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MOBILE APPS: THE DUAL IMPACT ON EFL VOCABULARY MASTERY AND LEARNER AUTONOMY

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Abstract: Learner autonomy is a critical yet underdeveloped skill among Indonesian EFL students, who often exhibit a high dependence on teachers, particularly in vocabulary acquisition. Addressing this, this mixed-methods study investigates the dual impact of self-directed mobile application use (specifically Quizlet and Duolingo) on vocabulary mastery and learner autonomy. Twenty undergraduate English education students participated in a three-week self-regulated vocabulary program. Data were collected via pre- and post-tests, an autonomy questionnaire, and semi-structured interviews.

Quantitatively, the results demonstrated a significant improvement in vocabulary mastery (mean score rise from 56.3 to 72.5). A paired t-test confirmed this gain was statistically significant ($p < 0.01$). The strongest gains were observed in the contextual application of words, suggesting deeper lexical processing facilitated by the mobile tools. The autonomy questionnaire indicated substantial positive changes, with the overall mean score increasing from 3.1 to 3.9. The most pronounced growth was found in the key self-regulatory sub-constructs of self-monitoring (3.0 to 4.0) and persistence (3.3 to 4.1). Analytically, interview data reinforced these findings: students highly valued the gamified motivation and the flexibility of learning, which systematically fostered a sense of ownership and agency. Challenges reported primarily related to internet instability and distractions.

The study concludes that the systematic integration of mobile applications effectively enhances vocabulary acquisition while specifically fostering key self-regulatory skills, particularly self-monitoring and persistence. These findings underscore the imperative for EFL educators to utilize mobile technology as a core resource for cultivating independent, self-regulated language learners.

Keywords: *learner autonomy, mobile-assisted vocabulary learning, self-directed learning, EFL*

INTRODUCTION

Vocabulary stands as the foundation of language proficiency. As Nation (2013) posits, insufficient vocabulary knowledge fundamentally limits a learner's ability to express ideas and comprehend input, even when grammatical structures and pronunciation are mastered. In restrictive EFL contexts, such as Indonesia, vocabulary acquisition presents a significant hurdle due to the limited exposure to authentic English outside educational settings. Unlike ESL environments, Indonesian students rarely encounter English in their daily lives, forcing them to rely heavily on classroom instruction for vocabulary growth (Suryani & Nugroho, 2022). This structural limitation often fosters a detrimental teacher dependency, where learners passively await vocabulary lists and explanations. Consequently, this reliance, coupled with the failure of traditional methods like rote memorization to promote long-term retention (Schmitt, 2010), results in stagnant lexical development that severely compromises their advanced communicative competence.

To counter this dependency, learner autonomy has been widely promoted in language pedagogy, emerging from the learner-centered movement of the 1980s. Holec (1981) famously defined autonomy as "the ability to take charge of one's own learning," an influential concept spanning decades of research. Benson (2011) expanded this notion, asserting that autonomy involves both the capacity and willingness to act independently in learning contexts. Autonomy is closely linked to metacognitive awareness, requiring learners to plan, monitor, and evaluate their own progress (Oxford, 2017). Specifically, in vocabulary learning, this means employing conscious strategies like selecting appropriate retention methods, monitoring word knowledge gaps, and sustaining practice outside the classroom. Research indicates that autonomous learners demonstrate higher motivation, persistence, and adaptability to new learning situations (Dam, 2008; Palfreyman & Smith, 2021), enabling them to extend learning opportunities beyond formal instruction.

Despite its theoretical importance, studies confirm that many Indonesian EFL students still struggle to exercise this autonomy. Rahmawati (2020), for instance, found that learners frequently rely on explicit teacher guidance, exhibiting uncertainty when required to make independent decisions regarding learning strategies. This pervasive lack of self-direction can potentially impede not only vocabulary growth but also the development of broader communicative competence. Consequently, cultivating learner autonomy is not merely desirable but imperative for Indonesian EFL learners to transition into proficient and lifelong users of English. Fortunately, recent technological developments—particularly the widespread adoption of mobile devices—offer practical and scalable avenues for supporting this transition toward self-directed learning.

Recent technological developments offer promising solutions for supporting learner autonomy. Mobile-Assisted Language Learning (MALL), utilizing ubiquitous smartphones and tablets, has become highly relevant given the high accessibility among university students (Kukulska-Hulme & Shield, 2008). The choice of Quizlet and Duolingo is strategic: Quizlet

inherently supports self-testing and self-monitoring (key autonomy skills) via its flashcard and gamification features, while Duolingo provides structured, independent progress tracking within a gamified, autonomous learning framework. These applications not only improve learning outcomes but also change learning behavior by encouraging self-initiated practice (Viberg & Grönlund, 2012). Empirical evidence supports their efficacy, showing that learners using mobile applications for vocabulary practice often demonstrate higher retention rates compared to traditional methods (Wu, 2015; Lai & Zheng, 2018).

However, a critical gap remains in the existing literature. While MALL has been widely proven effective for vocabulary learning, few studies rigorously investigate the *process or mechanism* by which mobile apps trigger and raise the behavioral and attitudinal shifts necessary for learner autonomy development in the specific Indonesian EFL context. The majority of studies measure quantitative vocabulary gains but rarely examine the corresponding behavioral and attitudinal changes that characterize autonomous learning. Autonomy is not automatically achieved through technology use; learners may still struggle with self-direction or face challenges like distractions or internet access (Rahmawati, 2020).

This gap underscores the need for research that not only assesses the instrumental effectiveness of mobile applications in improving vocabulary knowledge but also systematically investigates their contribution to learner autonomy.

Specifically, this study is guided by the following research questions:

1. To what extent do mobile applications improve students' vocabulary mastery?
2. How do the structural features and learner experiences of mobile applications impact the development of learner autonomy in vocabulary learning?

The significance of this study lies in its shift from merely asking *if* mobile apps are effective to a more crucial inquiry into *how* they reshape learning behaviors and attitudes. By addressing this dual focus, the study contributes meaningfully to the growing MALL literature and provides practical pedagogical recommendations for integrating mobile applications more systematically into Indonesian EFL classrooms as essential tools for fostering independent, self-regulated learners.

RESEARCH METHODOLOGY

3.1 Research Design

This study employed an explanatory sequential mixed-methods design (QUAN → QUAL) structured as a single case study. This design began with the quantitative measurement of changes (vocabulary tests and autonomy questionnaires) and was followed by the qualitative strand (interviews) to explain and deepen the interpretation of the numerical results. Specifically, the qualitative investigative questions were designed to explain *how* the applications' features mediated the *significant quantitative change* observed in self-monitoring and persistence. This mixed approach was crucial for capturing both the measurable change in knowledge and self-regulation, as well as the underlying contextual experiences and perceptions of the learners. The integration of data sets known as triangulation was performed to ensure the comprehensive validity of the findings (Creswell, 2014).[1]

3.2 Participants and Sampling

The participants were 20 undergraduate students (10 male, 10 female) from the English Education Department at Universitas Pembinaan Masyarakat Indonesia. All participants were in their first year of study, with an average age of 19. Participants were selected using a purposive sampling technique based on specific inclusion criteria: Must be currently enrolled in a general English course, must own and have functional access to a personal smartphone and stable internet, have limited prior experience with formal mobile-assisted learning interventions in the classroom, and provide informed consent to participate in the three-week intervention. The single case study design was justified because the focus was on gaining deep, contextual understanding of the *process* of autonomy development within a homogenous, teacher-dependent setting (Indonesian EFL undergraduates) rather than seeking generalizability.

3.3 Instruments

Three primary instruments were utilized for data collection:

1. Vocabulary Tests (Pre- and Post-test): A 20-item multiple-choice test focusing on high-frequency academic vocabulary relevant to the students' level. The test items were adapted from the Academic Word List (AWL) and contextualized based on the reading materials of the general English course. The reliability was established using Cronbach's alpha (α), yielding a high coefficient of 0.82.
2. Learner Autonomy Questionnaire: An instrument consisting of 25 five-point Likert-scale items (1=Strongly Disagree to 5=Strongly Agree) measuring four key components of autonomy. The questionnaire's internal consistency on the current sample indicated an acceptable reliability coefficient (α was 0.78).
3. Semi-structured Interviews: Conducted with five randomly selected participants (25% of the total sample) to gather rich, in-depth accounts of their motivations, perceptions of the mobile apps' features, challenges faced, and perceived changes in their self-directed learning behaviors.

3.4 Procedure

The intervention was conducted over a four-week period:

The duration of three weeks for the core intervention (Weeks 2–3) was chosen as a manageable pilot exploration to capture immediate behavioral shifts and minimize participant attrition, aligning with the timelines of similar short-term Mobile-Assisted Language Learning (MALL) effectiveness studies (e.g., Lai & Zheng, 2018).

Week	Activity	Focus
Week 1 (Baseline)	Administration of Pre-test and Baseline Autonomy Questionnaire.	Establishing initial vocabulary mastery and autonomy levels.
Weeks 2–3 (Intervention)	Participants engaged in self-directed vocabulary learning using Quizlet or Duolingo.	Participants were given the autonomy to **freely choose** between using Quizlet or Duolingo (based on their preference and prior familiarity) for a minimum of 15 minutes per day, six days a week. They were required to submit weekly progress screenshots (e.g., Duolingo streaks, Quizlet study time) for tracking.
Week 4 (Evaluation)	Administration of Post-test and Final Autonomy Questionnaire; Conduct of Semi-structured Interviews.	Measurement of changes and collection of qualitative data to explain those changes.

3.5 Data Analysis

Quantitative Data Analysis

The quantitative data were analyzed using IBM SPSS Statistics. Paired-sample t-tests were performed to determine if there were statistically significant differences between the pre-test and post-test scores for both vocabulary mastery and learner autonomy. Descriptive statistics (mean, standard deviation, and frequency distribution) were used to illustrate the specific patterns of change within the sub-components of the autonomy questionnaire.

Qualitative Data Analysis

Qualitative data from the semi-structured interviews were analyzed using Thematic Analysis as outlined by Braun and Clarke (2006). To enhance the trustworthiness of the qualitative findings, two measures were implemented:

1. Member Checking: Interview transcripts and theme summaries were shared with the participants for validation.
2. Researcher Reflexivity: The lead researcher maintained a detailed reflexivity journal throughout the coding process to monitor and acknowledge potential pre-understandings or biases that could influence theme construction, thereby enhancing the confirmability of the data interpretation.

RESULT AND DISCUSSION

Results

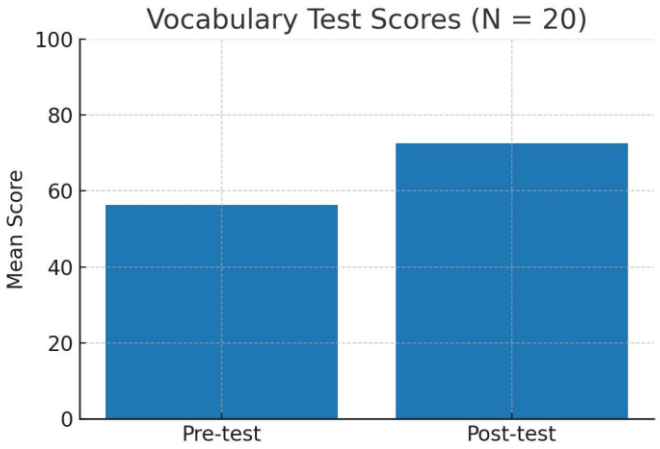
The findings of this study are presented in three integrated parts: vocabulary test results, learner autonomy questionnaire results, and insights derived from semi-structured interviews.

4.1 Vocabulary Test Results

The analysis of pre- and post-tests revealed a significant improvement in students' vocabulary mastery following the three-week mobile application intervention. The mean pre-test score was 56.3 (SD = 8.4), which rose substantially to a post-test mean of 72.5 (SD = 7.6). A paired-sample t-test confirmed that this gain was statistically significant ($t = 6.47$, $p < 0.01$).

Crucially, improvements were not limited to simple word recognition. Students demonstrated enhanced ability to use collocations and apply vocabulary in contextualized sentences. The most substantial progress occurred in contextual application, suggesting that the interactive and multimodal nature of the mobile applications supported deeper lexical processing rather than mere rote memorization.

Figure 1. *Vocabulary Test Scores Before and After Mobile-Assisted Learning Intervention.*



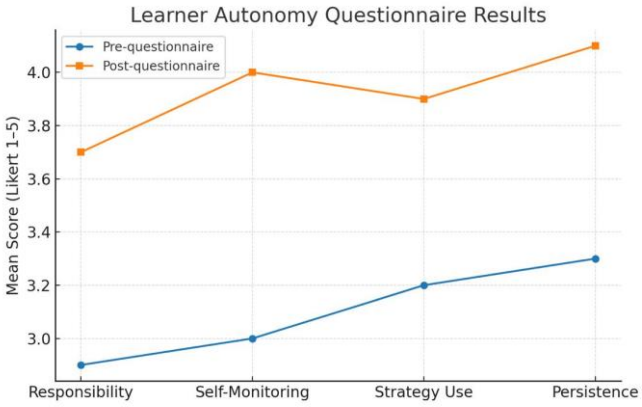
4.2 Learner Autonomy Questionnaire Results

The autonomy questionnaire demonstrated a significant positive shift in self-directed learning behaviors. The overall mean score increased from 3.1 (categorized as moderate autonomy) to 3.9 (high autonomy) on a five-point Likert scale. Specific sub-constructs showed varied but universally positive growth:

1. Responsibility increased from 2.9 to 3.7, indicating that students became more proactive in planning their vocabulary learning sessions.
2. Self-monitoring improved the most, rising sharply from 3.0 to 4.0. Students reported being more consciously aware of their progress and more consistent in tracking their learning milestones.

3. Strategy Use grew from 3.2 to 3.9, suggesting learners actively experimented with varied techniques embedded in the apps, such as spaced repetition, association, and the use of mobile reminders.
4. Persistence rose from 3.3 to 4.1, reflecting increased willingness to continue practicing even when facing lexical difficulties or distractions.

Figure 2. Comparison of Pre- and Post-Questionnaire Mean Scores Across Learner Autonomy Sub-constructs (Likert Scale 1-5)



4.3 Interview Insights

Qualitative data from the interviews provided rich contextual explanations for the observed quantitative gains. Students highlighted several key factors facilitating their progress:

1. Motivation through Gamification: Features like streaks, badges, and scoreboards served as powerful extrinsic motivators, encouraging them to maintain daily consistency.
2. Flexibility and Accessibility: Learners valued the ability to review vocabulary in short bursts during non-traditional study times (e.g., commuting), fostering a sense of control over their learning schedule.
3. Increased Sense of Ownership: Participants felt more confident in selecting *what* and *how* to learn without solely relying on teacher directives, demonstrating increased agency.
4. Challenges and Limitations: Despite positive outcomes, persistent challenges included unstable internet connections and distractions from other mobile applications. However, the majority of participants developed coping strategies, such as utilizing offline app features.

The combined evidence strongly supports the conclusion that mobile applications contributed not only to enhanced vocabulary outcomes but also to significant growth in learner autonomy, setting the stage for the subsequent discussion.

Discussion

The present study investigated the extent to which mobile applications support vocabulary development and foster learner autonomy among EFL university students in Indonesia. The compelling evidence gathered confirms that the consistent, self-directed use of mobile applications (Quizlet and Duolingo) positively influences both vocabulary mastery and self-regulated learning behaviors. The discussion of these findings is structured around three main areas: (1) the role of mobile apps in improving vocabulary knowledge, (2) their contribution to the development of learner autonomy, and (3) the challenges and implications for EFL pedagogy.

5.1 Vocabulary Gains through Mobile Applications

The statistically significant improvement in vocabulary test scores strongly validates the efficacy of mobile applications as lexical learning tools. This finding is consistent with previous research (Wu, 2015; Lai & Zheng, 2018), which attributes superior vocabulary retention to the gamified mobile environments and systematic spaced repetition provided by these applications. The notable gain—from 56.3 to 72.5 in just three weeks—suggests that mobile apps can accelerate vocabulary acquisition, even within a relatively short intervention period.

These gains are likely explained by the cognitive benefits of the app designs. The strong progress in contextual application confirms that the apps facilitate deeper word processing. Quizlet, for instance, provides varied input modes (flashcards, matching, quizzes), reinforcing memory through multimodal exposure, while Duolingo promotes contextualized vocabulary production through sentence-based exercises. This varied, repeated exposure in different contexts strengthens lexical networks, a core principle in vocabulary theory (Nation, 2013). Furthermore, the positive correlation between app use and learning confirms earlier claims that mobile technologies significantly increase engagement compared to passive methods (Stockwell & Hubbard, 2013).

Another factor contributing to vocabulary improvement is motivation through gamification. Many students mentioned the influence of streaks, points, and badges in sustaining their daily practice. Motivation is a well-documented mediator of vocabulary learning (Schmitt, 2010). In traditional classroom contexts, sustaining motivation outside lessons can be challenging. However, the design of mobile apps provides constant reinforcement and feedback, which appears to encourage persistence. This resonates strongly with Deci and Ryan's (2000) Self-Determination Theory, which highlights that meeting the fundamental psychological needs of autonomy, competence, and relatedness (all facilitated by the apps' design) is crucial for sustaining intrinsic motivation and self-regulated learning.

5.2 The Fostering of Learner Autonomy

Beyond the direct vocabulary gains, the most significant finding is the observable shift in learner autonomy, reflected by the substantial increase in autonomy scores (from 3.1 to 3.9). This confirms that learners acquired not just words, but also the skills and attitudes necessary for independent learning. The rise in Responsibility and the most pronounced growth in Self-monitoring validate the emergence of key self-regulatory behaviors (Benson, 2011).

Interestingly, the growth of autonomy in this study did not occur in isolation but was strategically mediated by the structural design of the mobile apps. Features like Quizlet's

progress tracking and Duolingo's daily reminders functioned as external metacognitive scaffolds that gradually nudged students toward self-monitoring and planning. This observation confirms Oxford's (2017) perspective that autonomy does not necessitate learning without support; rather, it thrives on appropriate scaffolding that systematically transitions control to the learner. The apps provided "soft guidance" retaining the student's freedom of choice while structuring their capacity for planning and monitoring.

Furthermore, autonomy was expressed as an increased sense of agency over their learning path. The interviews revealed that students deliberately moved away from dependency by actively selecting vocabulary relevant to their personal academic needs (e.g., writing tasks). This emphasis on agency and the ability to make learning decisions that align with personal goals is consistent with the view of autonomy as a social and contextual phenomenon (Palfreyman & Smith, 2021). The present study thus analytically demonstrates how the structural features of digital tools can operationalize autonomy, creating contexts where students feel empowered and exercise greater control over their learning trajectories.

5.3 Challenges, Constraints, and Sustainability

Despite the overwhelmingly positive results, several constraints emerged. First, the reported issues with unstable internet access and data packages highlight critical issues of digital equity in the Indonesian context (Rahmawati, 2020). The full benefits of mobile-assisted learning cannot be universally realized without institutional or governmental efforts to provide affordable and reliable connectivity, particularly for students from disadvantaged backgrounds.

Second, the challenge of digital distraction was a recurring theme. The same mobile devices that enable learning also provide instant access to social media and entertainment. This paradox confirms Viberg and Grönlund's (2012) observation that while mobile learning increases flexibility, it demands a higher level of self-discipline. This finding underscores that technology alone is insufficient; learners must be trained in metacognitive strategies to manage distractions and sustain focus.

Finally, the three-week duration of the intervention raises questions about the long-term sustainability of the observed autonomy development. Since autonomy is a gradual process that evolves over time (Benson, 2011), future research utilizing longitudinal designs is essential to determine whether these newly acquired self-regulatory behaviors persist and deepen without continuous external scaffolding.

5.4 Implications for EFL Pedagogy

The findings generate three critical implications for EFL teaching and curriculum design:

1. Integration, Not Supplementation: Teachers should re-frame mobile applications as integral components of learning tasks rather than mere supplementary tools. Assignments requiring students to use Quizlet/Duolingo and submit reflective journals or self-reports will reinforce both vocabulary development and self-regulation skills. Instructors should initially scaffold app use but deliberately reduce support over time to promote independence.
2. Training in Digital Learning Strategies: Institutions must prioritize training students in digital literacy and self-management skills. Workshops focused on time management,

goal-setting within the apps, and strategies for minimizing digital distractions can significantly complement the use of mobile apps and strengthen learner self-regulation.

3. Blended Models for Autonomy: The study supports the implementation of blended learning models for autonomy development. By designing activities where students receive initial teacher guidance in the classroom before engaging in independent practice using mobile apps, teachers can effectively scaffold autonomy development while ensuring students remain connected to the overall learning community.

5.5 Contribution and Novelty of the Study

This study contributes significantly to the MALL literature by focusing on the dual role of mobile applications: as efficient vocabulary learning tools *and* as active mediators of learner autonomy. Previous Indonesian studies largely focused only on effectiveness or general attitudes (e.g., Suryani & Nugroho, 2022). By clearly demonstrating that even a short-term, systematic intervention with mobile apps can significantly trigger and measure autonomy-related behaviors, this research highlights a practical and evidence-based pathway for promoting essential learner-centered pedagogy in resource-limited EFL contexts.

CONCLUSION

This study investigated the impact of mobile applications on vocabulary learning and the crucial development of learner autonomy among Indonesian EFL students. The evidence overwhelmingly confirms that mobile-assisted vocabulary learning, specifically through apps like Quizlet and Duolingo, offers significant pedagogical benefits.

The results demonstrated a statistically significant improvement in students' vocabulary mastery, transitioning the mean score from 56.3 to 72.5. The notable gains observed in contextual application confirm that these applications support deeper lexical processing and meaningful word use, moving beyond simple recognition and rote learning.

Equally consequential, the study confirmed that mobile applications acted as effective mediators in fostering learner autonomy. Questionnaire data indicated positive growth across all measured dimensions, including responsibility, strategy use, and, most prominently, self-monitoring and persistence. Qualitative data supported this, illustrating that gamification, flexibility, and progress tracking fostered a strong sense of motivation and ownership among learners. While challenges related to internet instability and digital distractions were acknowledged, the capacity of students to develop coping strategies further underscored their emergent self-regulated learning behaviors.

In light of these findings, the study concludes that mobile applications serve not merely as correlating factors for vocabulary gains, but as causal agents that structurally support and facilitate the development of key self-regulatory behaviors (self-monitoring and persistence) required for learner autonomy.

The study analytically defines the function of the app features: Gamification (streaks, badges) acts as a systematic extrinsic reinforcement mechanism, promoting persistence. Conversely, progress tracking and self-testing features function as metacognitive scaffolds, providing learners with the continuous data necessary to monitor gaps and plan future study sessions independently.

For pedagogical practice, the findings highlight the necessity for teachers to shift toward blended learning models that actively integrate mobile apps into formal instruction. Specifically for the Indonesian context, teacher training and professional development must be prioritized to coach students in digital self-regulation: how to mitigate mobile distractions, manage learning time effectively, and interpret app data (e.g., progress charts, error rates) to make autonomous decisions.

For future research, two primary avenues are suggested:

1. Longitudinal Study: Research should employ longitudinal designs to determine the long-term sustainability of autonomy development and persistence among learners following extended use of mobile applications.
2. Skill Extension: Future studies should extend the focus to other language skills (e.g., reading comprehension, speaking fluency) to investigate whether the autonomy fostered in vocabulary learning can be successfully transferred to different areas of language acquisition.

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