Research Article

Effects of Foreign Language Learning Mobile Applications on the Success of Fourth-Grade Students

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ABSTRACT

The purpose of this research is to investigate the effect of mobile applications on fourth-grade English language learners' academic achievement. This study employs a combination of quantitative and qualitative research methodologies in an explanatory sequential mixed methods approach. Quantitative data were collected using the Children's Educational Mobile Application Usage for Foreign Languages Scale (CEMAUFL), while qualitative data were obtained through semi-structured interviews. Quantitative data were gathered from 208 students, while qualitative data were obtained from a cohort of 24 teachers, students, and parents. The results of this research show a significant positive relationship between the frequency of app use and academic performance in English classes. Findings from qualitative interviews with students, parents, and teachers shed light on how these applications facilitate vocabulary acquisition, pronunciation improvement, exam preparation, and exposure to illustrative cases. The findings underscore the importance of incorporating technology into language learning to enhance skills achieve better outcomes and encourage further research into the effectiveness of language learning applications in different settings.

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Introduction

Mobile learning, facilitated by mobile devices and applications, presents distinct advantages, as highlighted by Kacetl and Klímová (2019). These benefits position mobile learning as a potent tool for enriching educational practices across diverse contexts. The interactive features of mobile applications enable immediate feedback and active participation, leading to heightened student engagement and improved information retention (Kacetl & Klímová, 2019). Moreover, the omnipresence of mobile devices empowers learners to engage with educational materials at any time and from any location, seamlessly integrating learning into their daily routines. Furthermore, the mobility of these devices liberates learning from the confines of traditional classrooms, promoting continuous learning and enabling individuals to seize educational opportunities in various settings (Ahn & Lee, 2015). Consequently, incorporating mobile learning into educational frameworks can revolutionize conventional learning models, fostering personalized and adaptable learning experiences.

The integration of mobile applications in foreign language teaching has the potential to significantly enhance language learning outcomes. Mobile-assisted language learning (MALL) is a methodology that utilizes handheld mobile devices like smartphones to strengthen language learning experiences (Indriani, 2020). It is a specialized form of mobile learning that distinguishes itself from computer-assisted language learning (CALL) by utilizing personal, portable devices such as mobile phones, PDAs, smartphones, and tablet computers (Duman, et al., 2014). MALL has been recognized as a valuable tool that can positively impact language learning results by providing interactive and engaging platforms for students to practice language skills, facilitating personalized and adaptive learning experiences, and enabling continuous access to language resources outside the traditional classroom setting (Uygun & Fırat, 2023).

This study aims to investigate how mobile applications for foreign language acquisition impact the academic achievement of fourth-grade English language learners. Understanding the impact of mobile applications on language learning at the elementary level can guide the effective integration of technology into language learning curricula and enhance educational practices for young learners.

Foreign Language Learning in Elementary Education

The age at which children begin learning a foreign language significantly influences their language acquisition process. The Turkish education system initiates English language education from the second grade, where students undergo two hours of English instruction weekly in the 2nd, 3rd, and 4th grades. In Grade 2, students in Turkey are introduced to English with basic vocabulary, greetings, and simple instructions for use in the classroom. Building on these basics, Grade 3 expands on vocabulary learning (Sali, 2014). By Grade 4, students are encouraged to express what they have learned in more complex sentence structures, reflecting a progression towards higher language proficiency (Sali, 2014). In educational settings, students frequently encounter limited speaking opportunities within the confines of a two-hour class. Effective language acquisition necessitates ongoing engagement. Vygotsky's Social Learning Theory underscores the significance of interaction

in acquiring a second language. It asserts that interaction plays a pivotal role in the language learning journey of second language learners (Kazazoğlu, 2014). Mobile applications represent a technological tool facilitating sustained interaction in second language acquisition (Bustillo et al., 2017).

Jean Piaget's cognitive development theory suggests that children at different ages possess different ways of thinking. Specifically, according to Piaget, the period between ages 7 and 11 (the concrete operational stage) is when children develop logical thinking abilities and can process concrete information (Piaget, 1952). Fourth-grade students generally fall within this age range, making it a time when their ability to understand and use new language structures rapidly develops. During this critical period for language learning, mobile learning tools can effectively enhance children's language skills.

Fourth grade is a crucial stage for language acquisition, as children exhibit cognitive flexibility and rapid information absorption abilities (Lai & Zheng, 2017). Research suggests that fourth-grade students are well-suited for foreign language acquisition due to their developmental stage and exposure to more complex language structures and vocabulary (Lai & Zheng, 2017). This makes fourth grade an ideal point to study the effects of mobile applications on language learning at the elementary level, as students are developmentally prepared to benefit from these advanced educational tools.

Fourth-grade students typically demonstrate the highest level of proficiency in technology usage among elementary school students when compared to their peers in the 2nd and 3rd grades. The advanced proficiency of fourth-grade students in utilizing technology can be attributed to their more developed cognitive and motor skills, enabling effective engagement with educational technologies and digital tools (Akkaya et al., 2021). Students in the 4th grade exhibit a heightened level of familiarity and ease with technology, enabling them to effectively utilize mobile devices for language learning purposes. This proficiency with technology allows them to partake in various activities beyond the classroom, such as language drills, practice, and authentic communication, using mobile devices as educational tools (Lai & Zheng, 2017).

Conceptual Framework of Mobile-Assisted Language Learning

The theoretical underpinnings of MALL are also explored in the literature. Chuah and Kabilan (2022) emphasize the need for a systematic review to examine the theoretical frameworks of mobile applications in language learning. Additionally, the conceptual framework for MALL through learning analytics for self-regulated learning (MALLAS) was introduced by Viberg et al., (2020). This framework captures the essential dimensions required to support effective MALL, emphasizing the intersection of self-regulated language learning, and learning analytics. The MALLAS framework serves as an analytical tool to operationalize the support of MALL, providing valuable insights for researchers and practitioners seeking to understand better and facilitate self-regulated language learning in mobile contexts (Viberg et al., 2020).

Ali and Segaran's (2013) conceptual framework emphasize using 3D talking-head animations in MALL to improve pronunciation skills among non-native English speakers. Based on Mayer's Cognitive Theory of Multimedia Learning and Constructivist Learning

Theory, the framework utilizes dual-channel processing—visual and auditory—to enhance memory retention and active learning. The animated characters' lip-syncing and facial expressions provide an interactive, self-paced learning experience, making pronunciation practice more effective.

Furthermore, Razzak and Jassem (2021) present a conceptual framework for MALL based on the Meta-Unified Theory of Acceptance and Use of Technology (Meta-UTAUT) model, particularly focusing on its effectiveness in educating citizens to learn English as a foreign language (EFL) in societies where English is not widely spoken. This framework provides insights into applying MALL as a tool for language education in diverse linguistic contexts.

The significance of utilizing technology to establish interactive, supportive, and efficient language learning environments is underscored by all three frameworks. They stress the fusion of theoretical underpinnings with pragmatic implementations to enrich learner engagement, autonomy, and efficacy across various educational contexts. The beneficial effects of MALL applications on student motivation, language proficiency advancement, and self-directed learning underscore the criticality of research and practical implementations in this domain (Tanır, 2023). In this perspective, the incorporation of MALL into educational curricula has the potential to enhance the effectiveness and accessibility of language learning.

Mobile Applications in Language Education: Literature Review

The "Information Technology Usage Survey in Children" conducted by the Turkish Statistical Institute (TUIK) was applied to children aged 6-15. When examining the rate of mobile phone usage by age group, it was reported that this rate was 53.9% in children aged 6-10 and increased to 75.0% in children aged 11-15 (TUIK, 2021). The notable rise underscores the increasing dependence on mobile technologies as children mature. As mobile technologies continue to evolve, ongoing research will be essential in keeping pace with these changes and optimizing their benefits for child development and education.

The proliferation of mobile devices has sparked scholarly debates regarding their impact, with critics expressing concerns about children's excessive use and potential disengagement from traditional play (Akbulut, 2013; Hasebrink et al., 2009). Conversely, proponents argue that mobile technologies can foster creativity and align with children's learning styles (Haugland & Wright, 1997). One of the reasons for this debate can be shown as the inadequacy of studies determining the place of mobile technologies in children's education. Sung et al., (2016) stated that although qualitative research has been conducted on the use of mobile devices in education, there is a lack of research in the literature that includes quantitative analyses of the effects of mobile learning. The objective of this study is to fill this research gap by examining the impact of mobile applications on the academic performance of fourth-grade students in English lessons.

Mobile technologies make foreign language learning more feasible and engaging. Due to their omnipresence, MALL creates opportunities to extend foreign language learning beyond the classroom. In Turkey, foreign language education is generally limited to classroom activities (Çapan, 2022). Learners face difficulties integrating the target language into their daily lives, and this limitation reduces the effectiveness of language learning (Smith

& Johnson, 2020). Therefore, the findings from this study are important in that they offer a solution to one of the most significant problems in language education in Turkey: the inability to extend language learning beyond the classroom.

The integration of mobile applications in foreign language learning has attracted significant attention in educational research. Studies have explored the impact of MALL on students' language acquisition. MALL effectively improves students' speaking abilities, listening skills, and vocabulary acquisition (Amalia, 2020; Athoillah, 2022; Wu et al., 2021). Cerezo et al. (2019) investigated the effectiveness of a mobile application developed for EFL children to practice word pronunciation. With 70 young learners, the study reported that the mobile app improved performance compared to traditional methods.

Hao et al. (2018) introduced an innovative mobile application named APP designed for vocabulary instruction within an English curriculum, as part of a study involving ten seventh-grade students in Taiwan. The study aimed to assess the efficacy of this application in enhancing vocabulary acquisition. Alongside a success test devised by the researchers for data collection, questionnaires, and interview protocols were utilized to gauge students' perceptions and experiences. The outcomes revealed a significant enhancement in learners' English vocabulary skills through the utilization of the developed application, with students expressing favorable opinions about its utility. This study collectively contributes to the understanding of how MALL can enhance the success of young learners in English courses by improving vocabulary acquisition. Nevertheless, it is important to acknowledge that the limited sample size of participants in the study may constrain the generalizability of the research findings.

In the research conducted by Tanır (2023), 60 master's theses and 19 doctoral dissertations published in Turkey during 2009-2022 on MALL were examined. The results reported that MALL applications are generally implemented with preparatory class students at universities. Tanır (2023) indicated that most studies focused on vocabulary teaching in the target language. However, research aimed at developing the four fundamental language skills —listening, reading, speaking, and writing—was mostly neglected (Tanır, 2023).

There are numerous mobile applications that you can download to your phone from platforms such as Google Play Store and App Store to learn a foreign language; however, their efficacy has not been definitively established, particularly regarding young learners' language acquisition. These applications are used not because they are proven effective, but because they are believed to be effective. The study by Deris and Shukor (2019) addresses the research gap on the effects of mobile applications on children's success in learning a foreign language. Therefore, this study aims to investigate the effectiveness of mobile applications on fourth-grade students' success in English classes.

Purpose of the Study

The purpose of this study was to investigate the effect of mobile applications commonly used in foreign language learning on the English language achievement of 4th-grade students. The research aims to answer the following research questions:

1. How do 4th-grade students use educational mobile applications that support foreign language learning?

    a. Is there a significant relationship between 4th-grade students' English lesson grade point averages and their use of mobile applications that support foreign language learning?

2. What are the views of 4th-grade students, teachers, and parents regarding the effects of using mobile applications that support foreign language learning in English lessons?

3. Based on the qualitative data analysis, what are the different dimensions of the effects of using mobile applications to support English language learning on children's language acquisition?

Method

Research Design

This research and its protocols were conducted with the approval of the Anadolu University Scientific Research and Publication Ethics Committee. This study utilized an explanatory sequential mixed methods design, a type of mixed methods research model. This design involves conducting the quantitative and qualitative phases sequentially, with the qualitative data serving to further explore, explain, and validate the initial quantitative findings (Clark & Ivancova, 2018).

In the initial stage of the research, quantitative data were collected and analyzed using statistical tests to offer an initial overview of the results. In the subsequent stage, qualitative data were collected and analyzed to complement and provide more depth to the quantitative findings.

Publication Ethics

On November 5, 2020, the necessary permission was obtained from the Anadolu University Scientific Research and Publication Ethics Committee.

Data Collection Instruments

In the quantitative phase, the Children's Educational Mobile Application Usage for Foreign Languages Scale (CEMAUFL), which was developed by Uygun and Fırat (2023), was used in this research. CEMAUFL was applied by Uygun and Fırat (2023) to 309 students for validity and reliability. According to the study results by Uygun and Fırat (2023), the scale was reliable (Cronbach's Alpha =.945). The $\chi 2/df$ ratio was 2.54, indicating a good fit between the model and the data. The CFI value was calculated as .954, and RMSEA was .07. The results indicated that the model demonstrated a high level of fit. The findings of the study conducted by Uygun and Fırat (2023) demonstrate the validity of the scale and the appropriateness of the model in fitting the data.

The initial section of the scale gathers demographic data concerning the respondents, including gender, access to the internet, possession of mobile devices, duration of usage, and their utilization of mobile applications for English learning. This section also asks those who use mobile applications for foreign language education to specify which applications they use. Furthermore, there is an inquiry regarding the participants' English lesson grade point averages. The second part of the scale comprises 16 items of the CEMAUFL scale grouped

into three factors: willingness to use mobile applications, contribution to foreign language learning, and perceived control. The scale employs a 5-point Likert-type response format, ranging from "1 Strongly Disagree" to "5 Strongly Agree." An additional control item helps identify random responses, and the 5th item serves as a negatively worded counterpart to the 13th item.

Semi-structured interviews were used to gather qualitative data, following an explanatory sequential mixed-methods research design. The qualitative phase aimed to elaborate on the quantitative findings and focused on students, parents, and teachers. Due to the young age of 4th-grade students, interviews were also conducted with teachers and parents to gain more comprehensive insights. To ensure content validity, the interview forms were reviewed by field experts. Study participants volunteered for the interviews, and their feedback was incorporated into the forms to enhance their quality.

This study used self-reported data collection tools to gather detailed and personal insights from the participants regarding their use of mobile applications. This method allows for the collection of subjective experiences and perceptions that might not be captured through observational or experimental methods (Cotton et al., 2010). It provides a comprehensive understanding of how students interact with these technologies in their daily lives, which is crucial for evaluating the effectiveness of MALL applications.

Participants

The study employed stratified sampling, a random sampling method, to select 4th-grade students from three distinct geographical units: city center, close to the center, and village. These units represent different residential areas, and data collection was carried out in all three to explore how mobile applications affect students' academic performance across various settlement types, offering insights into potential differences.

The sample size was calculated using G Power 3.1.9.4 statistical program (Effect size: 0.25, α = 0.05, Power (1- β err prob) = 0.80, Number of Groups = 3), and the calculated sample size was 159. The numerical data of the participants included in the quantitative phase of the study are presented in Table 1.

Table 1. Distribution of Participants in the Quantitative Phase of the Study

Place of schools	*f*	%
Center	67	32
Close to the center	81	39
Village	60	29
Total	208	100

Table 1 shows similar percentages and frequencies of students studying in central, close to the center, and village schools.

Qualitative data were gathered through purposive sampling, selecting participants from the same schools involved in the quantitative phase to closely align with those results. This approach allowed for more comprehensive and in-depth interviews, enriching the understanding of participants' experiences and opinions. Purposive sampling included fourth-

grade students, teachers, parents from the center, close to the center, and village schools that actively used mobile applications for English language learning. See Table 2 for numerical data on these participants.

Table 2. Distribution of Participants in the Qualitative Phase of the Study

Place of schools	Students	Teachers	Parents	Total
Center	3	2	3	8
Close to center	3	2	3	8
Village	3	2	3	8
Total	9	6	9	24

Data Collection

The researchers obtained the necessary permissions from institutions and participants. The CEMAUFL scale was transferred to Google Forms and shared electronically with 4th-grade students' parents, along with a message explaining the study's purpose and confidentiality. Data collection began in June, targeting central, near central, and village schools. Initially, 151 students responded online. However, due to a digital divide and summer vacation, only 3 students from village schools completed the survey. In September, the researcher visited village schools in person, distributed the scale, and collected data from 63 students, discarding 6 blank forms. In total, data were collected from 208 students, including 151 online and 57 face-to-face responses.

Qualitative interviews were conducted by the researcher after obtaining permission and informing participants. The interviews involved students, teachers, and parents, with precautions taken to ensure clarity and comfort. Parental permission and voluntary participation forms were required. Appointments were scheduled for each group, and participants were informed about the review of the questions, starting when ready and stopping the audio recording if needed. In total, data were gathered from 24 participants.

Data Analysis

Quantitative data were analyzed using percentages (%), frequencies (*f*), standard deviation (SD), and mean ($\bar{x}$). The data's distribution and normality were assessed through skewness, kurtosis, and normal distribution graphs. Spearman correlation tests were conducted to determine the relationship between mobile app usage for foreign language learning and English grades. This analysis utilized participants' CEMAUFL scale scores and their end-of-year English grades, which were based on four written exams and four performance grades averaged at the end of the year.

Interviews were recorded with participants' consent and transcribed. MAXQDA software facilitated data analysis, including coding, and identifying themes and sub-themes. Quantitative descriptive analysis using frequencies was applied to the data. The themes were reviewed for validity and reliability through independent coding by the researcher and thesis advisor. Inter-coder reliability reached 95%, enhancing research reliability and validity.

Direct quotations from students, teachers, and parents were included to accurately represent participants' perspectives.

Findings and Interpretation

Findings

The findings section presents results from both quantitative and qualitative phases: the first research question aligns with quantitative findings, the second is qualitative, and the third is a mixed-method question.

Quantitative Phase

This section presents the findings derived from the statistical analysis of the data collected via the CEMAUFL scale. The scale aimed to assess the impact of mobile applications designed for foreign language learning on the English lesson performance of 4th-grade students. Initial analyses include demographic characteristics such as internet access, mobile device ownership, daily usage time, the utilization of mobile applications for English learning, and the name of the mobile apps they use to learn English. Table 3 summarizes the internet access and participants' mobile devices.

Table 3. Findings About Internet Access and Participants' Mobile Devices

Location of schools		Internet access		mobile devices		use of mobile apps to learn English	
	f/%	Yes	No	Yes	No	Yes	No
Centre	*f*	58	9	65	2	39	28
	%	86,6	13,4	96,9	3,1	43	24
Close to center	*f*	70	11	68	13	34	47
	%	86,4	13,6	84	16	39	40
Village	*f*	47	13	46	14	17	43
	%	78,3	21,7	76,7	23,3	19	36
Total	*f*	175	33	179	29	90	118
	%	84,1	15,9	86,1	13,9	43	56

It is noteworthy that 33 students do not have an internet connection. Participants were asked whether they had mobile devices such as tablets or cell phones. 86% of the participants (n=179) had a mobile device, which can be considered as an indicator of the increase in children's access to mobile devices. 43% (n=90) of students generally use mobile apps for learning English, while 56% (n=118) do not. Notably, there is a significant difference in rural schools, where only 17 students use such apps. This might be due to limited mobile device usage time among rural learners, primarily allocated to live lessons or entertainment, rather than English learning. Participants were asked about their average duration of mobile device use per day. Four options were given: a maximum of 2 hours, between 2-4 hours, between 4-6 hours, and more than 6 hours. The findings are given in Table 4.

Table 4. Findings on the Average Duration of Mobile Device Usage Per Day by the Participants

Location of schools		maximum 2 hours	between 2-4 hours	between 4-6 hours	more than 6 hours
Centre	*f*	18	22	15	12
	%	21	39	44	38
Close to center	*f*	30	20	15	16
	%	35	35	44	51
Village	*f*	34	15	4	3
	%	44	26	11	9
Total	*f*	86	57	34	31
	%	41	27	16	14

Table 4 reveals that most participants (n=86) use mobile devices for a maximum of 2 hours daily. In contrast, the rate of students using devices for 4-6 hours (n=4) and more than 6 hours (n=3) is lower in village schools compared to central and near-central locations. This difference might be attributed to students in rural areas often sharing their devices with family members, leading to reduced individual usage time. The answers given to the question of which applications were used by those who answered yes to the question of using mobile applications for learning English are given in Figure 1.

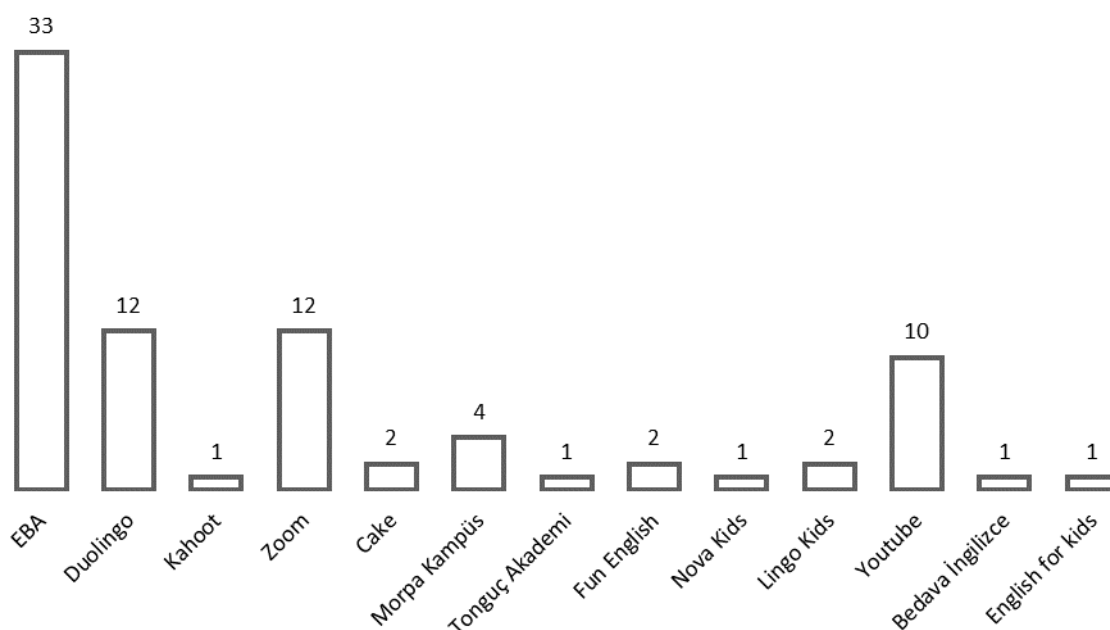**Figure 1**. Mobile Apps Used To Learn English

Figure 1 reveals that 33 participants use the EBA mobile app for English learning, followed by Duolingo (n=12). Interestingly, zoom (n=12) and YouTube (n=10), while not primarily designed for language learning, were also popular among participants. This trend could be attributed to the tech-savvy nature of digital natives, who have integrated platforms like Zoom and YouTube extensively, particularly during the pandemic.

1. How do 4th-grade students use educational mobile applications that support foreign language learning?

Before discussing the significant relationship between 4th-grade students' English lesson grades and mobile application usage, we analyzed the frequencies and percentages of the CEMAUFL scale items. These findings were interpreted separately for each factor to facilitate analysis. Our analysis reveals a strong willingness among participants to use mobile applications. Specifically, 37% (n=76) found mobile apps enjoyable for learning English, and responses to the statement "When learning English, I prefer to learn using mobile applications" were closely distributed, with 35% (n=72) agreeing and 21% (n=43) strongly agreeing. Additionally, 35% (n=72) expressed interest in using mobile apps in English class if allowed by their teacher. The statement "I look forward to the times when I use mobile applications while learning English" also indicated a positive attitude toward app-based learning. Most students agreed or strongly agreed that mobile apps benefited their English writing, vocabulary, grammar, reading, speaking, listening, and pronunciation. Furthermore, 40% (n=82) agreed, and 27% (n=57) strongly agreed that mobile apps enhanced their success in English lessons. Many participants also noted that they found remembering English learned through mobile apps easy. Overall, the data indicates a widespread belief among students that mobile apps benefit language learning. Related to the perceived control factor, results indicated that most students quickly grasp how to use new mobile apps for English and exhibit confidence in their English learning abilities through these apps. However, it is noteworthy that when analyzing responses to the item "I can learn English by myself with mobile applications," there is an equal distribution, with the "undecided" option being the most frequent choice. This may stem from children receiving assistance from their families when using language-learning mobile apps; a topic explored further in the qualitative part of the study.

1.1. Is there a significant relationship between 4th-grade students' English lesson grade point averages and their use of mobile applications that support foreign language learning?

To assess the impact of mobile applications on English lesson achievement, the study examined whether a significant correlation existed between students who reported using mobile applications for English learning and their end-of-year English grades. End-of-year grade point averages in English were considered a reliable measure of students' overall performance and language proficiency. The analysis used Spearman's correlation test due to the ordinal nature of the scale's data and the non-normal distribution of English grade point averages. End-of-year English scores for students in central, near-central, and village schools were similar, suggesting no significant differences in average scores among these groups. Regarding the total scores of students' responses to the CEMAUFL scale, the mean total score for students who use mobile applications supporting foreign language learning scores indicates that the averages are relatively similar across school locations, with no significant differences observed.

The Spearman correlation test was used to determine whether there was a statistically significant relationship between the total scores of the 4th-grade students' responses to the CEMAUFL scale and their year-end grade point averages in English lessons. We found a

statistically significant, positive correlation between the year-end grade point averages of the 4th-grade students in the English lesson and their responses to the CEMAUFL scale (r= .305, p< .05). In other words, the positive correlation indicates that as the use of mobile applications increases, students' English grades also tend to improve.

Cohen (1988) interprets the r (correlation) value and states that r values between .10 and .29 are small correlations, r values between .30 and .49 are medium correlations, and values between .50 and 1.0 are large correlations. The r value between students' use of mobile applications that support foreign language learning, and their English grades is .305. This shows that the relationship is at a medium level.

Qualitative Phase

This section presents the findings and interpretations obtained from the semi-structured interview forms. Based on the quantitative findings obtained in the research, the questions in the semi-structured interview forms were prepared separately for students, parents, and teachers. Inductive content analysis was used for qualitative data analysis, leading to the identification of themes and sub-themes. The frequencies of themes and sub-themes are also provided. The findings are presented under the relevant subheadings to address the research question.

2. What are the views of 4th-grade students, teachers, and parents regarding the effects of using mobile applications that support foreign language learning in English lessons?

The interviews with the 4th-grade students were recorded as audio recordings, which were transcribed. The raw data from 24 face-to-face interviews were then analyzed using the MAXQDA program.

Students were asked only one question: "Does using mobile applications to learn foreign languages affect your success in English class?" The main themes and sub-themes derived from the student interviews are presented in Figure 2.

Figure 2. Students' Opinions
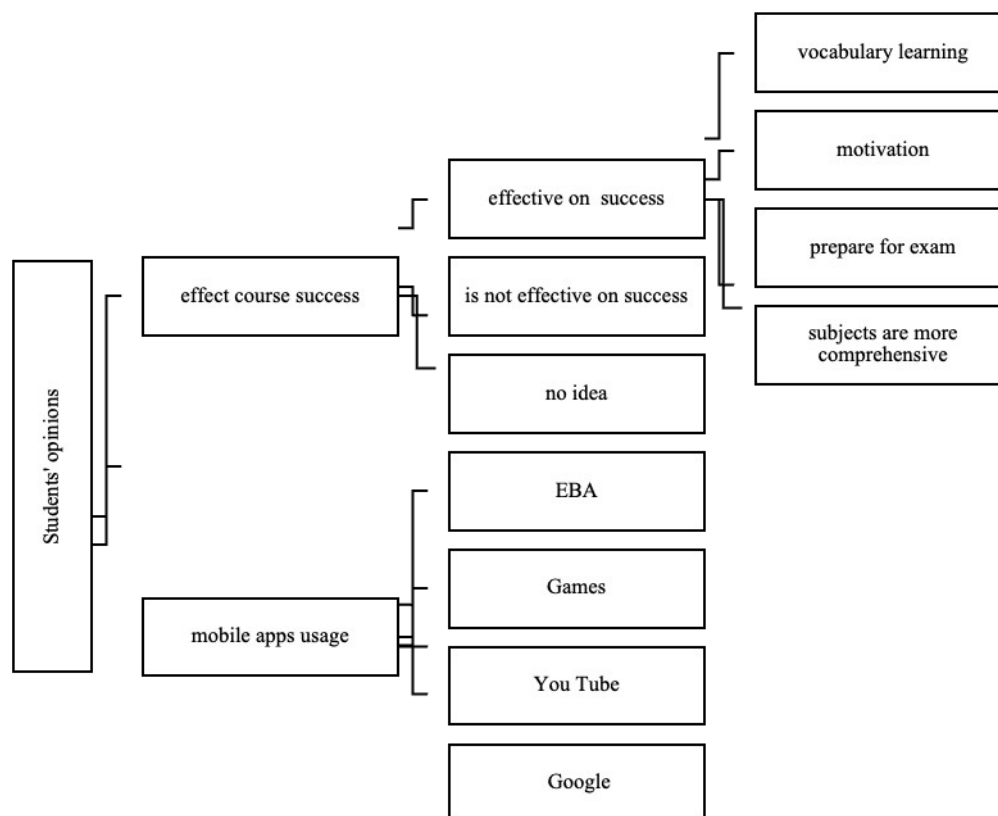
The student interviews revealed two key themes: The use of mobile applications and their effect on English lesson success. Most students (n=7) believed these applications positively affect their English lesson success by providing better explanations, comprehensive content, and exam preparation. Commonly mentioned mobile applications included EBA, Google, games, and YouTube.

The qualitative findings revealed that participants did not use the same MALL applications exclusively. Instead, they utilized a variety of applications, each serving different purposes. Figure 2 includes applications like Google and YouTube, commonly accessed through mobile devices but not exclusively designed for language learning. These platforms, alongside dedicated MALL apps like Duolingo, contribute to a holistic language learning experience by offering diverse resources and interactive opportunities. The mention of Google and YouTube in Figure 2 likely reflects their general use of mobile phones, encompassing educational and non-educational activities.

For instance, one student from a central school stated,

"It can affect you because you already know something in English class. If you saw it in your English class, it happens again in the mobile application."

Another student from a school near the center commented,

"I think it might affect; more information is out there."

Two interview questions were asked of the parents: "Does the use of mobile applications developed to learn foreign languages impact your child's success in English class?" and "How do children learn by themselves in mobile applications developed for foreign language learning?" The main themes and sub-themes derived from the parent interviews are presented in Figure 3.

Figure 3. Parents' Opinions
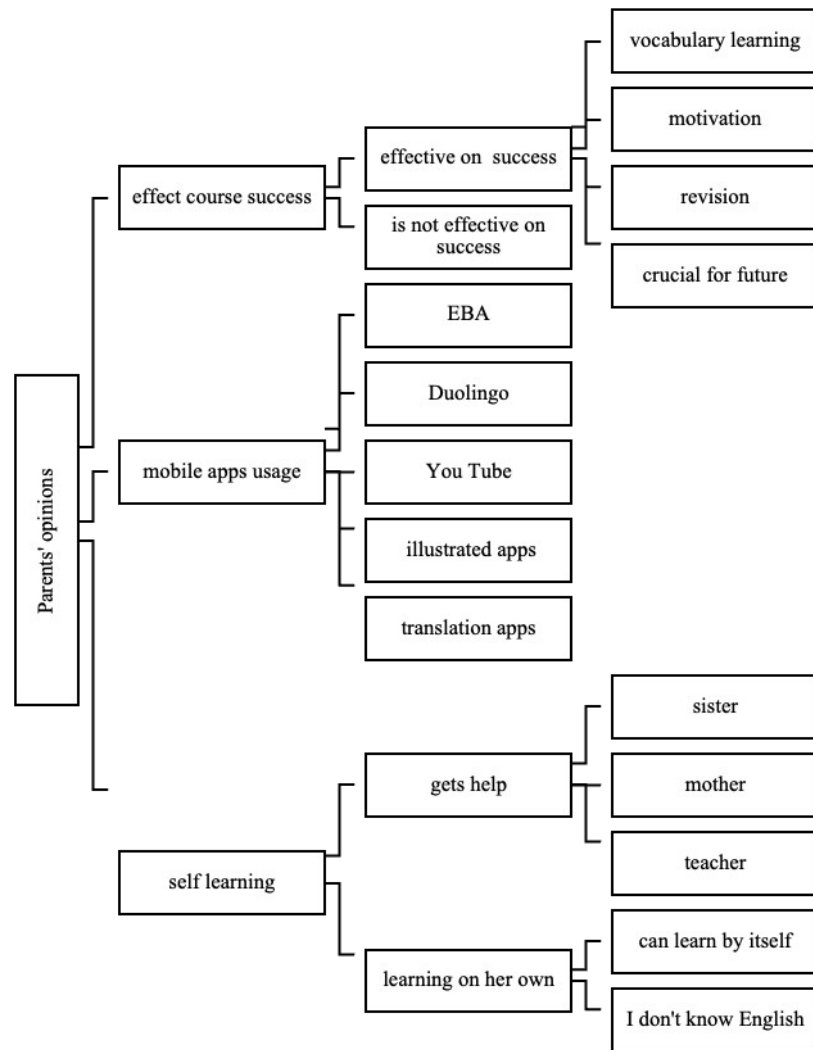
The parent interviews revealed two main themes for the first question: The use of mobile applications and their effects on English lesson success. Many parents (n=8) believed that mobile applications supporting foreign language learning positively impact their children's success in English lessons. They mentioned that these apps motivate students, facilitate vocabulary learning, and reinforce English lesson topics.

For instance, a parent from a central school stated,

"If it is a reliable application, I think it will be very beneficial. In terms of reinforcement, instead of sitting in a notebook and repeating them in terms of repetition, they can have more fun by doing the activities in the mobile application and reinforcing the subject and doing it again. So, it can be pleasant."

Regarding mobile application usage theme, sub-themes included EBA, YouTube, translation apps, Duolingo, and illustrated apps. Translation apps like Google Translate are frequently used for immediate translations and vocabulary enhancement. Illustrated apps, including interactive storybooks and visual dictionaries, help students understand and retain new vocabulary through visual aids.

A parent from a school near the center said,

"You may have a chance to learn the word you do not know by looking up a dictionary or translating a sentence in translation."

The parent interviews revealed two main themes for the second question: getting help and learning on her /his own. Most parents (n=6) believed their children needed assistance using mobile apps to learn foreign languages. They mentioned that students received help from parents, teachers, or older siblings. However, some parents believed children could learn independently through these apps (n=3).

For example, a parent from a central school stated,

"I think they can do it themselves. The children of this time are brilliant; they are ahead of us regarding applications. I think they can do it."

Another parent from the same school who reported their child using a mobile app said,

"Yes, he asks if they do not understand. There was a time or something to get excited, and he asked for my help."

Parents from village schools also mentioned that their children sometimes sought help but were generally self-reliant with mobile apps.

Due to limited teacher availability in the 4th grade, only six teachers were interviewed. Therefore, two interview questions were also asked of the teachers of the 4th-grade students: "Does the use of mobile applications developed to learn foreign languages affect the student's success in the English lesson?" and "How do children learn by themselves in mobile applications developed for foreign language learning?". The main themes and sub-themes derived from the teacher interviews are presented in Figure 4.

Figure 4. Teachers' Opinions
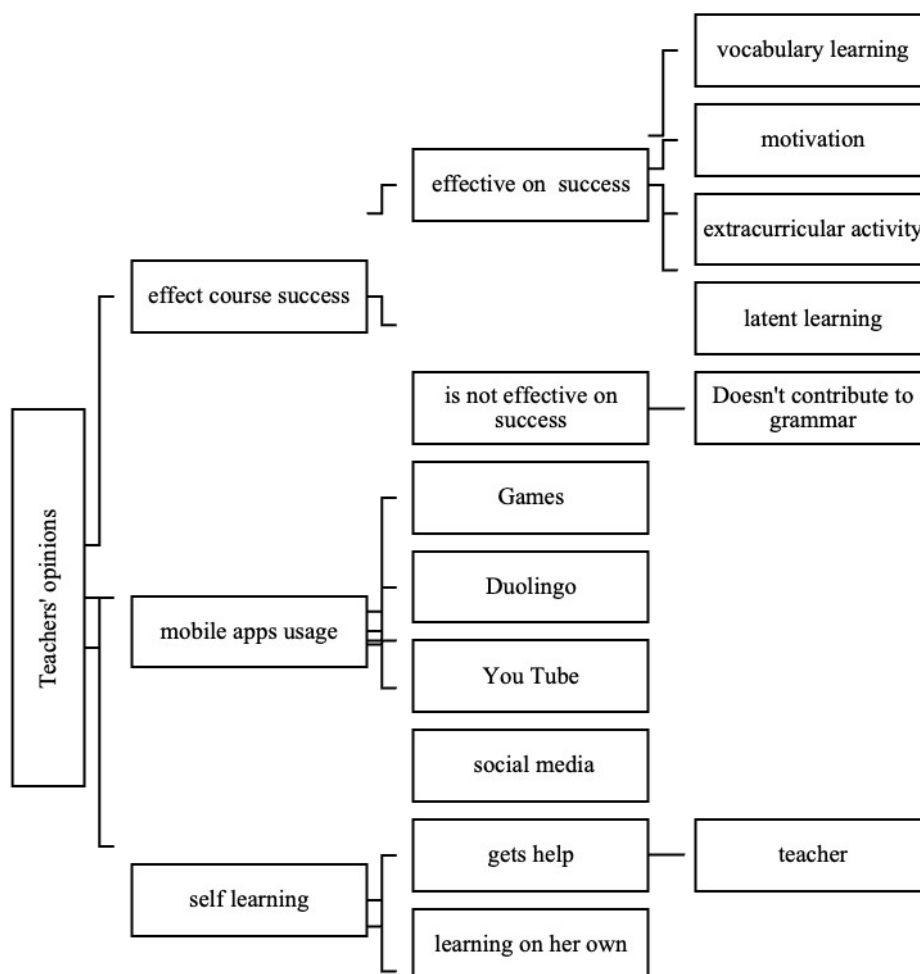
The teachers' interviews revealed two main themes for the first question: The use of mobile applications and their effects on English lesson success. All six teachers agreed that mobile educational applications developed for foreign languages impact students' success in English lessons. However, one teacher expressed doubts about their effectiveness in teaching English grammar. The teachers mentioned several positive effects of mobile apps, including increased motivation, vocabulary improvement, and latent learning. Sub-themes related to mobile app usage included YouTube, Duolingo, social media, and games.

For example, a teacher from a central school stated,

"Yes, it has an effect. Nevertheless, this needs to be followed by the English teacher at school; students may not start with excitement and continue. Observing the development process, evaluating the process, rewarding, and giving feedback should be considered."

Another teacher from a school near the center acknowledged the positive impact of mobile apps on motivation, saying,

"Of course, the more the student is exposed, the more successful the words will be in his memory, so doing this with games through such mobile applications will be effective and increase the student's interest."

Teachers at village schools also recognized the potential benefits of mobile apps, though they did not observe students using them. One teacher mentioned potential issues with advertisements in these apps.

The teacher interviews revealed two main themes for the second question: getting help and learning on her/his own. Regarding students' self-learning abilities with mobile apps,

two teachers believed that 4th-grade students could learn English independently, while four teachers thought students should receive support. The teachers' opinions appeared to differ depending on the school location, with those in the central area expressing more confidence in students' self-learning abilities.

For instance, a teacher from a central school stated,

"I think they can; the next generation of learners is more talented. The type of application is also important; an app should provide feedback. For this, the application must be qualified."

In contrast, a teacher from a school near the center said,

"I do not think they can do it independently; they can learn by seeing their mistakes through trial and error."

A teacher from a village school believed students should get support and said,

"I do not think it will be possible; they should get support."

While teachers in central schools believed students could learn English independently with mobile apps, teachers in village schools and schools near the center suggested that students might need assistance.

Integration of Quantitative and Qualitative Findings

In mixed methods research, there are two research questions: quantitative questions representing the quantitative dimension of the research and qualitative questions representing narrative knowledge. In addition, a single integrated question that can correspond to a mixed methods research question can also be included in the research questions (Clark & Ivancova, 2018). This question generally emphasizes the combination of quantitative and qualitative methods. The third research question of this study is about integrating quantitative and qualitative results.

3. Based on qualitative data analysis, what are the various dimensions of the effects of mobile applications that support English language learning on children's language acquisition?

The study's quantitative and qualitative results are in harmony, reinforcing the conclusion that mobile applications supporting foreign language learning positively impact 4th-grade students' English lesson achievement. Quantitative findings reveal a statistically significant positive correlation between students' use of mobile language learning applications and their year-end English grades. This suggests that their English grades tend to improve as students engage more with mobile language learning apps. Qualitative findings complement the quantitative results by shedding light on how and why mobile applications contribute to improved English lesson achievement. Key qualitative themes include vocabulary learning, which is crucial for language acquisition, and the role of mobile apps in facilitating vocabulary acquisition. Additionally, qualitative insights highlight how mobile apps support the repetition of English lesson topics, aid in exam preparation, provide comprehensive content, and offer opportunities for interaction outside the classroom.

Together, these findings paint a comprehensive picture of the positive impact of mobile applications on English language learning among 4th-grade students. They underscore the value of mobile apps as practical tools for enhancing language skills, particularly in areas like vocabulary acquisition and exam readiness. The qualitative results provide valuable context and depth to the quantitative findings, offering a more holistic understanding of the

relationship between mobile app usage and English lesson success. Both quantitative and qualitative data converge to support the idea that integrating mobile language learning apps into the educational process can lead to positive learning outcomes, reinforcing the importance of technology-enhanced language education in primary school settings.

Discussion

In conclusion, a significant and positive correlation was found between the English year-end grade averages of 4th-grade students and their responses to the CEMAUFL scale. As the use of mobile applications supporting foreign language learning increases, so do English grades. This finding aligns with the research conducted by Amalia (2020), Athoillah (2022), Cerezo et al. (2019), Hao et al. (2018), and Wu et al. (2021). However, in these studies, the researchers selected the mobile applications. This study differs from others as it encompasses all mobile applications supporting foreign language learning and has students respond to the CEMAUFL scale based on the mobile applications they personally use. This approach helps to eliminate factors such as students' negative perceptions of the applications or finding them difficult to use, leading to more reliable results.

Previous studies (Amalia, 2020; Athoillah, 2022; Cerezo et al., 2019; Hao et al., 2018; Wu et al., 2021) have focused on single language skills. Recently, there has been a shift in foreign language education towards integrating language (Smit & Dafouz, 2012). This integrative approach helps EFL learners develop communicative competence and supports their ability to communicate in English inside and outside the classroom (Davies & Pearse, 2000). Therefore, this study holistically addresses language skills, covering reading, writing, listening, speaking, grammar, vocabulary, and pronunciation. This comprehensive approach distinguishes this study from previous research.

During the quantitative part of the study, it became apparent that most students were willing to utilize mobile applications to learn the English language. Furthermore, the students perceived these applications positively impacting their overall success in their English lessons. This finding suggests that students perceive mobile applications as valuable instruments for acquiring foreign language skills, consistent with their favorable opinions towards these technological resources.

When analyzing the responses to the item " I can learn English by myself using mobile applications" in the CEMAUFL scale, it was observed that most participants chose the "undecided" option. This may be attributed to children receiving assistance from their families when using mobile applications that support foreign language learning. The qualitative phase of the study included interviews with parents and teachers to gain a more comprehensive understanding of the use of mobile applications and the role of families in the language learning process. The question " How do children learn by themselves in mobile applications developed for foreign language learning?" was asked to parents and teachers, as it had already been asked to students in the quantitative section. Differences were observed in the responses of teachers. During the interviews, preparatory questions were asked, and it was found that teachers did not directly observe students using mobile applications, likely due to restrictions on mobile device usage at school. This difference in teachers' opinions may be attributed to their lack of direct observation of students using mobile devices. The same

question was asked to the parents of 4th-grade students, and they stated that their children received assistance while learning English with mobile applications. In the preparatory questions, parents mentioned that their children used mobile applications developed for foreign languages. It can be concluded that 4th-grade students are not fully independent in the learning process due to their young age. This finding aligns with the study conducted by Gömleksiz and Bozpolat (2012), which investigated the views of foreign language learners on autonomy. The study concluded that students felt dependent on explanations and supervision, indicating a lack of autonomy. This finding is consistent with the notion that 4th-grade students may not be fully autonomous in learning.

The limited experience and knowledge in language acquisition among children may hinder their ability to exercise autonomy, mainly as they are in the process of developing their linguistic aptitude and may not yet possess complete confidence in their linguistic capabilities. Furthermore, the prevalent utilization of conventional instructional techniques in the educational system, which often emphasizes a teacher-centered approach, may contribute to students assuming a passive role as mere consumers of information. This traditional strategy may not effectively foster autonomy or facilitate the cultivation of independent decision-making skills among students. These factors collectively contribute to the reasons why students may struggle to exhibit autonomy in their learning processes.

Despite these considerations, the research demonstrated a positive correlation between mobile application use and English academic performance. This suggests that students benefit from actively engaging with these applications, as evidenced by their improved grades. Additionally, qualitative data supported the positive impact of mobile applications on language skill acquisition. Insights from students, parents, and teachers highlighted improvements in understanding English concepts, vocabulary development, and increased motivation.

Conclusion

The study examined the impact of mobile applications on the English language learning process of fourth-grade students in Turkey. The results revealed a generally positive attitude among students towards the effectiveness of mobile apps in enhancing their English language skills. These findings align with existing literature highlighting the beneficial role of technology in language acquisition (Loewen et al., 2019). The study employed quantitative and qualitative methodologies to demonstrate the effectiveness of these applications in improving language skills.

The quantitative analysis revealed a significant and positive relationship between the frequency of mobile application use and students' English grades at the end of the academic year. The results of the Spearman correlation test indicated that an increase in the use of mobile applications was associated with higher English grades among students. This suggests that MALL has a moderately positive influence on student academic performance.

Qualitative data obtained through interviews with students, teachers, and parents indicated unanimous agreement on the advantages of mobile applications in language learning. Students expressed that these applications offer more precise explanations, comprehensive content, and aid exam preparation. Parents observed that mobile applications boost their children's motivation and assist in vocabulary acquisition. Teachers also

highlighted the positive impact of these applications on students' vocabulary development and overall English proficiency.

The overall conclusions drawn from this study underscore the value of mobile applications as practical tools for learning foreign languages and enhancing English language proficiency among fourth-grade students. The findings suggest that MALL can play a constructive role in students' achievements in English classes, and incorporating such technologies in the educational framework can be advantageous. Educators and policymakers are encouraged to advocate for using mobile applications in language learning to assist students in enhancing their language skills.

Foreign language education is generally limited to in-class activities. Learners experience difficulties integrating the target language into their daily lives, which reduces language learning effectiveness. This study's findings are significant in offering a solution to the problem of being unable to carry language learning outside the classroom. Mobile applications provide a practical means of extending language practice beyond traditional school hours, potentially enhancing the effectiveness of language education (Kukulska-Hulme, 2009).

It is important to note that the research is based on data collected through the CEMAUFL scale and semi-structured interviews conducted with 217 4th-grade students, six teachers, and nine parents. However, it is essential to acknowledge the study's limitations, particularly regarding the children's use of the mobile application developed for foreign language learning, which is confined to personal statements. Additionally, assuming that 4th-grade students completed the scale with their parents may also present a limitation that warrants consideration in future research endeavors. These limitations should be considered when interpreting the findings and considering avenues for further investigation.

Recommendations

Here are some key recommendations and implications based on the study's findings:

1. Integration of MALL in Curriculum:

Schools should consider integrating MALL applications into their English language curricula. Incorporating these tools in classroom activities and homework assignments can reinforce learning and enhance language skills.

2. Parental Involvement:

Parents should be informed about the benefits and appropriate use of MALL applications. Workshops or informational sessions can help parents understand how to use these digital tools to support their children's language learning at home.

3. Training for Educators:

Teachers should receive training on effectively integrating MALL applications into their teaching practices. This includes understanding the features of various applications and how to align them with curriculum goals. Supporting teachers in fostering learners' autonomous thinking skills is crucial for successful implementation.

4. Monitoring and Evaluation:

Regular monitoring and evaluation of the effectiveness of MALL applications should be conducted. This can help understand the impact on student's learning outcomes and make necessary adjustments to improve their effectiveness.

5. Research on Younger Learners:

More research should focus on younger learners to better understand how MALL applications can be tailored to meet their needs and enhance their learning experiences.

6. Exploring Learner Autonomy:

Future research can explore learner autonomy in online learning environments at various educational levels, including high school, middle school, and primary school. Understanding how learner autonomy develops at different stages of education can inform more tailored approaches.

7. Enhancing Mobile Applications:

Mobile application developers should identify areas where students lack autonomy and incorporate supportive features such as interactive exercises, self-assessment tools, and opportunities for independent decision-making to enhance student engagement and autonomy. Developers should focus on understanding students' needs and preferences to create user-friendly and effective mobile applications.

8. Visual Elements in Apps:

Participants in this study highlighted the visual-oriented nature of mobile applications. Developers should consider the importance of visual elements in designing language learning apps, as they can significantly impact English language achievement.

9. Effective Vocabulary Teaching:

Emphasizing vocabulary learning in the qualitative findings, researchers should focus on effective teaching methods in mobile applications for children. Mobile apps can be designed to provide frequent opportunities for vocabulary practice and reinforcement.

10. Broader Educational Impact:

Future research can explore the effects of educational mobile applications on variables beyond language achievement, such as creativity, critical thinking, and problem-solving skills. This can provide a broader perspective on the benefits of mobile apps in education.

11. Interactive Exercises and Self-Assessment Tools:

Researchers can explore the contributions of interactive exercises, self-assessment tools, and language production interactions to language learning skills.

12. Comparative Analyses:

Comparative analyses of different language learning materials (e.g., books, digital platforms, educational games) can help identify the most effective resources for language learning. This can guide educators and developers in selecting the best tools.

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