and bespoke, teacher-developed applications. Research into commercially available apps like "Liulishuo" has shown benefits like higher language complexity and speech rate along with fewer mistakes. However, Wang and Han [15] pointed out ongoing problems like repairs and pauses, which show that it's hard to adapt to non-proceduralized linguistic knowledge in spoken communication. In contrast, Sun *et al.* [16] reported that mobile social networking enhances fluency in English speaking among young learners, although it does not significantly affect accuracy or pronunciation. Similarly, Grimshaw and Cardoso [17] found that using the "Spaceteam" app reduced anxiety and improved language proficiency among Canadian EFL learners, while Berry [18] documented its efficacy in improving pronunciation among South Korean students.

On the other hand, bespoke mobile applications developed for specific learning contexts also show promise. Palomo-Duarte *et al.* [19] highlighted the adaptability of mobile devices to tailor learning materials to student preferences through an application that promotes active learning via interactive evaluations. Hwang *et al.* [20, 21] observed that game-based learning enhanced listening and speaking skills, with designed interactive elements and scenarios that closely mimic real-life interactions, improving conversational skills. These findings stress the potential of personalized applications for fostering effective language acquisition. However, despite these advancements, research focusing on mobile applications specifically designed for EFL environments remains limited, underscoring the importance of this study.

Also, mobile-game-based learning combines mobile technology with game-like elements to get benefits like better cognitive skills and learner autonomy. However, research by Kacetl and Klímová [22] and Giannakas *et al.* [23] warns against putting this method into practice without thinking it through first. They emphasize that the effectiveness of such applications depends on their design and the authenticity of the learning experiences they provide. Similarly, Tsai *et al.* [24], Govender and Arnedo-Moreno [25], and Acquah and Katz [26] have identified key features like familiarity, challenge, and interactivity as critical for engaging students and enhancing language learning through digital games. These studies collectively highlight the complex dynamics of mobile-game-based EFL learning and the critical need for well-designed applications that are educationally effective and responsive to students' linguistic needs.

Research on the integration of mobile applications with automatic speech recognition (ASR) technology in language learning also presents mixed results, especially regarding the enhancement of speaking skills among EFL learners. Studies by Ahn and Lee [27] have shown positive learner responses to applications such as Speaking English 60 Junior, which uses ASR for practicing speaking skills, noting increased enthusiasm and positive attitudes. Similarly, Ko and Lim [28] noted that the WikiTalki application, which provides personalized peer feedback through features like audio recording and peer sharing, enhanced learner engagement and collaborative learning. Lim and Toh's [29] systematic review, on the other hand, found that while some mobile-assisted language learning apps, like quizzes and augmented or virtual reality platforms, help students learn new words and stay interested, they don't have much of an effect on how well they speak. The effectiveness of these apps, according to the review, depends critically on factors such as the quality of the apps, their alignment with existing pedagogical frameworks, the readiness of students to engage with digital tools, and the overall integration of these technologies within the classroom

ecology. This indicates that while educational apps can support various aspects of language learning, their successful deployment in improving specific skills, such as speaking, requires careful consideration of educational contexts and learner needs. It also suggests the critical need for designing mobile applications not just to fit linguistic aims but also to incorporate 21st-century skills such as critical thinking, creativity, collaboration, communication, and digital literacy. Integrating these skills is essential for preparing learners to operate successfully in a technologically driven world, ensuring that language learning apps do more than enhance linguistic capabilities—they must also foster broader cognitive and interpersonal skills that are vital in today's era.

B. Unified Technology Acceptance Model (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT) is a theoretical framework designed to predict and elucidate the acceptance and adoption of new technologies, incorporating elements such as perceived usefulness, ease of use, social influence, and facilitating conditions. Originating from the synthesis of earlier technology acceptance models, Venkatesh *et al*. [30] recognized the need to consolidate various overlapping theories which previously led to the neglect of alternative models, culminating in the development of UTAUT. This framework marked a significant advancement over its predecessors, which explained only 17% to 53% of the variance in users' intentions to adopt technologies, by accounting for up to 70% of the variance in behavioral intention and 50% in actual technology use [31]. Recently, UTAUT has been increasingly applied to studies investigating technology adoption in language learning, particularly within the scope of educational game design [32]. Initially developed to enhance organizational performance through better utilization of information systems, UTAUT's application has expanded to include mobile technologies, significantly aiding in data collection related to technology acceptance and effective usage. Despite its widespread use in various domains, the specific application of UTAUT to educational games focusing on language speaking skills has not been thoroughly explored [32]. While it has been integrated into several entertainment-based games, its utility in educational settings, especially those dedicated to language learning, represents fertile ground for further research [31], suggesting that the potential of UTAUT in these contexts remains largely untapped and merits more detailed investigation.

This study centers on four exogenous mechanisms that accentuate the influence of external predictors on four key determinants: performance expectation, effort expectation, social influence, and facilitating conditions. An investigation involving educational online games, developed by the researchers themselves, identified correlations between elements of the TAM and UTAUT acceptance models. The study revealed that performance expectancy, effort expectancy, attitude, and enjoyment significantly correlated with the behavioral intentions of 180 undergraduate computer science students who were surveyed regarding their acceptance of the provided online games [32]. Delving into the application of the UTAUT model to students' behavioral intentions concerning animations and storytelling, a study surveyed 350 Malaysian business and management students from public tertiary institutions. The findings highlighted performance expectancy as the most influential determinant, followed by facilitating conditions and effort expectancy, signifying the importance of providing resources to support students' integration of these methods within the classroom [33].

1) Performance expectancy

Within the framework of UTAUT, performance expectancy emerges as a pivotal determinant. It gauges the extent to which users perceive an information system as advantageous to their needs [34]. This facet encompasses five key components: perceived usefulness, extrinsic motivation, job fit, relative advantage, and outcome expectations. In 1986, Fred Davis introduced perceived usefulness within the Technology Acceptance Model (TAM), aligning it closely with performance expectancy. It signifies a user's belief that their performance will be enhanced through the system's functions and capabilities [35]. Extrinsic motivation delves into external outcomes resulting from system utilization. Notably, a study involving animation and storytelling highlighted how users believed these elements improved their classroom performance [33]. The association between performance expectancy and the adoption of new technologies, such as language learning mobile applications, has been corroborated by various studies. For instance, users embracing educational games via mobile applications, expecting language skill improvement, displayed a substantial link between performance expectancy and usage intention [32].

2) Effort expectancy

The user's inclination to adopt a system is heavily influenced by its ease of use. A user is more likely to engage with a system if it is user-friendly and requires minimal effort [33]. An example is illustrated in a study involving Chinese customers using mobile payment systems in Bangkok, where the simplicity of the system facilitated its adoption [36]. Similar ease of use has been observed in the realm of healthcare wearable devices, where respondents experienced minimal effort due to the devices' comfortable design and their technological literacy [37].

3) Social influence

Social influence pertains to the impact of others on a user's decision to adopt a system. It is believed that the presence of others significantly shapes a user's behavior towards system usage [34]. However, certain studies challenge this notion. For instance, in the context of m-shopping fashion applications, the influence of peers was not a major determinant, potentially because these applications already held intrinsic appeal [38]. Likewise, a study involving students using animation and storytelling found that social influence had a limited impact on their creative classroom use despite teacher and peer support [33].

4) Facilitating conditions

Facilitating conditions encompass the user's environment, knowledge, and skills that influence their intention to use a system [34]. In the aforementioned animation and story-telling study, facilitating conditions emerged as positive

influencers, as students' intentions were bolstered by the support they received [33].

III. Materials and Methods

A. Research Design

This research centered on effectively addressing the issue of insufficient speaking skills among Thai students through a comprehensive approach. To achieve this goal, a research and development (R&D) framework, consisting of three distinct phases, was executed. This design successfully merges theoretical foundations with practical applications, facilitating the achievement of the study's intended objectives. As outlined by Richey and Klein [39], the R&D design arises from specific problem-solving scenarios or broader investigative methodologies. Unlike basic instructional development, developmental research involves a systematic exploration of crafting, refining, and evaluating instructional programs, methods, and products, all guided by benchmarks of coherence and effectiveness [40].

The phases were sequentially implemented as follows: need analysis, design and development of a mobile application, and its subsequent implementation. The initial phase determined the requirement for English language practice within the classroom context. It then identified instances, as reported by participants, that necessitate English speaking practice, ultimately identifying key attributes for a game-based mobile application. This led to the creation and deployment of the *SPEAK APP*, which aimed to address research questions. This study primarily concentrated on the second and third phases, investigating the integration of the teacher developed *SPEAK APP* into students' English learning sessions, while also evaluating its effectiveness in enhancing their speaking abilities.

B. Ethical Consideration

Participants were informed about the study's phases and volunteered willingly. Their responses were treated confidentially, and ethical practices were rigorously upheld throughout, ensuring privacy and sensitivity. The research was approved by Institutional Review Board, Institute for Population and Social Research, Mahidol University (IPSR-IRB-2021-194).

C. Research Context and Participants

In this study, the adoption of purposive sampling was strategically employed to ensure that the sample was particularly suited to address the research objectives, especially during the critical initial phase of needs analysis. By selecting Naresuan University and its affiliated institution, Naresuan University Demonstration School (NUDS), located in Phitsanulok, Thailand, the research could concentrate on a unique educational environment known for its academic excellence and diverse student population. Naresuan University attracts students from various public and private schools throughout the northern region of Thailand, while NUDS, one of the largest secondary schools in Phitsanulok, is recognized for its high student performance in Thailand's National Examination, a key university admission criterion. This setting provided a rich demographic mix and a substantial student body, with class sizes ranging from 30 to 40 students across multiple sections, totaling approximately 500 students.

Moreover, the prevailing COVID-19 pandemic necessitated a blended learning format, combining both offline and online educational modules, which added an additional layer of relevance to the study. The purposive selection of 287 participants—123 high school students and 164 college students—in the initial needs analysis phase allowed for an in-depth exploration of both high school and university levels under these hybrid learning conditions. This approach not only facilitated a thorough investigation into students' digital learning needs and responses across different educational stages, but also enabled the identification of specific cause-and-effect dynamics within this educational framework. In the second phase of the study, we selected a smaller, focused group of 16 participants, equally from the senior high school and the university, to further explore the practical application and effects of the examined educational strategies. This deliberate and careful selection process ensured that the study could effectively illuminate the nuanced interactions between student needs, educational methods, and learning outcomes in a controlled yet diverse academic setting.

D. Instruments and Measures

In the whole process, this study employed survey questionnaires, pre- and post-speaking tests, and interviews, as detailed below.

1) Survey questionnaires

a) Need analysis survey

The use of a three-point Likert scale in the questionnaire for this study was strategically chosen to streamline the decision-making process for participants, thereby enhancing the clarity and efficiency of data collection. This scale, typically comprising options such as 'Agree,' 'Neutral,' and 'Disagree,' was selected to mitigate the potential for central tendency bias—where respondents might avoid extreme positions on more nuanced scales—and to simplify the interpretation of data. This scaling method is particularly effective in situations where the objective is to obtain a clear direction of opinion without the need for gradation in responses, which is integral to understanding the basic attitudes and perceptions of Thai senior high school and undergraduate students regarding English language skills.

Adapted from previous studies [41–43], the questionnaire's design aimed to identify the specific English language skill requirements, assess the perceived utility of these skills, and explore attitudes toward game-based mobile applications for learning English. Given the potentially complex nature of assessing language skills and the use of technology in education, the three-point scale's simplification was crucial in maintaining respondent engagement. To ensure the questionnaire's reliability and validity, it underwent a rigorous pilot study with 20 participants and validation by three English-language experts. These experts reviewed the content, its translation into Thai, and its relevance using an Index of Content Validity form to guarantee that the questions accurately captured the necessary data points. Moreover,

achieving Cronbach's alpha of 0.75 confirmed high internal consistency among the items, indicating that the scale effectively measured the constructs it intended to assess. This methodological choice was further justified as it accommodated both English and Thai speakers, ensuring broad accessibility and comprehension, which is pivotal in educational research involving diverse linguistic backgrounds.

b) Unified Theory of Acceptance and Use of Technology (UTAUT) survey

The survey utilized the Unified Theory of Acceptance and Use of Technology (UTAUT), comprising four scales: performance expectancy, effort expectancy, social influence, and facilitating conditions. With a total of 42 items, this questionnaire gauged participants' perceptions regarding the mobile application's effectiveness based on these four aspects. It also assessed participants' levels of self-confidence during and after engaging with the application. Additionally, the researcher conducted individual follow-up interviews with respondents to complement and reconcile their questionnaire responses. To enhance the questionnaire's quality, three UTAUT experts assessed its content, validity, and translation. The Index for Content Validity was employed to rate and provide recommendations. The experts evaluated each variable statement on a scale ranging from 1 (not relevant) to 4 (highly relevant). They also provided comments in an open section of the form. All three experts rated the variables as highly relevant, with minor translation content adjustments noted within the questionnaire. The reliability results were higher than 0.70, indicating high internal consistency among the items, presented in the following Table 1.

Table 1. Reliability results

UTAUT Constructs	Cronbach's Alpha	Number of Items
Performance Expectancy	0.724	15
Effort Expectancy	0.776	9
Social Influence	0.726	9
Facilitating Conditions	0.782	9

2) Pre- and post-speaking tests

To evaluate the English language speaking skills of the students, a pre- and post-test comprising adapted and refined speaking tasks were administered by two expert English test conductors during phase 2 of this study. The Speaking Skills Set encompassed three distinct parts. In Part 1, respondents were asked for personal information. The subsequent part presented students with a selection of topics, from which they chose one to discuss within a stipulated timeframe. The final segment involved presenting questions or scenarios for respondents to select and offer their opinion on within a limited timeframe.

The Speaking Skills test set was divided into three parts: Part 1 encompassed eight questions centered around personal information. Part 2 provided five topics, allowing students to select one for a 2-minute discussion. Lastly, Part 3 presented five topics, prompting students to express their opinions on one of their choosing. Following the pattern and format of the Test of English for International Communication (TOEIC), the open-ended questions formed the basis of the Speaking Skills test set, with content validation conducted for each section. During pre- and post-test sessions, the adapted oral proficiency rubric, obtained with author permission, was utilized by evaluators. This rubric, comprising five criteria—fluency, pronunciation, grammar, vocabulary, and content—was employed to assess respondents' performance in both the pre- and post-tests, aiming to determine any improvement in their English-speaking abilities after one month of using the mobile application. Employing a point-based scoring system ranging from 1 to 5, with 5 indicating the highest and 1 the lowest score in each criterion, a total of 20 points were obtainable across the five criteria.

3) Interviews

Upon the conclusion of the mobile application implementation, a series of interview sessions was undertaken, with the active involvement of 16 volunteering students. These sessions were strategically designed to delve into the students' learning encounters with the *SPEAK APP*. Subsequently, the collected data underwent transcription and underwent qualitative data analysis to glean valuable insights from the participants' perspectives.

E. Research Procedures

1) Phase 1 need analysis

The need analysis survey, as explained in Instruments and measures, engaged 287 participants, comprising 123 high school students (44 males and 79 females) and 164 college students (59 males and 105 females). Key findings emerged from the survey. Both senior high school and second-year undergraduate students perceived the necessity of practicing English speaking within classroom settings. Out of 3, high school students prioritized scenarios like communicating with foreign friends (M = 2.82), speaking with foreigners (mean: 2.80), and visiting English-speaking countries (M = 2.75). Conversely, creating videos for English assignments ranked as the least pressing need. Similarly, second-year undergraduates highlighted communicating with foreign friends (M = 2.89) and foreign lecturers (M = 2.88) as significant, with interviewing for international jobs (M = 2.74) and classroom presentations (M = 2.73) as lower priorities. This suggests that high school students emphasize external communication, while undergraduates focus on varied contexts.

Regarding game-based mobile applications, out of 5, high school students agreed that they enjoyed learning English through games (M = 3.56) and believed such applications could boost their speaking motivation (M = 3.54). They also favored applications that increased their speaking confidence (M = 3.44). However, uncertainties emerged for some aspects, such as using applications for scoring speaking skills (M = 3.26) and competing with peers (M = 2.65). On the other hand, second-year undergraduates strongly agreed that mobile applications motivated English speaking (M = 4.27) and fostered collaboration (M = 4.24), revealing a more substantial familiarity with applications characteristics and use in English classrooms.

2) Phase 2 mobile applications design and development

After analyzing the results of the Needs Analysis questionnaire, the researcher collaborated with developers to seamlessly integrate preferred traits of a game-based

application into the development of "*SPEAK APP*." This incorporation encompassed attributes outlined in the Task-Based Language Teaching, MALL, and UTAUT Acceptance models.

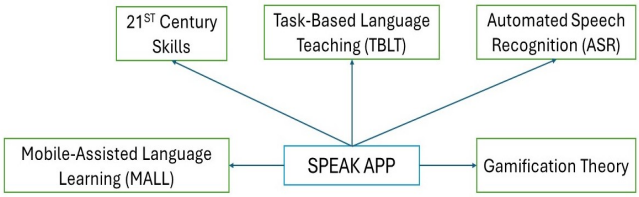

Fig. 1. *SPEAK APP* development model.

Fig. 1 illustrates the conceptual framework of the proposed educational mobile application, "*SPEAK APP*." This innovation draws upon diverse teaching approaches, pedagogies, and language learning principles. In line with Thailand's Educational Reform 4.0, the application aims to equip tertiary students with 21st Century skills to excel in international work settings within or beyond the ASEAN community. To achieve this goal, it is crucial for university students to attain essential skills, particularly in English language learning. These encompass communication, critical thinking, lifelong learning, collaboration, problem-solving, perseverance, literacy, and information technology skills [44]. Given that innovation is a central component of Thailand's Education Reform 4.0 initiative, it becomes imperative to align with contemporary global language and teaching trends. This study embraces the concept of Mobile-assisted Language Learning (MALL), leveraging a mobile application through which students engage in task-based activities. Rooted in the Task-Based Language Teaching approach, this research amalgamates learning with enjoyment, immersing students in real-life scenarios to facilitate self-discovery [45].

a) 21st century skills

The skills are vital competencies, particularly for high school and university students, equipping them to navigate the ever-evolving landscape of technology and life changes. These skills contribute to personal competence and the growth of their culture or nation [46]. Fig. 2 showcases the process where students, by responding to randomly selected question cards, engage in English speech practice devoid of translation. This approach facilitates simultaneous English communication, fostering continuous improvement and enhancement of their speaking skills.

Fig. 2. *SPEAK APP*- 21st Century skills feature.

b) Task-Based Learning and Teaching (TBLT)

It is an instructional approach in language learning where students are assigned tasks to complete, necessitating communication and interaction with peers. Upon task completion, the teacher provides feedback and initiates a subsequent discussion centered around the language utilized during the task [47]. For instance, as depicted in Fig. 3, students engage in a turn-based question-and-answer activity involving randomly selected cards. They choose a category (easy, medium, or hard) and respond to all questions within that category, totaling 20 questions each. Ultimately, their cumulative scores are displayed on a scoreboard. This process not only makes task completion enjoyable but also fosters communication and the expression of experiences, exemplifying the principles of task-based learning.

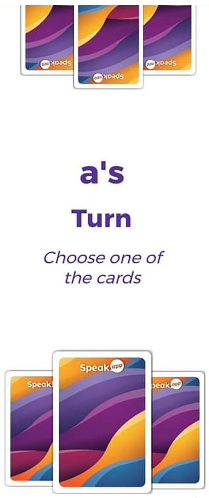

Fig. 3. *SPEAK APP* -TBLT feature.

c) Mobile-Assisted Language Learning (MALL)

MALL involves utilizing mobile devices for language acquisition. This technological approach offers authentic communicative scenarios to facilitate active learning, supporting, and enhancing the learning experience [48]. Fig. 4 illustrates a teacher-led game wherein the teacher assesses each player's English language proficiency during question answering.

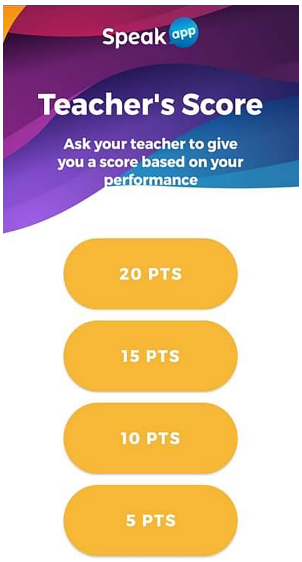

Fig. 4. *SPEAK APP* - MALL feature.

d) Automatic Speech Recognition (ASR)

Termed "*SPEAK APP*," the educational mobile application employed in this study integrates the principles of gamification, where students collaboratively participate in a question-and-answer game. Fueled by automatic speech recognition (ASR), the game promotes English language usage by recording and assessing their responses. The ASR component aims to infuse enthusiasm and confidence into the speaking practice, fostering language fluency. *SPEAK APP* was meticulously designed and developed to address the essential aspects outlined in the study's concept, objectives, and relevant literature. The application aligns with the framework of a teacher-led mobile application, wherein teachers evaluate students using an oral proficiency rubric during both pre- and post-tests.

e) Gamification

It pertains to the scenario in which learners derive enjoyment from the learning process, coupled with the pursuit of defined goals and accomplishments within a collaborative game-based context [49]. Illustrated in Fig. 5 is the embodiment of gamification theory, where students accrue scores by alternately responding to questions within the application.

Fig. 5. *SPEAK APP* -gamification feature.

The *SPEAK APP*, built upon the TBLT framework, aims to facilitate the use of familiar, conversational English, enhancing speaking skills and leveraging existing vocabulary. It aids students in recalling past language knowledge (vocabulary, grammar, pronunciation) and practicing grammar structures. The application encourages the use of casual, real-life-applicable English, promotes cooperation and collaboration, motivates self-expression through picture prompts, and bolsters self-confidence in public English speaking. Question categories are aligned with general education English syllabi for both high school and tertiary students. Drawing from the researcher's 25-year experience as an English as a Foreign Language teacher in Thailand, these topics are integrated into the application. The question difficulty level corresponds to IELTS speaking assessment standards, encompassing personal information sharing, discussing experiences, and expressing opinions [50].

Furthermore, question difficulty is classified based on Bloom's new taxonomy, which spans six levels: remembering, understanding, applying, analyzing, evaluating, and creating [51]. Task-based language learning emphasizes meaningful engagement in tasks [45], collaborative competition through gaming [52], and heightened task motivation through immediate feedback [53].

3) Phase 3 implementation

Eight senior high school students were chosen by their classroom advisors based on their national achievement test scores and average grades in English language subjects. Similarly, eight second-year undergraduate students were selected based on their English language level in the standardized entrance examination during university enrollment and their English language achievement tests from their respective faculty. The students' names were recommended to the researcher by their classroom advisors, under the dean's approval.

The researcher gathered the participants and had them use the *SPEAK APP* for a minimum of two weeks, dedicating one to two hours per session. Subsequently, the respondents engaged with the application alongside their friends for another two weeks. Throughout this period, the researcher maintained continuous interaction with the participants, ensuring their ongoing engagement with the application, aided by a dedicated supervising teacher. Before this phase, the participants underwent a pre-test to gauge their English-speaking proficiency. All eight students from both respondent groups had equal opportunities to use the application in rotation during the play sessions. Selected play sessions were video recorded to supplement qualitative data. Following a month, the participants underwent an English language proficiency post-test administered by another subject expert. They also completed the UTAUT questionnaire, assessing their perceptions and acceptance of the mobile application. This questionnaire probed their views on application enhancement, improvements in English language skills, and self-confidence. It included open-ended questions to delve deeper into their perceptions of application usability.

During this study phase, the mobile application *SPEAK APP* underwent enhancements and was subsequently evaluated using the same participant groups: eight senior high school students and eight second-year undergraduate students. Budget and time constraints prompted the researcher to incorporate valuable feedback from students, including the following suggestions: 1) Display questions while considering the answer, 2) Enable AI to read questions aloud, 3) Allocate 1 minute for formulating an answer, 4) Allocate 1 minute for delivering the answer, and 5) Include an "end" or "finish" button to conclude answering. Following the application's re-enhancement, the researcher conducted the English-speaking Skills Proficiency pre-test with the participants. This was followed by a 2-week evaluation period of the enhanced *SPEAK APP* with both groups of students. Over this period, participants from both groups engaged with the mobile application four times per week, each session lasting at least 2 hours. Observations were recorded during

play sessions for both participant groups.

Subsequently, the researcher provided the mobile application to the participants for an additional two-week period, allowing them to engage with their friends. During the 5th week, the researcher returned to administer the UTAUT questionnaire and conduct comprehensive follow-up interviews with the participants. Following this, the English-speaking Skills Proficiency post-test was administered by a different English instructor to the group of 16 respondents.

E. Data Analysis

This study combined quantitative and qualitative findings to address each research question, presenting quantitative results first followed by qualitative insights. The first research question was approached through descriptive statistics and thematic analysis, the second question through the Wilcoxon signed-rank test, Mann-Whitney U-Test, and thematic analysis, while the third question was explored using thematic analysis. US is the code used for undergraduate/college students, while SHS is the code used for senior high school students.

IV. RESULT

A. RQ 1: The Effectiveness of Teacher -Developed Game-Based Mobile Speaking Application

The examination of high school and college students' perspectives on the effectiveness of a teacher-developed game-based mobile speaking application, guided by the Unified Technology Acceptance Model (UTAUT), uncovers a noteworthy alignment between the two groups. Across Performance Expectancy metrics, both high school and college students resoundingly express the application's perceived usefulness, with a mean of 5 and standard deviation (SD) of 0 for all relevant statements. This pattern continues in the Motivation sub-scale, where both groups strongly agree on the application's stimulating mechanics and engaging questions, boasting means of 4.83 (high school) and 4.96 (college), both with SDs below 0.5. Converging perceptions also manifest in the Job Fit dimension, with both cohorts acknowledging the application's potential to enhance English-speaking proficiency, yielding mean scores of 4.83 (high school) and 4.88 (college) and SDs below 0.5. Relative Advantage resonates similarly, as both groups attribute the application's appropriateness and fair scoring to achieve English proficiency, resulting in means of 4.81 (high school) and 4.94 (college), both with SDs around 0.1.

Turning to Effort Expectancy, the narrative of shared perceptions continues, as both high school and college students affirm the application's user-friendliness and clarity. In the sub-scale of Complexity, both groups find the application easy to master, with means of 4.79 (high school) and 4.88 (college), accompanied by SDs below 0.5. Moreover, the Ease-of-Use sub-scale witnesses resounding agreement, with both groups attributing effortless interaction with means of 4.96 (high school) and 5 (college), with SDs around 0.1. In Social Influence, shared sentiments persist as both high school and college students perceive substantial backing from influential individuals. Particularly, high school students demonstrate means of 4.71 in Subject Norms and 4.75 in Social Functions, while college students display means of 4.88 and 4.92, respectively, all with SDs around or below 0.5. These aligned perspectives extend into Facilitating Conditions, where both cohorts acknowledge the application's motivational qualities, with means of 4.92 (high school) and 4.96 (college), both boasting SDs around 0.1. Lastly, in the Compatibility sub-scale, parallel perceptions prevail as both groups see the application's content and mechanics as fitting their levels, resulting in means of 4.83 (high school) and 5 (college), with SDs around 0.35.

Table 2. Descriptive statistics of the students' perceptions

	Unified Technology Acceptance Model (UTAUT)	**High School Students**			**College Students**		
		M	SD	Interpretation	M	SD	Interpretation
1	PERFORMANCE EXPECTANCY						
	Sub-scale 1: Perceived Usefulness	5	0	Strongly agree	5	0	Strongly agree
	Sub-scale 2: Motivation	4.83	0.25	Strongly agree	4.96	0.12	Strongly agree
	Sub-scale 3: Job Fit	4.83	0.25	Strongly agree	4.88	0.25	Strongly agree
	Sub-scale 4: Relative Advantage	4.81	0.14	Strongly agree	4.94	0.12	Strongly agree
2	EFFORT EXPECTANCY						
	Sub-scale 1: Perceived Ease of Use	4.96	0.12	Strongly agree	4.96	0.12	Strongly agree
	Sub-scale 2: Complexity	4.79	0.25	Strongly agree	4.88	0.25	Strongly agree
	Sub-scale 3: Ease of Use	4.96	0.12		5	0	
3	SOCIAL INFLUENCE						
	Sub-scale 1: Subject Norms	4.71	0.42	Strongly agree	4.88	0.25	Strongly agree
	Sub-scale 2: Social Functions	4.79	0.25	Strongly agree	4.92	0.15	Strongly agree
	Sub-scale 3: Image	4.75	0.3	Strongly agree	4.92	0.15	Strongly agree
4	FACILITATING CONDITIONS						
	Sub-scale 1: Perceived Behavioral Control	4.92	0.15	Strongly agree	4.96	0.12	Strongly agree
	Sub-scale 2: Facilitating Conditions	4.67	0.36	Strongly agree	4.88	0.25	Strongly agree
	Sub-scale 3: Compatability	4.83	0.36	Strongly agree	5	0	Strongly agree

This comparative analysis emphasizes a striking concordance in the perspectives of high school and college students regarding the teacher-developed game-based mobile speaking application. Their shared sentiments on aspects of performance expectancy, motivation, job fit, relative advantage, effort expectancy, social influence, and facilitating

conditions collectively highlight the application's effectiveness across both academic stages. These congruent viewpoints emphasize the application's successful adaptation to meet the diverse needs of both groups, substantiating its efficacy in enhancing English language proficiency within the context of the UTAUT model. Table 2 presents the detailed results.

Meanwhile, the thematic analysis of the interview results provides insights into the students' experiences, preferences, and perceptions related to the SPEAKAPP. Four main themes emerge from the interviews. The first theme is positive experiences and enjoyment. A prevailing theme across the students' responses is the positive experience and enjoyment they derive from playing the application, especially when engaging with friends. This theme is particularly evident in Student 1's response, "We had a good game," and Student 6's statement, "I enjoyed it." The interaction with friends adds a social dimension that enhances the overall experience of using the application. Then, the second theme is application features enhancing skills. A significant theme revolves around the features of the application that contribute to skill enhancement. Several students highlight how the application's features, such as AI-generated questions and scoring mechanisms, positively impact their English-speaking abilities. Students 2, 4, 5, and 8 express their appreciation for the application's ability to prompt critical thinking and self-improvement. The ability to track the number of words spoken and receive word correction feedback is particularly noted. Student 7 emphasizes that the application's features align well with their learning goals, as it provides a structured method for practicing English.

I like the questions and scoring. The questions are appropriate and creative. The number of words we say is seen. The application gives scores with word correction and the teacher also gives the score. (US4)

Yes, if we use it every day it can help me to speak for good English and can help me improve my self-confidence because I use it every day. (US5)

The third theme is usability and technical concerns. Another prominent theme is the students' experiences related to usability and technical aspects of the application. Students 4, 5, and 6 raise concerns about application stability and functionality. Their responses emphasize the importance of a seamless user experience and highlight areas for improvement, such as reducing application instability and ensuring proper responsiveness to user interactions. Student 2 also points out that the absence of a "finish" button after answering may lead to an elongated engagement time. The next theme is confidence and improvement in English speaking. A recurring theme is the students' anticipation of improved English-speaking skills through engaging with the application. Students 3, 4, 5, 6, and 8 express a strong belief that consistent use of the application will contribute positively to their language proficiency. They highlight that the application not only enhances language skills but also boosts their self-confidence in using English. This theme reflects their motivation to engage with the application as a tool for skill development.

I like the vision because it made me think and improve my speaking and thinking skills. (US2)

The question lets the player think and analyze before they answer. I liked many questions in the app. (US4)

It will improve my English skills because the AI checks (or corrects) my grammar. (US6)

In summary, the thematic analysis of the interview results reveals a convergence of positive experiences, the appreciation of skill-enhancing features, concerns regarding usability and technical issues, and a shared anticipation of improved language skills and confidence among the students using the SPEAKAPP. These insights shed light on the multifaceted impact of the application on their learning experiences and perceptions of English language improvement. A well-presented results section coupled with a convincing discussion will definitely prove the novelty and importance of your study. It should provide a concise and precise description of the experimental results, their interpretation, as well as the experimental conclusions that can be drawn.

B. RQ 2: The Effectiveness of The SPEAK APP in Improving Students' Speaking Skills

The study employed the Wilcoxon signed-rank test to delve into the progression of students' speaking abilities from pre- to post-speaking assessments. Within the high school cohort, the findings stressed noteworthy enhancements in the overall scores, fluency, and content of students' speaking skills. Conversely, no statistically significant variances surfaced in terms of pronunciation, grammar, or vocabulary. Shifting focus to college students, their speaking proficiencies exhibited substantial advancement across total scores, fluency, vocabulary, and content dimensions. However, similar to the high school group, no distinctions emerged concerning fluency, pronunciation, or grammar. Detailed results can be found in Table 3.

Table 3. Results of the Wilcoxon signed ranks test (pre- and post test results)

		Total Scores	Flue	Pron	Gram	Voc	Cont
High School	Z	−2.392b	−2.000b	−1.414b	−1.00b	−1.41b	−2.000b
	Asymp. Sig. (2-tailed)	0.017	0.046	0.157	0.317	0.157	0.046
College	Z	−2.565b	−2.460b	−1.633b	−1.414b	−1.73b	−2.646b
	Asymp. Sig. (2-tailed)	0.01	0.014	0.102	0.157	0.083	0.008

Furthermore, this study delved into the disparities in learning achievements discernible among high school and college students. To investigate these variations, the Mann-Whitney U test was employed, illuminating intriguing insights. Notably, the post-test speaking outcomes of college students outshone those of their high school counterparts, a

distinction marked by statistical significance. Upon closer examination, the divergence in performance was particularly prominent in the dimensions of fluency and pronunciation. However, it is noteworthy that no substantial contrasts emerged concerning grammar, vocabulary, or content, underscoring an area where the two groups converged in their linguistic progress. Table 4 displays the statistical results.

Table 4. Results of the Mann-Whitney U test(Post-test result comparison between high school and college students)

	Total scores	Flue	Pron	Gram	Voc	Cont
Z	−2.336	−2.475	−1.723	−1.225	−0.62	−1.567
Asymp. Sig. (2-tailed)	0.019	0.013	0.085	0.221	0.535	0.117

One recurring theme emerging from the interviews is the participants' proactive suggestions for enhancing SpeakApp's features. As articulated by Student 1, "I want you to add more questions." Similarly, Student 2 remarked, "I want to have more options to choose the questions." This desire for greater variety underlines the importance of engaging content. Student 3 raised a crucial concern, stating, "stability in terms of sometimes it is stuck (or stops?), it has to move consistently." This highlights the necessity of consistent functionality. Student 4 offered a valuable suggestion, emphasizing the need for a "finish" button during the answer portion, explaining, "I think 1 minute is appropriate, but some people will end before 1 minute." Such insights provide tangible directions for refining user experience. The frequency of application usage and its influence on language learning emerged as another pivotal theme. The sentiment shared by Student 2 encapsulates this perspective: "Yes, I will use it every day." This commitment reflects a keen interest in leveraging the application's potential benefits for language improvement.

Furthermore, the interviews unveiled the profound impact of SpeakApp on self-confidence in using English. Student 1 conveyed, "This application helped me to have confidence when I talk to my foreigner friend." Echoing this sentiment, Student 3 shared, "Yes, self-confident is very important for me to speak English. Before I was shy, but now I think I improved my self-confidence to speak English." Such accounts accentuate the application's role in fostering confidence, a crucial aspect of effective language communication. In terms of spontaneous speaking, participants exhibited varying perspectives. Student 1's response of "Yes" indicated that regular use of SpeakApp facilitated spontaneous expression. In contrast, Student 5 provided nuanced insight, stating, "The vocabulary that I knew. The time that is enough and balanced, not too long and have to rush to answer." This emphasizes the critical interplay of vocabulary and response time in encouraging natural speech. The discussions on confidence during gameplay illuminated its pivotal role. Student 7 succinctly captured this sentiment: "Yes, it can be a big role to have confidence when speaking." Student 8 echoed this sentiment, affirming, "Yes, I think so. I enjoyed the game." These responses collectively show how confidence plays a foundational role in language engagement.

C. RQ3: Essential features for improved speaking skills in mobile applications

Table 5 illustrates that participants highlighted the mobile application's utility by affirming that it encourages thinking, sharing experiences, English communication, storytelling, and interactive English play among friends. These sentiments emerged consistently during interviews, as students expressed, "The game let me speak English," "The application makes me share short stories" (SHS03, Individual interview), and "It lets me play in English with my friends" (SHS06, Individual interview). One student elaborated, "The application provides opportunities to engage in English conversations that we normally wouldn't have, offering question patterns such as 'Have you ever... families...,' thus fostering interactions with friends" (US02, Individual interview). Similarly, another student emphasized, "The application facilitates English conversations with friends, fostering openness and fun. It effectively achieves its purpose, especially through its thought-provoking questions" (US06, Individual interview). Echoing this sentiment, another participant noted, "I appreciate answering; the questions are relevant to my life" (US08, Individual interview). These statements featured the students' motivation to engage with the application due to its perceived usefulness.

Regarding Perceived Ease of Use, the table highlights students' consistent recognition that the application is user-friendly and easy to grasp. Interviews affirmed these findings, with statements such as "Taking turns is enjoyable, allowing stress-free participation and attentive listening" (US01, Individual interview), and "I prefer reading the application's questions; they are easier to comprehend" (SH04, Individual interview). A participant noted, "The application's features and platform are both convenient and user-friendly" (US02, Individual interview). These responses collectively affirm the application's ease of use. Concerning Satisfaction, themes of Anxiety and Fun emerged from respondents' answers. Instances of anxiety stemmed from concerns about limited response time and the application's speech recognition feature, which occasionally missed answers. Conversely, references to Fun were prevalent, with students highlighting the excitement and appeal of the game, its novelty, and its suitability. During interviews, students expressed sentiments like, "Additional time would alleviate the heart-pounding pressure to answer" (US04, Individual interview), and "Waiting for scores is suspenseful, but AI's failure to recognize words is disheartening, particularly for nervous friends" (US05, Individual interview). Conversely, enjoyment was emphasized: "Initially, excitement prevailed, but with regular play, the experience becomes enjoyable" (HS06, Individual interview), and "The application's visuals are appealing, facilitating understanding; answering the questions is enjoyable" (HS03, Individual interview).

Furthermore, confidence emerged as a recurring theme, with participants asserting that the application improved their self-assurance. Comments like "Listening to others' responses

aids my thinking and confidence" (US03, written comment) and "Regular practice through the application enhances direct and correct articulation, thus boosting confidence" (US07, written comment) were prevalent. This resonance reinforces students' written questionnaire responses. Responding to application improvement suggestions, students recommended increasing response time for complex questions, enhancing the speech recognition accuracy, and introducing auditory cues for timing. These views align with the application's initial development phase, highlighting potential areas for enhancement.

These viewpoints correlate with quantitative results, validating students' responses across written answers and interviews. While the satisfaction results and verbal and written responses underline students' contentions, indicating dissatisfaction due to time constraints and speech recognition issues, overall findings from the initial phase suggest the application's user-friendliness and potential for boosting students' classroom English confidence.

Table 5. Themes of In-depth interview data

Emerging Themes	Keywords	Constructs
Motivation	- The application makes me think - The application encourages me to share my experiences - The application makes me speak English - The application lets me tell a story - The application makes me play with my friends in English	Perceived Usefulness
Comfortability	- Easy to use the application - Easy to explore - Easy to understand the game - Have no problem to follow the rules	Perceived Ease of Use
Anxiety	- I am satisfied with the application, but the time makes me nervous - The time is scary - I hope there is more time to answer - The AI does not get my correct words - The AI is slow to record my words	Satisfaction
Fun	- The game is fun - The game is exciting - The application is new to me and fun - The application is good for me - It is fun to answer the questions - I like the questions	Attributes of Usability
Confidence-Building	- The application can help me with my confidence to speak - The game encourages me to share stories - I think if I play every day, I can be confident to speak English in front of my friends - I feel confident to play this game because the questions are easy to answer	
Opinion	- Time to answer should be longer - There should sound on time - AI should be improved to understand me - AI must be developed more	

V. Discussion

The present study aimed to evaluate the effectiveness of a teacher-developed game-based mobile speaking application in enhancing English-speaking proficiency among high school and college students. Guided by the Unified Technology Acceptance Model (UTAUT), the investigation combined quantitative and qualitative approaches to comprehensively assess students' perceptions of the application's efficacy. Three points are worth discussing.

A. Perceptions of the Teacher-Created Mobile Speaking Application

First, descriptive comparisons reveal substantial alignment between high school and college students' viewpoints within the UTAUT framework. They both perceive the application's usefulness, motivating mechanics, and engagement benefits, extending across dimensions like Job Fit, Relative Advantage, Effort Expectancy, Social Influence, Facilitating Conditions, and Compatibility. Qualitative insights amplify this understanding, highlighting positive experiences, skill-enhancing features, usability concerns, and confidence in speaking improvement. Prior research, such as Palomo-Duarte *et al*. [19] and Hwang *et al*. [20], point out personalized mobile applications' value in language learning, echoed by Hwang *et al*. [21] emphasizing application-designed talks. Overall, the study highlights the application's positive impact on language proficiency, supported by aligned perceptions and valued features, while acknowledging usability concerns and advocating for further research in the field.

B. Impact on Students' Speaking Skills

Moreover, the integration of quantitative findings, analyzed through tests such as the Wilcoxon signed-rank and Mann-Whitney U tests, demonstrating improvements in speaking scores among high school and college students, with qualitative insights from interviews revealing suggestions for application enhancement and highlighting boosted confidence and natural language use, offers a comprehensive

understanding of the impact of the *SPEAK APP* on language skills. This aligns with the Unified Technology Acceptance Model (UTAUT), which merges prior acceptance models and identifies four determinants—performance expectancy, effort expectancy, social influence, and facilitating conditions—to comprehend users' technology acceptance [30]. UTAUT, explaining 70% of behavioral intention and 50% of technology usage variance [31], has been applied to various domains, yet its application to language learning and speaking skills development remains relatively unexplored [32]. The study's findings correspond to UTAUT constructs, with improved speaking skills relating to performance expectancy, qualitative confidence boost aligning with facilitating conditions and social influence, and application enhancement suggestions resonating with effort expectancy.

C. Key Features and Benefits of the SPEAK APP for Enhancing Speaking Skills

Lastly, the qualitative findings regarding essential features for improved speaking skills in mobile applications highlight participants' perceptions of the *SPEAK APP*'s utility and ease of use. Through thematic analysis, participants consistently emphasized the application's encouragement of thinking, sharing experiences, English communication, storytelling, and interactive play among friends, indicating the application's positive impact on their language skills and interactions. This aligns with previous studies that emphasize the benefits of mobile-based learning, including enhanced cognitive abilities, motivation, autonomy, and personalized learning opportunities [22]. However, the challenges in adopting mobile game-based learning also indicate the need for thoughtful design and effective implementation [23]. The findings suggest that well-designed mobile applications like *SPEAK APP* can effectively enhance language skills and confidence, particularly in speaking. The integration of previous studies' findings further supports the rationale behind developing teacher-designed mobile applications for language learning. The studies highlight the importance of familiarity, challenge, and diverse game components in digital game-based language learning, aligning with the participants' positive responses to the *SPEAK APP*'s user-friendliness and engagement [24, 25]. Additionally, the principles identified in mobile game-based application development, such as ease-of-use, challenge, incentives, and interactivity, underline the key aspects that contribute to the effectiveness of digital learning games, further validating the participants' feedback on the *SPEAK APP* [26]. These collective insights emphasize the significance of well-designed mobile applications in language learning, particularly for speaking skills enhancement, and shed light on the multifaceted elements that contribute to their success.

D. Implications of the Findings

The research findings hold significant implications for the development of mobile game-based applications aimed at enhancing students' speaking skills. The study's alignment with the Unified Technology Acceptance Model (UTAUT) points out the importance of creating applications that are perceived as useful, motivating, and engaging by students, which can be achieved by focusing on factors such as performance expectancy, effort expectancy, social influence, and facilitating conditions. Furthermore, the research's comprehensive approach, combining quantitative assessments of skill improvement with qualitative insights on user experiences, provides developers with a well-rounded understanding of the application's impact. This approach encourages application designers to prioritize essential features like promoting critical thinking, English communication, storytelling, and interactive play among peers, while also addressing challenges related to user experience, ease of use, and effective implementation.

The study's alignment with previous research shows the value of personalized mobile applications in language learning, especially when designed by teachers to cater to specific learning goals. It emphasizes the significance of incorporating familiar and challenging game components, along with user-friendly design principles such as ease-of-use, challenge, incentives, and interactivity. By adhering to these principles and integrating multifaceted elements that encourage natural language use and boost confidence, developers can create impactful mobile applications that effectively enhance students' speaking skills and contribute to a positive and engaging language learning experience. Furthermore, adopting a cognitive approach in game-based learning is critical for optimizing cognitive processing and managing cognitive load [54]. This involves aligning game mechanics directly with educational objectives, employing multiple representations of information coupled with scaffolding strategies, and utilizing iconic representations particularly for younger learners or those with limited prior knowledge. While minimizing non-essential game elements that may impede cognitive processing is crucial, incorporating components that bolster emotional, motivational, and sociocultural engagement can also yield substantial educational benefits, enriching the overall learning experience.

VI. Conclusion, Limitations, and Recommendations

In conclusion, this study rigorously evaluated the efficacy of the teacher-developed *SPEAK APP*, a game-based mobile speaking application, in enhancing English-speaking proficiency among high school and college students. Guided by the Unified Technology Acceptance Model (UTAUT) and employing a combination of quantitative and qualitative methods, the research findings accentuate a strong consensus among both high school and college students regarding the application's efficacy. Their shared perspectives across multiple dimensions highlight its adaptability and success. Notably, the *SPEAK APP* yielded substantial improvements in speaking skills, particularly in fluency and pronunciation, for both student groups. Insights drawn from interviews further illuminated positive experiences, improvement suggestions, and increased self-confidence. The study identified key attributes for augmenting speaking skills in mobile applications, such as fostering reflective thinking, facilitating experience sharing, promoting English communication, and enabling interactive engagement with friends. While acknowledging the application's user-friendly nature, some reservations regarding response time and speech

recognition accuracy surfaced alongside the acknowledgment of confidence enhancement.

However, limitations include a potential lack of generalizability to diverse groups, UTAUT's potential limitations in capturing language learning intricacies, self-report bias, and a relatively short study duration. Despite these limitations, the study advances insights into designing mobile applications for language learning, urging further research and improvement in this area. While the findings indicated positive perceptions, skill enhancement, and usability concerns, future studies should explore broader participant demographics, consider more nuanced frameworks for language learning technology evaluation, and conduct long-term assessments to provide a comprehensive understanding of the app's effectiveness over time.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

JE initiated and executed the research, as well as wrote the manuscript. KB provided overall supervision throughout the research process. All authors have reviewed and approved the final version.

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