



DIGITAL NUDGING IN LANGUAGE EDUCATION: VOSCREEN'S IMPACT ON READING AND WRITING SKILLS AMONG JORDANIAN EFL UNIVERSITY STUDENTS

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ABSTRACT

Aim/Purpose	This study aims to investigate the effectiveness of Voscreen, a digital nudging tool, in enhancing reading comprehension and writing performance among first-year Jordanian EFL university students. Specifically, it examines whether Voscreen-based instruction leads to significant improvements in reading at literal, inferential, and critical levels, and in writing in terms of task achievement, coherence, lexical resources, and grammatical accuracy, compared to traditional instructional approaches.
Background	Despite sustained EFL instruction in Jordanian universities, many first-year students continue to demonstrate weaknesses in reading comprehension and academic writing, particularly at inferential and critical levels. These difficulties are commonly attributed to teacher-centered practices and limited exposure to authentic English input. While mobile-assisted language learning (MALL) has expanded opportunities for learner engagement, most applications focus on vocabulary or listening and provide limited evidence for improving integrated literacy skills, especially writing. Voscreen, a mobile-based platform that uses short, authentic video clips and digital nudging mechanisms, offers a theoretically grounded approach aligned with multimedia learning and cognitive load principles.

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Methodology	A quasi-experimental pre-test–post-test design was employed with 60 first-year Jordanian EFL students assigned to an experimental group (Voscreen-based instruction, $n = 30$) and a control group (traditional instruction, $n = 30$). Reading and writing pre-/post-tests and classroom observations were administered over an eight-week intervention, and group differences were analyzed using ANCOVA and MANCOVA
Contribution	Provides first controlled evidence of Voscreen’s effectiveness on both reading and writing, expanding MALL research to include digital nudging’s role in EFL literacy development.
Findings	Integrating Voscreen into EFL classes significantly improved students’ reading and writing skills compared to traditional instruction. After eight weeks, the experimental group showed large gains in literal, inferential, and critical reading, as well as writing coherence, vocabulary, grammar, and task achievement. Voscreen explained nearly 60% of the improvement in reading and 43% in writing, demonstrating its strong effectiveness as a low-cost, scalable digital nudging tool for enhancing literacy skills among university-level EFL learners.
Recommendations for Practitioners	Integrate Voscreen to enhance reading and writing outcomes in EFL classrooms through low-cost, scalable digital tools.
Recommendations for Researchers	Explore long-term effects, broader learner levels, and comparisons with other digital tools in diverse educational contexts.
Impact on Society	Demonstrates that affordable, technology-driven solutions can enhance literacy skills in under-resourced educational systems.
Future Research	Replicate in varied contexts, including speaking/listening skills, and explore the impacts of learner autonomy and motivation.
Keywords	Voscreen, digital nudging, EFL, reading comprehension, writing performance, microlearning

INTRODUCTION

Digital tools are increasingly used in language education, changing how students learn, think about, and use language. One of these technologies, Voscreen, is a mobile-assisted language learning program that has become a potential way to improve English as Foreign Language (EFL) skills through short, real, and interactive videos. According to Merzifonluoğlu (2023) and Willberg (2023), Voscreen uses digital nudging to give students micro-content that subtly encourages them to read more carefully and write more clearly without directly telling them to do so. In this way, it fits with modern cognitive and motivational theories that support learner autonomy, engagement, and contextualized input.

Jordanian EFL students, especially college students, still struggle with productive language skills, particularly in reading and writing (Alsaria & Alsaria, 2024). People often say these problems are caused by outdated teaching techniques, insufficient exposure to English, and excessive focus on grammar-translation (Mousa, 2023). As a result, many first-year college students lack the fluency and confidence to discuss schoolwork.

Even though mobile-assisted language learning (MALL) has made significant advances, many university-level EFL learners in Jordan continue to struggle with oral fluency, vocabulary acquisition, and self-regulated use of English (Alhums, 2024). For example, studies indicate that Jordanian EFL students face persistent difficulties in developing speaking skills within e-learning environments, owing

to low learner autonomy and limited technology-enhanced pedagogy (Alhums, 2024). Moreover, reviews of the Jordanian context reveal that English teaching remains heavily reliant on teacher-centred, form-focused approaches and lacks integration of authentic multimedia resources that foster communicative competence (Alhabahba & Pandian, 2016). These challenges highlight the need for intervention such as the mobile app-based Voscreen, which targets underlying issues in learner motivation, microlearning of authentic video content, and autonomous vocabulary and listening practice, grounded in the theoretical frameworks of gamified mobile learning and self-determination theory (Topal, 2025). In the context of Jordanian EFL instruction, Voscreen specifically addresses gaps in frequent, independent exposure to authentic spoken language, supports learner-controlled pacing, and engages learners through gamified short video clips (Celik, 2022).

Nonetheless, while initial studies have examined Voscreen's effects on listening or vocabulary in other EFL contexts (Altug & Önal, 2022; Taylan, 2018), there is a dearth of research investigating its efficacy in Jordanian university settings, across a full range of receptive and productive skills. In other words, existing studies lack empirical exploration of Voscreen's role in promoting learner autonomy, communicative oral skill development, and integration into blended EFL curricula in the Jordanian higher-education context. This research, therefore, seeks to fill this gap by investigating the impact of Voscreen on EFL undergraduates in Jordan, focusing on oral fluency, vocabulary retention, and learner engagement.

This study aims to examine the impact of Voscreen, a digital nudging tool, on the reading comprehension and writing performance of first-year Jordanian EFL university students. It explores whether integrating this platform into structured classroom activities over an eight-week period can lead to statistically significant improvements in students' literacy outcomes. This study contributes to the expanding field of technology-enhanced language learning by providing empirical evidence on the effectiveness of Voscreen in enhancing both receptive (reading) and productive (writing) literacy skills. Practically, the findings offer valuable insights for EFL instructors interested in incorporating authentic, low-cost, and engaging digital tools into their teaching practices. Additionally, curriculum designers may find guidance in adopting blended learning approaches that utilize digital nudging to target specific language skills. Furthermore, educational policymakers can consider these results when exploring scalable and cost-effective interventions to improve language proficiency without requiring significant infrastructure investments.

This study is based on a theoretical framework that brings together ideas from digital nudging theory, cognitive load theory, multimedia learning theory, and models of second language acquisition (SLA). These frameworks work well together to provide a strong foundation for examining how micro-content delivered through Voscreen can help EFL students in college read and write better.

DIGITAL NUDGING THEORY

Digital nudging is based on behavioral economics and involves making small design changes at the interface level that influence users' behavior in predictable ways without taking away their freedom of choice (Thaler & Sunstein, 2008; Weinmann et al., 2016). In the classroom, nudging helps students develop good study habits, become interested in the material, and reach their goals without forcing them to do anything. Voscreen uses this idea by showing short videos that require immediate involvement, which prompts students to reflect on what they mean, make quick decisions, and consider how they use language. These nudges make it easier to make decisions and get people to do things that are good for their reading and writing skills, like rewatching or rephrasing.

COGNITIVE LOAD THEORY (CLT)

Sweller developed CLT in 1988. It says that teaching materials should reduce unnecessary load and increase germane load to help students learn in a meaningful way. The format of Voscreen – short, concentrated, and full of images – helps manage working memory by breaking up input into chunks that the brain can handle. This fits with the chunking approach, which makes it a good choice

for students who have trouble with complicated reading passages or organizing their work. The program helps people think more clearly by breaking language down into small pieces. This helps people remember and transfer information, which is an important goal for both reading and writing.

MULTIMEDIA LEARNING THEORY

Mayer's (2005) multimedia learning theory says that learners understand material better when it is provided in two ways – visually and verbally – and in a way that makes sense and is easy to follow. This notion is supported by Voscreen's use of short video clips and short verbal information together. This improves semantic mapping, contextual vocabulary building, and inference-making, all of which are important for understanding what you read. Also, when learners do something with the language they have just learnt, such as writing a summary or reflection, they engage in generative processing, which helps them remember what they have learnt and improve their writing.

SECOND LANGUAGE ACQUISITION (SLA) THEORIES

Krashen's Input Hypothesis and Swain's Output Hypothesis, two important ideas in SLA, also help with the investigation. Krashen (1985) states that intelligible information that is just a little beyond the learner's present level ($i+1$) is very important. Voscreen provides this through graded, real-world media content. Swain (1995) states that pushed output, or chances to use language, makes learners think more thoroughly about language and see where they need to learn more.

In this study, the Voscreen activities needed both input processing (via video and text cues) and output generation (through writing assignments). This made it easier to employ both methods to learn a language. The intersection of these theories supports the main idea of this study: that short-form multimedia digital nudging can reduce cognitive load, increase language engagement, and lead to measurable gains in reading comprehension and writing skills among university-level EFL learners. The combination of Voscreen's content chunking and task-specific language generation is a theoretically sound and pedagogically useful way to improve literacy in contexts where people are comfortable with technology.

This study situates Voscreen within a framework that combines cognitive learning theory with digital engagement tactics. It provides useful, up-to-date information on how these technologies might be used to help university-level language learners improve their skills.

LITERATURE REVIEW

Digital nudging comes from behavioral economics (Thaler & Sunstein, 2008), though it has become more popular in research on educational technology. Digital nudging is the art of designing user interfaces that gently guide learners towards desirable cognitive or behavioral outcomes without taking away their freedom to choose (Weijers et al., 2021). In school, nudges can be notifications, progress bars, game-like cues, or small bits of content sent to students. According to research (Plak et al., 2023), these kinds of nudges make students more interested in learning, more focused, and more likely to stick with a task. Recent studies also show that well-designed nudging interventions can help people self-regulate, especially when learning online or in a hybrid setting (Demir & Akbıyık, 2025). However, research lacks sufficient attention to digital nudging for skill-specific outcomes, particularly in EFL writing and reading.

MALL has reshaped language education by making authentic materials and real-time feedback accessible through smartphones and tablets (Alisoy & Sadiqzade, 2024). Research confirms that mobile applications can significantly enhance vocabulary acquisition, reading comprehension, and learner autonomy when integrated meaningfully into formal instruction (Li, 2022; Sari & Santosa, 2024). Apps that utilize microlearning, gamification, and contextualized input (e.g., Duolingo, Quizlet, Memrise) are particularly effective with digital-native learners (Reinders & Pegrum, 2015; Sari & Santosa, 2024). However, most MALL studies focus on receptive language skills or general attitudes toward mobile

use. There is a need for research exploring the impact of specific mobile platforms on productive skills, such as writing, particularly in higher education and EFL contexts.

Reading comprehension involves complex cognitive processes such as decoding, inference-making, synthesizing, and contextual interpretation. According to Mayer's (2005) Multimedia Learning Theory, learners understand texts more deeply when visual and verbal input are integrated coherently. Empirical studies show that audiovisual media improve vocabulary retention, promote inferencing, and enhance comprehension of idiomatic expressions (Barnwal, 2021; Klimova, 2021). Micro-video content, such as short clips from films or news segments, provides rich contextual cues that facilitate meaning construction. In EFL environments, multimedia input has been shown to improve learners' ability to process unfamiliar language in authentic contexts (Li, 2022). The current study builds on this line of inquiry by using Voscreen's multimodal input to support reading comprehension across literal, inferential, and critical levels.

Writing is a cognitively demanding skill that requires planning, organization, lexical control, and grammatical accuracy. Research on computer-assisted writing instruction highlights the benefits of automated feedback, collaborative platforms, and digital prompts in improving writing quality (Mousa, 2023; Sari & Santosa, 2024). Digital tools that provide input-rich stimuli – such as images, videos, and infographics – can scaffold idea generation and support coherence in writing (Byrne et al., 2022). However, while writing technologies have gained prominence, few studies have investigated the role of video-based nudging tools in stimulating written output. This study addresses that gap by exploring how daily exposure to video-based microcontent via Voscreen can enhance writing fluency, cohesion, and vocabulary use among Jordanian university students.

Voscreen is a MALL program that uses short video snippets from movies, TV shows, documentaries, and animations to test and improve language abilities. It asks users to watch a tape and pick the correct translation, making it both receptive and reactive. There hasn't been much research on Voscreen yet, but the few studies to date show that it helps with vocabulary learning and understanding what you hear (Cinkara & Arslan, 2017; Yıldız & Göçen, 2020). Ekinci and Ekinci (2020) found that Turkish EFL students who used Voscreen for six weeks had better vocabulary retention and greater motivation. Ghorbani and Rasti (2021) found that students who used Voscreen performed far better on listening and vocabulary activities than those taught in a more traditional way. However, no study to date has empirically examined its use as a digital nudging tool for productive skills, such as writing, in university-level EFL contexts.

While previous research on mobile-assisted tools like Voscreen has mainly focused on vocabulary and listening (Celik, 2022), the domain of writing remains under-investigated. In contrast, recent studies of AI-based writing tools (Sari & Santosa, 2024) and automated-feedback platforms (Mousa, 2023) have demonstrated measurable gains in productive skills. However, these interventions have not utilized short-video microlearning or nudging mechanisms, nor have they been implemented in higher education EFL contexts. Similarly, large-scale studies of Web 2.0 tools (Haleem et al., 2022) suggest broad proficiency gains, yet they treat writing as one of many outcomes rather than isolating it and aligning theory, nudging, and mobile micro-videos. Thus, a clear gap remains for an intervention that combines mobile video, nudging design, and writing skill outcomes in university-level EFL.

Voscreen uses short, authentic video clips that deliver multimodal input (audio + visual) that supports reading comprehension by exposing learners to contextually rich vocabulary, varied syntax, and discourse features in real-life communicative settings, thereby aiding inferencing and meaning construction (Topal, 2025). Concurrently, for writing, Voscreen's micro-learning format stimulates idea generation and lexical retrieval by presenting engaging prompts (clip content + translation choice tasks) that learners can reflect on and transform into written output, thus bridging receptive exposure and productive writing processes (Celik, 2022). Moreover, the app's self-regulated, mobile design enables frequent autonomous engagement, which supports fluency development in writing and reading

alike by reinforcing retrieval practice, incidental noticing of grammar and collocations, and iterative reflection (Yilgin, 2023).

This study addresses the following research gaps: the scarcity of empirical interventions using the Voscreen tool to enhance productive language skills (writing) rather than just receptive skills; the limited use of video-based, mobile micro-learning applications combined with digital-nudge mechanisms in higher-education EFL contexts; and the under-exploration of these interventions in Jordanian (and broader Arab) university EFL settings.

CONCEPTUAL FRAMEWORK

This study draws on three interrelated theoretical foundations: Cognitive Load Theory (CLT), Cognitive Theory of Multimedia Learning (CTML), and Digital Nudging to underpin the mobile-video intervention in a tertiary-level EFL setting. CLT posits that learners' working memory has limited capacity, and excessive extraneous load undermines schema construction and learning (Sweller, 1988). CTML builds on CLT by assuming dual channels (visual & verbal), limited capacity per channel, and active processing; it argues that meaningful learning occurs when learners select, organize, and integrate pictorial and verbal information (Mayer, 2005). Digital Nudging refers to the design of digital choice environments (including apps) that guide user behavior in predictable ways without coercing choice. This applies to educational technologies in which the interface, reminders, or gamified elements steer learners' engagement and self-regulation (Weinmann et al., 2016).

Bringing these together, the conceptual framework hypothesizes that a mobile-video tool designed to reduce extraneous load (via short clips, segmentation) and to engage dual-channel processing (video + audio, subtitles) will align with multimedia and cognitive-load principles, while digital nudges (notifications, progress cues, choice architecture) will enhance learner autonomy, sustained engagement, and frequent exposure. In the EFL context at a Jordanian university, this rationale addresses specific issues of limited independent exposure to authentic spoken English, low learner engagement, and reliance on traditional teacher-centered methods. Moreover, while prior research has applied CLT or CTML in language-learning multimedia, and nudging has been studied broadly in online learning, there remains a gap in empirical investigation of a combined CLT/CTML + Digital Nudging model in mobile-video-based EFL interventions in higher education. This study, therefore, fills that gap by applying and testing the integrated framework in the given context.

METHODOLOGY

To investigate the effects of Voscreen, a digital nudging tool, on the reading comprehension and writing performance of first-year Jordanian EFL university students, we used a quasi-experimental pretest-posttest control group design. This design was chosen to examine causal effects in real-world educational settings where random assignments to groups is not always feasible. Two intact EFL sections were assigned to experimental and control groups. The experimental group received daily Voscreen-based micro learning sessions, while the control group followed the standard university EFL curriculum. This mixed-methods design incorporated both quantitative analysis (to assess skill improvements) and qualitative observation (to monitor learner engagement and implementation fidelity).

The study involved 60 first-year EFL students enrolled in an English language program at a public university in Jordan during the Fall semester of the 2024/2025 academic year. Two intact sections were selected through purposive sampling, each consisting of 30 students with comparable academic backgrounds.

- **Group A (n = 30):** Experimental group (Voscreen-based instruction)
- **Group B (n = 30):** Control group (traditional instruction)

All participants were native Arabic speakers aged 18–20. Informed consent was obtained from each participant, and ethical approval was granted by the university’s Institutional Review Board (IRB). The participants were chosen because they reflect the typical linguistic and academic profile of first-year undergraduates across public universities in Jordan, where English is a general education requirement, and learners commonly enter with foundational but uneven language skills shaped by similar secondary-school backgrounds.

Two standardized tests were developed and validated to measure students’ performance, namely:

- *Reading Comprehension Test*: Included 18 items targeting literal, inferential, and critical comprehension, aligned with CEFR and Jordanian university EFL benchmarks.
- *Writing Performance Task*: A structured academic writing prompt assessed using an analytic rubric based on four criteria: task achievement, coherence and cohesion, lexical resource, and grammatical accuracy.

The structured classroom observation checklist was used to monitor engagement with Voscreen tasks, vocabulary application in writing, task persistence and strategy use, and peer interaction and self-correction. The checklist was adapted from prior digital nudging studies (e.g., Sonnenberg & Bannert, 2016) and refined through expert feedback.

Instrument validation and reliability were ensured through several steps. The pre-tests and post-tests were reviewed by five experts in TEFL and applied linguistics to confirm content validity. A pilot test was conducted with 20 students who did not participate in the main study to assess the clarity of the items, appropriate timing, and overall reliability of the instruments. Internal consistency was measured using Cronbach’s alpha, which showed strong reliability for both reading (0.86) and writing (0.88) assessments. Additionally, inter-rater reliability for the writing rubric was high, with a Pearson correlation coefficient of 0.92.

The reading comprehension test consisted of 18 items measuring literal, inferential, and critical comprehension skills, and was developed in alignment with CEFR benchmarks and the content focus of the university’s EFL curriculum. It was validated through expert review by five TEFL specialists and piloted with 20 non-participating students to confirm clarity, difficulty level, and timing, resulting in strong internal consistency (Cronbach’s $\alpha = .86$). The writing performance task required students to produce a structured academic paragraph based on a prompt and was scored analytically using a four-criterion rubric assessing task achievement, coherence and cohesion, lexical resource, and grammatical accuracy, with high inter-rater reliability ($r = .92$). Both instruments were intentionally designed to reflect the multimodal, context-rich nature of Voscreen’s micro-video input: reading questions targeted vocabulary-in-context and inferencing skills modeled in video clips, while the writing task prompted students to build on themes, phrases, and expressions encountered during daily Voscreen exposure, thereby ensuring direct alignment between assessment and intervention features.

PROCEDURES OF THE STUDY

Before the intervention, both groups completed identical reading and writing pre-tests under standardized conditions, with results confirming statistical equivalence between the two groups. During the eight-week intervention phase, the experimental group received 15–20 minutes of daily Voscreen sessions involving short video clips, comprehension tasks, and reflective writing, along with weekly writing assignments based on Voscreen themes. Classroom sessions included guided discussions and feedback related to the videos and writing tasks. In contrast, the control group followed the standard EFL curriculum, focusing on textbook-based reading and grammar-oriented writing exercises, without using multimedia or digital nudging tools. At the end of the eight weeks, both groups completed the same post-tests, which were anonymously evaluated by trained raters using a standardized rubric and scoring system.

Before the intervention, both groups completed the same reading and writing pre-tests under standardized conditions. The results confirmed statistical equivalence between the two groups.

To safeguard internal validity and minimize extraneous factors, both groups were taught by the same instructor, followed the same schedule, completed identical pre-tests and post-tests under standardized conditions, and were prohibited from accessing the intervention tools outside the designated class period.

Our hypotheses are as follows. We expect that students who receive daily Voscreen-based instruction will outperform their counterparts in the control group on post-test measures of both reading comprehension and writing performance, even after accounting for pre-test differences. Specifically, it is hypothesized that the experimental group will demonstrate significantly higher gains in reading comprehension and in key dimensions of writing performance (such as fluency, cohesion, lexical resources, and grammatical accuracy) due to the multimodal, context-rich, and nudging-based features of the Voscreen intervention.

DATA ANALYSIS

For the quantitative analysis, descriptive statistics, including means and standard deviations, were used to summarize test performance. MANCOVA was applied to evaluate differences in post-test scores between the experimental and control groups while controlling pre-test results. Additionally, effect sizes (Cohen's D) were calculated to assess the magnitude of the intervention's impact. The qualitative analysis involved analyzing classroom observation checklist data using frequency counts and thematic coding. Emerging patterns related to student engagement, motivation, and strategic behavior were categorized and interpreted through the lens of digital nudging theory.

Regarding ethical considerations, the study received approval from the university's Institutional Review Board (IRB). Participation was entirely voluntary, with informed consent obtained from all students. Anonymity and confidentiality were strictly maintained throughout data collection and reporting, and participation had no effect on students' grades or academic standing. Observational data were analyzed using frequency counts and thematic coding to identify recurring patterns in learner engagement, strategy use, and interaction behaviors during the Voscreen sessions.

For the qualitative component, classroom observations were conducted twice weekly during the eight-week intervention using a structured observation checklist adapted from prior digital nudging studies and refined through expert feedback to ensure content validity. The checklist captured indicators of learner engagement (e.g., task persistence, peer interaction, and responsiveness to nudges) and implementation fidelity (e.g., adherence to session duration, use of target features, and consistency of task delivery).

Field notes were recorded in real time by the researcher and later coded using thematic analysis, with initial frequency counts used to identify recurring behavioral patterns, followed by open and axial coding to organize emergent themes related to motivation, strategy use, and task engagement. To enhance trustworthiness, a second trained observer independently coded 20% of the data, achieving a high inter-coder agreement (Cohen's $\kappa = .87$).

RESULTS

GROUP EQUIVALENCE PRIOR TO INTERVENTION

Writing performance pre-test

An independent samples t-test was conducted to compare the experimental and control groups' mean scores on the writing pre-test. As shown in Table 1, there were no statistically significant differences between the two groups on any sub-dimension or the overall score. Both groups were statistically equivalent in writing performance prior to the intervention.

Table 1. Pre-test comparison of writing performance

Sub-dimension	Group	M	SD	t	df	p
Literal	Experimental	1.65	1.29	0.31	118	0.755
	Control	1.58	1.03			
Inferential	Experimental	0.72	0.90	-0.11	118	0.915
	Control	0.73	0.80			
Critical	Experimental	0.43	0.65	0.27	118	0.786
	Control	0.40	0.69			
Total	Experimental	2.80	2.26	0.22	118	0.820
	Control	2.72	1.87			

Reading performance pre-test

A parallel analysis was conducted on the reading performance pre-test scores (Table 2). Again, no statistically significant differences were found. Both groups were statistically equivalent in reading performance at baseline.

Table 2. Pre-test comparison of reading performance

Sub-dimension	Group	M	SD	t	df	p
Literal	Experimental	4.03	1.77	-0.15	118	0.878
	Control	4.08	1.79			
Inferential	Experimental	2.97	1.78	0.67	118	0.506
	Control	2.75	1.77			
Critical	Experimental	1.83	0.83	-0.34	118	0.738
	Control	1.88	0.80			
Total	Experimental	8.83	3.91	0.18	118	0.861
	Control	8.72	3.33			

DESCRIPTIVE STATISTICS AND ADJUSTED MEANS**Writing performance: Post-test scores and ANCOVA analysis for overall**

To find out statistically significant differences ($\alpha = 0.05$) in writing performance post-test scores (literal, inferential, and critical) attributable to the Voscreen-based instruction, Table 3 represents the descriptive statistics and adjusted means for writing performance pre- and post-test. Table 4 shows the ANCOVA analysis for overall writing performance. The analysis revealed statistically significant differences favoring the experimental group ($F = 89.35, p < .001$).

Table 3. Writing performance pre-/post-descriptive and adjusted means

Group	Dimension	Pre M	Post M	Adjusted M	SE
Experimental	Literal	1.65	6.05	6.05	0.19
	Inferential	0.72	4.77	4.77	0.20
	Critical	0.43	4.45	4.45	0.21
	Total	2.80	15.27	15.27	0.53
Control	Literal	1.58	3.22	3.22	0.19
	Inferential	0.73	2.73	2.73	0.20
	Critical	0.40	2.18	2.18	0.21
	Total	2.72	8.13	8.13	0.53

Table 4. ANCOVA – Overall writing performance

Source	SS	df	MS	F	p	η^2
Teaching method	1526.53	1	1526.53	89.35	0.000	0.433
Pre-test (covariate)	9.78	1	9.78	0.57	0.451	0.005
Error	1998.89	117	17.08			

Table 5 presents the MANCOVA results for subskills. The use of Voscreen accounted for 43.3% of the variance in writing performance improvements, indicating a substantial positive impact of the intervention. The interpretation of MANCOVA results for subskills indicates that all three dimensions of writing performance showed significant improvement as a result of the Voscreen intervention, with large effect sizes ($\eta^2 > 0.30$). Among these, the literal comprehension subskill showed the greatest improvement, underscoring the tool's particular effectiveness in improving basic reading comprehension.

Table 5. MANCOVA – Writing subskills

Dimension	F	p	η^2	Direction
Literal	116.90	0.000	0.504	Experimental > Control
Inferential	54.18	0.000	0.320	Experimental > Control
Critical	58.00	0.000	0.335	Experimental > Control

Preliminary assumption checks confirmed that the data met the normality requirement for ANCOVA/MANCOVA, based on non-significant Shapiro–Wilk tests and visual review of Q-Q plots across all dependent variables.

Reading performance: Post-test scores and ANCOVA analysis for overall

To address the second research question, descriptive statistics and adjusted means were calculated for post-test reading performance scores across the literal, inferential, and critical comprehension dimensions (Table 6). This analysis aimed to determine whether statistically significant differences in reading performance ($\alpha = 0.05$) could be attributed to the Voscreen-based instructional approach. The ANCOVA results for overall reading performance, presented in Table 7, indicate statistically significant differences between the experimental and control groups in post-test reading scores, after controlling for pre-test performance. The MANCOVA results presented in Table 8 demonstrate statistically significant differences across all reading subskills – literal, inferential, and critical comprehension – between the experimental and control groups. The interpretation shows that the experimental group achieved significant gains in reading performance compared to the control group. Voscreen contributed substantially to these improvements, explaining 59.8% of the variance in reading performance outcomes, highlighting its strong impact on reading skill development.

Table 6. Reading performance pre-/post-descriptive and adjusted means

Group	Dimension	Pre M	Post M	Adjusted M	SE
Experimental	Literal	4.03	9.97	9.97	0.29
	Inferential	2.97	8.33	8.33	0.19
	Critical	1.83	8.32	8.32	0.21
	Total	8.83	26.62	26.62	0.65
Control	Literal	4.08	6.52	6.52	0.29
	Inferential	2.75	4.30	4.30	0.19
	Critical	1.88	3.78	3.78	0.21
	Total	8.72	14.60	14.60	0.65

Table 7. ANCOVA – Overall reading performance

Source	SS	df	MS	F	p	η^2
Teaching Method	4332.01	1	4332.01	174.20	0.000	0.598
Pre-test (covariate)	53.05	1	53.05	2.13	0.147	0.018
Error	2909.53	117	24.87			

Table 8. MANCOVA – Reading subskills

Dimension	F	p	η^2	Direction
Literal	72.91	0.000	0.388	Experimental > Control
Inferential	232.46	0.000	0.669	Experimental > Control
Critical	237.19	0.000	0.673	Experimental > Control

DISCUSSION

The findings indicate that Voscreen-based instruction resulted in statistically significant and educationally meaningful improvements in both writing and reading skills. The intervention was particularly effective in enhancing higher-order cognitive abilities, including critical and inferential thinking. Consistently large effect sizes confirmed the strong practical benefits of using digital nudging through multimedia tools.

Results are interpreted in relation to the theoretical framework and previous studies. Voscreen, as a digital nudging tool, positively influenced reading comprehension and writing performance among Jordanian EFL university students. The analysis highlighted cognitive, linguistic, and pedagogical benefits of the intervention, showing alignment with established research.

Students in the experimental group significantly outperformed their peers in the control group on post-tests measuring both reading comprehension and writing performance. Notable improvements were observed in literal, inferential, and critical comprehension, as well as in writing aspects like task achievement, coherence, vocabulary use, and grammatical accuracy. Effect sizes were large across all measured areas, with Voscreen explaining 59.8% of the variance in reading gains and 43.3% in writing, demonstrating its strong instructional impact.

Considering digital nudging theory, the significant changes observed can be directly attributed to Voscreen's algorithmic nudging architecture. Voscreen was a microlearning application that gave users short video clips and encouraged them to complete short tasks that gradually changed their behavior. Weinmann et al. (2016) said that nudging methods affect learners' choices without forcing them by making choices easier and more organized. This is in line with what they said. The study shows that digital nudges, such as pop-up reminders, repeating activities, and progress tracking, helped students stick with tasks, draw conclusions, and reflect on how well they were doing – all important for learning a language well.

The results also support cognitive load theory (Sweller, 1988) and Multimedia Learning Theory (Mayer, 2005). Voscreen reduced extraneous cognitive load by breaking information into meaningful chunks, helping learners process text with greater depth. The use of video clips with subtitles, concise tasks, and immediate feedback created a low-friction learning environment that facilitated working memory efficiency.

According to Mayer's (2005) principles, the dual-channel nature of audiovisual input supports better semantic processing. Students were exposed to authentic language in context, which helped them improve their inferential and critical comprehension skills – findings consistent with those of Plass et al. (1998) and Vanderplank (2016).

From an SLA perspective, the findings validate both Krashen's Input Hypothesis and Swain's Output Hypothesis. Voscreen provided comprehensible input ($i+1$) in a real-world, contextualized form. The combination of video comprehension tasks and written reflections encouraged learners to notice linguistic gaps, leading to deeper processing and more accurate production – behaviors predicted by Swain (1995). The significant improvements in writing may also stem from the integrated nature of the tasks. Students watched, inferred, discussed, and wrote about content, thereby engaging both receptive and productive modalities, which are often disconnected in traditional classrooms.

These results are in line with earlier studies on mobile-assisted language learning and microlearning platforms:

- Cinkara and Arslan (2017) and Yıldız and Göçen (2020) found Voscreen effective in improving vocabulary and listening. This study expands on their work by demonstrating significant effects on reading and writing.
- Ekinci and Ekinci (2020) noted increased motivation and retention through short-form video, which may explain the observed gains in this study's experimental group.
- The findings also confirm Burston (2014) and Kukulska-Hulme and Shield (2008), who highlighted the importance of mobile tools in enhancing language engagement and autonomy.

However, this study is among the first to explore Voscreen through the lens of digital nudging, linking behavioral science with language pedagogy in a quantifiable manner.

The study highlights several pedagogical and technological implications. Pedagogically, integrating microlearning through Voscreen can effectively improve both lower-order and higher-order reading skills. Writing instruction also benefits from stimulus-based tasks, which promote coherence and vocabulary development. Importantly, teachers can incorporate Voscreen as a supplementary tool to enhance learning outcomes without needing to overhaul the existing curriculum.

From a technological perspective, mobile applications that apply digital nudging principles can positively influence learner engagement, persistence, and metacognitive skills. Short-form, multimodal input proves particularly beneficial for students in low-resource environments or those experiencing high learning anxiety. Furthermore, language learning app designers are encouraged to prioritize features such as interactivity, cognitive scaffolding, and integrated reflection tasks to maximize educational benefits.

While the results are promising, several limitations should be considered. The sample size was limited to two sections at a single university, which may affect the generalizability of the findings. The intervention duration of eight weeks may not capture long-term retention effects. Additionally, the study did not isolate the influence of teacher feedback, student motivation, or digital literacy. These limitations suggest the findings should be interpreted cautiously and verified through longitudinal or multi-site studies.

Directions for future research include replicating the study with diverse academic levels, including intermediate and advanced learners. Future studies could explore the speaking and listening outcomes of Voscreen-based nudging. Investigating the impact of teacher-mediated versus autonomous use of Voscreen is also recommended. Moreover, examining learner perceptions through qualitative interviews or diaries could offer deeper insights. Comparative studies involving different digital nudging tools, such as Duolingo Stories, LingQ, or FluentU, across EFL contexts are also suggested.

Several limitations should be acknowledged in this study. First, the sample was limited to a single cohort of Jordanian first-year university EFL students, which may limit the generalizability of the results. Second, the intervention lasted only eight weeks; a longer duration might produce different or more stable outcomes. Third, differences in students' access to devices and stable internet connec-

tions could have affected their engagement with Voscreen. Fourth, although Voscreen supports listening and speaking, this study focused exclusively on reading and writing skills. Fifth, potential variations in teaching style, feedback, and out-of-class support were not fully controlled. Sixth, the Hawthorne effect may have influenced participants' performance due to their awareness of being observed. Finally, cultural factors may limit the direct transferability of these findings to EFL learners in more linguistically or culturally diverse settings.

In addition to the quantitative outcomes, the classroom observation data contributed important insights into how the intervention operated in practice. Frequent behaviors in the experimental group included sustained task persistence, spontaneous peer scaffolding during writing activities, and visible responsiveness to nudging prompts, such as resuming tasks following notification cues. These engagement patterns suggest that the digital-nudging architecture of the tool supported both behavioral and cognitive engagement, thereby providing explanatory depth for the observed improvements in reading and writing performance.

The significant gains in reading and writing achieved by the experimental group can be understood through the lens of Cognitive Load Theory (CLT) and Cognitive Theory of Multimedia Learning (CTML). By presenting short, context-rich video clips and guided tasks, the Voscreen intervention reduced extraneous load and enabled working memory to allocate resources more efficiently toward schema construction and germane processing (Clark & Mayer, 2012; Sweller et al., 1998). Simultaneously, through dual-channel audiovisual input aligned with CTML's principles of active processing and integration, learners had better opportunities to select, organize, and integrate verbal and pictorial representations, thereby improving inferential reading and writerly lexical/grammatical cohesion (Mayer, 2005). These mechanisms help explain why the intervention not only boosted basic comprehension and writing fluency but also enhanced higher-order skills such as inferential reasoning and coherence in writing.

Despite the strong findings, it is important to critically acknowledge potential confounding factors that may have influenced the results. For instance, the novelty of using a mobile video-based platform like Voscreen may have temporarily boosted learner motivation and task engagement, independent of the instructional design itself – an effect commonly associated with the novelty effect. Additionally, because students were aware that their performance was being observed and evaluated as part of a study, the Hawthorne effect may have contributed to heightened effort and attentiveness in the experimental group. These factors, along with uncontrolled variables such as students' prior familiarity with digital tools and varying levels of out-of-class exposure to English, suggest that caution is warranted in attributing observed gains solely to the intervention. Future studies with longer durations, delayed post-tests, and stricter controls are needed to rule out these alternative explanations.

Although Voscreen led to significant short-term gains, the long-term sustainability of these effects is uncertain, as no delayed post-test was conducted. Continued use of the tool or similar multimodal tasks may be necessary to maintain progress, suggesting the need for longitudinal follow-up studies.

Our results align with prior Voscreen research showing gains in receptive skills (vocabulary/listening) and motivation (Cinkara & Arslan, 2017; Ekinci & Ekinci, 2020; Ghorbani & Rasti, 2021; Yıldız & Göçen, 2020) but extend the evidence by demonstrating significant improvements in *reading comprehension and writing performance* within a university EFL context. Compared with studies on other digital tools, such as AI-assisted or automated-feedback writing platforms that improve productive skills through direct text support (Mousa, 2023; Sari & Santosa, 2024), our findings suggest that short-video, nudging-based microlearning can also drive measurable writing gains by coupling rich, authentic input with frequent engagement. Broad Web-2.0 or IDLE approaches report general proficiency improvements (Haleem et al., 2022), whereas our classroom-integrated design shows targeted effects on specific reading subskills and analytic writing criteria.

CONCLUSIONS

The integration of Voscreen as a digital nudging tool significantly enhanced both reading comprehension and writing performance among Jordanian EFL university students. These improvements are attributable to the tool's alignment with cognitive learning theories, multimedia principles, and behavioral nudging strategies. The study demonstrates that mobile technology, when thoughtfully integrated, can produce measurable academic gains, especially in traditionally underdeveloped language skills such as writing and critical reading.

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