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The Impact of Xeropan: An Online Application Assisting Language Learning on the Processes of Foreign Language Learning

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Abstract

Examining the relationship between technology and the success of language acquisition and the integration of technology into language instruction has been around of a long time by now. The development of technology can essentially change how languages are taught. Nevertheless, it is only in the last few years that the road has opened up for new language learning opportunities. In this current study, the impact of a pedagogical intervention is presented grounded on Xeropan, a gamified language learning application. In addition to assessing the impact of the app, a questionnaire was also applied to find out how efficient language learners find language learning with the application. Based on the original aim of the literature and the study, answers were sought as to how Xeropan influences the English language learning process, how student users find Xeropan in terms of efficiency and motivation, and how self-regulated motivation correlates with use of Xeropan. It was found that Xeropan application has a positive impact on language learning processes. There was a visible improvement in language learners, and at the level of some tasks, it was indicated that there was a significant improvement as a result of the developmental intervention using Xeropan. It was also pointed out that students are content to work with Xeropan and find that it has a positive effect on them. Further conclusions are drawn.

Introduction

Many EFL instructors are motivated to have the possibility of improving student learning through mobile assisted language learning (MALL). Concurrently, however, they can easily be overwhelmed by the sheer amount and variety of applications available for MALL. Consequently, the fundamental challenge of rethinking and integrating new technology into the language classroom comprises three components: sound pedagogy, the technology's capabilities, and the way of using an effective curriculum. Three recent innovations in MALL lay the foundation for this study: student response systems (SRS) (Cheng et al., 2017), gamification (Hamari, Koivisto, and Sarsa, 2014), and the bring your own devices (BYOD) strategy (Wu, 2019). This study seeks to gain insight into one of these innovations: gamification. It is also an intention to determine the impact of one MALL application, Xeropan, a gamified digital app. The rationale behind the study is that with the emergence of MALL digital apps, it is timely to assess their impact on the language learning process.

Research on the impact of MALL has become an independent field in particular over the past decade. The acquisition of the English language is essential for international, cultural and scientific communication, and due to the rapid internationalization developments in education, it is vital for learning in a university intercultural environment. The emergence of new digital technologies greatly aids the language acquisition process and more and more students are using tools and mobile applications to support out-of-school learning (Fűz, 2017; Teng, 2020). Especially in the last four years, language MALL applications have emerged to help language learning, which can effectively help the development of skills (especially listening and reading comprehension). This rapid shift from traditional to innovative methods constantly encourages the renewal of language teaching methods (Hwang et al., 2016). Students typically find learning English words a difficult and tedious activity (Montero Perez, Peters & Desmet, 2018) because, for example, keeping abnormal forms of verbs in long-term memory requires constant focus (Dashteshani, 2016; Deghenzadeh, 2019).

Examining the relationship between technology and the success of language learning and the integration of technology into language teaching is not new. The digital revolution, and the development of technology can fundamentally change the way languages are taught. However, it is only in the last few years that the road has opened up for new language learning opportunities. Research published in the 1980s and 1990s compared the effectiveness of traditional and technology-supported language teaching with mixed results. The term language teaching technology itself referred to the operation and use of technical tools that can be applied in language teaching, as well as the development of language instruction materials. Recently, recognizing the qualitatively new possibilities of language teaching technology, the main question is no longer whether the use of technology affects the effectiveness of language learning, but how it can be maximized to increase the efficiency of language learning. In the last two decades, a record number of studies have been published on technology-assisted learning, language teaching technology, and language learning supported by information and communication technologies (ICT). Due to the rapid change in available hardware and software tools, even the most effective teaching-learning methods have changed rapidly, posing serious challenges for researchers in foreign language acquisition, language teachers, and language teacher training institutions.

Over the past two decades, technology-based measurement evaluation has become the most innovative part of pedagogy. ICT technologies provide an opportunity to revolutionize pedagogical assessment systems (Csapó & Molnár, 2019). There are huge benefits to involving computers and mobile phones in development and evaluation. The range of possibilities is inexhaustible, as many new elements can be incorporated into education and assessment, from audio material to color graphics to videos. As a result, motivation changes in a very good direction. Language learners are much more likely to be involved in the development and assessment process, not to mention that the test reporting time is virtually instantaneous compared to previous offline measurement tools.

In the current study, the impact of a pedagogical intervention is presented based on a language learning application. Xeropan application has been developed by a Hungarian educational institution. The application is described in detail below. In this study the extent was investigated to which a developmental intervention using Xeropan brings improvement among participants. In addition, the aim was to assess language learners'

satisfaction with the application. Therefore, in addition to the test measuring progress, a measurement tool was also developed based on self-regulatory motivation (see Al-Jarf, 2012) in the form of a questionnaire. Based on the original aim of the literature and the study, the following three research questions were formulated:

1) How does the Xeropan online application influence the English language learning process?
2) How do student users find Xeropan in terms of efficiency and motivation?
3) How does self-regulated motivation correlate with use of Xeropan?

What is Xeropan?

Xeropan is a gamified EFL learning application and LMS offering EFL learners over 500 lessons at 13 different levels with more than 10,000 headwords to learn. Xeropan's developers envision teaching 100 million students worldwide English and developing their reading, writing, speaking and speaking skills. In the near future the developers seek to create online gamified learning material in the following languages: German, Spanish, and French. In addition to plenty of visual elements, users can also see the curriculum in writing. The scientific grounding of Xeropan is provided by Paivio's (1969) double coding theory, Vygotskiy's zone of proximal development (ZPD) theory (1987), and Bruner & Bruner's scaffolding theory (1978). /For detailed description of these theories, see Thékes (2016).

While studying assisted by Xeropan, students may gain access to a level of education and language development that is usually only available in real classroom lessons. According to the developers (Al-Gharawi, 2019) many language learners are already tired of the constant restart and the frustration they experienced during the language learning process. Students want to feel successful; they want to prove to themselves that they are able to achieve their goals; moreover, they want to feel confident in using English. Xeropan app development began in 2014, and numerous language educators and educational scientists contributed to the conceptual development of the language learning content and structure of the app. After downloading Xeropan, students will be taken to the imaginary Xeropan Islands. Students can choose from six levels of knowledge (*CEFR*, 2002).

Xeropan users can choose from a variety of lesson topics. The lessons include a picture dictionary list, short videos, grammar tasks, and a conversation task supported by artificial intelligence as an innovation. At the end of each lesson, students may practice what they have learned. The developers made five different statements about Xeropan and the reason for the development: (1) daily playful language learning is the best way to learn successfully, (2) it offers a fun learning process for all students, (3) English is an important world language that unites different people, (4) technology can innovate learning by providing new structures and methods, (5) development can be achieved through communication.

The developers (see Al-Gharawi, 2019) designed a background digital environment for the Xeropan application. Users see the instructions of the imaginary Professor Max. Professor Max is an eccentric English teacher who lives in 2157. According to the story, a comet then crashes into Earth and mysteriously everyone loses their ability to communicate. Without communication, people say what they want to say and interpret everything the

way they want. Truths are relativized; normal communication does not take place. This is when Professor Max helps people regain the ability to communicate effectively. The learning content is divided into 13 different levels. Each level consists of twelve lesson groups. Within each lesson group there is a video lesson and vocabulary lesson before the video lesson. The vocabulary lesson pre-teaches words that students encounter with in the video lessons. The app comprises 22 different test types. Figure 1 presents the opening screen of the platform whereas Figure 2 and Figure 3 present two different tasks. Apart from the vocabulary and the video lessons, a lesson group may contain further lessons sporadically such as a chat-bot conversation, a pronunciation lesson and a grammar lesson. Learners are supported by translations in their own language throughout the learning process.

Figure 1. Screenshot of the Opening Screen of Xeropan

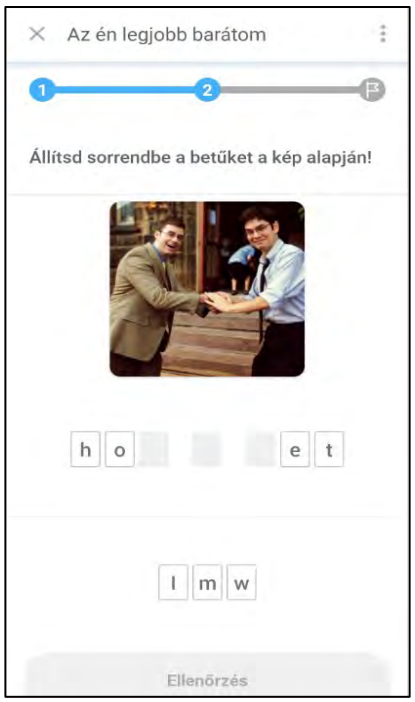

Figure 2. Example of One Gap-Filling Task

Figure 3. Example of One Matching Task

Mobile-Assisted Language Learning

In the literature review, some of the mobile language learning applications are mentioned that were considered in the development of Xeropan and have been taken over many of their elements during the design and development of the application. Furthermore, in this section of the text, studies that report on the inclusion of language learning applications were reviewed. The research to be reviewed was selected according to two aspects: (1) the publication of the research should not be earlier than 2010 because in the period before this year it was not yet possible to use a smartphone with as effective a technique as now, (2) the research should describe some experiment; or report research on the impact of gamified tools on language learning.

In addition to cognitive factors, the success of language learning is also influenced by affective factors such as anxiety, intrinsic motivation, and attitudes. Mobile applications that support language learning have a positive

effect on these affective factors and reduce anxiety, increase motivation, and also change learners' attitudes in the right direction (Flores, 2015). Shadiev and Huang (2017) highlighted that the gamified environment increased learners 'motivation, time spent learning, and contributed better to the acquisition of English as a foreign language vocabulary. Mobile language learning is taking on increasing proportions in the world and developers of language learning applications are working to increase the motivation and reduce the anxiety of language learners by developing the graphics and content of the interfaces (Arndt & Woore, 2018). Furthermore, with the growing prevalence of gamified elements, they intend to make out-of-school, leisure-time mobile language learning attractive in the future (Nahmod, 2017). The emergence of gamification in language teaching helps to understand foreign language content more effectively, prolongs time spent on learning a language, and increases motivation to learn a language (Zarzycka-Piskorz, 2016).

Mobile Language Learning Applications

Mobile language learning gained a lot of ground in the second decade of the 21st century thanks to the rapid development of technology. More and more people are learning outside of classroom using MALL applications. Instead of traditional lessons, using a mobile phone allows students to learn in real life with a mobile device and spend their time anywhere, anytime developing their language skills. Applications for MALL can be divided into two groups: (1) applications for children and (2) applications for adults.

Table 1 lists the applications for children and Table 2 lists the applications for adults. Although there are other downloadable applications in different qualities, five applications were found worth presenting with a view to the Hungarian context. In the selection, two aspects were taken into consideration: (1) they should be present amongst Hungarians, (2) they should have some playful elements in them. Domestic usage patterns were checked in online forums and in discussions with language teachers and developers. The played element was regarded to be important because it is indispensable in developments.

In developing Xeropan, an experimental tool used in the present study, the developers considered the properties of the ten applications listed here, with particular reference to three characteristics: (1) visualization, (2) task types, and (3) a played scoring system. It is not the purpose of the study to write a summary of these MALL applications. It has been judged that at present these applications represent in quality the professionalism that allows the software to be effective for language learning.

Table 1. Mobile Language Learning Application for Children

Application	Software	Field to be developed	Conditions of use
Pogg – Spelling & Verbs	iOS	vocabulary	pay
MindSNACKS	iOS	vocabulary with gamification	pay
Speech with Milo Apps	iOS	speaking	pay
Kids Learn to Read	Android	pronunciation	free
Super WHY	iOS	writing and reading	pay

Table 2. Mobile Language Learning Application for Adults

Application	Software	Field to be developed	Conditions of use
Rosetta Stone	iOS	vocabulary	free
Memrise	Android/iOS	vocabulary	free
FluentU	Android/iOS	vocabulary	pay
Busuu	Android/iOS	speaking	pay
Duolingo	Android/iOS	complex	free

Research on Mobile Language Learning

Investigations into the Impact of Mobile Language Learning

In this section, an attempt is made to summarize studies published in the field of mobile language learning and communications on pedagogical interventions. Furthermore, it is attempted to explore the research results of empirical studies in the field of language MALL.

Caldwell-Harris et al. (2014) reported that students often talk anecdotally about the fact that they prefer live instructors to videotape lectures, but there are few controlled comparisons and none had been performed for L2 learning. Students attended only one Samoan (L2) language class. Some of them learned the language lesson from a live language teacher, others saw the same lesson on video. Students participating in various classroom classes were asked to passively monitor or carry out instructions. Students who learned from a live instructor in class performed better on the vocabulary test (average 92% correct) than those who saw the same lesson on video (79% correct). Execution of the instructions facilitated learning (88% correct) compared to passive viewing of the lesson (82%). This result may suggest that passive viewing of L2 videos is not as effective as participating in language development with the help of a teacher. The current research aimed at partly refuting this finding. It was sought whether a digital language learning app can contribute to the development of language proficiency.

Before Caldwell-Harris, Anaraki (2010) described the development of an English as a foreign language multimedia curriculum. The system was tested over four weeks by 76 university students who downloaded three hours of study materials per week with their smartphones. The results of the post-test confirmed that all students had improved their language skills. Participants felt that English language MALL had the greatest effect on their pronunciation, followed by heard comprehension and speech production. This result highlighted the skills that are most affected by mobile learning. Due to advances in technology, Anaraki's research would likely yield a different result in the current study. This is supported by the research of Teng (2020), who assessed the effect of L2 videos watched on a mobile phone with and without subtitles helping the language acquisition process. Over two-hundred Chinese primary school students were included in the research. It was found that the receptive vocabulary of the students developed the most and mainly those who watched the short films with subtitles. This finding is important in terms of the research as Xeropan mainly develops receptive vocabulary.

In alignment with the conceptualization of Xeropan, Rogers and Webb (2017) argued in their study that people

learn and understand the meaning of words better when they visualize the words to be learned with images. This study is cited here since Xeropan uses videos with subtitles and it is relevant to see previous research experience by other authors. The potential benefit of language learners watching English-language films while also being able to read the subtitle has been reported in other studies in the past. The authors argue that their research fills a gap in the sense that prior to that, only a short video was watched by the participants involved in the research. In their study, 372 Japanese university language students watched ten 42-minute episodes of an American series with and without subtitles. While watching the episodes, participants completed a comprehension test. Although the results showed that students who watched the videos had better scores, there was only a significant difference between the two groups in only three of the ten cases. As the researchers pointed out, it is likely that watching videos with captions will effectively help language learning. Since in the empirical research of the current study students participating in a language course were involved, it is vital to gain insight into what researchers found in previous investigations in mirrored classrooms.

Amiryousefi (2017) examined the effect of mirrored classroom on English language acquisition with students learning English (N=67). He studied students 'speech, speech comprehension, and out-of-classroom participation at two Iranian universities. He formed three groups: structured mirroring, semi-structured mirroring, and traditional learner group. In the group taught with semi-structured mirroring, participants collaborated to select their curriculum, while in the group taught with structured mirroring, the curriculum was selected by the teacher. A telegram instant messaging system was used for communication in order to perform the preparatory work in a collaborative manner (see also Grau & Turula, 2019). For data collection, participants were given a hearing comprehension test and a speech production test. In addition, a learning experiences questionnaire and four open-ended questions were answered. Amiryousefi found that the mirrored classroom had a good effect on language acquisition, more specifically, the participants 'ability to speak and understand speech developed effectively.

Wang (2019) described a project that had been going on for three years in his study. The research examined the development of reading and syntactic skills during mobile-assisted English (L2) language learning. During the project, teaching materials that improved reading comprehension and grammar were sent to students' mobiles. Participants had a positive view of mobile learning. However, the researcher pointed out that the success of any MALL project can be limited unless some aspects are taken into account, which are: (1) to provide an interesting curriculum that is neither too long nor too challenging; (2) teacher monitoring is adequate; (3) active student participation is important; (4) providing appropriate incentives; and (5) ensuring the private sector and (6) a secure technical environment.

Kim et al. (2013) studied the mobile learning experiences of graduate students (N=55). 48% of participants said they used their phone several times a day to learn a language, however, 90% of respondents said they had a positive view of MALL. Even then, language learners argued that their MALL activity would increase if they could learn in a personalized, collaborative environment. This finding is cited since Xeropan's developers used the concept of creating a tool that students would use daily and creating a learning management system (Xeropan Classroom) that would make collaboration possible.

In a pilot study conducted by Ockert (2018) with Japanese high school students, the researcher sought to explore the impact of a tablet-assisted online language course on language learning motivation. The questionnaire included questionnaire items for the following subscales: Language Learning Orientation Subscale, Intrinsic Motivation, Extrinsic Motivation, and Amotivation Subscale. The questionnaire was recorded with the participants both before and after the pedagogical intervention (8-8 people in the experimental and control groups). It was found that students who had developed a lot in their foreign language skills in a short period of time were particularly aware of self-regulation and their intrinsic motivation was outstanding. The conclusion is that he thinks this suggests that students who are positive about online language learning are also more consciously regulating their own learning processes.

The Accomac report (2017) stated that language learning supported by mobile technology had made the learning process much more interactive and interesting. This study, conducted at a Thai university with Chinese-language students, aimed to assess the potential for mobile learning in relation to the development of Chinese (L2) skills. An online questionnaire was used. The Thai researchers conducting the research found that students had a positive view of mobile language learning. Furthermore, it was concluded that this finding was valid for all language learning, stating that their measurement tool had been validated. Both Ockert's and the Accomac report's questionnaires were considered in the development and validation of data-gathering instrument used for this current investigation.

Ornprapat and Wiwat (2015) conducted a control group experiment with 80 undergraduate language learners to explore whether a vocabulary development application effectively aids word acquisition in English (L2). Participants were distributed equally. The control group traditionally learned the same words as the experimental group. In the follow-up test, the two researchers found a significant difference between the performances of the two groups (experimental M=33.25, SD=5.67; control M =29.7, SD=5.57).

Investigations into MALL App Use with Questionnaires

Since in the present study, the self-regulatory motivation of students is also assessed, it is inevitable to gain insight into some of the empirical studies conducted with the use of questionnaires in the field. Three studies (Dashestani, 2016; Ma, 2017; Ko, 2017) are cited that have lately inquired into language learners' use of MALL apps and that the researcher has found relevant towards the assessment of the impact of a gamified tool. Dashtestani (2016) examined the attitudes of Iranian students towards mobile language learning through questionnaires, interviews, and classroom observations. It was found that students appreciated the anywhere, anytime type of learning opportunity and that language learning applications could be with them and they could enjoy it when they got it. Ma (2017) proposed a holistic approach to assessing the MALL habits of the students surveyed, in which three key components are included: (1) language learning motivation, (2) mobile technologies, and (3) help of others, classmates, and parents.

Similar to Ma (2017), Ko (2017) examined the use of digital devices by 167 Korean university students. About 59% of respondents argued that desktops and laptops are more convenient than smartphones when learning a

language. Facts such as a larger screen, faster data transfer, and fewer technical problems were listed as reasons. More than 60% of respondents found the use of desktops and laptops positive. On the other hand, like the research cited earlier, smartphones and laptops were preferred because of their anywhere, anytime features. This study is in alignment with the concept of Xeropan's developers in that the app is designed from the beginning for smartphones and laptops. An internal survey reported that 74% of users use the app on a smartphone and 26% of them use Xeropan on the net with a laptop.

Research on Mobile Language Learning in the Hungarian Context

Since the present research was conducted in Hungary, it is considered important to reveal previous studies in the Hungarian context. Barnucz (2019), Kétyi (2016), and Polonyi (2019) were found worthwhile citing. Barnucz (2019) conducted an attitude survey on MALL among 43 students in a Hungarian higher education institution. The questionnaire survey would have initially included more than 700 students, but only slightly more than forty reported data. The results show that the majority of students surveyed said that "LearningApps" learning materials contribute to vocabulary acquisition, knowledge assessment, and found that language learners find learning more enjoyable.

Kétyi (2016) also conducted a similar study among Hungarian higher education students. In addition to general background information, the research examined the extent to which students were satisfied with the electronic curriculum prepared by the instructors. Another main direction of the control group experimental research was provided by the students' opinions, habits and motivations of the education supported by educational technology tools. Among the researcher's main findings, it should be noted that the level of ICT competence does not affect the rhythm of language acquisition, the instructor's ICT competence does not affect the course success in either the experimental or control group, and students' learning style does not affect their test results. however, he found that learning strategy was related to motivation. Overall, the research highlights that language learners have a positive attitude towards learning on digital devices.

Another Hungarian development is the mobile application called HANNA. The application for language learning is still under development (Polonyi, 2019). The developers say gamified curriculum elements will be incorporated into the app, which will effectively improve students 'English language learning. Furthermore, it should be mentioned that one of the representatives of language learning supported by Hungarian mobile phones and digital devices, Tibor Prievara, explains that the language learner of the 21st century needs to use different ICT devices (Prievara, 2019).

Gamification in Language Learning

Defined by Deterding, Dixon, Khaled, and Nacke (2011) as the use of game design, elements in non-game contexts gamification has been applied variously in fields such as marketing, finance, and health, only very lately as a new type of strategy for language learning. The main purpose of gamification, as pointed out by Deterding et al. (2011), is to increase student motivation and retention through a rewards and reputation system.

Dehghanzadeh et al. (2019) pointed out that the most commonly used elements for gamifying language learning content are feedback, challenge, point, reward, leaderboard, and level. In this part of the study the author reports the synthesis of research on the impact of gamified tools having these above listed characteristics.

Scholz and Schulze (2017) postulated that having the gameplay experience occur extramurally is desirable, but makes the direct observation of the learners' activities by a researcher difficult. Their study drew on an investigation examining language learners playing the online role-playing game *World of Warcraft* over four months. Their overall analysis suggests that the language observed in the gaming environment is indeed transferable to non-gaming contexts, especially when the context to which the language is being transferred is directly related to the in-game experiences of each learner, as is the case where learners will share their gameplay experiences in the L2 in non-gaming contexts. Regardless of the trajectories of gameplay in which each learner participates, second language development will occur. With the efficacy score, which indicates the overall effectiveness and quality of the gameplay experience and its implications for second language development outside of the game, it can be determined to what degree the experience was impactful for the player while considering the multitude of learner and gaming-related factors that impact the process.

In another instance of investigation of the impact of gamification, Vazquez-Calco et al. (2019) stated that fan practices involving translation open up opportunities to explore language learning practices within the fandom. They examined how three fans capitalize on fan translation and language learning. The researchers drew set four themes to present fans' literacy practices and language learning: (1) fan translation, (2) understanding the original text, (3) writing and preparing the translation, and (4) tools, resources, and collaborative online practices. Results indicated that the three informants encountered an open space for agency, creativity, and identity building and reinforcement through fan translation. As fan translators, students learned language in multiple ways, such as peer-to-peer feedback, autodidactism, and creative uses of Google Translate. They also pointed out that future research may attempt to transfer knowledge from digital wilds into formal education.

These studies (Dehghanzadeh et al., 2019; Scholz, & Schulze, 2017; Vazquez-Calco et al., 2019) have been cited here because the developer laying the ground for the concept of Xeropan exploited from the notion of gamified tools and fun elements of game-play, furthermore, in future development, translation will be a crucial element.

Methods

Participants and Research Purpose

The gender-specific adult participants of the traditional language course learning English (N = 12, CEFR level: A2; average age: 26.8; SD=2.98) were included in the pedagogical intervention. The intervention lasted for two months between August 2019 and October 2019. Only a small number of participants could be involved in the study since the researcher wanted to be present intensively in the language learning process of participating students. The maximum number of students in a course is twelve in Hungary in an adult education context so that active participation can be assured. In future research a much larger number will be involved after relevant

experience is gained in the midst of the current research. Students took part in 90-minute lessons twice a week learning along the syllabus provided by one of the textbooks offered on the market and they were assigned daily two lesson groups at Level A2 and then B1. Students spent approximately 45 minutes daily on Xeropan, thus gaining a large amount of input of English as a foreign language. After the second offline class of each week students had to report which lesson groups they had dealt with. They were given an opportunity to share their experience with the app. These sessions were also the venue for the researcher-teacher to assign tasks. In cooperation with the backend developers of Xeropan, times spent on the app could be monitored. It can be stated that students took work with Xeropan seriously and they were honest about their spoken report on working with the app during these sessions. On the first day of the course, Xeropan was introduced to students and advised that the application be used daily for two months to supplement the course. Prior to the intervention, students were given an offline pre-test of 26 tasks (alpha=.81; M=8.09; SD=2.12).

Instruments

Three measures were used in the research: (1) online test, (2) online questionnaire, and (3) online interview.

1) The online test consisted of 26 tasks; each task contained four items. In order to validate, an item analysis was performed as described below, and after the development of the measurement tool and before testing, each task was discussed and item with three language teachers. The researcher considered it important to add words with a rank frequency corresponding to their level (see Vidákovich et al., 2013), as the students were at the B1 level at the time of the intervention. The vocabulary required for the elementary state language exam for Hungarian is approximately 2,000 words (*CEFR*, 2002). Care was taken to ensure that a word with a higher frequency (Kilgarriff, 1996) only entered the meter if it was encountered while using Xeropan. In total, the researcher considered three principles in selecting the items: (1) the word or phrase should be included in the curriculum to be learned during development, which should be learned when using the application, (2) the item in the test should not be outside the 4,000 word frequency rankings because the level is not yet expected from learners, and (3) learning the word or phrase should not cause extreme difficulty. Another important consideration was that no more than ten words be included in the test which are not among the top 3,000 in the word frequency ranking. The two language teachers received a list of words in the meter and had to decide with a yes-no answer whether the items met the third condition. In case of a unanimous decision, a decision was made on replacement of the items. Selection of the lexical items for the tasks was completed by choosing words from all three frequency categories. In all tasks the majority four or five words belonged to Category 1 and at least one word represented Category 3, which means that Category 2 included three or four items. With this system, it was guaranteed that words form all the possible categories were assessed. Three-word categories were established on the basis of the BNC list and the amount of occurrence of a particular word in the course-books. The necessity of creating categories is underlined by the fact that major vocabulary tests (Nation, 2001) include items selected on the basis of layered word list. Three perspectives served as the basis of classifying words into categories: 1) word frequency based on the BNC, 2) occurrence of the words in course-books used by 6th graders, 3) personal judgement on the assumed difficulty of the word. The process of determining word categories is tantamount to the procedure in the doctoral dissertation of author of this study (see Thékes, 2016).

The tasks edited in Google Forms was in the modality of mainly form recognition and to a lesser extent productive recognition in a multiple-choice format, and participants had to select the correct answer in the check box. Each correct answer was worth 1 point.

The modalities of tests measuring different foreign language skills were already described by Schmitt (2008). It is not done separately here. The modalities of the tasks were receptive recognition (20 tasks) and productive recognition (5 tasks) in the measurement tool, however, there were many different types of tasks, from embedded videos to images, to simple sentences designed to elicit responses from participants. It is important to emphasize that the tasks and the items that make them up appear in the content seen by the B1 level learner in the Xeropan application, so the participants were able to learn these words and phrases during the development.

Validation of the online test was had been carried out prior to the research with the participation of twenty students at a similar level of English. The test proved to be fairly reliable (alpha=.78). Following the investigation of descriptive statistical data and the frequencies of the different items, item-analysis was carried out by means of examining corrected item-total correlations. This value indicates how each item correlates with the rest of task. It is a regularly applied statistical method in pilot studies. On a sample of twenty students, the reliability and the validity of the items with values under .20 are problematic (Field, 2005). The value of none of the items fell under this figure so each item was kept.

2) In addition to the language test, an 11-item Likert-scale questionnaire was also complied in Google Forms. Questionnaire items were adapted from the self-regulated motivation questionnaire (Tseng et al., 2006). Items were adapted to the context of the current research; that's why the phrasing involves a reference to Xeropan. This method of data collection was chosen because as the most effective tool for mapping the independent, out-of-school language learning process, the self-regulatory learning questionnaire was considered by the researcher. Two factors were determined in the questionnaire. A Cognitive factor (Items 3,4,6,8,9) and an Affective factor (Items 1,2,5,7,10,11). In the online questionnaire, respondents were able to complete responses from home at any time within one week of posting. The process of validation was the same as that of the online test. Table 3 shows the items of the questionnaire.

Table 3. Items of the Questionnaire

Questionnaire items	**1 totally disagree**	**2 disagree**	**3 neither agree nor disagree**	**4 agree**	**5 totally agree**
1) When the enjoyment with Xeropan is gone, I become impatient.					
2) When I become stressed when solving Xeropan tasks, I know how to decrease stress.					
3) When the environment is uncomfortable during language learning, I start using Xeropan.					

Questionnaire items	1 totally disagree	2 disagree	3 neither agree nor disagree	4 agree	5 totally agree
4) I can use proper techniques when I solve Xeropan tasks					
5) I am satisfied with the methodology of Xeropan because it decreases language learning anxiety.					
6) When I use Xeropan I feel that I can more efficiently reach my language learning goals.					
7) I feel less bored when I use Xeropan.					
8) When using Xeropan, I can focus my concentration very well					
9) When I solve a task on Xeropan app, I do it as long as I have solved the task.					
10) When I get nervous while solving a Xeropan task, I give up and close the app.					
11) When I feel bored when learning languages, I open the Xeropan app.					

3) Finally, for the qualitative process, a five-question interview was edited in Google Forms for participants. It was requested from them to freely describe their responses based on their experiences. The qualitative method also provided useful data and information. The five interview questions were the following:

- Describe in a few words why you find Xeropan effective!
- Which of your skills has Xeropan helped you develop?
- Which curriculum element did you find most exciting?
- Write down some critical thoughts about Xeropan.
- If you were the developer, what would you change from a student perspective?

Results

The online post-test proved to be reliable (alpha=.79). Item analysis was also performed for all tasks. The item-total correlation indicator, which shows whether the item measures what the test as a whole, i.e., separates students with different knowledge from each other in the same way as the test. It was found that each item fits properly with the meter. In the offline pre-test (alpha =.81; M=8.09; SD=2.12), participants performed relatively poorly, however, there was a significant improvement (alpha=.79; M=16.72; SD=4.12) on the post-test. Investigating the impact, a significant improvement (t=2.82; p <.05; Cohen's D=.72) was also found. To calculate the effect size, Cohen's D was used, which indicates the difference between the two means divided by the standard deviation. Following the post-test, a delayed online test was also taken with the participants in

November 2019 (alpha=.82; M=13.78; SD=3.68).

Based on the results, it can be said that Xeropan contributed to the development of students' general English (L2). Since the pre- and post-tests were equivalent, i.e., each task was similar to items of similar type and word frequency rankings (see Vidákovich et al., 2013), the results were also comparable at the item level. In 17 of the twenty-six cases, based on t-tests, it can be stated that there was a significant difference, i.e. the participants performed better in the post-test (eg: Task 12: $t=1.26$, $p <.05$; Task 17: $t=1.86$, $p <.05$). Even in case of some items that were hypothesized to be more difficult, significant differences were observed (Task 5: $t=1.38$, $p <.05$). It can be said that the students significantly improved their performance compared to the pre-test ($t=2.82$; $p<.05$), although in the delayed post-test it was already found that some of the words and word chunks were forgotten; thus there might be some doubt concerning the storage of these items in long-term memory. This finding is similar to that of Vesselinov and Grego (2012). Furthermore, these findings support the results of Amer (2010) and Amirjosefi (2017). In order to get a clear picture of the operation of each element, item-by-item descriptive statistics were prepared (Table 4). All items underwent item-total correlation analysis and it was found that none of the items were outliers. It was clear to see that students performed best on Tasks 9 and 2 and weakest on tasks 21 and 25. By the end of the test, exhaustion might have set in and this may have also contributed to more frequent mistakes.

Table 4. Itemwise Statistical Data of the Post-Test

Item number	Mean	SD
1	.71	.36
2	.75	.16
3	.61	.42
4	.61	.42
5	.68	.32
6	.58	.32
7	.59	.12
8	.58	.17
9	.76	.19
10	.72	.24
11	.67	.49
12	.74	.24
13	.68	.49
14	.64	.12
15	.49	.26
16	.75	.19
17	.71	.27
18	.75	.29
18	.52	.12
20	.71	.18
21	.42	.19
22	.78	.21
23	.74	.26
24	.69	.16
25	.46	.18
26	.70	.26

To answer research question 2 (‘How useful do students find Xeropan?’), questionnaire data were analyzed. The questionnaire proved to be reliable (alpha=.82). Above all, each questionnaire item underwent item analysis and, according to the item-total correlation indicators, each statement fits the measure.

One item, “When I get stressed when solving Xeropan tasks, I know how to reduce stress” (M=4.25; SD=.78), has a fairly high level of agreement. This is in line with what Kétyi (2016) found in his research. Almost all participants fully agreed that the application reduces stress and language learning anxiety (Horwitz & Horwitz, 1986), which is an important factor in the language learning process. However, when participants reported data on whether they could achieve their learning goals more effectively and whether they were less bored, students were less confident (M=3.26; M=3.16). Overall, students found the mobile application effective and enjoyable, similar to the research found in the literature and described in the present study (Barnucz, 2019; Kétyi, 2016; Ockert, 2018, Wu, 2019). Table 5 shows the descriptive statistics of the online questionnaire.

Table 5. Descriptive Statistical Data of the Online Questionnaire

Questionnaire Items	M	SD
When the enjoyment with Xeropan is gone, I become impatient.	4.14	1.12
When I become stressed when solving Xeropan tasks, I know how to decrease stress.	4.25	.78
When the environment is uncomfortable during language learning, I start using Xeropan.	4.11	.98
I can use proper techniques when I solve Xeropan tasks	4.06	1.21
I am satisfied with the methodology of Xeropan because it decreases language learning anxiety.	4.12	1.12
When I use Xeropan I feel that I can more efficiently reach my language learning goals.	3.26	1.22
I feel less bored when I use Xeropan.	3.16	1.18
When using Xeropan, I can focus my concentration very well	3.88	.86
When I solve a task on the Xeropan app, I do it as long as I have solved the task.	3.76	1.14
When I get nervous while solving a Xeropan task, I give up and close the app.	2.72	1.41
When I feel bored when learning languages, I open the Xeropan app.	3.66	1.22

It is worth examining those questionnaire items for which a result was obtained close to the mean. For the statement ‘When I am nervous while solving a Xeropan task, I give up and close the application’, the average is 2.72, but here a value as close to zero as possible means that participants are likely to have a positive opinion about the application, i.e. they do not give up using the app. This might be the case also due to the high quality design and user experience. Similarly, the reverse statement is ‘I am less bored when I use Xeropan’, this questionnaire item also states that the closer it is to zero, the less bored the respondents are. As for the responses to the interviews, it was also confirmed that students find Xeropan a useful and effective tool, but also useful critical statements for the future, which can be discussed with developers to create an even better tool. This similar idea is described in Wang (2019).

The first interview element was an invitation for participants to describe why they found Xeropan to be effective. ‘It teaches with varied elements’ and ‘visual representation makes words more immersive and non-

boring' responses point in the direction that language learners find the application appropriate. The second question in the questionnaire focused on which element Xeropan develops. Students responded primarily that it helps develop grammar and vocabulary. The question about the exciting curriculum element provided clear answers. Everyone marked the artificial intelligence-supported dialogue in the app, although there was also a comment that they don't find it so useful yet. Here are some answers that have been found useful for development:

> Maybe practicing words could be more imaginative… Sometimes a lot of pictures, I can't focus on the task.

The last question 'If you were the developer, what would you change from a student perspective?' sought to place informants in the developer's perspective. Here are some answers:

> I would like it to be good that in some cases the Hungarian translation could be in addition to English… I would put more talking tasks and fewer pictures in it… Some figures are too childish.

As for some negative comments, one student indicated that 'I do not find Xeropan effective that much.' and it must be highlighted that two students wrote some critical thoughts. Some of their comments are reported here:

> 'I find some elements too playful', 'I would definitely change the design that is too childish', 'I miss translation practice', ' I miss productive tasks from the app', 'After some time, tasks become too repetitive', 'I find the matching tasks too easy and not challenging.'

A large number of conclusions may be drawn from these user statements and they have been. A new version of Xeropan came out in the summer of 2020 reflecting on user feedback. The design was changed and it does not have any more elements that would remind users of a game for under 10-year-old children. New tasks are considered to be integrated into the app. These tasks will require productive skills and translation will have a larger emphasis in some of the tasks. As for the repetitiveness, the developers are working on adding even more new tasks and elements to the app. In future development, it should be reconsidered that more illustrations for adults should be included in the graphics and that fewer images could be used.

Having investigated the descriptive statistics of the questionnaire results and having gained an insight into the items, factor analysis was conducted to check whether the two factors reflect the original conceptualization. After the factor-analysis had been conducted, it turned out that the previously conceptualized two factors, Cognitive and Affective factor existed on the basis of the results. The KMO-index was .72 which was an indication that the strength of the correlation between the two dimensions makes it moderately adequate for factor analysis. The factor-loadings over the .50 factor-loading limit (Everitt, 2002) were taken into account.

The correlation of the two variables with the results of the post-test was investigated. The Affective factor is significantly correlated in a strong relationship with the result of the post-test ($r=.82$, $p<.05$); however, the Cognitive factor did not show a significant correlation with the post-test result ($r=.61$, $p>.05$). This outcome is an indication that gamification exerts an influence on language learning because of emotional factors. It must be added that based on the z-test ($z=2.42$, $p>.05$), it can be concluded that there is no significant correlation

between those of the Cognitive and Affective factor with the post-test result.

To further get an insight into the relationship between the impact of Xeropan and self-regulated motivation, two sub-samples were created. One sub-sample was created out of the four best achieving students and the other was created out of the four worst achieving students regarding the scores on the post-test. The answers given on the questionnaire were taken into consideration. Grounded on the t-tests, three items were found to show a significant difference between the answers of the best achieving group and those of the worst achieving group (Item 2: $t=2.12$; $p<.05$; Item 5: $t=1.18$; $p<.05$; Item 10: $t=1.65$; $p<.05$). All of these items belong to the Affective variable of the self-regulatory motivation construct. Thus, it can be concluded that emotion control might play a vital role in the success of learning languages supported by digital technology.

Conclusions

The research presented here was a good starting point for further research examining the impact of Xeropan and compare it with other MALL applications. In order to draw through conclusions, an item analysis for the language test was performed. The construction of the tasks and the selection of the items were performed according to several criteria listed above. In the current research, it was found that the Xeropan application has a positive effect on language learning processes. There was a visible improvement in language learners, and at the level of some tasks, it was demonstrated that there was a significant improvement as a result of the developmental intervention using Xeropan. It was also found that students are satisfied to work with Xeropan and find that it has a positive effect on them.

Based on the results of the questionnaire, it is likely that the application is motivating for learners to learn independently. However, it was found that the affective variable of self-regulated motivation is more significant than the cognitive variable towards the impact of a gamified language learning app. It must be pointed out that the research was conducted with a relatively low sample size of participants, which is a significant limitation. Another drawback of the research is that there was no control group whose development and results could be compared to the progress of the experimental group (this deficiency was remedied in the fall of 2020 when the author of this study conducted a control group treatment with 312 primary school participants using Xeropan). However, some implications can be drawn from this study. Language courses in the 21th century are better off providing students with MALL part. Traditional offline language courses are legitimate but they can provide more robust service when supported by a digital app. Thus, after deducing some conclusions from the research conducted here it can be recommended that language course providers (state schools, language schools, adult education institutions) may have to tend to provide language education supported by gamified digital apps.

It is planned that in the near future, students of several different language levels will participate in the study. Unlike that used for the present research, the pre-test will be recorded online in the next research. Furthermore, it is planned to conduct focus group in-depth interviews with at least fifteen participants in order to gain even deeper knowledge about the impact of mobile application and mobile language learning in general.

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