Journal of Teacher Education and Lifelong Learning (TELL)

Volume: 6 Issue: 2 Year: 2024 | Research Article | ISSN: 2687-5713

The Effect of the Mobile Application on Students' Achievement, Readiness and Technology Acceptance [1]

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Article Info

Article History
Received: 30/05/2024
Accepted: 26/11/2024
Published: 31/12/2024

Keywords:
mobile-assisted language learning, mobile technology acceptance model, mobile learning readiness.

ABSTRACT

The purpose of this study is to develop a mobile learning application for teaching vocabulary learning in order to support English as a foreign language education and to test its effectiveness. In this study, carried out in two phases, the multi-phase mixed method, which allows using qualitative and quantitative methods, was used. In the first phase (Phase 1), a Mobile-Assisted Language Learning (MALL) application was developed. At this phase, the study group consists of 14 students who have previously taken English courses in web-supported learning environments at a university. In accordance with the ADDIE model, a needs analysis was carried out first, the application was developed in the light of the results and in line with the opinions of the field experts, and the application was finalized with pilot studies. In the second phase of the study (Phase 2), the effectiveness of the mobile learning application was tested. For this purpose, the effects of MALL application on students' academic achievement, technology acceptance and technological readiness were examined. For this study, an experimental study lasting four weeks was conducted using a quasi-experimental design. In the experimental study, whose study group consisted of 61 students taking English courses at the same university; as pre-test and post-test, achievement tests and scales were administered to the experimental and control groups. According to the data obtained from the study, it was found that the mobile assisted language learning environment is more effective than the web supported learning environment in terms of students' academic achievement; however, no significant difference was observed on students' acceptance levels and readiness. As a result of the research, it is recommended that MALL applications should be used to support language learning. Additionally, it is thought that this study can be a guide for researchers who want to conduct studies for developing mobile-assisted language learning applications.

Citation: Aygül, F., & Çakır, R. (2024). The Effect of the mobile application on students' achievement, readiness and technology acceptance. *Journal of Teacher Education and Lifelong Learning*, *6*(2), 366-384. http://doi.org/10.51535/tell.1474393

[1] This article has been produced from the master thesis that has been conducted by Faruk Aygül in company with Recep Çakır's academic advisor.

INTRODUCTION

Technological developments have found its way in information and communication technologies as in almost every field of study. In this progress in information-communication technologies; in addition to the processing of information, accessing information from anywhere and anytime has taken an important place. This state of being mobile (Crompton, 2014), which was achieved with the production of the first mobile phone in the 1970s, accelerated with the production of smartphones in the 2000s. It has been moved even to a higher level with the mobile devices', which have already increased access opportunities, support of internet technologies. Today, users can stay mobile thanks to hardware such as tablets, smartphones and personal digital assistants.

According to the Digital in 2024 (We are Social, 2024) report published by We Are Social, a digital media agency, as of January 2024, 69.4% of the world's population (5.61 billion) uses mobile devices. According to the report, while the total population increased by 0.9% (74 million), the number of mobile device users increased more and reached 2.5% (138 million). Looking at the statistics, it is seen that the ownership rate of mobile technologies is high and mobile technologies are used frequently. This gives an idea of how effective it can be to integrate mobile technologies into education. Advances in mobile technology affect educational practices and provide new concepts in this field (Attewell, 2005). One of these is "mobile learning", which has been studied since the 2000s (Hameed, Qayyum & Khan, 2024).

Mobile Learning and Mobile Assisted Language Learning

Although the definition of the concept has been made many times in the relevant literature, there is still no agreed-upon definition of mobile learning (Kukulska-Hulme, 2009). One of the main reasons for this situation is the rapid advancements in mobile technologies. Another, perhaps most important one, is the ambiguity of the concept of "mobile". Some of the researchers argue that the "mobile" is technology, some of them are the learners, and some of them are the learning content (Kukulska-Hulme, 2009). According to Wagner (2008), the concept of mobile learning is the learner's realization of learning in line with their individual needs, by accessing information whenever and wherever they want.

Mobile learning not only provides the opportunity to learn anytime, anywhere, but also brings some other advantages. Some of these advantages are:

- It provides a learning environment in accordance with the pace of each learner
- As the mobile learning environment supports working in groups, it can realize collaborative learning.
- It also supports informal learning as learning activities continue outside the classroom environment.
- The learner can interact with the teacher and other learners.
- Learning becomes interesting (Naismith & Corlett, 2006; Cheon, Lee, Crooks & Song, 2012; Corbeil & Valdes-Corbeil, 2007)

Besides the advantages of mobile learning environments, there are also some limitations. Small screen sizes, low resolutions, internet bandwidth problems and high cost of qualified mobile devices are some of these problems (El-Hussein and Cronje, 2010; Hockly, 2012). In addition to those technical limitations, there are some psychological limitations as well. According to Park (2011), the use of social media and messaging applications on mobile devices and the use of these mobile devices for surfing the Internet hamper learning activities. Mobile learning tools, which have gained an indispensable place in education with many important opportunities compared to their limitations, are also preferred in language teaching, whose importance is increasing day by day.

The reflections of the developments and changes in mobile technologies in the field of education are also seen on the applications related to language learning and teaching. One of the most common uses of mobile technologies in educational environments has been in foreign language education (Wrigglesworth, 2020). Integration of mobile devices in language learning processes is explained by the concept of mobile-assisted language learning (Liu, Tao, & Cain, 2016; Wang & Hafferman, 2009). Kukulska-Hulme (2013) also defines this concept as taking advantage of the portability of mobile devices in language learning processes.

When the relevant literature is examined, it is seen that there are studies that explain the concept of mobile-assisted language learning by associating it with the concept of computer-assisted language learning (Zhang & Zou, 2020). According to Caudill (2007), mobile-assisted language learning is the successor and sub-dimension of computer-assisted language learning. Kukulska-Hulme and Shield (2008) underline that these two concepts are different from each other by stating that MALL emphasizes individuality and is more learner-centered compared to computer-assisted language learning, thus it is a more learner-related concept. Parkavi, Abdullah, Sujitha, and Karthikeyan (2018) defined MALL as a subset of both computer-assisted language learning and mobile learning. According to Stockwell and Hubbard (2013), the concept of mobile-assisted language learning should be examined together with mobile learning and second language acquisition theories.

When we look at the studies on MALL, it is seen that these studies deal with the issue from different perspectives (Cheng & Chen, 2019). Some studies have compared MALL with traditional methods or other learning environments. For example, Hayati, Jalilifar, and Mashhadi (2013) compared the effectiveness of three different teaching environments for teaching English idioms. According to the results of the pre-test and post-test administered in this research, conducted as an experimental study, it was understood that students who learned in the MALL environment learned better than the other students. It was concluded that thanks to the driving force of mobile technologies, students' regular exposure to foreign language elements enabled them succeed better.

Similarly, Wu (2014) designed a mobile application for teaching English vocabulary and investigated the effectiveness of this application. In order to test the application, he worked with a study group of 50 students, all of whom were Chinese students, who wanted to learn English. The researcher, who divided the study group into two as experimental and control groups, ensured that the control group continued their in-class learning with traditional methods and did not intervene. He enabled the experimental group students to use the MALL application he designed. According to results of the tests, administered before and after the experimental process, it was seen that the students in the experimental group who used the MALL environment outperformed the students in the control group in vocabulary learning.

Another study, examining different variables, was conducted by Kurt and Bensen (2017). The researchers formed a study group of 32 first-year undergraduate students and divided this group into two equal and homogeneous groups. While the first group, the experimental group, used a mobile environment for learning vocabulary, the control group didn't benefit from such an environment. According to the data obtained from the research, it was found that the students in the experimental group improved their vocabulary more than the students in the control group. In the same study, qualitative data was also collected and the analysis of the qualitative data showed that the students found the mobile learning application motivating and entertaining, and that stated that the mobile application provided them with a collaborative learning environment.

Foreign Language Teaching Methods and Approaches

a) Lexical Approach: This approach, put forward by Lewis, emerged against the distinction between grammar and vocabulary and argues that these two concepts are in continuity (Ördem, 2013). Acording to this approach, vocabulary teaching is important in foreign language education (Çetinkaya, 2005).

Words have an important function in understanding what is said and written, and in conveying feelings and thoughts to someone else (Çetinkaya, 2005). It is not possible to understand what is written, read or said without knowing the meaning of words. According to Nation (2001), who states that words are as important as grammar and language structures, vocabulary is a complementary part for foreign language learners' general proficiency and a prerequisite for an effective communication.

Vocabulary learning is an individualized process and individuals have different perceptions of words that connect their previous experiences and knowledge (Pearson, Hiebert, & Kamil, 2007). Therefore, in order to learn a word successfully, learners' individual needs and their vocabulary knowledge must be taken into account (Pressley, Disney, & Anderson, 2007). Vocabulary knowledge continues to develop based on each individual's experience, learning history and some other external factors. Therefore, the vocabulary of each individual differs. An individual's vocabulary knowledge affects his/her comprehension and expression skills in the target language (Özbay & Melanlıoğlu, 2008). The individual, who has a rich accumulation of words and concepts, has fluency and richness of thought in the thinking process. According to the studies, the vocabulary that directly affects the comprehension and expression skills of foreign language learners is open to development with different teaching methods and techniques (Hasbún 2005; Eden 2005; Acar & Yaman, 2011; Sarıgül, 2017). The Mobile Assisted Language Learning environment is one of these innovations.

b) Context-Based Vocabulary Teaching: In the teaching of the word, a meaningful learning will not take place by teaching only the knowledge of pronunciation and lexical meaning, and this does not ensure that the words can be used appropriately (Duran & Bitir, 2017). Glynn and Kobala (2006), who defined context-based learning as transferring the information to be taught by associating it with daily life, stated that this will facilitate the learners' comprehension and increase the chance of their recalling the information. Gür (2014), mentioning that for using context-based learning, associations have to be established by determining the word lists and contexts beforehand, stated that it is aimed to perceive, understand, use and remember words in contexts. According to Finkelstein (2001), one of the important advocates of this concept, context-based vocabulary learning is realized by inferring the meaning of a word from the context it is in, and this method is one of the most effective vocabulary learning methods. This method, which has attracted attention by many researchers, is used by adapting it to education systems (Acar & Yaman, 2011). In the current study, this approach was taken into consideration while developing the application.

Readiness for Mobile Learning

Readiness is a concept that is frequently researched and paid attention to in learning environments such as distance education, mobile learning and online learning (Demir-Kaymak & Horzum, 2013; Hukle, 2009; Leigh & Watkins, 2005; Watkins, Leigh & Triner, 2004). This concept refers to the learner's physical and mental readiness for a mobile learning organization. Although the learner has hardware and software opportunities in this learning environment where mobile technologies are used; psychological and technological skills should also be ready. Readiness is one of the most important variables that affect the effectiveness of mobile learning and its acceptance by individuals (Lin, Lin, Yeh, & Wang, 2016). According to Kalelioğlu and Baturay (2017), if individuals are not satisfied with the technologies they use and they do not feel ready to use them, they will avoid using these technologies. Abas, Chng, and Mansor (2009) suggested that readiness in mobile learning processes should be supported in research studies. This situation reveals the importance of measuring readiness in mobile learning environments.

In this respect, Suwantarathip and Orawiwatnakul (2015) conducted an experimental study that lasted seven weeks to examine the effect of MALL on learning English vocabulary and students' attitudes towards MALL. Based on the results of the research, the researchers, stating that the contents used in MALL should be carefully designed, highlighted that the students' readiness for MALL would affect their success.

Mobile Technology Acceptance

The acceptance of technology by users started to be researched frequently in the literature in the 1970s and continued to be researched in various fields in the following years (Legris, Ingham & Collerette, 2003). During these studies, theories such as planned behavior theory, diffusion of innovation theory and causal behavior theory emerged in order to explain the user's attitude and intention towards using technology (Menzi, Nezih, & Çalışkan, 2012). The Technology Acceptance Model, which investigates the acceptance of information technologies by users and makes important contributions in this direction, was developed by Davis in 1989 based on the theory of reasoned behavior (Davis, Bagozzi, & Warshaw, 1989; Omar, 2009). Studies in the field of education gained momentum in the 2000s regarding this concept, which points to the adoption and use of technology by individuals (Teo, 2010). In these studies, it has been observed that the technology acceptance model is effective on the habits, behaviors and intentions of users to use technology (Tarcan, Varol, Kantarcı, & Fırlar, 2012; Ma, Andersson and Streith, 2005; Menzi, Nezih and Caliskan, 2012). In their quasi-experimental study, Tsai, Wang, and Lu (2011) underlined the positive effects of designing the learning environment according to this model.

The evolution of the current model in order to explain mobile technologies in the educational environment has revealed the mobile technologies acceptance model. Paturisi, Chisaki, Usagawa, and Lumenta (2015) studied the acceptance of mobile learning technologies by students at the higher education level in a study they conducted. Researchers conducting an experimental study conluded that the lack of Students' Acceptance of Mobile Learning Tools would affect the success of mobile learning. A similar study was conducted by Zakaria, Hanapi, Zakaria, and Ahmad in Malaysia in 2016. In that study, which was conducted with 36 students aged between 19 and 22, the researchers aimed to question the effect of a MALL environment on students' English vocabulary acquisition and acceptance of mobile technologies. At the end of the study, the researchers drew attention to the linear relationship between students' mobile technology acceptance and academic achievement and suggested investigating this variable. Similarly, Chen, Seilhamer, Sugar, and Mao (2013) stated that there is a need for further studies on the acceptance of mobile technologies by learners, while Özer and Kılıç (2017) stated that there is a need for research on the acceptance of mobile technologies in foreign language teaching.

Although there are various studies on designing and developing a MALL environment, there is a need for further studies to find out the variables that affect the learning environment and to examine how these variables affect learning and the learning environment. At this point, this research aimed to develop an effective MALL environment and to test the effectiveness of this environment. In this respect, the research questions were as it follows:

1) What are the expectations of the learners from a MALL application?

2) Taking the experimental group using MALL application and control group using web-based distance education environment into consideration;

a) Is there a significant difference between the academic achievement test post-test scores?

b) Is there a significant difference between the readiness scale post-test scores for mobile learning?

c) Is there a significant difference between the mobile learning tools acceptance scale post-test scores?

METHOD

In this study, the multi-stage mixed method design, which is one of the 6 different mixed method research designs defined by Creswell and Clark (2011), was used. According to Creswell and Clark (2011), the multi-stage mixed method design is used in research that spans a certain period of time and includes the stages of design, development and evaluation. In this context, first of all (phase 1), a needs

analysis was carried out using qualitative research methods and a MALL application was designed and developed based on the findings obtained from the qualitative data. In this part of the research, the ADDIE research model, which was framed by the steps of analysis, design, development, implementation and evaluation, was used. Afterwards, experimental research was conducted to examine the outputs of the (phase 1) design process. In this part, the independent variable of the study is MALL, and the dependent variables are readiness for mobile-assisted language learning, acceptance of mobile technology, and academic success.

Study Group

In the design process of the mobile application, the study group, determined using the purposive sampling method, consisted of 14 students enrolled in six different programs at Amasya University. In the determination of these students, their academic success in Foreign Language courses and their mobile application usage habits were taken into consideration. Equal in number of students below and above the academic achievement average participated to the study. Additionally, students who use mobile applications frequently and those who use them less were brought together in order to create a heterogeneous group.

The study group of the experimental research carried out for testing the effectiveness of the mobile application, developed by the researchers, consisted of a total of 61 students taking Foreign Language Education courses at Amasya University. These students participated into the study voluntarily and were visited upon the recommendation of the field expert working in the distance education center. The gender distribution of the research group in the experimental and control groups was given in Table 1.

Table 1. ***Distribution of the Study Group by Gender***

Groups	Female	Male	Total
Experimental	27 (84%)	5 (16%)	32 (52%)
Control	24 (83%)	5 (17%)	29 (48%)

Data Collection Instruments

A semi-structured interview form was used in order to conduct a needs analysis during the development phase of the MALL application. In the experimental process of the research, academic achievement test, acceptance scale of mobile learning tools and readiness scale for mobile learning were administered.

Interview Form: This form, which was prepared in accordance with the semi-structured interview technique that provides in-depth information on a subject, is advantageous in asking further questions for some unclear answers and thus making the situation more explanatory (Çepni, 2007). A semi-structured interview form consisting of seven questions under two main headings was prepared in order to get the opinions of the learners about the MALL application by taking the opinions of the field experts. Examples of interview questions: What information would you like to learn from a mobile application developed for teaching vocabulary in the context of learning English as a foreign language? Why? How would you like to learn the content? Why? What motivates you in such an application? such questions were asked.

Academic Achievement Test: In order to measure the effect of MALL application on students' academic achievement, it was prepared as 33 items in line with the opinions of field experts and its validity and reliability were tested. For the reliability studies of the test, a pilot study was conducted with 358 students who were studying at Amasya University, were in the same units as the experimental and control groups of the study, and had taken Foreign Language courses before. In the pilot study, when the reliability analysis was performed after the items with low validity and reliability were removed, the KR-20 reliability coefficient was found to be 0.94 and the average difficulty index was 0.48. The finalized test was 100 full points and applied to the experimental and control groups as a pre-test and post-test.

Mobile Learning Tools Acceptance Scale (MLTAS): This scale consists of items targeting to determine the students' acceptance level of mobile learning tools. This scale, developed by Özer and Kılıç (2017), consists of 19 items in 4 factors. Cronbach's Alpha reliability coefficient for the whole scale was calculated as .83 and it was found to be reliable.

Mobile Learning Readiness Scale (MLRS): This scale, developed by Lin, Lin, Yeh, and Wang (2016), was adapted into Turkish by Gökçearslan, Solmaz, and Kukul (2017) who also conducted validity and reliability studies of the scale. The Cronbach's Alpha coefficient of this tool was calculated as .95 and was found to be highly reliable. The scale consisted of three factors and 17 items in total.

Designing and Developing MALL Application (PHASE I)

The data obtained as a result of the needs analysis research administered with the learners formed the basis for the development of the application. The data obtained from the needs analysis can be summarized as follows:

As a result of the needs analysis, it was found that the students wanted to learn words that could help them improve their speaking skills rather than English grammar. In this regard, they need the knowledge of the pronunciation and usage of the words, categorized according to themes and mainly encountered in daily life. They want this knowledge to be presented in a collaborative learning environment that allows interaction with other learners who will use the app. Another point underlined by the participants is the necessity of an environment that allows each individual to construct their own unique knowledge, that is, is adaptable to individual differences thanks to its using both visual and auditory elements. They also stated that it is important for this application to predict each learner's background knowledge and level of language proficiency and to present a content appropriate to each student's level of language proficiency. Students additionally mentioned that there should be some education games in the application. They stated that the competitive atmosphere in games was the most important factor that would increase their motivation towards language learning. In addition, they expect the application to send notifications at regular intervals, which would help them to reinforce their learning. However, the participants underlined that the high frequency of notifications would increase the cognitive load and negatively affect the use of the application. The learners expressed their needs for instant technical support within the application in order to cope with the technical problems they may encounter in the mobile learning environment.

The word pool, to be taught in the mobile application, was created after the interview, conducted with two field experts on Foreign Language Education. The words in the pool were categorized by themes. Appropriate sample sentence patterns were created for the words to be taught by paying attention to in-context learning. Questions were prepared in order to provide feedback to learners using the application and for the various in-app competitions. As a result of the preliminary study, 104 words were selected from 386 words in seven categories. After finding out the expectations and suggestions, the development process of the mobile application, which will be developed in accordance with these expectations and suggestions, has been started. Defining more broadly, an application was designed via which students can learn English words, assess their improvements, receive daily notifications for revising the newly-acquired vocabularies, interact with the other language learners in a competitive atmosphere.

First of all, it is aimed to develop a hybrid application so that the mobile application to be developed will work on all mobile devices. Thus, it was ensured that the application could be used on any mobile platform without being dependent on the operating systems of the mobile devices used by the students. In order for students to download and use the mobile application on their phones, the application was placed in the application markets with the name "Word Land".

As seen in Figure 1, the main menu of the "World Land" application, is as it follows: "I'm Learning Words", "Assessing Myself", "Word Challenge", "My Daily Tasks", "Tournament", "Clipboard", "Settings and Help" and "Learner of the Week".

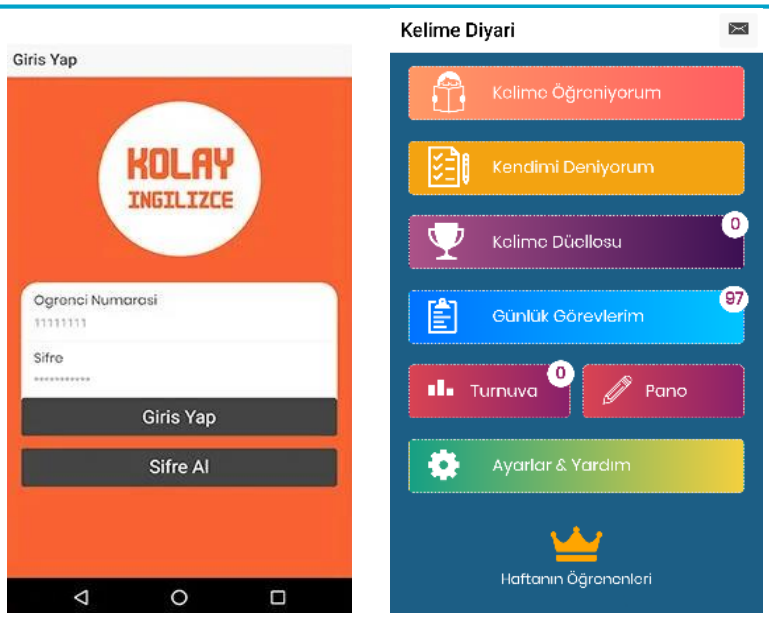

Figure 1. *An overview of "Kelime Diyarı" app menus*

"I'm Learning Words" menu: It is a menu that allows students to access and learn categorized words. When the students choose the category, they want to learn, the words grouped in that category are presented to the students in a random order. Each word, with its dictionary meaning, pronunciation and sample sentence informing about the usage, is placed in an ergonomically designed menu. In order to support contextualized learning, the sample sentences informing about the usage of the target word is placed just below the dictionary meaning. The following figure shows the general view of this menu.

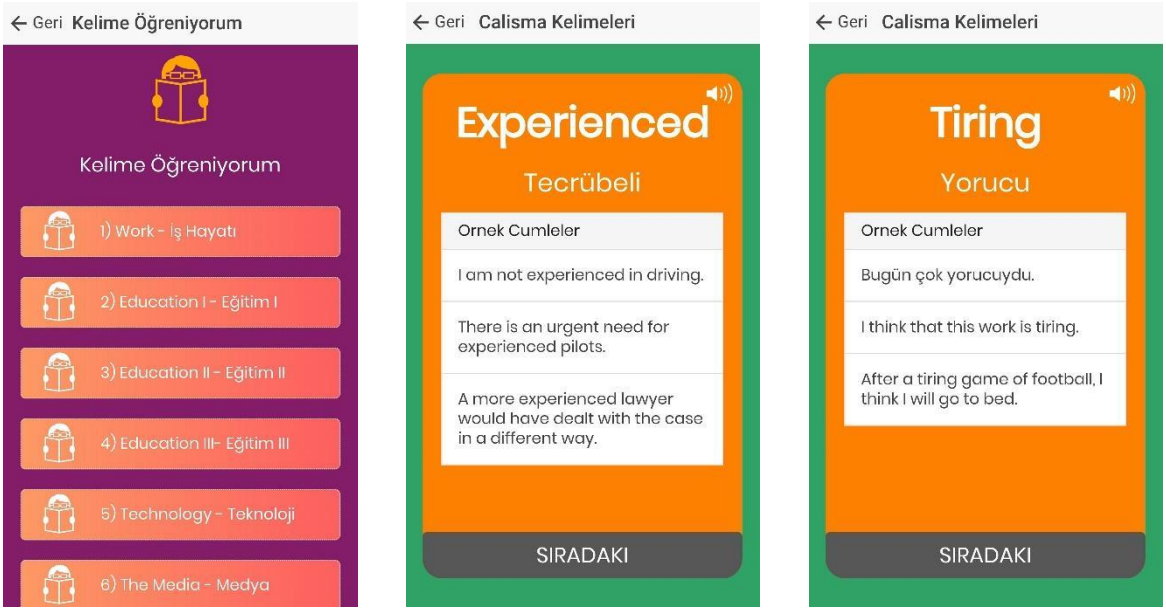

Figure 2. *"Kelime Diyarı" application, "I'm Learning Words" menu*

"Assessing Myself" menu: It is designed as a menu where students can test their knowledge or what they have learned. Exams that are open to access are highlighted with a check mark, and those that are not yet open to access are highlighted with a lock icon. At the end of the exam, a screen is displayed informing the student about how many correct and how many wrong answers they have. The questions asked in the exams are planned in the form of audio questions and multiple-choice questions. In multiple-choice questions, a selection animation is executed for the option chosen by the student and a check mark is placed next to the selected answer, making the answer option clearer. Voice questions, on the other

hand, have a play button and a text box where students can specify their answers. Students can listen to the audio question by pressing the play button as many times as they want. This menu is shown in Figure 3.

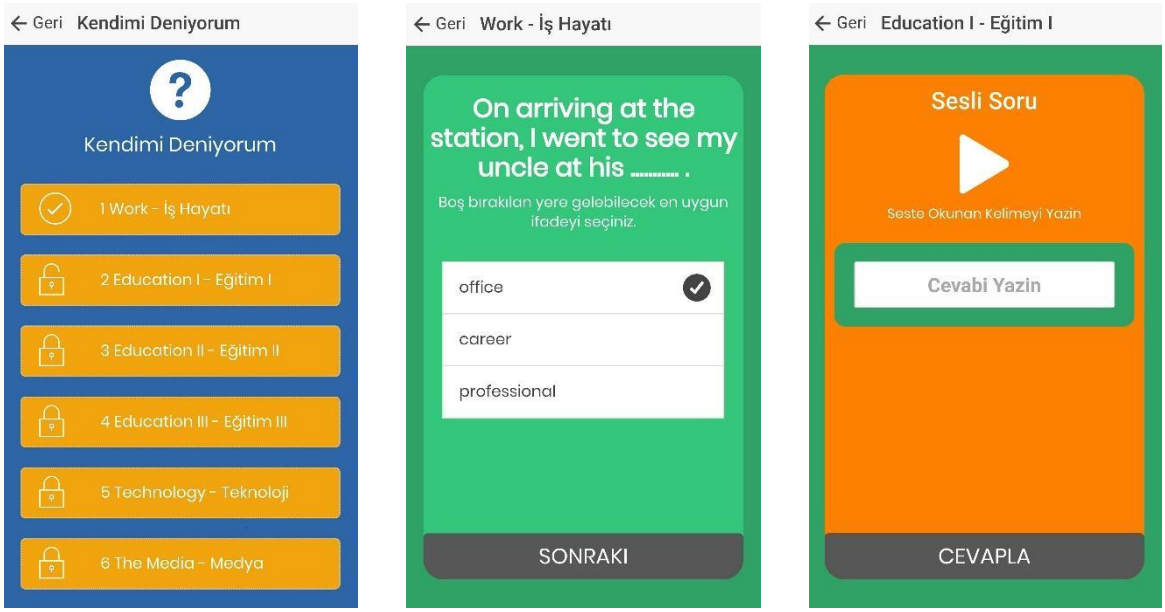

Figure 3. *"Kelime Diyarı" application "Assessing Myself" menu*

"Word Challenge" menu: It is designed as an educational game menu that allows students to interact with other students competitively. When the student presses the challenge button, the program randomly matches the student with another student who has started the learning activity, regardless of whether he is online at the moment. In order to ensure that students match up with different students, this random matching is planned in such a way that two students paired in the last 24 hours will not be paired again. When students decide to challenge and are matched with another student, a screen that shows who they are matched with pops up and then they see a quiz randomly generated by the program on their screens. The student who gives the most correct answers to the questions wins. Students can see the current score table and their own ranking in this table, together with the points they have earned, by clicking the "Score Status" button in the "Word Challenge" menu. The quiz consists of 5 questions randomly drawn from the question pool, from which both students started to learn using the "I'm Learning Words". Thus, it is ensured that the vocabulary items in the quiz are the intersection set of the words that both students have already started to learn. The questions are in the form of multiple choice and audio questions. Students must finish the exam within 6 hours to respond to the challenge started by the other learner. Otherwise, they lose the duel. The program reminds the students of the duels that are not answered within the 6-hour period by sending a notification "Hurry up, time is running out" when 10 minutes remain. After the students finish the exam, the winner is determined by the program and the scores are sent to both students.

"My daily Tasks" menu: This menu is used for reminding the students of the words they have learned at certain time intervals, in order to spread the learning over time and to increase the effectiveness in the learning. The program defines the words to be reminded the student and the frequency of reminders of these words with the help of the data obtained from the "I'm learning Words" menu and "Assessing Myself" menu. The number of the remaining words that students need to review on that day is displayed to students through a counter placed in the corner of the daily tasks button in the main menu.

"Tournament" menu: It is designed as a different tool in addition to "Word Challenge" menu in order to meet the expectations of the students for competition, interaction and educational game. In the "Word Challenge" menu, two students play with each other, while in the "Tournament" menu, the game is between all students. By using the management menu, the system administrator plans the name of the

tournament, its duration, the number of the questions to be included in the tournament, the type of the questions to be asked, and how long the tournament should remain open to students. Figure 4 below is an example of the "Tournament" menu.

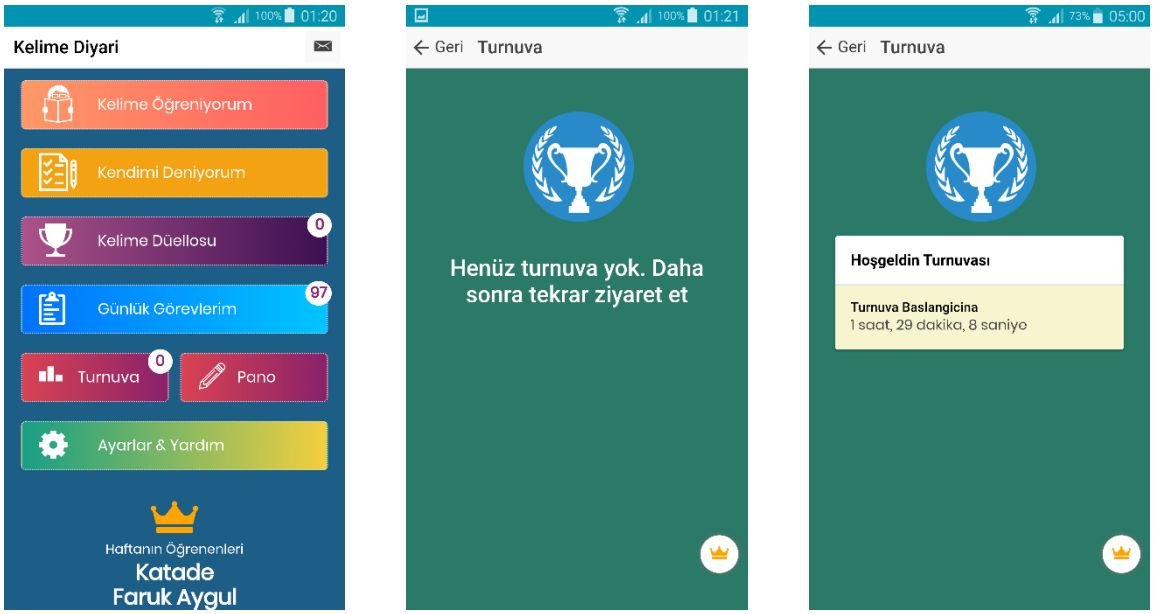

Figure 4. *"Kelime Diyarı" application "Tournament" menu*

"Clipboard" menu: It is designed as a menu that allows students to contribute to the program content themselves. In this menu, students can write sample sentences about the words they have learned and post those sentences via a board on the application. The most liked post by the students is determined as the sentence of the week. The post, which is the sentence of the week, is highlighted with a "Crown" icon and a different background color and pinned to the top of the board. The post, which is the sentence of the week, provides the owner with some additional points to become the learner of the week.

"Settings and Help" menu: It is designed as a menu that allows students to adjust some features of the program according to themselves and to request help in any problem they encounter in the program, thus enabling them to use the program in the most effective way.

After the program was made operational with all its features, it was published under the name "Kelime Diyarı" in the application markets in order to provide access to the students. Brochures were designed to introduce the program to students. The use of the menus and their functions are briefly mentioned in the brochure. Thus, it is aimed to prevent the demotivation of students as a result of the any confusion that may occur while learning to use a new program.

Web Based Distance Education Environment

A learning management system is used to provide a distance education environment. In this system, students can follow both their progress in the courses they are responsible for and the course curriculum. There is no restricted time for reaching the content of the course. The student can access the course content, available both as a video and written document, by selecting which week's content they want to view. In the lecture menu of the distance education environment, students can find the relevant courses videos, recorded in the studio environment, and the content in those videos was presented and taught by the responsible instructor of the course. The student can not only watch these records, but also have access to additional course resources prepared by the lecturer responsible for the course. The English vocabulary content presented to the students in this environment is in line with the content presented in the MALL environment. In the experimental part of the study, the students in the control group used this platform.

Figure 5. *Distance Education Environment Lecture Menu*

Experimental Research Process for the MALL Application (PHASE II)

Experimental research was carried out in order to teach English words in a mobile-assisted language teaching environment and in a distance education environment. Those words were in parallel with the English as Foreign Language lessons of the students. The implementation period of the experimental design was planned to be four weeks, and in this process, there were homogeneously formed two groups, the experimental and the control group. While the control group learned English words through the web-based distance education system, which they had to follow as a part of the foreign language course they were attending; the experimental group used the mobile application developed in addition to this system.

The experimental group students were introduced to the "Kelime Diyarı" application and they were motivated to use the application. The control group students were instructed to follow the distance education environment on a regular basis.

Academic achievement test, mobile learning technologies acceptance scale and mobile learning readiness scale pre-test and post-test were administered to the experimental and control groups.

RESULTS

Data analysis

In the study, content analysis method was used in the analysis of qualitative data collected via semi-structured interview forms. The data set formed by listening to the audio recordings and the notes taken during the interview were grouped according to the themes and content analysis was made with the NVivo program.

In addition, SPSS program was used in the analysis of the data obtained from the Academic Achievement Test, Mobile Learning Tools Acceptance Scale and Mobile Learning Readiness Scale. When the normal distribution characteristics of the data sets were examined, it was seen that they showed normal distribution according to the Shapiro-Wilk test. Accordingly, it was understood that the data showed normal distribution, and parametric tests were preferred for the analysis of the data (Büyüköztürk et al., 2017).

Paired Sample t-Test was used to examine the difference between the in-group pre-test and post-test scores of the experimental and control groups. Independent Sample t-Test was applied to examine the difference between the pretest and posttest scores of the experimental and control groups.

In order to determine whether the Experimental and Control groups were homogenous in terms of the variables (Academic success, Acceptance of Mobile Learning Tools and Readiness for Mobile Learning) measured before the experimental process, a pre-test was applied to the groups before the experimental process and the results were compared. According to the results of the independent sample

t-test, it was observed that the experimental and control groups were homogeneous in terms of the measured variables (p>0.05).

According to the analyses made after the experimental process

a) An independent sample t-test was conducted to find out if there is a significant difference between the groups in the academic achievement test post-test scores. Table 2 shows the analysis results.

Table 2. *The Effect of MALL environment on Academic Achievement*

Academic Achievement post-test	N	$\bar{X}$	SS	Sd	t	p
Experimental group	32	44,13	18,91	55,92	2,41	,019
Control group	29	34,07	13,42			

At the end of the experimental period, when the post-test results of the academic achievement test applied to the experimental and control groups were examined; there was a difference between the mean score of post-test of the experimental group (=44,13, ss=18,91) and the mean score of the post-test of the control group (=34,07, ss=13,42). According to the results of the independent sample t-test administered for the analysis of the data, this difference is statistically significant in favor of the experimental group (t(55.92) =2.41; p<0.05).

b) The results of the independent sample t-test, conducted to find out if there is a significant difference between post-test scores of the Readiness for Mobile Learning Scale are given in Table 3.

Table 3: *The Effect of MALL environment on Readiness for Mobile Learning*

Sub-dimensions of the Scale		N	$\bar{X}$	SS	Sd	t	p
Self-sufficiency	Experimental Group	32	4,04	0,62	59	,334	,740
	Control Group	29	3,99	0,47			
Optimism	Experimental Group	32	3,93	0,70	59	,725	,471
	Control Group	29	3,81	0,52			
Self-regulated learning	Experimental Group	32	3,85	0,59	59	,339	,691
	Control Group	29	3,78	0,72			
Scale Overall	Experimental Group	32	3,94	0,50	59	,644	,522
	Control Group	29	3,86	0,42			

The results of the Mobile Learning Readiness Scale post-test administered to both the control and the experimental groups at the end of the experimental process are shown in Table 3. When the table is examined, although the means of the experimental group are higher than the means of the control group both in the sub-dimensions and in the overall scale, there is no statistically significant difference according to the results of the independent sample t-test. According to the overall scale, the mean of the experimental group was =3.94, while the mean of the control group was 3.86. The difference between them is not statistically significant (t(59)=0.644; p>0.05)

c) The results showing if there is a significant difference between the post-test scores regarding Mobile Learning Tools Acceptance Scale are given in Table 4.

Table 4: *The Effect of MALL environment on Mobile Learning Tools Acceptance*

Sub-dimensions of the Scale		N	$\bar{X}$	SS	Sd	t	p
Mobile Willingness	Experimental Group	32	3,78	0,69	59	-,210	0,835
	Control Group	29	3,81	0,46			
Perceived usefulness	Experimental Group	32	3,93	0,63	59	0,976	0,333
	Control Group	29	3,78	0,52			
Contribution to Foreign Language Learning	Experimental Group	32	3,79	0,56	59	1,60	0,114
	Control Group	29	3,57	0,51			
Negative Perception	Experimental Group	32	2,69	0,61	59	-,058	0,954
	Control Group	29	2,70	0,70			
Scale Overall	Experimental Group	32	3,55	0,40	59	,650	0,392
	Control Group	29	3,47	0,33			

The results of the Mobile Learning Tools Acceptance Scale post-test, administered to control and experimental groups at the end of the experimental process are shown in Table 4. As can be seen from the data obtained from the independent sample t-test, there are no statistically significant differences between the groups. When the overall scale was examined, a difference was observed between the post-test scores in favor of the experimental group (Experimental=3,55; Control=3,47). As it is understood from the results of the independent sample t-test administered to find out if this difference is significant or not, this difference was not statistically significant ($t(59)=0.65$; $p>0.05$). When the sub-factors are examined, it is remarkable that only the experimental group's results in the mobile willingness sub-factor (Experimental=3,78) were lower than the control group results (Control=3,81). However, this difference was not statistically significant. ($t(59)=-.21$; $p>0.05$).

DISCUSSION

Students' Expectations for MALL

As a result of the interviews conducted during the development of MALL application, most of the students think that their English vocabulary knowledge affects their academic success in foreign language courses, which is one of the compulsory common subjects at the higher education level. In this respect, learners mostly wanted to improve their speaking skills in English and they wanted to learn words that they may encounter frequently in daily language. They found it important to learn words in context. That is, it is important for learners to know how words are used in sentences. According to the relevant literature, the use of educational games is a method preferred by most of the learners in in this regard. For example, Ishaq et al. (2021) analyzed 67 studies selected based on inclusion criteria from a pool of 53,467 works. They stated that gamification is used in language education to make learning more enjoyable and engaging and to achieve high learning outcomes.

In addition, the learning environment's capability to address individual differences and to support interaction and communication between users are among the expectations of the learners because learners think that these factors will make learning English vocabulary fun. As mentioned in the related literature, these expectations of the learners are inherently found in MALL environment. In that, MALL environment can address individual needs and enable social learning by providing multi-way interaction thanks to the communication opportunities it offers (Shadiev, Liu & Cheng, 2023; Assapari, & Hidayati, 2023). EFL speaking student readiness to use mobile-assisted language learning. These facts make MALL environment fun and interesting. The students believe that MALL environment will increase their

motivation towards learning, make learning more effective and permanent. In their study, Kurt and Bensen (2017) found that MDQ practice increased students' motivation. When the literature is examined, it is possible to come across studies stating that MALL environment affects the permanence of learning in a positive way (Kadri, 2024; Bakay, 2017; Wardak, 2020).

Moreover, according to the majority of the learners, it is seen that it is important to encourage competition in the learning environment. All of the participants expected that the MALL application, which they will use for learning vocabulary, will support collaborative learning by providing interaction between users. Hsieh and Tsai (2023), who emphasized the importance of collaboration in MALL environments, also stated that among the learning methods offered in MALL, collaborative learning methods are more preferred by students. Although smartphones have been integrated into our daily lives, the majority of learners need a platform where they can get technical support in a mobile application that they will use for learning English vocabulary. Because they think that the technical problems encountered during the use of the applications remain unresolved or the delay in the solution will adversely affect the continuity of the use of the application. Another justification for the need for a technical assistance menu is that the problems encountered in practice prevent learners' cognitive load from increasing. It is seen that most of the participants do not integrate smart phones in the language learning process of, and they use these devices mostly for connecting social media and accessing the Internet. This situation can be explained by the lack of mobile learning applications and the relevant content or the lack of awareness.

The Effect of MALL Environment on Students' Academic Achievement in English Vocabulary Learning

When the academic achievement test post-test scores of the experimental group and control group were compared; it is found out that the mean score of the experimental group was =44.13 and the control group =34.07. When these post-test scores, which show an increase according to the pre-test results, were examined, it was determined that the increase in the academic achievement of the experimental group was higher than that of the control group, and this increase was statistically significant ($t(55.92) = 2.41$; $p<0.05$). In this case, it can be said that MALL has a more positive effect on academic achievement than WBL. In an experimental study conducted in China, Chen, Jia and Li (2021) also concluded that MALL environment is more effective than other learning environments. In the current study, researchers who examined the effectiveness of traditional learning environment, MALL and WBL environments, measured the students' success in learning English vocabulary in these learning environments. Researchers who observed that WBL increased student achievement compared to the traditional learning environment (Liu, 2016) stated that the most successful learning took place in MALL. The researchers explained that MALL environment was more effective than WBL environment just because of the fact that MALL environment was more successful in engaging students in the learning environment. Researchers mentioned that by helping students to gain autonomy, MALL environment provides an easier way to access to the course content and a more comfortable learning atmosphere. They also emphasized the importance of design factors regarding the content and the learning activities in the success of a MALL environment (Chen, Jia & Li, 2021; Hayati, Jalilifar & Mashhadi, 2013; Wu, 2014)

According to the findings obtained as a result of the experimental process, it was observed that the academic success of the students in the experimental group increased more than the academic success of the students in the web-based learning environment. In this case, it can be concluded that the MALL application is more effective and efficient than the WBL environment in teaching English vocabulary. When the literature is examined, many studies supporting these findings have been found (Makoe & Shandu, 2018; Alemi, Sarab & Lari, 2012; Zakaria et al., 2016;)

The Effect of MALL Environment on Students' Acceptance of Mobile Learning Technologies and Readiness for Mobile Learning

At the end of the experimental process of the research, although the means of the students in the experimental group, that is, the students who took the course via MALL environment, were high, no statistically significant difference was observed between the experimental and control group students in terms of readiness for mobile learning. These results can be explained by the fact that the control group students were not exposed to mobile learning technologies in the experimental process. Obtaining these results from the experimental group students who used mobile learning technologies throughout the experimental process indicates that being familiar with mobile technologies and using mobile technologies for educational purposes do not affect readiness. Similarly, Habib et al. (2022), in a study examining the readiness of students in colleges and universities in India for Mobile Assisted Language Learning (MALL) technologies, collected data from 581 students through surveys. They found that while many university students extensively use mobile technologies in their daily lives and are familiar with them, there is no significant relationship between familiarity with mobile technologies and their readiness for online learning.

In this study, it is estimated that the high level of readiness has an effect on the academic success of the experimental group. Krasulia and Saks (2020), researchers working with EFLlearners among 1st-year students in the Germanic Philology Department at Sumy State University, Ukraine, highlighted readiness as a crucial element of MALL. Suwantarathip and Orawiwatnakul (2015) postulated similar findings. In the study, the researchers observed the effectiveness of MALL environment at the end of the 7-week experimental period and they also examined the readiness of the students. Researchers stated that students who feel ready to use mobile learning technologies are more successful in the MALL environment. They estimated that this readiness allows the student to focus on the course content rather than the technological tool, which increases success.

Assapari and Hidayati (2023) conducted a study investigating the relationship between MALL and students' readiness at the higher education level. The study, conducted over one academic term, revealed that students did not exhibit a negative attitude toward the use of mobile technologies in their foreign language learning processes. The researchers also highlighted that students tended to use mobile technologies even when such tools were not explicitly provided to them.

Another finding of the study is that no significant difference was observed in the acceptance of mobile learning tools by the experimental and control group students at the end of the experimental process. In this respect, there may be various reasons that affect students' acceptance of mobile learning (Kim, Rueckert, Kim, & Seo, 2013). In the same vein, Dolawattha, Salinda Premadasa, and Jayaweera (2018) mentioned that the factors affecting students' acceptance of mobile learning include usefulness, interactivity, motivation, perception, facilitating environmental factors, and ease of use, and the most important factor among them is interactivity. Similarly, in a study conducted by Hoi (2020) investigated the factors affecting university students' use of mobile technologies for educational purposes. Performance expectation, the effect of facilitating condition, social influence are among the determining factors, while effort expectancy is not determining factor.

CONCLUSION AND RECOMMENDATIONS

The results obtained as a result of the research are as follows:

• Students want MALL applications to offer educational games supporting competition.

• They want MALL applications to offer both collaborative and individualized learning and to foster interaction and communication.

• Although they want MALL applications to support their learning by sending notifications and reminders, they especially mention that the frequency of those notifications should not be exaggerated.

• They stated that a MALL application developed based on their needs would increase their motivation and willingness to learn English vocabulary.

• The MALL application developed based on students' expectations increased the learners' English vocabulary learning success more than the web-based learning environment.

• It has been found out that the developed MALL application does not have a significant effect on the students' readiness for mobile technologies.

• It has been found out that MALL application has no significant effect on students' acceptance of mobile technologies.

Suggestions

• "Kelime Diyarı", the application, can be used alone to enhance students' language skills and vocabulary learning processes, or it can also be used as a tool to support their WBL.

• The effect of MALL applications on different variables can be examined.

• This study was conducted with students at higher education level. Studies can be carried out on the effectiveness of MALL at different education levels and in adult education.

• There is a need for similar studies to be conducted by gathering both qualitative and quantitative data from more participants participated in a longer experiment.

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