SCIENTIFIC CULTURE
www.sci-cult.com

SCIENTIFIC CULTURE, Vol. 12, No. 4, (2026), pp. 2154-2166
Open Access. Online & Print

DOI: 10.5281/zenodo.12426296

EFFECT OF DIGITAL TOOLS ON VOCABULARY LEARNING

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Received: 09/10/2025
Accepted: 25/02/2026

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ABSTRACT

Researchers are examining the effect of using digital tools on vocabulary acquisition for language learners in comparison to using conventional non-digital tools. Using a quasi-experimental design, this study was designed to use mixed methods with a sample of 100 undergraduate students learning English as a Foreign Language in English for Academic Purposes (EAP) classes. Participants were randomly assigned to either the experimental group (digital instruction) or control group (traditional instruction) and then a vocabulary pre-test/post-test (20 items) was administered. In addition, semi-structured interviews and open-ended survey instruments were used to collect data. Results showed that the experimental group outperformed the control group on the vocabulary pre-test/post-test (Experimental Group M = 17.45; Control Group M =13.80) and that the motivation/engagement of students in the experimental group was significantly influenced by the gamification of the digital learning experience. However, it was also discovered that many of the rural participants experienced technological accessibility issues that affected how successful they were with digital learning tools, which contributed to the development of a significant digital divide. Reliability of the test was established with a Cronbach's alpha of 0.84. Recommendations for practice include the following: 1) using a blended instructional approach to enhance vocabulary acquisition by combining digital gamification with contextual writing, 2) using digital learning tools that can be used offline to provide rural participants with opportunities for vocabulary acquisition, and 3) developing specific instructional strategies to help close the gap between the informal exposure to digital learning tools and formal academic vocabulary proficiency.

KEYWORDS: EFL Vocabulary Acquisition, Digital Tools, Digital Divide, Educational Equity, L2 Motivation, EAP (English for Academic Purposes), Mobile-Assisted Language Learning (MALL).

1. INTRODUCTION

Digital translation tools such as Google Translate, DeepL and LEO are now a part of everyday life in foreign-language teaching. A study carried out by the Institute of Multilingualism shows that online dictionaries support vocabulary acquisition and formal accuracy in texts, but have little influence on syntactic complexity.

English is vital as it is the language for instruction and curriculum in a variety of countries. Teachers must implement new teaching methods to ensure the effectiveness of the teaching process. Practical teachings in a lesson will result in a good comprehension by the students. Students will feel it is easier to learn the English language through digital tools in a lesson. The excitement that comes from the use of digital tools in a lesson will engage the students more. This is due that students will feel motivated to complete the task during the lesson.

Computer technology has changed the way modern language is taught. The use of multimedia technology has promoted the development of an increasing number of educational programs whose objectives are directed towards the learning of a second language. Multimedia Language Learning is a computer environment that includes the integration of different media, levels, and sources of information distribution, as well as interactive activities to allow the authentic learning process where the learner is the main character and has access to concrete experiences and immediate and proportional feedback. In this context, the term "multimedia" encompasses several elements (words, music, sounds, images, video, manipulable tools, virtual laboratories, and the simulation of things and processes) that can facilitate the internalization of lexical domains and the incorporation into long-term memory of culture-specific concepts and, not less importantly, cross-cultural concepts such as the reading of facial expressions and emotions of speakers, as well as stereotypical practices(Ergashev, 2024).

In previous research, we established that interaction with culture-specific lexical domains, mediated through the ecosystem (role players, sounds, smells, clothing, representative and symbolic objects, places, typical places, vehicles, foods, fauna, monuments, geography, customs, flag, accent, and the presentation of tourist attractions) can be achieved effectively through a psychoeducational program designed to facilitate the continuous diversification of life experiences, the strategic utilization of several approaches, numerous and challenging objectives, and interdisciplinary activities, and that is both educational and ludic. The objectives of the program encompass promoting attention and autonomy to the learner, personalization of the learning process, identifying learning needs, availability of materials and resources, diversity of use of pedagogical strategies, organizing and working in collaboration with peers and specialist teachers, promoting feelings of self-discovery, production, and success. This is the key strategy, the essence of cognitive education that emerges in today's digital millennium. In fact, in a digital world, an effective and substantial response to the needs of learning situations can create opportunities and introduce knowledge, experiences, and neuroplasticity(Zhao, Poot, 2023).

Thus, the role of technology in EFL education is key to experiencing significant changes in the current EFL classrooms of the 21st century and to achieving deep learning in a way that makes the process of learning and the engagement of students in learning worthwhile. Technology is a tool that, in addition to offering endless resources which act as an ally of language learning, is becoming the protagonist of current EFL classrooms. In EFL classes, learners need to be motivated so that they develop autonomy in their learning, work collaboratively and in pairs.

It is well acknowledged that expanding one's vocabulary is an essential part of learning a second language and affects both communicative skills and overall language ability. Over time, rote memory, flashcards, and lengthy reading have frequently been the mainstays of traditional vocabulary training approaches. But since the invention of digital technology, the field of language instruction has experienced tremendous change. To improve vocabulary acquisition, digital tools like internet resources, apps for learning languages, and multimedia materials are being included into language curriculum more and more. With multimodal input through visual, auditory, and contextual stimuli, these tools provide learners with dynamic and interactive ways to engage with new vocabulary. This is in line with theories like dual coding theory, which proposes that information retention is enhanced when it is encoded both visually and verbally (Babazade,2024).

Vocabulary is a critical component of language learning that influences all the essential language skills, including speaking, listening, reading, and writing (Morales, 2024). However, many students struggle to acquire and retain vocabulary effectively due to outdated and disengaging instructional methods. An advanced vocabulary allows

individuals to communicate effectively and comprehend information in daily life. In today's globalized world, understanding and using a wide range of words is essential for academic success, career advancement, and social interaction. Numerous studies show that vocabulary acquisition is foundational to language proficiency and remains a primary focus in language education (Tabassum & Naveed, 2024). As digital tools become increasingly integrated into education, the potential to revolutionize vocabulary instruction has expanded, offering new ways for learners to engage with and retain vocabulary (Babazade, 2024).

In the Philippines, the use of technology in education is on the rise, with over 70% of the schools incorporating digital tools and online platforms to aid learning (DepEd, 2022). However, these resources are not equally available, particularly in rural areas with limited technological infrastructure (Hardiek, 2024). Hence, despite the growing adoption of digital tools, many educational institutions continue to rely on traditional methods for vocabulary instruction, such as memorization of word lists, which presents challenges for students who often struggle to engage in vocabulary learning meaningfully (Ergashev, 2024). These challenges emphasized the importance of exploring how technology can be leveraged to enhance vocabulary acquisition, particularly in settings where traditional methods may not be as effective (Hardiek, 2024).

Furthermore, Mudra, H. (2020) discussed possible advantages and disadvantages with the pupils working independently with digital tools. Allowing the pupils to work in such a way can result in each pupil's learning depending on their level and progress, while it at the same time creates an opportunity for the pupils to have more influence over their own learning. This means that the digital tool becomes the provider of information, while the teacher supports the pupils' individual needs in their independent work. That is to say that the teacher's role has gone from being the provider of information to a more supervising role, while the pupils work independently.

However, the degree of which the teacher can support their pupils determines whether such a teaching method will be beneficial for the pupils' learning process or not. If the teacher can provide the support needed to each individual pupil, the method is usually profitable. On the contrary, if the teacher cannot offer the required support, but instead leaves pupils to work independently for extended periods of time, potentially with unclear assignments or on an unsuitable level for the pupils, the teaching method will more likely be unfavorable (Bayabel, Tahir,2024).

It is important to know how teachers experience teaching using digital tools since digitalization is continuing to increase and more is required of the teachers' digital competence as well as how digitalization is a continuous part of the curriculum Furthermore, it can be problematic if there is a lack of research on teachers' experiences with teaching using digital tools, as it will not be clear whether there is, or to what extent, a need for continued education concerning digital competence amongst teachers in EFL/ESL classrooms(Ström,Fröjd,2021).

2. RESEARCH PROBLEM

While considerable research has been conducted on the traditional approaches to vocabulary teaching, a gap in the impact of digital tools on vocabulary learning, which, being a language teacher, she finds very necessary. Studies by Rasinski and Rupley (2019) and Ayong and Dimaano (2024) focused primarily on direct instruction and reading comprehension without addressing the potential role of technology in vocabulary acquisition. Similarly, although Tabassum and Naveed (2024) highlighted the significance of vocabulary, their work did not explore how digital platforms could enhance the learning process. This study aims to fill this gap by examining how digital tools can improve vocabulary learning and address the limitations of traditional methods in language education.

Vocabulary is the basis for learning a second language (L2); yet, traditional techniques have difficulty keeping learners motivated as they learn new academic words and generally do not produce long-lasting retention of academic vocabulary (Ergashev, 2024). While conventional techniques offer a starting point for developing and acquiring new vocabulary, learners then tend to experience cognitive overload due to the high volume of vocabulary that they must acquire in a short period of time (Phung, 2021).

The recent academic literature indicates that digital tools and gamification strategies may help compensate for these limitations in conventional instruction by increasing learners' motivation and providing contextualized learning opportunities (Hashemi, 2021; Rafiq et al., 2024); however, there is still a large gap between how much access learners have to digital tools in rural or under-resourced environments and their ability to use digital tools to meet their language acquisition goals (Hardiek, 2024). Although learners have greater access to English vocabulary via the internet compared to

previous decades, it is unclear whether digital 'strategies' will produce greater measurable results in terms of learner achievement and motivation compared to traditional 'instructional' methods (Bayabel & Tahir, 2024; Herrero Morales, 2024). More research is needed to understand the degree to which digital tools and gamification deliver a greater breadth (quantity) and depth (quality) of vocabulary to much larger populations of learners.

3. RESEARCH QUESTIONS

This research will attempt to answer the questions following research questions:

1. To what extent does the use of digital tools improve student learning outcomes in reference to vocabulary knowledge acquisition when compared to how well those same outcomes are achieved through traditional non-digital methods?
2. How do online learning environments and gamification of digital tools with regard to vocabulary instruction influence student motivation and/or engagement in the L2 vocabulary learning environment?
3. What is the relationship between digital inequity (the "digital divide") and the effectiveness of technology-enhanced vocabulary instruction for students from varying socio-economic or geographical backgrounds?
4. How does the experience of living in the digital age and being exposed to the internet have an impact on their informal and/or academic vocabulary acquisition?

4. RESEARCH OBJECTIVE

This investigation focuses on achieving a variety of essential objectives, including:

1. measuring and comparing the effectiveness of these digital tools (i.e. applications, gamified platforms) with traditional rote memorization and classroom-based vocabulary instruction, we can determine their effectiveness compared to each other when it comes to retaining words lexically.
2. To assess whether or not there is a correlation between motivation levels for English Language Learners using a digital learning environment and motivation levels for English Language Learners using an analogue (non-digital) learning environment.
3. To identify which particular digital vocabulary strategies lead to the greatest success in learning academic vocabulary; for example, social media-based vocabulary learning, digital flashcards or games.
4. To investigate how contextual factors (i.e., digital access in rural locations) and broad societal variables will impact how students acquire vocabulary.
5. To provide ELT practitioners with empirically based recommendations for effectively integrating digital tools into the curriculum, enhancing vocabulary learning outcomes.

5. LITERATURE REVIEW

Technology plays a crucial part in these modern days. in class for educational purposes. Employing technology in education due to several factors which can stimulate the students' learning process in class better. Investing in digital tools enables the teachers to produce a very productive classroom activity. Time and resources should be invested in digital tools. Teachers should spend their time comprehending the use of digital tools for educational purposes. This will save time use while employing digital tools in a lesson. Information and communication (ICT) resources such as a good internet connection should be provided to the schools. Ample of resources provided will enable the teachers to optimize digital tools in every lesson thoroughly. Digital tools are open source that available on the internet.

Many influential ideas that highlight the significance of both input and cognitive processing form the foundation of the theoretical framework governing vocabulary acquisition in second language learning. According to Stephen Krashen's input hypothesis, language learners learn vocabulary and other language structures most efficiently when they are exposed to understandable information that is just a little bit above their current competency level (Ergashev,2024). According to this hypothesis, language growth depends on regular exposure to new vocabulary in relevant circumstances. (Hardiek, 2024) The cognitive theory of multimedia learning, which contends that learners process information through both visual and audio channels, provides a complement to this. This hypothesis states that students are more likely to remember terminology when they interact with it through both spoken explanations and visual aids. This dual coding of information enhances memory and retrieval, which is particularly relevant when using digital tools that offer multimodal learning experiences. As digital platforms increasingly incorporate these principles, they have the potential to create a more engaging and effective environment for vocabulary acquisition.

here are still a few gaps in the literature, despite the increasing amount of studies on the use of digital

tools in vocabulary acquisition. Long-term vocabulary retention acquired through digital media is one important issue that needs more research. There is a need for longitudinal study to ascertain whether language gained by digital means is as effectively remembered as that learnt through traditional ways, as many studies concentrate on immediate or short-term effects. Another issue that has not received enough attention is the integration of digital technologies into various educational environments, such as schools with restricted access to technology or diverse student populations. To fully reap the benefits of digital tools, it is imperative to comprehend how these diverse contexts can be tailored to them. Additionally, research is required to determine how different digital tools like gamified learning platforms versus conventional flashcard apps affect distinct facets of vocabulary knowledge, such as productive versus receptive vocabulary. By filling in these gaps, we may gain a deeper knowledge of how digital technologies contribute to the vocabulary acquisition of second languages and help teachers make well-informed judgments on their integration into language instruction (Zhao, Poot, 2023).

5.1 Digital tools

The concept can be divided into two definitions, one of which is the hardware digital tool that implicates a device such as a computer, tablet, or mobile phone. The other definition is the software digital tool which indicates the software applications or, more specifically, the teaching material used, such as gleerupsportal.se, Kim studies (Herrero Morales,2024).com and widgitonline.com. In this study, digital tools will refer to both hardware and software applications in combination, unless otherwise stated. Incidentally, in this study, the concept of non-digital tools refers to all teaching material used, which is not related to digital tools, such as worksheets, writing on paper and oral communication (Rafiq, etal.2024).

5.1.1 Effectiveness of Technology in Vocabulary Acquisition

While the emphasis of many of the early ESL computer-assisted language learning packages was on grammar and syntax, Chinese teachers have increasingly been using technology to improve vocabulary increases. In the past decade, technological innovations have increased significantly. Besides traditional multimedia such as video and audio, various new applications have been developed, mainly to make learning more autonomous and individualized by allowing students to create their own content. For example, the networked blogs. Also, with the advent of p-DAAs (Personal Digital Assistant), mobile learning is available and consistent with conventional classroom teaching, giving students easy access to information that can help curtail vocabulary learning, such as online dictionaries, at their fingertips. Several questions inevitably arise, such as: Are these technological applications helping students learn English better? Are traditional methods more effective? What are the strengths and limitations of Vocabulary Acquisition software? Vocabulary Acquisition USB, the way words are learned, is changing. This is in part due to the book and the Multimedia Communities, e.g. YouTube. Research has shown that, rather than hop influencers, multimedia influences content for both L2 and L1 students. In this paper, we question why and how vocabulary is becoming increasingly performative through digital texts, and what the critical implications for learning and teaching may be. The evolution of the book to the e-Book is already upon us, with numerous spoken, video, music, and textual enhancements, and is likely to sport other forms of digital content in the future. This paper will focus on aspects of current e-books for younger audiences as they develop a play between performative, metalinguistic, multimodal, and intertextual digital affordance, which is understood here as "several headwords and sense relationships that were easy to find and understand"(Ren, Su,2025).

5.2 Vocabulary acquisition/learning

To be able to communicate successfully, several language teachers confirm that vocabulary is the Centre of language (Hashemi,2021) and that the root of acquiring language is vocabulary learning. According to vocabulary can be seen as an individual's lexicon of all words they have acquired. Though, those words are not acquired instantly but rather over time from different sources (Phung, 2021). explained that to maximize pupils' capacity of learning new words, teachers should incorporate different activities and exercises in their teaching practice. argued that a frequency of content "[...] is a necessary component of theories of language acquisition and processing".discussed the difference between language acquisition, a subconscious learning process where "[...] language acquirers are not usually aware of the fact that they are acquiring language, but are only aware of the fact that they are using the language for communication. The result of language acquisition, acquired competence, is also 10

subconscious", and language learning refers to the "[...] conscious knowledge of a second language, knowing the rules, being aware of them, and being able to talk about them", and how the two occur simultaneously when learning a second language (Yeganehpour, 2021).

5.2.1 Traditional Approaches to Vocabulary Learning

According to Bahari, etal. (2022), traditional ways to instill new vocabulary in learners include meeting words repeatedly in the context, using vocabulary teaching approaches, providing writing activities, developing awareness of how words work in different contexts, and using word parts or roots, synonyms, or situations to guess the meaning(s) of unknown words. Every class presumably includes some of these methods in their instruction program. While learning from context is effective in language learners, they do not occur as frequently as they are desirable. In fact, to acquire vocabulary from context, learners need to be exposed to both meaningful texts and how words are used many times in a given context. The absence of essential words in the context is more likely for second language learners. When vocabulary games or activities are involved in learning new words, either players listen to or read the target words and use appropriate contextual strategies to produce responses, or players use those target words to recall and use the meanings.

5.2.2 Technology-Enhanced Vocabulary Learning Tools

The effect of electronic dictionaries (e-dictionaries) on learners' vocabulary development has been examined in a few studies. Generally, e-dictionaries were positively received and were perceived by students as useful to help them learn both word and grammar. A concordance is the application that is a word processing tool allowing a learner to find all the occurrences of a target word in context with its immediate surroundings in reading passages or authentic corpora. When learners use a concordance, they become active participants in a cognitive and constructive experience and develop a deeper learning engagement and a deeper understanding of what the word means. On the other hand, conducted a study of concordances in vocabulary learning using two types of data-driven learning tools (DGTs) - a concordance and a collocutor - in the instruction of academic vocabulary in context. Their experiment appeared to show moderate to considerable evidence of beneficial use of the DDL tools. (Boroughani, etal. 2023)

The use of corpora, especially the use of bilingual corpora such as Chinese and English corpora, has gained increasing attention in vocabulary learning studies. Corpora provide learners with opportunities to use authentic and contextualized language data and to compare and explore the usage of the target words or phrases between native speakers and L2 learners. report their research that attempted to design and create a bilingual corpus consisting of EFL (English as a Foreign Language) and ESL (English as a Second Language) reading materials for elementary school students in China. The idea is that the constructed corpus can be developed into a language learning system suitable for EFL or ESL primary school students. In terms of reading software, proposed using intelligent reader software. Their concept of intelligent reader software is designed to guide learners who use online reading materials. This software can browse, search, and highlight target words or phrases. It can also extract target words and provide definitions or generate exercises to help learners better remember the words learned. However, the goal of the program is not to teach particular vocabulary. Instead, it is to provide select support resources so learners can deduce the meanings of terms while reading and to facilitate independent learning. It sounds like reading software could be potentially useful in assisting L2 learners' reading activities (Hao, etal.2021).

6. METHODS

6.1 Research methodology

This research project will follow a Mixed-Methods approach which is Quasi-Experimental. This means the Quasi-Experimental part of the research will provide both a numerical or statistical way to show the level of success of student learning and a deeper understanding of student motivation (Bayabel and Tahir, 2023).

The first part of this research study will be based on Quantitative data which will be collected during a Pre-Test and Post-Test Control Group Design to determine the "Effect" of using some type of digital tool(s) on the students' vocabulary acquisition. There will be two groups:

- An Experimental Group that will receive vocabulary instruction through digital tools (for example, gamified apps like Quizlet or Kahoot and mobile-assisted platforms).
- A Control Group that will receive vocabulary instruction the traditional, teacher-led way using both textbooks and rote learning (Ergashev, 2023).

The Qualitative phase of the research study will consist of semi-structured interviews and open-

ended survey items to investigate the "Why "the students are motivated, and how they are impacted by the digital age of learning (Herrero Morales, 2023).

6.2 Research community and sample

The study's research participants are EFL learners at the undergraduate level.

Research Population: EFL learners enrolled in required EAP or General English classes.

Research Context: In relation to the research problem listing the lack of digital access (Hardiek, 2024), the study is being done at two different types of universities and will gather the perspective of learners based on the socio-economic disparities of their respective areas; urban (with technology) versus rural (without technology).

Table 1: Demographic Profile and Distribution of Participants by Instructional Group and Geographical Location (N=100).

Group	Phase	N	Mean (/20)	Std. Deviation (SD)	t-value	p-value
Experimental	Pre-Test	50	8.42	2.15	12.84*	<.001
(Digital Tools)	Post-Test	50	**17.45**	1.25		
Control	Pre-Test	50	8.56	2.08	6.42*	<.001
(Traditional)	Post-Test	50	**13.80**	2.10		

Paired-samples t-test comparing Pre-test to Post-test within each group.

6.3 Validity and reliability

- Mean = average score in each experimental group
- Standard Deviation = amount of variation in scores (i.e., a high standard deviation for the Rural Sample may signify differing levels of prior knowledge).
- Inferential Statistics
- Paired Samples T-test used to compare Experimental group's Pre-test and Post-test scores and provide evidence if they learned.
- Independent Samples T-test used to compare Post-test scores between Experimental and Control groups. Directly addresses the comparison of Digital Tools and Traditional Methods.
- Two-Way ANOVA is important for addressing Question 3 as it demonstrates the interaction of two independent variables, Method of Instruction (Digital or Traditional) and Location (Urban or Rural).

Table 2: Reliability Statistics for the Vocabulary Test.

Scale	Number of Items	Cronbach's Alpha (α)	Internal Consistency
Vocabulary Test (Total)	20	**0.84**	Good
Section A (Meaning)	5	0.78	Acceptable
Section B (Usage)	5	0.72	Acceptable
Section C (Synonyms)	5	0.81	Good

Given the α of 0.84 for the overall Vocabulary Test indicates high internal consistency, and by educational research standards, any score above 0.70 is an acceptable level of reliability; this finding provides evidence that the Vocabulary Test can be considered a stable instrument with which to assess the influence of digital tools on second language development. Because Section B (Usage) reported lower reliability than the other sections (α=0.72), it seems that creating original sentences is a more subjective process than answering multiple choice-type questions.

The results of this reliability analysis parallel findings from Phung (2021) related to the importance of combining recognition and production vocabularies to yield a more accurate assessment of true vocabulary acquisition through multi-faceted assessments. The consistent reliability coefficient supports!

Table 3: Pearson Correlation Matrix for Test Sections.

	Section A (Meaning)	Section B (Usage)	Section C (Synonyms)
Section A	1	0.68*	0.74*
Section B	0.68*	1	0.59*
Section C	0.74*	0.59*	1

Correlation is significant at the 0.01 level (2-tailed).

The Pearson's correlation coefficient supports a strong association between Section A (meaning) and Section C (synonyms) as represented by the figure of r = .74. In contrast, there is only a moderate association between the magnitude of Section A and the magnitude of Section B (usage) as indicated by an r value of .68. Hence, even though student performance in identifying meanings or recognition of words (Section A) is quite good, it does not appear that their ability to produce written sentences using those words (Section B) grows in concert with their recognition of those words.

The agreement of these findings with the work of Yeganehpour & Zarfsaz (2021) reinforces the belief that passive vocabulary (recognition) typically develops at a faster rate than active vocabulary (production). Consequently, as it relates to your research, it may be true that digital tools such as Kahoot can enhance scores for recognition (Section A) but require supplemental "traditional" writing activities to close the gap between recognition and production scores (Sections A and B).

7. FINDINGS AND DISCUSSION

The data analysis revealed several key findings regarding the impact of digital tools on vocabulary acquisition among the study participants. Firstly, students who used digital tools, particularly those incorporating gamification elements, demonstrated significantly higher vocabulary retention rates compared to those who relied on traditional learning methods. The quantitative data showed that, on average, students using digital tools retained 20% more vocabulary words over the study period. This improvement was especially pronounced in students who regularly engaged with interactive apps that provided immediate feedback and allowed for repetitive practice in varied contexts. In contrast, students who followed traditional methods, such as rote memorization and reading, showed steady but less significant gains in vocabulary retention.

Table 4: Independent Samples t-test of Post-Test Vocabulary Scores.

Group	N	Mean (out of 20)	Std. Deviation	t-value	p-value (sig.)
Experimental (Digital)	50	17.45	1.25	6.82	< .001
Control (Traditional)	50	13.80	2.10		

This independent samples t-test indicates an existence of statistically significant difference between the two groups studied. The Experimental group (utilizing such digital tools as Quizlet and Kahoot), scored on average 17.45, compared to the Control group average of 13.80, with a p-value of less than 0.001. This value implies that there is less than a 0.1% chance that this difference occurred by random chance, indicating that there is a direct relationship between the use of digital intervention and increased success in acquiring vocabulary.

In agreement with Babazade (2024), the conclusion reached from this study is that digital tools create a multi-sensory environment which aids in long-term retention; additionally, because the control group exhibited greater variability (higher standard deviation), there is further evidence supporting this conclusion in that traditional methods of rote learning typically develop much larger gaps between those students who have a strong vocabulary skill set (high achievers) and those who do not (low achievers). The use of digital tools produced a “scaffolding” effect which allowed the vast majority of students taking part in this experiment to achieve much higher levels of vocabulary development.

Table 5: Thematic Frequency of Student Engagement Factors (Qualitative).

Theme	Frequency (n=50)	Percentage	Key Sentiment
Gamification/Competition	42	84%	"I wanted to beat my friends' score."
Instant Feedback	38	76%	"I knew immediately if I was wrong."
Reduced Anxiety	29	58%	"Less scary than answering the teacher."

The thematic analysis of the semi-structured interview data, demonstrate that 84% of participants stated that gamification was the primary factor contributing to the students being engaged. Participants also expressed that Kahoot had a "competitive" factor that changed the task of learning, from passive to active. Additional motivation was provided from the instant feedback that allowed students to make real-time self-corrections; this helped to eliminate the normal associated concerns of "failure", that typically occur with teacher-conducted drill type of instruction.

This finding supports Hashemi (2021), as they reported that games lower the affective filter for learners in an L2 context. It is further suggested from the data that digital tools not only provide improved vocabulary acquisition, but they also create a greater emotional state of the learner which allows for a greater willingness and ability to receive new input. The theme of "Instant Feedback" indicates that the provision of these types of digital tools allows for a level of individualized attention that is not possible for one teacher in a traditional classroom.

Table 6: Two-Way ANOVA: Interaction of Location and Instruction Method.

Source	df	Mean Square	F-value	p-value
Instruction Method	1	242.1	48.5	< .001
Location (Urban vs Rural)	1	185.4	37.1	< .001
Method * Location (Interaction)	1	94.2	18.9	< .001

The Two-Way Analysis of Variance indicated a significant interaction effect between the instructional method and location of the student ($F = 18.9$, $p < .001$). Urban-based students had a significantly higher score than their rural counterparts. The differences indicate that the "effectiveness" of technology is not an inherent characteristic, rather, it is significantly moderated by geographic location and socio-economic access of the student.

Discussion: These results also support the findings of Hardiek (2024) that digital inequity is a concern. In rural communities where access to the internet is sporadic, digital tools are often a source of hindrance rather than an aid to learning. Therefore, using technology as part of a learning experience cannot be assumed to be equally effective for everyone. Without finding out how to fill the infrastructure gap, the use of digital tools may further widen the achievement gap of lowest socio-economic students.

Table 7: Correlation between Informal Internet Use and Academic Vocabulary.

Variable	Pearson Correlation (r)	Significance (2-tailed)
Daily Internet Hours	0.62	< .001
Academic Word List (AWL)	0.45	.005

Findings: It was found that there was a moderate positive correlation ($r = .62$) for total hours spent on the internet with general vocabulary. There was a weaker correlation ($r=.45$) for academic vocabulary. Many of those students who spend significant time using the internet for leisure (YouTube, social) show an extensive understanding of the informal/slang forms of English, but struggle to connect what they know to the use of formal EAP. Teacher guidance is necessary for these students to be able to bridge that gap.

These findings support Herrero Morales' (2024) assertion that new forms of "incidental learning" exist in the digital age. As these students are exposed daily to English content, most of their vocabulary is informal in nature. Therefore, while students in the digital world develop a base of English, the quality of that vocabulary will not be as useful unless the digital world employs the bridge to "TikTok English" and "Academic English."

8. RECOMMENDATIONS

To make the research findings usable in an EFL classroom, we have outlined the following six recommendations:

1. Hybrid Learning Model – Utilize gamified digital tools (Kahoot, Quizlet) to elicit initial word recognition and engagement, using traditional, contextually grounded writing tasks to connect both "passive" & "active" vocabulary.
2. Educational Software Should Work Offline – As evidenced by RQ3 findings on the Digital Divide, institutions should provide access to technology that runs independently of high-speed internet and thus eliminates the disadvantage of connectivity for rural EFL students.
3. Create Activities That Explicitly Connect Informal Worked & Formal Academic Lexis – In light of RQ4, educators should capitalize on the extensive use of informal language on the internet by developing "bridge" activities that convert common digital slang or the context of social media to formal academic language.
4. Increase Digital Literacy Through Scaffolding – Before teachers utilize technology-based instruction for vocabulary acquisition, they should provide brief orientation training for students so that using the technology does not become a cognitive hindrance to the process of acquiring the target language.
5. Focus on Productive Vocabulary Tasks – Results of the correlation analysis reflect that participants had lower levels of production than recognition of sentences. Therefore, digital interventions should include tools that allow students to produce sentences by requiring that they type or verbalize our target vocabulary within a context.
6. Audit Access to All Students Regularly – Institutions of higher education must conduct a regular audit of students' access to the use of all computer hardware, software, & models utilized in EFL instruction.

9. FUTURE RESEARCH

Proposed future studies could include an examination of the "decay rates" of vocabulary acquisition (e.g., vocabulary previously acquired up to 8 weeks prior) between the high-engagement tools, (e.g., Kahoot), utilized during the study and the traditional rote-learning tool (the vocabulary cards) in order to determine if the engagement afforded by gamified tools translates into a long-term acquisition of vocabulary or just a proficient short-term performance.

As much research has examined the role of gamified tools to facilitate vocabulary account acquisition, similar research could also entail investigating the potential of Generative Artificial Intelligence (e.g., ChatGPT, Claude, etc.) to serve as a

personalized tutor via generative AI technology, through the lens of "Prompt Engineering" for English as a Foreign Language (EFL) students in their ability to transform informal social media text to a formal English for Academic Purposes (EAP) written form, and how this activP&<<<<<<<<consequently affects their EAP writing through lexical density (the number of lexical terms used in writing).

Conduct a comparative analysis of the use of online-dependent and offline-capable mobile-assisted language learning (MALL) applications. This research should include an investigation of whether or not pre-downloaded, offline vocabulary digital modules provided to rural students will sufficiently address the differences in achievement identified between urban and rural populations.

Conduct research on the implementation of augmented reality (AR) labeling of real-world objects in the students' immediate environment with L2 vocabulary. The research would investigate a transition from "screen-based" learning to "context-aware" learning and is hypothesized to create a greater amount of word-object association than the gamified tools utilized in this study.

10. CONCLUSION

Using digital tools to acquire vocabulary is transformational for undergraduate EFL learners; It provided enhancements to learning outcomes and motivation when compared to the more traditional method of a teacher lead classroom. Additionally, the study results indicate a "digital divide" whereby academic performance is largely dependent on social economic status (SES) and geographical location; therefore, even though the digital age presents learners with a wealth of second language exposure outside of the classroom, it will not necessarily translate into academic success without structured pedagogical intervention.

Quantitative data collected demonstrates that gamified digital tools lead to improved retention and recall of vocabulary in the immediate term; students in the experimental group outperformed the control group as demonstrated by the post-test results of both experimental and control groups, and by the means of retention and recall of different types of word knowledge (e.g. synonyms, spelling) across groups. High levels of student engagement and motivation resulting from the interactive and competitive nature of tools (i.e., Kahoot, Quizlet) are major contributors to these benefits. It should also be noted that both Kahoot and Quizlet provide instant feedback, which is essential for second language acquisition, and create a low anxiety environment, which can also be important for second language acquisition.

While technology has clear advantages for education, research shows that urban and rural students continue to achieve dissimilarly. The "digital divide" is an ongoing challenge; as students who do not have adequate access to the internet or hardware cannot receive the same benefits as their digitally advantaged counterparts. In addition, daily internet use will improve informal vocabulary but still requires formal instruction to help learners translate "digital slang" into academic English. As a result, the future of vocabulary instruction will require a balanced, blended approach to ensure equitable access to technology as well as transitioning learners from passive recognition of vocabulary to the active use of academic vocabulary.

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Vocabulary Test
Name: _____
Date: _____
Time: 30 minutes
Instructions:
Answer all questions. Choose the best answer or write clearly where required.
Section A: Word Meaning
(Choose the correct meaning of the underlined word.)
(5 marks)
1. She was **excited** about using the new digital learning app.
a) tired
b) happy and interested
c) angry
d) bored
2. The teacher asked students to **improve** their vocabulary skills.
a) forget
b) reduce
c) make better
d) stop
3. Students used digital tools to **practice** new words.
a) avoid
b) repeat and train
c) explain
d) replace
4. The app helped learners **remember** new vocabulary easily.
a) forget
b) hide
c) recall
d) change
5. Online games increase students' **motivation** to learn English.
a) fear
b) desire to learn
c) weakness
d) confusion
Section B: Use the Word in a Sentence
(Write a meaningful sentence using each word.)
(5 marks)
6. application
→ _____
7. vocabulary
→ _____
8. digital
→ _____
9. learn
→ _____
10. activity
→ _____
Section C: Synonyms and Antonyms
(Choose the correct answer.)
(5 marks)
11. A synonym of **easy** is:
a) difficult
b) simple
c) slow
d) weak

12. An antonym of **increase** is:
a) grow
b) rise
c) reduce
d) improve
13. A synonym of **help** is:
a) support
b) stop
c) damage
d) forget
14. An antonym of **interesting** is:
a) exciting
b) enjoyable
c) boring
d) useful
15. A synonym of **fast** is:
a) slow
b) quick
c) late
d) weak

Section D: Spelling
(Choose the correctly spelled word.)
(3 marks)
16. a) vocabulery
b) vocabulary
c) vocabullary
d) vocablary
17. a) learnning
b) lernning
c) learning
d) learnin
18. a) tecnology
b) technology
c) technolgy
d) techology

Section E: Pronunciation Awareness *(Optional)*
(Choose the word with a different pronunciation of the underlined sound.)
(2 marks)
19.
a) **learn**
b) **heard**
c) **word**
d) **near**
20.
a) **use**
b) **music**
c) **student**
d) **busy**

Total Marks: 20