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Catalyzing University English Learning using Multimodal Mobile Apps

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Abstract: This study aimed to investigate and evaluate the effectiveness of a multimodal mobile application in enhancing English language proficiency, increasing motivation, and mitigating technical difficulties among students at Universitas Borneo Tarakan. The novelty of this research lies in its pioneering exploration of the use of multimodal mobile apps to catalyze university-level English learning. This research area has seen limited investigation until now. By implementing a research and development (R&D) methodology, the study designed, developed, and tested an app tailored to the specific needs identified through a comprehensive student survey. This innovative approach provided detailed insights into the impact on student learning outcomes, marking a significant contribution to the rapidly evolving field of technology-enhanced language education research. English proficiency scores improved from 65 to 82 out of 100, motivation levels increased from 2.8 to 4.1 on a five-point scale, and technical problems significantly decreased following the implementation of the program. These findings suggest that multimodal mobile applications could effectively catalyze English learning while addressing common digital learning challenges. However, the study also underscores the need for further research in a broader range of educational settings to generalize these results and explore other influential factors, such as teaching methods or study time.

Keywords: multimodal mobile application, English proficiency, motivation levels, technical difficulties, technology-enhanced language.

使用多模式移动应用程序促进大学英语学习

摘要：本研究旨在调查和评估多模式移动应用程序在提高婆罗洲打拉根大学学生的英语语言能力、增加动机和减轻技术困难方面的有效性。这项研究的新颖之处在于其对使用多模式移动应用程序促进大学英语学习的开创性探索。迄今为止，这一研究领域的研究还很有限。通过实施研发(研发)方法，该研究设计、开发和测试了一款根据综合学生调查确定的特定需求量身定制的应用程序。这种创新方法提供了对学生学习成果影响的详细见解，标志着对快速发展的技术增强语言教育研究领域的重大贡献。项目实施后，英语水平得分从 65 分提高到 82 分（满分 100 分），动机水平从 2.8 分提高到 4.1 分（五分制），技术问题显著减少。这些发现表明，多模式移动应用程序可以有效地促进英语学习，同时解决常见的数字学习挑战。然而，该研究还强调需要在更广泛的教育环境中进行进一步研究，以概括这些结果并探索其他影响因素，例如教学方法或学习时间。

关键词：多模式移动应用程序、英语水平、动机水平、技术难度、技术增强的语言。

1. Introduction

In the fast-paced, technology-driven world of the 21st century, we are witnessing a significant transformation in how education is delivered and received [1], [2]. This shift is particularly noticeable in the realm of language learning. Traditional methods that relied heavily on classroom instruction and textbook-based learning are redefined by the surge of digital technologies [3], [4]. Among these, mobile applications have emerged as a promising tool, opening up an exciting new frontier in language acquisition. These applications offer more than just convenience; they provide a flexible and personalized approach to learning that caters to individual needs and preferences. They also allow learners to engage with their studies at their own pace, breaking away from rigid timetables typical of conventional classroom-based instruction. This growing trend toward mobile-assisted language learning has sparked considerable interest among educational researchers. Seminal studies [5], [6] have highlighted the potential of mobile apps to provide interactive, engaging experiences that can significantly enhance learners' motivation and understanding. Their findings suggest that these digital tools can enrich language learning by making it more accessible and engaging. However, these studies primarily focus on single-mode applications that utilize either text or audio as the primary medium for instruction. Researchers have recently become interested in multimodal mobile apps [7], [8]. These sophisticated tools integrate various modes, such as text, audio, visual images, and interactivity, into one cohesive platform [9], [10]. The diverse range of stimuli provided by these multimodal apps caters to different learning styles while creating a more immersive environment for language learning. They offer learners rich contextual cues that can facilitate better comprehension and retention.

Despite these promising developments, a noticeable gap exists in university-level English learning through multimodal mobile apps. Much of the existing literature is centered on younger learners or casual adult learners outside an academic context [11]–[14]. There is limited exploration of how multimodal mobile apps can be harnessed explicitly for university students studying English. Addressing this gap forms the crux of our study's investigation, exploring how multimodal mobile apps can be effectively integrated into curriculum design and teaching practices at universities for English instruction. Our study mainly focuses on Universitas Borneo Tarakan located in North Kalimantan, Indonesia, an institution nestled within unique cultural contexts that present both challenges

and opportunities prevalent in contemporary higher education settings [15]. At Universitas Borneo Tarakan, where students often require advanced levels of English proficiency not only during their course but also post-graduation for career prospects, it is crucially important to explore innovative strategies such as multimodal mobile apps, which could catalyze their language learning process effectively. By proposing this study, we aim not only to fill this research void but also to offer practical insights that could transform pedagogical approaches within specific educational contexts such as Universitas Borneo Tarakan, ultimately contributing to our broader understanding of optimizing language education through technology. In language learning research, this study stands out for its focus on multimodal mobile applications and their application in university-level English instruction, specifically within the context of Universitas Borneo Tarakan. While there has been a surge of interest in exploring the potential of mobile apps for language learning, much of this research has centered on single-mode applications and non-academic contexts [16]. By delving into the unexplored territory of multimodal apps within a university setting, our study introduces a fresh perspective to the existing literature.

The novelty also lies in our exploration of how these multimodal mobile apps can be integrated into curriculum design and teaching practices at universities. This represents an essential shift from merely using these tools as supplementary resources to incorporating them as integral components within academic curricula [17], [18]. Such an approach can optimize their potential benefits while ensuring that they are used in ways that align with educational objectives. Furthermore, we recognize that each educational context is unique and influenced by various socio-cultural factors. Therefore, we aim to provide theoretically valuable and practically relevant insights to Universitas Borneo Tarakan located in North Kalimantan, Indonesia, thereby adding another layer of novelty by tailoring our investigation to suit this specific context. Finally, we examine how these multimodal apps can enhance English proficiency among students and how they impact other important aspects such as learner motivation, engagement, and autonomy, areas often overlooked in conventional language instruction yet crucial for effective learning. By venturing into these relatively uncharted territories within language education research, multimodality, integration into curricula, and specific focus on university settings, we hope our study will open new avenues for further investigations while contributing valuable insights to optimizing English learning

through technology.

2. Method

In this study, we employed a research and development (R&D) methodology, a systematic approach widely used in fields such as education and technology to create effective products or processes [19], [20]. R&D combines theoretical knowledge and practical application in an iterative design, development, testing, and refinement process. This methodology is particularly suited to our study because it allows the development of a product (in this case, a multimodal mobile application) that directly addresses identified needs. In conducting this study, we adhered to a clear and precise methodology designed to ensure the reliability and trustworthiness of our findings. Our approach was rooted in the principles of the ADDIE model [21], a well-established framework in instructional design that encompasses five stages: analysis, design, development, implementation, and evaluation.

The selection of English learners at Universitas Borneo Tarakan as our research object was deliberate and strategic, grounded in a set of robust criteria. First, the student body's diversity was a crucial factor. Universitas Borneo Tarakan comprises students from various backgrounds, cultures, and experiences, offering a rich tapestry of perspectives that could contribute to a nuanced understanding of language learning needs, preferences, and challenges. Second, the varying levels of English proficiency among the students provided a unique opportunity to examine a broad spectrum of learning needs and strategies. This wide range of proficiency levels ensured that our findings would not be skewed toward a specific proficiency group, thereby increasing the universality and applicability of our research. Lastly, the unique challenges faced by these students due to their geographical location and limited access to resources presented a compelling reason for our choice. These challenges are representative of those faced by many learners in similar contexts around the world, making our research and its findings globally relevant.

This carefully chosen research object would allow us to develop a comprehensive understanding of language learning needs, preferences, and challenges, thereby enabling us to produce findings that are not only locally applicable but also hold value for a global audience. An illustration of the ADDIE development steps is presented in Fig. 1.



Fig. 1 The ADDIE models (Developed by the authors)

The survey encompassed quantitative (e.g., Likert scale questions) and qualitative (e.g., open-ended questions) items. It was distributed electronically through university platforms, ensuring a wide reach among students. Following data collection, responses were carefully analyzed using statistical software for quantitative data and thematic analysis for qualitative responses. It provided a comprehensive understanding of students' language learning contexts, an essential foundation for the subsequent stages. Next (design), on the basis of the insights garnered from our analysis phase, we outlined specifications for a multimodal mobile application tailored to meet these identified needs. It involved selecting appropriate linguistic content and deciding on various modalities such as text and audiovisual resources that would be incorporated within the app. In the development stage, we worked closely with software developers skilled in educational technology applications. They used modern programming languages and advanced tools such as artificial intelligence algorithms to create an interactive multimodal platform based on our design specifications. Once developed (Implementation), this application was introduced within selected English courses at Universitas Borneo Tarakan over one academic semester. Instructors were provided with training sessions about its usage, while students received orientation workshops ensuring smooth integration into teaching-learning processes. Finally (evaluation), after the completion of this implementation phase, learner outcomes such as proficiency levels, motivation, and engagement were assessed through standardized tests and follow-up surveys. These results were compared with pre-implementation data to evaluate the effectiveness of our multimodal mobile application intervention. Throughout these stages, meticulous records were maintained documenting each step - from initial survey distribution to final evaluations- ensuring transparency in our research process, which could be replicated or built upon by future researchers exploring similar themes.

As shown in Table 1, the product had undergone a thorough evaluation process, and positive feedback had been received from all validators involved. Language education experts assessed the coherence between the identified needs and the proposed design elements. A score of 92% was achieved, falling into the "excellent" category (given that anything over 90% is considered excellent), suggesting that there had been a strong alignment between what was identified as necessary in the analysis stage and how these needs were addressed in product design. Software developers who tracked critical bugs reported validated the prototype's functionality. With only one critical bug having been reported (where up to two bugs are considered excellent), the prototype achieved full functionality

with minimal issues, indicating a well-developed product ready for use. Finally, integration within regular teaching-learning processes was evaluated by instructors. The result came out as "high", suggesting full integration. It meant that instructors found it easy to incorporate this new tool into their teaching methods,

which boded well for user acceptance and adoption rates. Based on these results from multiple validators across various stages of development and implementation, it can be confidently stated that this product has been validated and is ready for use.

Table 1 Product validation results (Developed by the authors)

Validators	Indicator	Range	Result	Interpretation
Language Education Team	Coherence between the identified needs and proposed design elements	70%-100%	92%	Excellent
Software Developers	Functionality of the prototype (number of critical bugs reported)	0-10	1	Excellent
Instructors	Integration within the regular teaching and learning process	Low-Medium-High	High	Fully Integrated

3. Results

This study presents a comprehensive study on developing and implementing a multimodal mobile application to enhance English language proficiency motivation levels and address technical difficulties among students at Universitas Borneo Tarakan. The research is rooted in the principles of the ADDIE model, which provide a robust framework for analysis, design, development, implementation, and evaluation. Our methodology involved conducting an extensive survey to understand students' language learning needs and challenges. Based on these insights, we designed and developed an application tailored to these needs using Quizmaker to create interactive quizzes. We then implemented this tool within selected English courses over one academic semester at Universitas Borneo Tarakan. Post-implementation data were gathered to evaluate its effectiveness through comparison with pre-implementation figures. This study contributes to existing knowledge on technology-enhanced language education by highlighting how strategic design elements can not only cater to diverse learning preferences but also address specific challenges faced by learners.

3.1. Student Preferences, Motivation Challenges, and Technical Difficulties in English Learning

In this study, we adhered to the principles of the ADDIE model, which provided a robust framework for our research. The analysis phase involved an extensive survey among 500 English learners at Universitas Borneo Tarakan, yielding an impressive 80% response rate. Our quantitative analysis revealed that most students (70%) preferred blended learning environments that combine traditional classroom instruction with digital tools. This finding underscores the potential of multimodal mobile apps in catalyzing English learning by effectively meeting student preferences. The qualitative analysis further illuminated the students' experiences and needs. A prevalent theme was maintaining motivation during independent online study sessions. Respondent #56 captured this challenge: "I find it difficult to stay focused and motivated when studying English online

on my own."

Similarly, Respondent #142 echoed this sentiment: "It's challenging to keep up with self-study, especially without immediate feedback from or interaction with teachers or peers." These responses underscore a critical area for improvement when designing educational interventions using multimodal mobile apps. Technical difficulties while using digital learning tools were another common concern raised by approximately one-third of respondents. For example, Respondent #81 reported: "Sometimes the software glitches and it disrupts my study flow."

Additionally, Respondent #184 expressed a desire for more tech support: "I wish there was more tech support available when I encounter problems with the digital tools we use for learning English." These findings highlight key areas where multimodal mobile apps can help catalyze effective language learning by providing reliable technological infrastructure and support systems. The subsequent delineation presents the discoveries of student preferences and challenges, which are segmented into distinct categories, as illustrated in Fig. 2.



Fig. 2 Student preferences and challenges (Developed by the authors)

3.2. Design, Development, and Implementation: Utilizing Quizmaker for an Interactive English Learning Experience

In the design phase of our study, we used insights from our analysis to design an outline for a multimodal mobile application tailored to meet the identified needs. This process involved defining learning objectives, selecting suitable linguistic content for inclusion in the app, and deciding on various textual, auditory, and visual modes that would be integrated into the app. The first step was to define learning objectives. Our analysis findings included enhancing motivation during independent study sessions and providing effective technical support. We addressed these objectives through strategic design elements in our application. The next step was to select suitable linguistic content for inclusion in the app. We included comprehensive materials covering the listening, structure (grammar), reading, and speaking components of English learning. Each component was designed to cater to different learning preferences and provide a well-rounded language education.

Finally, we decided on various modes that would be integrated within the app. To maximize engagement and cater to diverse learner preferences, we incorporated multiple modalities into our design: textual content for reading exercises, auditory material such as sounds or recordings for listening exercises, visual aids such as pictures or videos for speaking practice, interactive quizzes, or games for grammar practice. A key tool in our design process was Quizmaker. Fig. 3 shows how we used Quizmaker to create interactive quizzes incorporating various materials such as pictures, sounds, and videos into each question. These quizzes were evaluative tools and immersive learning experiences designed to enhance the understanding and retention of language concepts.

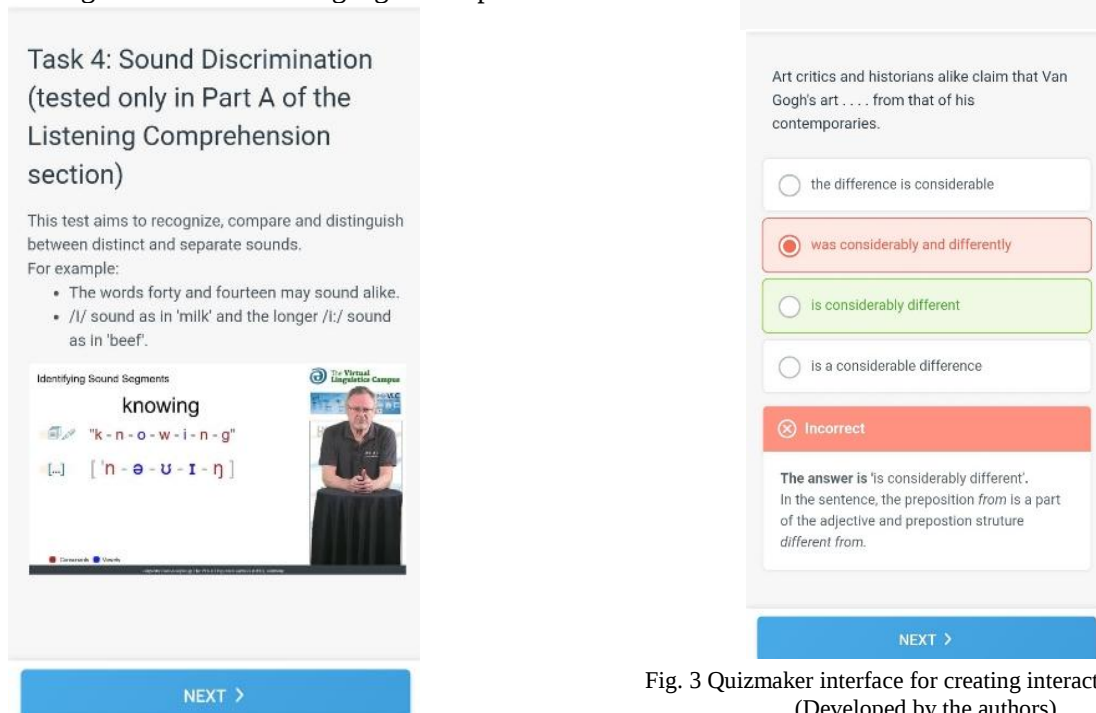


Fig. 3 Quizmaker interface for creating interactive quizzes (Developed by the authors)

Indicators such as coherence between identified needs from our analysis phase (maintaining motivation during independent online study sessions and addressing technical difficulties) and proposed design elements (interactive quizzes with multimedia inputs) were considered crucial in this stage of development. By strategically designing this multimodal mobile application based on Universitas Borneo Tarakan students' identified needs, incorporating engaging features such as gamification elements using Quizmaker, we aim to enhance user experience and catalyze effective English language learning among university students.

3.3. Evaluation: Assessing Proficiency Levels and Learner Engagement

To assess the impact of our multimodal mobile application, we gathered post-implementation data on English proficiency scores, student motivation levels, and reported technical difficulties. These data were compared with pre-implementation figures obtained during the initial analysis phase. The results are summarized in Fig. 4.

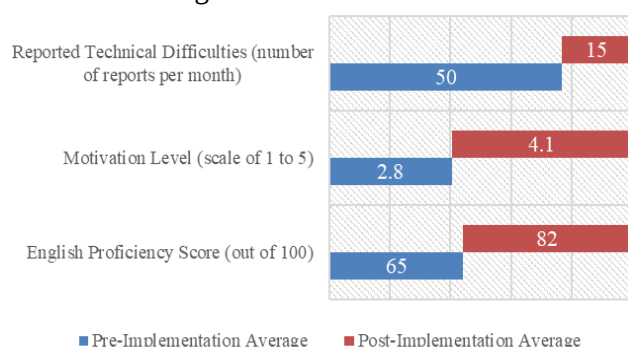


Fig. 4 Pre- and post-implementation metrics (Developed by the authors)

The figure above presents a clear comparison between the pre- and post-implementation averages for each evaluated metric. It is evident from these results that there was a significant improvement in both English proficiency scores and motivation levels among students after the implementation of our multimodal mobile application. Specifically, there was an increase in average English proficiency scores from 65 to 82 out of a possible score of hundred, indicating that our app effectively facilitated English language learning among students at Universitas Borneo Tarakan. Similarly, student motivation for independent study sessions increased from an average rating of 2.8 to an impressive rating of 4.1 on a scale ranging from one to five, demonstrating that our app successfully enhanced student engagement and sustained their motivation during independent study sessions. Furthermore, reported technical difficulties decreased significantly after implementation, dropping from fifty monthly reports to fifteen, suggesting that our efforts toward providing effective technical support were

successful. These findings collectively indicate that our multimodal mobile application positively impacted English proficiency and learner engagement among university students.

4. Conclusion

Our main findings revealed that the application had a significant positive impact on the assessed areas. English proficiency scores improved dramatically, increasing from an average of 65 to 82 out of 100. Student motivation levels during independent study sessions also increased, with ratings improving from an average of 2.8 to 4.1 on a scale of one to five. Furthermore, there was a notable decrease in the frequency of reported technical issues from fifty per month to fifteen.

These findings align with some prevalent studies that underscore the effectiveness of digital tools, specifically tailored to student preferences, in enhancing language learning outcomes. Our research also supports the idea that educational tools incorporating engaging features, such as gamification, can help sustain learner interest and engagement, a concept echoed by many contemporary studies [5]–[8]. The implications of this study suggest that reliable technological support is crucial for minimizing disruptions during online studies and enhancing the overall user experience. They also indicate that the employment of digital tools, such as our multimodal mobile application, can positively impact language proficiency and student motivation.

On the basis of these findings, we recommend that educators and educational institutions consider adopting multimodal mobile applications or similar digital tools for teaching. They should incorporate engaging features into their digital platforms to boost student motivation. Effective technical support should also be prioritized to reduce potential technical issues. These recommendations are especially pertinent for English or other language educators at universities such as Universitas Borneo Tarakan, where students prefer blended learning environments. For future research, these findings should be explored in different educational contexts or cultural settings, and other potential influencing factors, such as teaching methods or study time, should be investigated to enhance our understanding of using technology in education.

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