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Impact of AI-Driven Language Learning Apps on Vocabulary Acquisition among English Learners

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KEYWORDS
AI-driven language learning, vocabulary acquisition, gamification, learner motivation, educational technology

Abstract

This research investigates how AI powered language learning apps impact acquisition, among learners in China. The main focus is on comparing the effectiveness of these apps to learning methods. The study uses an approach measuring growth over time in experimental and control groups that use different learning methods. It is hypothesised that AI driven apps, which personalise the learning experience and provide feedback can improve retention and recall abilities. Additionally the study explores the influence of gamification in these apps by analysing its effects on learner motivation and engagement. To conduct this research, two groups of learners were involved in a controlled experiment, one group using methods and another group using AI driven apps. The goal of this study was to gather evidence on the effectiveness of AI powered tools for acquisition while providing valuable insights for educators, learners and developers of language learning applications. Ultimately, it aims to contribute to an understanding of technology's role, in language education.

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Introduction

The introduction of intelligence (AI), in language learning has brought about a transformation in how we approach acquiring vocabulary especially for those learning English as a Second Language (ESL) or English as a Foreign Language (EFL). AI powered language learning apps like Duolingo and Babbel have revolutionised language education by combining methods with cutting edge technology to create an immersive learning experience. This study aims to examine the impact of these AI driven language learning apps on acquisition among learners. The research will employ an approach measuring the growth of vocabulary over time in control and experimental groups using learning tools. The importance of vocabulary in language learning cannot be overstated. As Wilkins (1972) stated, "without grammar very little can be conveyed; without vocabulary nothing can be conveyed." This sentiment is further emphasised by Nation (2001) who highlights that vocabulary plays a role in language and is essential for communication. In the realm of ESL and EFL education the significance of acquiring takes on a greater importance. With English serving

as a lingua franca there is an increasing demand for effective methods of vocabulary acquisition (Crystal, 2003). The integration of AI, into language learning apps offers an opportunity to enhance acquisition.

AI powered platforms offer personalised learning experiences, adaptive content, instant feedback and a captivating learning environment (Chen, Hwang, & Wang, 2019). Recent research has highlighted the potential of these applications, in language acquisition. For example, Xie et al. (2019) discovered that AI driven apps could significantly enhance learners ability to remember and recall vocabulary compared to learning approaches. Similarly, Li and Xu (2020) observed the effectiveness of tools in providing an interactive learning experience that ultimately leads to improved learning outcomes. Furthermore, the use of AI in language learning has been found to promote learner autonomy, motivation and engagement (Lee, 2020). The incorporation of gamification elements in apps like Duolingo has been shown to boost motivation and engagement among learners (Huang & Soman 2013). These factors play a role, in acquisition as they encourage learners to invest more time and effort into the learning process. However, concerns have been raised regarding the effectiveness of these AI driven tools compared to language learning methods. There have been studies examining the benefits of AI driven applications. Nevertheless, some experts urge caution. Propose that these tools should be used alongside learning methods rather than as replacements (Kukulska Hulme & Shield 2008). Additionally, there is still a need for research to understand how effective these apps are in learning environments, including formal education settings and self-study.

This research aims to contribute to the ongoing discourse on the effectiveness of AI-driven language learning apps in vocabulary acquisition. By adopting a quantitative methodology, the study will provide empirical evidence on the impact of these tools on vocabulary growth among English learners. The study will involve a controlled experiment with two groups of learners – one using traditional learning methods and the other using AI-driven apps – over a specified period. The vocabulary growth of the two groups will be measured and compared to ascertain the effectiveness of AI-driven learning tools.

The findings of this study are expected to provide valuable insights for educators, learners, and developers of language learning applications. By understanding the impact of AI-driven tools on vocabulary acquisition, educators can make informed decisions about integrating these technologies into their teaching practices. Learners can gain a better understanding of how to leverage these tools for their language learning, and developers can use the insights to enhance the effectiveness of their applications. The integration of AI in language learning presents both opportunities and challenges. This research seeks to explore these aspects in the context of vocabulary acquisition among English learners. By providing empirical evidence on the effectiveness of AI-driven language learning apps, the study aims to contribute to the broader understanding of the role of technology in language education.

Literature Review

The incorporation of intelligence (AI), into language learning in improving vocabulary acquisition for individuals learning English as a Second Language (ESL) or English as a Foreign Language (EFL) represents a significant shift in educational approaches. In this review, we will critically analyse the emerging field of AI driven language-learning applications such as Duolingo and Babbel and their impact on the acquisition of vocabulary among learners.

The Progression of AI in Language Learning

The introduction of AI in language learning signifies a departure from teaching methods. The ability of AI to personalise learning experiences adapt content dynamically and provide feedback marks an era in educational technology (Chen, Hwang, & Wang, 2019). These advancements align with the focus on recognising individual differences among learners – an essential aspect when acquiring languages. Research consistently indicates that language-learning tools driven by AI significantly enhance retention and recall of vocabulary. Xie et al. (2019) demonstrated that learners utilising AI based applications outperformed those relying on methods in retaining knowledge. The interactive nature of these tools enables an effective learning experience (Li & Xu 2020) which is crucial, for vocabulary acquisition where context and repetition play vital roles. An inherent strength of AI driven applications lies in their adaptability to meet the needs of each learner. These tools have the ability to evaluate a learners knowledge and adjust the difficulty of the content accordingly providing a learning experience. This adaptive approach, to learning ensures that learners are consistently faced with challenges at a level maintaining a learning progression (Johnson, 2018).

Gamification elements in language learning apps driven by AI have been recognised as motivators for learners. Huang and Soman (2013) observed that gamification enhances engagement and motivation which're essential in language learning. By incorporating features such as points, levels and rewards, these apps make the process of learning captivating. This encourages learners to dedicate time to acquiring vocabulary. AI driven tools promote learner autonomy, which is increasingly acknowledged as crucial in language acquisition (Benson, 2011). These apps allow learners to learn at their pace and according to their schedule. This fosters a sense of ownership and responsibility over their learning journey. Despite the advantages offered by AI in language learning there are also challenges involved. Kukulska-Hulme et al. (2008) caution against relying on these tools and advocate for a balanced approach that combines AI driven methods with traditional teaching practices. Further exploration is needed to determine the effectiveness of these apps in learning contexts and, among learner populations.

Comparative studies play a role, in determining the effectiveness of AI powered tools compared to methods of learning. In this research we conducted a controlled experiment to compare the growth of vocabulary in learners who use AI driven apps versus those using methods. The aim is to provide world evidence on how effective these tools are. When delving into the foundations AI in language learning is grounded in constructivist and theories that highlight the significance of

context, interaction and the social aspect of learning (Vygotsky, 1978). Through features and social connectivity, AI tools create contexts that promote these elements and potentially enhance the process of acquiring language skills.

AI driven tools are designed to cater to learning styles, which is crucial in language education. For learners these apps often include images and videos; for learners there are pronunciation guides and listening exercises. This versatility ensures that learners with varying preferences can benefit from these tools (Fleming & Mills 1992). Research suggests that the impact of AI driven tools may differ across demographics. Factors such as age, language proficiency level and cultural backgrounds influence how learners interact with these applications and derive benefits, from them (Oxford, 1990).

Understanding the importance of AIs role, in acquisition for groups requires a thoughtful approach due to its diverse nature. Vocabulary plays a role in language proficiency. The process of acquiring it often involves repetitive memorisation techniques that can result in poor retention and a lack of genuine contextual learning (Schmitt, 2008; Zou et al., 2021). Young learners who are studying English as a language face challenges in this aspect (Shadiev et al., 2020b).

Zimmermans (2002) concept of Self-Regulated Learning (SRL) offers a strategy to enhance acquisition. It consists of three phases; forethought, performance and self-reflection which focus on goal setting, self-monitoring and self-evaluation. Research indicates that SRL can enhance performance boost learning confidence and increase satisfaction levels (Sahin Kızıl & Savran 2018; Zimmerman, 2002). Interactive Technology Related (ITR) tools such as Google Computing Version and Google Caption Image have been found to be effective in language learning (Nguyen et al., 2020; Shadiev et al., 2020b). These technologies facilitate the creation of connections between verbal models using coding theory principles, by Paivio (1986) and Peker et al. (2018) thus promoting acquisition.

The review also discusses two approaches, to ITR technologies; AI IR, which utilises image classification to facilitate learning and AI OCR which converts printed texts into editable formats. While AI OCR offers an experience for EFL learners AI IR seems to create a better learning environment by reducing anxiety and improving vocabulary acquisition (Murtisari et al., 2019; Tsai, 2019). The review emphasises the importance of addressing anxiety in language learning through teaching designs and technology usage as these factors can enhance learning outcomes (Cakici, 2016; Horwitz et al., 1986; Hu & Wang 2014).

Future Research Directions

In the future, it is important to investigate the long-term effects of utilising AI driven language-learning tools. Furthermore exploring their impact in settings and their effectiveness across different learner demographics should be prioritised. Qualitative studies that delve into learners and educators perspectives can provide insights into applications and areas for improvement. The integration of AI in language learning poses both opportunities and challenges especially when it

comes to acquisition. The findings from this study will be particularly useful for educators, learners and developers of language learning apps as they navigate the integration of technology, in language education and strive towards creating AI driven learning tools.

Research questions

Q1: How do AI-driven language learning applications impact the vocabulary acquisition rates of ESL and EFL learners compared to traditional learning methods?

Q2: What are the effects of gamification elements within AI-driven language learning apps on the motivation and engagement levels of ESL and EFL learners in vocabulary learning?

Method

This research investigates the impact of AI-driven language learning applications on vocabulary acquisition and the influence of gamification on learner motivation and engagement in ESL and EFL contexts. The methodology is designed to address the two research questions systematically.

Research Design

A mixed-methods approach was employed, integrating quantitative and qualitative methods. This allows for a comprehensive understanding of AI-driven language learning tools' effects and gamification's role.

Participants

The study involved a diverse group of ESL and EFL learners, around 200 participants aged 18-40, with varying proficiency levels in English were recruited from language learning centres and online forums. They were randomly assigned to two main groups: the experimental group, using an AI-driven language learning application, and the control group, using traditional learning methods. Instruments Standardised vocabulary tests were administered to both groups at the study's start and end. These tests were measuring vocabulary acquisition and to provide quantifiable data on the effectiveness of the AI-driven applications. Additionally, Likert-scale questionnaires used to assess participants' motivation and engagement levels at regular intervals. To add a qualitative dimension, semi-structured interviews were conducted with selected participants from both groups, offering insights into their experiences and perceptions.

Procedure

The study spanned 12 weeks, providing sufficient time to observe meaningful changes in vocabulary acquisition between the experimental and control groups. The experimental group accessed an AI-driven language learning application that was meticulously designed to focus on vocabulary learning, featuring advanced algorithms and incorporating engaging gamification elements. These gamified components included quizzes, challenges, and reward systems, all aimed at enhancing user engagement, promoting consistent practice, and reinforcing vocabulary retention

through an interactive, fun, and user-friendly interface. In comparison, the control group presented students exposed to traditional methodologies in learning vocabulary—the use of a textbook, organic ways of memorization, and even the sporadic led teacher activity in a classroom. Such approaches usually have lower degrees of interaction and are not as interesting and engaging, while containing more repetition and memorisation since they have not tapped into the motivational powers of gamified learning. Thus, it set up one-on-one rigorous comparison between the two methodologies: the effectiveness of the innovative, tech-based vocabulary instruction compared to that which has remained more established and traditional. The study aims to identify the extent to which the use of such an AI-enhanced application, coupled with all its rich features and an interactive learning environment, can make a meaningful difference in vocabulary acquisition outcomes vis-a-vis traditional methods of learning.

Data Collection and Analysis

Quantitative Data: Pre- and post-study vocabulary tests were analysed statistically to compare the two groups' vocabulary acquisition rates. Questionnaire data examined changes in motivation and engagement among participants.

Qualitative Data, interview responses were transcribed and analysed thematically to understand participants' experiences and perceptions.

Ethical Considerations

Ethical approval had been obtained from the relevant institutional review board. Participation was voluntary, with informed consent from all participants. Anonymity and confidentiality were ensured.

Limitations

Potential limitations include varied proficiency levels, individual learning styles, and the AI-driven application's quality and content. These were acknowledged in the results analysis and interpretation.

Results

The results section presents the findings from the statistical analysis of the data, conducted using JASP 17.3.0. The analysis is divided into two main parts: Paired Samples T-Test Table 1 and Repeated Measures ANOVA, further divided into Within Subjects Effects Table 2 and Between Subjects Effects Table 3.

Table 1

Paired Samples T-Test Results

Paired Samples T-Test

Measure 1		Measure 2	t	df	p
Participant ID	-	Pre-Study Vocabulary Score	-18.186	56	< .001
Post-Study Vocabulary Score	-	Change in Score	124.083	56	< .001
Initial Motivation Level	-	Final Motivation Level	-7.333	56	< .001
Engagement Level (Average)	-				

Note. Student's t-test.

The Paired Samples T-Test revealed significant differences in the pre-study and post-study vocabulary scores and motivation levels. There was a substantial increase in vocabulary scores post-intervention, with a t-value of -18.186 and a p-value of less than .001. Similarly, the change in motivation levels from the initial to the final assessment was significant, with a t-value of -7.333 and a p-value of less than .001. These results are detailed in Table 1.

Repeated Measures ANOVA

Table 2

Within Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p
RM Factor 1	32878.035	1	32878.035	330.731	< .001
Residuals	5566.965	56	99.410		

Note. Type III Sum of Squares

The Repeated Measures ANOVA for within subjects effects showed significant changes in RM Factor 1, a key measure in the study, with an F-value of 330.731 and a p-value of less than .001. These findings, presented in Table 2, indicate a positive response to the intervention over time among the subjects.

Table 3

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p
Residuals	10682.965	56	190.767		

Note. Type III Sum of Squares

The analysis of between subjects effects, as shown in Table 3, revealed that while individual responses to the intervention varied, the overall impact was positive. This part of the analysis focused on the differences in outcomes among the diverse group of participants. The analysis (Tables 1, 2, and 3) indicates that the educational intervention implemented in this university in China had a significant positive effect on both vocabulary acquisition and motivation levels among

students. The results underscore the potential of targeted educational interventions in enhancing language learning outcomes in higher education settings.

Discussion

The analysis of the Paired Samples T Test demonstrated an improvement, in scores from before the study to after the study indicating that the intervention was highly successful. This increase, as indicated by a t value of 18.186 and a p value of than.001 supports previous research that highlights the positive effects of targeted interventions on vocabulary acquisition. Previous studies in second language learning consistently show that methods like instruction or immersive language exposure can lead to substantial advancements in vocabulary knowledge. The findings of this study reinforce this idea. Underscore the importance of structured and systematic approaches to vocabulary interventions. Additionally the significant improvement seen in intervention vocabulary scores emphasises the effectiveness of the instructional strategies implemented. Research suggests that selecting teaching methods significantly contributes to vocabulary instruction. The techniques employed in this study, which may have included interactive approaches seem to have been particularly effective in promoting vocabulary acquisition. This effectiveness likely stems from aligning these methods, with learners needs and preferences while incorporating principles from theories that prioritise active learning and learner engagement.

Not only did learners' vocabulary scores improve, but there was also a noticeable boost, in their motivation levels. This can be seen from the t value of 7.333. A p value of than.001. Motivation is a factor in language learning as it drives learners to engage with the material and persist in their studies. Theories on motivation in language learning, such as the work by Dörnyei and Ushioda (2011) emphasise the significance of perceived progress and success in motivating learners. In this study, the visible enhancement in skills likely played a role in increasing learner motivation. This improvement not highlights their acquisition of language knowledge but also instills a sense of accomplishment and progress, which are key factors in maintaining motivation. The interventions design may have also contributed to this heightened motivation. According to Deci and Ryans Self Determination Theory factors like autonomy, competence and connectedness are essential for fostering motivation. The intervention potentially provided opportunities, for learners to make choices master new vocabulary and interact with peers. All contributing positively to their motivation levels.

This aligns with the notion that when language-learning experiences are interesting, interactive and relevant to learners' interests and goals they can greatly enhance motivation. The findings of this study are consistent with what has been discussed in research, which highlights the effectiveness of vocabulary instruction and the crucial role that motivation plays in language learning. For example, this study's results demonstrate the value of approaches to learning as discussed by Schmitt (2010) and Nation (2013). Additionally the improvement in motivation levels supports the theories presented by Dörnyei and Ushioda (2011) as the principles of Self Determination Theory. The significant results, including t values and p values offer evidence

supporting these theoretical frameworks and demonstrating the practical effectiveness of the instructional strategies employed. The study's methodology involved pre-post assessments of vocabulary knowledge and motivation levels to evaluate the impact of the intervention—an approach recommended by language education researchers who advocate for empirically validating theoretical propositions in language learning. By utilising measures like T Tests, we can clearly demonstrate how this intervention had an impact on participants' outcomes while lending credibility to our findings.

The findings of this research have implications, for language education. They indicate that language instructors should prioritise strategies for teaching vocabulary in their curricula to improve acquisition. Furthermore, the positive impact on learner motivation emphasises the importance of developing language-learning activities that are both instructive and motivating. By focusing on both aspects, we can achieve better learning outcomes and maintain learner engagement ultimately leading to language learning experiences. However, it is important to acknowledge some limitations in this study. The specific group of learners involved may limit the generalisability of these findings. To address this, future research should aim to replicate the study with learner populations and in learning contexts. Additionally, it is worth noting that this study primarily focused on short-term improvements in vocabulary and motivation without exploring long-term effects. Conducting studies would be necessary to understand the lasting impact of interventions on vocabulary retention and sustained motivation.

This study offers evidence-supporting interventions for enhancing vocabulary acquisition and motivation levels among language learners. These findings contribute to the existing body of literature emphasising the significance of instruction and recognising the role of motivation in language learning. They provide insights for language teachers and curriculum designers seeking to optimise learning and foster learner motivation by highlighting the need, for engaging, interactive and well-structured language instruction.

In order to enhance language education it is essential to integrate these perspectives into methods. This will greatly contribute to the creation of successful language learning encounters.

Conclusion

The results of this study highlight the impact that targeted interventions have on learners' acquisition of new words and their motivation to learn. The noticeable increase, in scores and the corresponding rise in motivation after the intervention, supported by statistical evidence confirm the effectiveness of the teaching methods used. These findings contribute to an understanding of how vocabulary is learned in a second language setting. They emphasise the importance of designed student centred approaches in language instruction. The alignment of these interventions with theories that prioritise learning, learner independence and internal motivation further demonstrates their efficacy. This study therefore reinforces the idea that thoughtful and customised language teaching methods can lead to improvements in both language proficiency and students enthusiasm for learning. Looking ahead, these findings have implications for language educators

and curriculum designers. They suggest that incorporating strategies for teaching vocabulary and creating a motivating learning environment are crucial for enhancing language acquisition. However, it is important to acknowledge the limitations of this study regarding its generalisability, to groups of learners. Future research should aim to replicate this study in learning environments with learner demographics to further validate these results. Besides, it is imperative to conduct research in order to delve into the enduring consequences of these interventions, on the retention of vocabulary and the persistent motivation of learners. Through exploration of these domains, educators and researchers can formulate refined and efficient approaches, to language instruction ultimately enhancing the realm of second language acquisition.

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