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Integrating mobile-assisted learning for a dynamic blended approach in higher education

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ABSTRACT

This research investigates the effectiveness of blended learning with mobile-assisted language learning (MALL) in english courses at Borneo University Tarakan. An experimental design was used with 80 english as a foreign language (EFL) student randomly assigned to an experimental group (EG) receiving blended learning with MALL and a control group (CG) receiving traditional instruction. The results demonstrate that blended learning with MALL significantly improves language learning outcomes and increases motivation, engagement, and satisfaction. This study contributes to the literature by highlighting language learning outcomes from a blended approach using MALL and emphasizes the importance of innovative teaching methods and technology integration. The findings have practical implications for educators, suggesting that incorporating MALL in blended learning enhances language learning outcomes and student engagement. Further research can explore the impact of MALL on different language skills and strategies to enhance intrinsic motivation in MALL-blended learning. This research provides valuable insights for improving language instruction through blended learning approaches.

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1. INTRODUCTION

The integration of mobile-assisted language learning (MALL) into higher education represents a dynamic approach to enhancing teaching and learning practices [1]–[4]. In the realm of blended learning, which involves the integration of traditional classroom teaching with technology-based elements, MALL offers unique opportunities to engage students, personalize learning experiences, and foster collaboration [5]–[7]. This overview lays the groundwork for examining the advantages and difficulties of implementing MALL in higher education settings and talking about its potential effects on student engagement, learning outcomes, and pedagogical practices [8]. However, despite its potential benefits, problems in effectively integrating MALL within higher education settings remain unsolved. Previous researchers have identified several unresolved problems in effectively integrating MALL within higher education settings. For instance, studies by Chang and Lang [9], Hoi [10] have highlighted the need for further investigation into the pedagogical design principles that align with the affordances of mobile devices. While there is evidence of increased student engagement and learning outcomes, there is a lack of consensus on the most effective instructional strategies and activities that leverage mobile technologies. Additionally, research by Khan *et al.* [11], Vega and Eppendi [12] has emphasized the importance of addressing technical support and infrastructure challenges. Connectivity issues, device compatibility, and maintenance problems can hinder student's access to mobile learning resources.

Therefore, finding solutions to ensure consistent technical support and robust infrastructure remains an ongoing concern. Equity and accessibility also pose significant challenges in the integration of MALL. Studies conducted by Kassaie *et al.* [13], Francom [14] have uncovered disparities in digital access and skills among students. The digital divide must be closed for inclusive mobile learning environments to be made, and all students must have the same chances.

Furthermore, it is essential for teacher training and professional development initiatives to provide educators with the requisite expertise and understanding to incorporate mobile technologies proficiently. The researches [15]–[17] has stressed the importance of providing comprehensive support to faculty members to enhance their confidence and competence in utilizing MALL approaches. Lastly, assessment and evaluation methods specific to MALL need further exploration. Researchers such as Dillon and Wells [18], Osifo [19] have highlighted the need for developing appropriate assessment strategies to measure the impact of MALL on learning outcomes accurately. It encompasses assessing the efficacy of mobile technologies in fostering profound learning, facilitating critical thinking, and nurturing problem-solving abilities. By building on the insights from previous researchers, this study aims to further investigate these unresolved issues in integrating MALL within higher education. It seeks to contribute to the existing literature by providing practical guidance and recommendations for educators and institutions looking to address these challenges and create meaningful and interactive learning environments using mobile technologies.

In line with this objective, it is important to examine the challenges faced by the Borneo University of Tarakan, the largest university in North Borneo, in delivering effective education. One of these challenges revolves around the english course, which all students must pass regardless of their department. Unfortunately, this course fails to adequately cater to students' diverse needs and interests, leading to low engagement and learning difficulties. Additionally, the reliance on conventional teaching methods by lecturers, which do not align with students' varied learning styles, exacerbates the problem. Addressing these obstacles and adapting to the demands of the "industrial 5.0" era, an innovative approach is necessary, such as blended learning, combining in-person and computer-based elements. Blended learning has shown promise in improving learning outcomes, increasing student engagement, and fostering learner autonomy [20]–[22].

Based on the causes of the problem above, it was pointed out that the offered solution was to develop blended learning as the teaching and learning media in higher students. The term "blended" referred to a combination or mixture, and "learning" referred to learning. The most accurate and general definition of blended learning was learning combining in-person and computer-based elements (online and offline). This statement is supported by Mayisela [23], this study combined offline and online learning techniques known as blended learning., including lectures and field trips. Kaur [24] stated that successful blended learning represented a shift from passive to active learning. It allowed learners to be together or apart, humanized education, and provided students with the best of both worlds by increasing flexibility and accessibility for teachers and students without sacrificing face-to-face contact. In line, Tambunan *et al.* [25] stated that professional competencies such as information and communication technology (ICT) skills, critical thinking, and information processing were required for specialists in the twenty-first century. These skills could and should have been fostered through the integration of technology into the classroom. Young people were sensitive and responsive to new technologies, which should have been leveraged to encourage them to use technology for learning [26]. To successfully use technology, it was necessary first to figure out what attracted young people to it in the first place (based on the results of a multidisciplinary investigation into the problem) and then capitalize on that (maintaining a proper ratio of learning materials that are both written and visual) [27]. Professionalism and creativity in teaching could motivate students by considering each students' unique characteristics and suggesting challenging and engaging learning activities [28]–[30].

Other findings also stated that both students and teachers benefited from blended learning's flexibility. Both teachers and students were able to learn through the blending of the physical and virtual environments, but this was most successful when there was institutional support in the form of professional learning and the chance to create courses for the best possible synthesis [31]–[33]. For this reason, teachers had to choose from various options based on their learning context and determine the target skills students should have mastered by the end of a term when using blended learning. In this research, designing and implementing mixed learning in english courses as general courses at Borneo Tarakan University was done by utilizing modular object-oriented dynamic learning environment (MOODLE) stands for, commonly referred to as MOODLE, is a platform designed for online learning and course management. This university had a MOODLE, Borneo e-learning (BeL). Lecturers and students could use this platform for free to implement distance learning, such as blended learning [34]. Despite the potential benefits of blended learning, there needs to be more alignment between the current teaching methods employed in the english course and students' diverse needs and interests. This gap hinders student engagement and contributes to learning difficulties. Moreover, lecturers' reliance on conventional teaching methods further exacerbates this problem, as it fails to cater to students' varied learning styles. Another gap lies in the need for comprehensive education for teachers and growth in the professional

programs specific to integrating blended learning and mobile technologies into the english course. There needs to be more support and guidance for educators to utilize these innovative approaches effectively. Addressing this gap is crucial to ensure instructors have the skills and confidence to deliver engaging and impactful lessons using blended learning strategies.

Furthermore, the technical support and infrastructure required to successfully implement blended learning present challenges at the Borneo University of Tarakan. Issues such as connectivity problems, device compatibility, and maintenance hinder students' access to mobile learning resources. Solving these technical challenges is crucial to ensure consistent and reliable access to digital learning materials. In terms of novelty, this research addresses these gaps specific to Borneo University of Tarakan's english course, providing practical recommendations and solutions tailored to the institution's context. This research will contribute to current understanding by addressing the specific difficulties encountered in a university setting and proposing strategies for enhancing the usefulness of blended learning and language learning with the assistance of mobile devices in this context. Through investigating the gaps in pedagogical design, teacher training, technical support, and infrastructure, this research seeks to provide novel contributions to blended learning by proposing context-specific recommendations to improve the delivery of adequate english language education at the Borneo University of Tarakan.

2. METHOD

An experimental study involved manipulating adjust for other factors to ascertain an independent variable's impact on a dependent variable [35]. In the study, adopting a blended learning strategy that incorporated MALL was the independent variable, while the dependent variable was the language acquisition results. An intervention group and a control group (CG) comprised randomly assigned participants (blended learning with MALL), and the CG was not [36]. Researchers were able to compare the results between the two groups to identify any significant differences that could be attributed to the intervention. The experimental study included the pre-experimental phase because it established a baseline for the participants before the intervention was implemented [37]. During the pre-experimental stage of the study, the participants' baseline language abilities were evaluated. This test enabled researchers to account for disparities in participants' language proficiency and allowed for the precise measurement of any changes in language abilities following the intervention [38].

2.1. Participants

The experimental design principles aligned, ensuring congruence with the goals and the study's research questions. The first study question aims to determine whether a blended learning strategy incorporating MALL significantly enhances language learning results in higher education compared to conventional face-to-face training. By changing the independent variable, the study tried to find a link between the intervention and the results (blended learning with MALL) and assess the dependent variable (language learning outcomes). The second research question examines whether a blended learning strategy incorporating MALL significantly affects motivation, engagement, and satisfaction compared to conventional face-to-face training. This question is important because it can shed light on the learner's attitudes towards blended learning and MALL and explain why it might be more efficient than standard training techniques. This experimental study included 80 english as a foreign language (EFL) student from the Guidance and Counseling Education Department of the Faculty of Teacher Training and Education at Borneo Tarakan University. Enrolling in the *Mata Kuliah Wajib Universitas (MKWU) Bahasa Inggris* (English general course) throughout the study semester was one of the selection criteria for participants. All first-year students at the university are required to complete the general course, which focuses on enhancing students' academic english language skills. Random selection was used to place participants in either the experimental group (EG) or CG groups. The EG used technology to teach MALL through mixed learning, while the CG learned language in a traditional classroom setting. Both groups were exposed to the same data and conducted the same experiments throughout the study.

2.2. Research procedures

Figure 1 depicts the experimental and control class designs employed in this study. The experimental group's research procedure commenced with a pre-test during the initial session. Lecturers in this group undertook several activities, including introducing blended learning with MALL technology, facilitating blended learning activities utilizing MALL technology, and offering feedback and support to the participants. Students engaged in various activities such as participating in blended learning tasks with MALL technology, accessing digital learning resources tailored for MALL-based assignments, and sharing feedback regarding their blended learning encounter. Throughout the subsequent sessions, ongoing communication with CG

participants was maintained. Any queries or concerns raised by CG students were addressed, ensuring alignment between learning materials and activities with the traditional instructional approach.

In the control group, the research procedure mirrored that of the experimental group, commencing with a pre-test during the first session. Lecturers in the control group conducted traditional face-to-face instruction, provided learning materials and resources for in-class activities, and extended support and clarification as required. Students partook in conventional face-to-face classes, utilizing the materials presented during in-class sessions and offering feedback concerning their experiences with the traditional approach. Throughout the study, control group participants actively engaged in classroom discussions and group tasks sought clarification or assistance from lecturers during class, and shared feedback on their encounters with the traditional face-to-face learning method. The research procedure concluded with a post-test and survey administered in the final session for both groups.

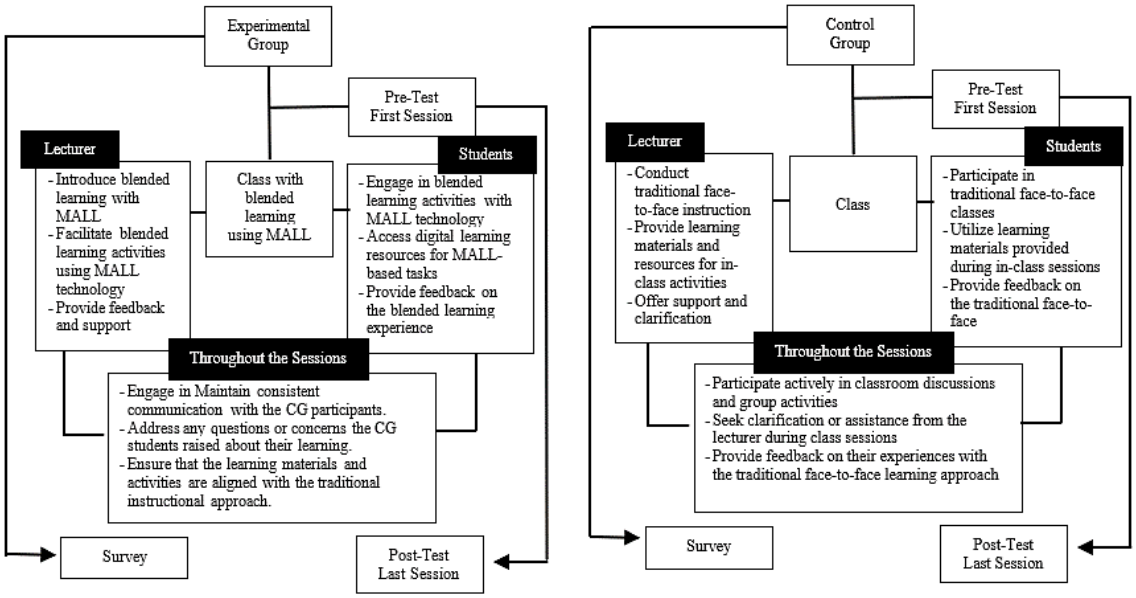

Figure 1. Experimental and control classes design

2.3. Data analysis

The validity and reliability of the study were ensured through several measures. Assigning participants randomly helped eliminate selection bias and guarantee that any differences between the control and EGs could be traced back to the treatment. Additionally, using pre-tests and post-tests helped control for individual differences and provide a reliable measure of language proficiency changes. External validity was addressed by selecting participants from Borneo Tarakan University's english general course, representing a specific population of EFL learners. However, generalizability to other populations may require further research.

The study hypothesized that the blended learning approach with MALL would positively impact language acquisition outcomes compared to traditional face-to-face instruction alone. This hypothesis guided the implementation of the intervention and the analysis of the results. In terms of language proficiency scores, descriptive statistics made it possible to summarize and comprehend how well the control and EGs performed. T-tests were used to see if there were any significant changes between the two groups before and after the intervention, which would show how well the blended learning method worked [39]. Analysis of variance (ANOVA) was conducted to assess any significant variations in performance among different levels of language proficiency within each group [40]. This statistical method aided in determining if the intervention had differential effects among participants with varying language abilities. Questionnaire responses were analyzed to evaluate the control and EG's motivation, engagement, and satisfaction. This analysis provided insights into the participants' subjective experiences and perceptions of the instructional approaches. Overall, the combination of these statistical methods, along with considering validity, reliability, and the formulation of a hypothesis, strengthened the study's findings and contributed to a robust evaluation of blended learning's impact with MALL on language acquisition outcomes.

3. RESULTS AND DISCUSSION

3.1. The intervention's effects

Table 1 presented the pre-and post-test scores of participants, providing a comprehensive evaluation of their academic achievements. The table aimed to assess the effectiveness of a specific intervention, specifically the use of MALL within a blended learning approach. The EG exhibited a significant mean difference of -24,359 between the pre-and post-test scores, with a standard deviation of 20,364 and a standard error mean of 3,261. This difference is a 95% confidence interval ranging from -30,960 to -17,758, indicating a statistically significant improvement in post-test scores. This finding supported the hypothesis that the MALL-based blended strategy improved language learning outcomes for the EG. However, it is important to critically analyze these results considering the wide confidence interval range and the relatively high standard deviation, suggesting potential variability in individual responses to the intervention. In contrast, the CG showed a more negligible mean difference of -2,821, with a standard deviation of 24,916 and a standard error of the mean of 3,990. The 95% confidence interval range (-10,897 to 5,256) indicated that the score change was not statistically significant. Additionally, according to the t-statistic, there was no statistically significant difference in the test results between the pre-and post-test periods for the CG. These findings suggest that the absence of the MALL-blended learning intervention had little to no effect on the CGs performance when learning a new language.

Table 1. Pre- and post-test scores of participants

Group	Test	Mean	Std. deviation	Std. error mean	95%		t	df	Sig. (2-tailed)
					Lower bound	Upper bound			
EG	Pre- and post-test	-24,359	20,364	3,261	-30,960	-17,758	-7,470	38	.000
CG	Pre- and post-test	-2,821	24,916	3,990	-10,897	5,256	-.707	38	.484

Furthermore, Table 1 demonstrates that the MALL-blended learning technique improved language learning performance for the EG compared to the non-significant change in the CG. The blended method utilizing MALL may positively affect language learning outcomes. The following formula was used to determine the effect size of the paired t-test within groups for the intervention group:

$$d = \frac{|\bar{x}_1 - x_2|}{\sqrt{\left(\sigma^{\frac{2}{1}} + \sigma^{\frac{2}{2}}\right) / 2}}$$

where x_1 and x_2 represent the means of groups 1 and 2, σ_1^2 and σ_2^2 represent the differences between groups 1 and 2, the calculated. To determine the effect size of the paired t-test within groups for the intervention group, the researchers employed cohen's d formula. It involved calculating the standardized disparity between the means of the EG and CG, using the average differences between their pre-and post-test scores (-24,359 for the EG and -2,821 for the CG and their respective variances (20,364 and 24,916). Cohen's criteria categorize effect sizes into small (d=0.2), medium (d=0.5), or large (d=0.8). In this study, the calculated effect size of 0.946 was deemed significant. It proves there was a major distinction between the test and CG's. However, it is important to consider the study's limitations that may affect the generalizability of these results, such as the lack of information about specific intervention features and potential confounding variables.

3.2. Perceived benefits

Unexpectedly, the data in Figure 2 revealed intriguing insights into the perceived benefits of blended learning, incorporating MALL for language learners. The technique was generally successful, encompassing three key categories: motivation, engagement, and satisfaction, with specific indicators used to assess learners' perspectives in each area. Surprisingly, the data indicated high percentages of intrinsic motivation (80%), self-efficacy (71%), and perceived value of mobile learning (89%). These findings suggest that learners found the blended approach using mobile learning to be meaningful, relevant, and enjoyable. However, contrary to expectations, lower percentages were observed for extrinsic motivation (67%) and goal orientation (55%). It implies that learners may have required more external incentives or apparent objectives to sustain their interest in learning.

Furthermore, during the implementation of the blended learning strategy, learners exhibited considerable engagement, as demonstrated by their high rates of active participation (88%), time spent on mobile learning activities (92%), and frequency of use (78%). Paradoxically, the lower percentages for

engagement with peers and instructors (69%) and the degree of focus and concentration (67%) raise questions about the effectiveness of social interaction and supervision in enhancing the overall learning experience. It is noteworthy that students expressed satisfaction with the mixed approach, scoring well in areas such as enjoyment and positive feelings (96%), usability and accessibility (92%), perceived material relevance (90%), and perceived learning outcomes (87%). However, unexpectedly, a lower percentage of students expressed a desire to continue utilizing mobile learning (74%), indicating possible reservations or limitations in their commitment to using mobile devices for language learning in the future.

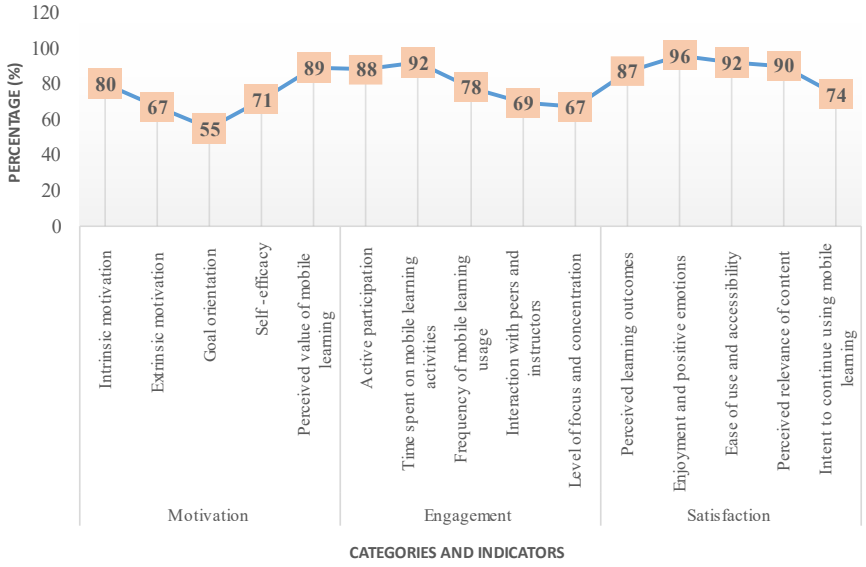

Figure 2. Perception questionnaire result

Despite these unexpected outcomes, the high levels of motivation, engagement, and satisfaction suggested that blended learning employing MALL had the potential to improve language learning results and enhance the learner experience. Nonetheless, critical examination reveals the need for further exploration and improvement in intrinsic motivation, goal orientation, interaction with peers and instructors, and intentions to sustain mobile learning. In conclusion, the data provided by the percentages offer valuable insights into learners' perceptions of the blended approach employing mobile learning. The unexpected findings highlight both the advantages and disadvantages of this instructional method, suggesting areas for growth and improvement. Further investigations are necessary to understand better how to optimize blended learning strategies, particularly in motivation, engagement, and learner commitment to MALL.

The study's findings demonstrated the positive impact of a blended learning approach incorporating MALL on language learning outcomes. EG exhibited a significant improvement in post-test scores compared to CG, as the paired t-test results indicated. The effect size of 0.946 highlighted the substantial influence of the MALL-blended learning technique on the EG's language acquisition abilities [41]. Additionally, students reported high motivation, engagement, and satisfaction levels when MALL was integrated into their learning experiences. The perception questionnaire results revealed that learners perceived the blended learning approach with MALL as meaningful, relevant, and enjoyable. They actively engaged in mobile learning activities, devoted considerable time interacting with the materials, and expressed positive views regarding enjoyment, usability, accessibility, material relevance, and perceived learning outcomes.

However, the study also identified areas for further development. These included extrinsic motivation and goal orientation among learners, peer and instructor involvement, focus and concentration levels, and willingness to continue utilizing mobile learning. A lower percentage of students desired to use mobile learning in the future, suggesting some reservations or lack of commitment among specific individuals. Overall, the study's findings indicate the potential of blended learning with MALL to enhance language learning outcomes and improve the overall learning experience, aligning with previous research [2]. They emphasize the importance of incorporating innovative teaching methodologies, such as blended learning with MALL, to optimize language learning outcomes and student achievement in today's digital and mobile language learning landscape [42], [43].

These findings have far-reaching implications for language education around the world. The fact that mixed learning with MALL helps people learn languages shows how important it is to use technology-based methods to help people learn languages. By leveraging the benefits of MALL, such as increased motivation and engagement, educators can create more effective and engaging learning environments. It underscores the importance of embracing innovative technology-based approaches in language education to meet the evolving needs of learners. Moving forward, the insights from this research can guide further advancements in language education. Educators and policymakers can utilize these findings to inform curriculum design and instructional practices to improve language learning outcomes. Addressing the identified areas for development, such as learners' motivation and peer involvement, can help refine blended learning with MALL strategies to maximize their effectiveness and enhance learner engagement. This study proves blended learning with MALL effectively enhances language acquisition and creates engaging learning environments. The results highlight the significance of incorporating innovative technology-based approaches to improve language learning outcomes. These findings have practical implications for language education worldwide, emphasizing the continued integration of MALL and other state-of-the-art teaching methodologies to optimize language learning experiences.

4. CONCLUSION

This study aimed to determine how MALL-blended instruction influences students' linguistic development and enjoyment of learning. The results demonstrated that the EG outperformed the CG in terms of language acquisition. It is compelling evidence for the beneficial effects of MALL. These results highlight the originality and significance of the work, emphasizing the potential advantages of incorporating MALL in language instruction. Additionally, learners perceived the blended approach incorporating mobile learning as engaging, relevant, and entertaining. However, a critical examination of the data identified specific areas for improvement. Learners' extrinsic motivation, goal orientation, engagement with peers and instructors, degree of focus and concentration, and willingness to continue using mobile learning could be enhanced. Addressing these aspects would further optimize the MALL-blended learning approach and improve the learner experience. The achievements of this study lie in its contributions to the field of language education. Demonstrating the positive impact of MALL-blended learning on language learning outcomes reinforces the importance of integrating mobile technologies in instructional design. Moreover, the identification of areas for improvement provides valuable insights for future research and pedagogical development. Enhancing the significance of this study needs future work should address the identified areas for improvement. Exploring ways to enhance social interaction and support among students, promoting intrinsic motivation and goal orientation, and investigating the effects of MALL on various aspects of language proficiency (such as listening and speaking) would allow for a deeper comprehension of the advantages that may be gained from taking this course of action. Furthermore, studying the integration of different mobile technologies, such as social media and virtual reality, would offer insights into their specific advantages and limitations in language learning contexts. Continued research in these areas will contribute to optimizing MALL-blended learning strategies and elevating language learning outcomes and learner satisfaction.

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