The Design and Implementation of a Smartphone App to Teach English Language Components and Its Effect on EFL Learners' Achievement Motivation

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Abstract: The researchers applied a smartphone e-learning app run on the Android operating systemto teach English vocabulary and grammar and investigated its effectiveness in boosting motivation among English as Foreign Language (EFL) learners. The app was designed via Java programming tools and the Android development environment. To test the app's effectiveness, sixtyupper-intermediate EFL learners were selected to participate in the study. The participants were then randomly assigned to an experimental and a control group. At first, the participants in the two groups were administered a questionnaire on their achievement motivation. This was followed by twenty sessions of instruction based on the developed app for the experimental group, the traditional teaching practice by a teacher, and the textbook for the control group. After the instruction, the post-test of achievement motivation was administered to both groups. The Mann-Whitney U test showed that integrating the app in EFL classes can significantly affect the mastery and performance types of achievement motivation among language learners.

Keywords: achievement, motivation, multimedia/hypermedia systems, language learning Smartphone application

INTRODUCTION

The proliferation of information and communication technology (ICT) among people of different societies has revolutionized their lives. In fact, the application of technology to human

life has brought about dramatic changes in the industrial, economic, political, and civic structures of societies, and these have greatly influenced the life and work of people throughout the world. This, in turn, has significantly influenced the educational systems and has challenged traditional teaching and learning methodologies (Beniger, 2009).

The world of education today has shifted attention from teaching to learning. This approach places learning as the foundation of all programs, policies, and educational goals. The realization of the objectives of such an approach calls for a comprehensive understanding of the concepts of ICT to apply the available facilities in educational systems. Electronic learning (e-learning) as a new form of educational technology is one of the phenomena of the modern world that has been introduced to knowledge-based societies. The main feature of e-learning is its interactive communication. What is currently provided for us by e-learning is better methods for processing, giving meaning to information, and re-creating it more successfully (Bates, 2005; Kalyuga, 2007).

In the last decade, due to the rapid progress made in the field of ICT and e-learning, on the one hand, and the limitations and deficiencies of the traditional educational systems, on the other hand, there has been increasing use of new software and programs within educational systems. According to Parsons (2014), the advent of smartphones as learning tools in the teaching-learning process has influenced educational systems and has led to the development and emergence of various types of apps and software. Moreover, access to the Internet has increased the application of these softwares. This is manifested in comprehensive publications on the use of e-learning in education and its possible implications. The astounding rate of developments in the area of ICT has created an environmentin which all organizations and educational systems must brace for new and different learner needs to not fall behind in the path towards growth and development.

The development of ICT in educational programs has brought about qualitative changes in educational goals, methods and practices and has increased its general efficiency. It is anticipated that with the development of technology, longstanding dreams and unresolved issues such as applied education, need and ability-based education, student-centered environments, the changing role of the teacher to that of a guide, and most importantly, the issue of lifelong learning are realized. The main philosophy behind the emergence of e-learning is the removal of time and space constraints from teaching and providing an education independent of time, space, and language. According to Bates (2005), E-learning is trying to create qualitative and cost-effective education and can play a significant role in providing education to larger groups of societies. In e-learning, contrary to traditional education, the focus is on autonomous learning. The ICT-based teaching methods help teachers and learners to work on a learner-centered approach.

In today's fast-paced world, many traditional teaching methods will not be effective in meeting the needs of the learners and will not have the power to transfer modern concepts and ideas. Therefore, it is necessary to make the best use of the tools that modern technologies have provided us with. Based on the results of a three-year-old ethnographic study, Ito (2009) explored the use of new multimedia tools. Results suggested that social networks, video games, online games, and mechanical appliances are now an indispensable part of youth culture as today's youth strive for independence and identity. The digital world has created new opportunities for young people to develop social norms and discover their favorite things.

Mobile phones, with their pivotal role in students' everyday lives, have also been investigated widely. Shadiev, Hwang, and Huang (2017) reviewed the recent literature on mobile language learning in authentic environments. They found that the most frequently used technologies in studies were smartphones, mobile phones, and personal digital assistants, whereas the most common target language was EFL. Hsu (2013), moreover, investigated the students' perceptions of mobile-assisted language learning (MALL) through cross-cultural

analyses and found significant differences among participants of different cultural backgrounds. However, all participants agreed that MALL is a potential tool for constructivism in EFL learning.

During the past century, English teaching programs have been trying to promote language teaching to result in autonomous learners equipped with applied communicative competence (Kumaravadivelu 2006). Therefore, user-friendly educational software and apps that can deliver high-quality images, texts, and sounds can provide the learners with valuable and exciting educational content. However, there is the potential danger of teaching and learning being disrupted by Smartphones being applied without necessary precautions (Godwin-Jones, 2008, 2017).

BACKGROUND OF THE STUDY

Language Learning Motivation

Psychologists, as well as researchers in the area of second language acquisition, have been constantly concerned with unraveling motivation as a multifaceted variable affecting language learners. To come to an understanding of the concept of motivation, psychologists have focused on two focal research traditions, namely motivational psychology which links behavior to motives stemming from human mental processes (e.g. expectancy-value theories, self-determination theories, goal theories, etc.) and social psychology which looks at the action in the light of a broader social and interpersonal context, as reflected primarily by the individual's attitudes (e.g. the theory of reasoned action, the theory of planned behavior, etc.), (Dornyei, 2001).

To account for this seemingly complex construct in the field of foreign/second language learning, previous research has followed the same tradition as in general psychology. Social psychology, in particular, was in vogue when Robert Gardner (1972) proposed his influential motivation theory. Since then, much research has been conducted on the dichotomy of integrative-instrumental motivation (two orientations that have become the most widely known concepts associated with Gardner's work in the L2 field) in second/foreign language motivation studies.

One prominent and highly potential area of academic motivation research which has been greatly studied in education and educational psychology but unfortunately has remained relatively unexplored in L2 motivation research is goal theories. This research area on general human motivation focused on basic human needs as the source and reason for motivation. The most important such paradigms are Ausubel's (1968) drive theory and Maslow's (1970) hierarchy of needs theory. In the current research, the concept of "need" has been replaced by the more specific construct of a "goal" and achievement goal theory has emerged as one of the most prominent theories of motivation over the last 30 years (Senko, 2016).

Achievement-goal orientation is defined as the set of purposes or reasons a learner may have for performing an academic task (Ames, 1992; Dweck & Legget, 1988). Initially, achievement-goal theory discussed two types of achievement goals, mastery and performance goals. Mastery orientation, also labeled as "task involvement goals" or "learning goals" is described as a student's wish to become proficient in a topic to the best of their ability. The student's satisfaction with the work is not influenced by external performance indicators such as grades. Students with a Performance approach goal orientation also labeled as "ego involvement goals", on the other hand,want to demonstrate their ability relative to others or want to prove their self-worth publicly.

Later Elliot and McGregor (1999) proposed and tested the distinction between performance-approach (gaining favorable judgment) and performance-avoidance (avoiding negative judgment) motivation suggesting a trichotomous framework consisting of mastery goals, performance-approach goals, and performance-avoidance goals. Subsequently, Elliot and McGregor (2001) tested and supported a 2 x 2 achievement goal framework. This framework emphasized the mastery-performance distinction leading to four types of goal orientations: performance-approach, performance-avoidance, mastery-approach, and mastery-avoidance goals.

Adopting a trichotomous framework, Elliot and McGregor (1999) studied the relationship between achievement goals and exam performance in normatively graded college classrooms. Their findings suggested that mastery goals are positive predictors of deep processing, persistence, and effort; performance-approach goals are positive predictors of surface processing, persistence, effort, and exam performance; and performance-avoidance goals are positive predictors of surface processing and disorganization and negative predictors of deep processing and exam performance. Similarly, Wolters (2004) examined how different components of achievement goal theory were related to achievement in mathematics. He found that a mastery orientation is not predictive of teacher-assigned grades, whereas performance and performance-avoidance goals were associated with higher achievement.

Although goal orientation theory has been greatly researched in education and educational psychology, it has yet to be explored in L2 motivation research. Given the potentiality and prominence of achievement goal theory to account for educational matters of importance, the need is felt to incorporate more of this research area in studies of second/foreign language learning motivation. This study, therefore, adopts the dichotomous view of motivational goals as its theoretical foundation to investigate the effectiveness of a language learning app in boosting motivation among learners of English as a foreign language.

Technology and Language Learning

One basic requirement for any language teacher is to create the appropriate context for learning to occur in the classroom, provide opportunities for the students' curious minds to be stimulated to grow, and eliminate emerging learning obstacles. So, the first teaching step is motivating the students to pursue their learning goals. This motive can arise either verbally or nonverbally. Students need to know what they are supposed to learn and why. Linking educational content with student experiences, for instance, is one way to motivate struggling readers (Guthrie & Davis, 2003). Researchers have always been looking for answers to fill in the learning gaps, addressing the problems and deficiencies of the teaching and learning process. They have been looking for ways to change mundane, dull, and everyday exercises into interactive and enjoyable learning experiences for students so that students may understand the underlying principles and concepts more deeply. Accordingly, many educational systems in recent decades have tried to improve learning by introducing and applying modern technologies.

On the other hand, the influence of emerging forms of technology such as educational software, smartphone applications, and games with their capabilities and features has gone beyond the traditional media such as television, radio, and cinema. Just like watching a movie, the user encounters a narration when using these new technologies, with the difference being that in cinema or television, this story is usually closed, while in such softwares these narratives are mainly open which provides the user with a sense of autonomy. Of course, exposing people (usually children and teens) to these media is more involving than being exposed to television programs and movies since these software programs incorporate many learning principles, such as conceptualization, practice, repetition, rewards, and reinforcement. Educational software

can subconsciously teach children the skills that make them successful in their future careers (Ager, 2013).

The impact of online networks on learning different aspects of the English language, such as conversation, reading comprehension, writing, and grammatical expression has been investigated widely (Kiu, Moore, Graham & Lee, 2002). Most studies conclude that using ICT features can help learners improve their proficiency in terms of different skills and components of the English language. Nakata (2011), for instance, found that in general, most flashcard software has been developed to maximize vocabulary learning. Similarly, Li and Cummins (2019) revealed that there are overall positive experiences in learning academic vocabulary through the intervention of texting. In addition, Samuel and Baker (2006) examined the impact of using computers and educational software as tools for learning English and found that these tools can save time for teaching and increase the depth of learning the material among students. Following the same line of research, Li and Hegelheimer (2013) developed and implemented a web-based mobile application, Grammar Clinic, for an ESL writing class. The progress made by students while working with the app was reported as reflecting their self-editing improvements. However, as Smith and Wang (2013) argue, several criteria need to be met before teachers can ensure the effectiveness of mobile apps. These include measures to engage and give students incentives and monitor their progress.

Therefore, educational games and software have become a socializing entity that reduces the age of impact and plays a more powerful role in transmitting cultural artifacts to children than traditional media. Hence, game and software developers have developed a multifaceted toolkit in terms of scenarios, highly simulated to real life in terms of graphics and closer to everyday life. Among the positive outcomes of the use of technology, one can refer to the coordination of hands and eyes, better understanding of space, increased knowledge of vocabulary, as well as increased social experience. (Campbell & Jane, 2012; Chiu, 2013; Fogg, 2002; Kebritchi, 2007).

Interest is another feature that distinguishes educational software from other media. The question is to what extent is this interest realized and shared by language learners themselves? (Ushioda, 2013). Boling and Lee (1999) argue that educational software or computer games can help organize motivational thinking and maintain motivation during activities. Based on their study, the learners first become involved with an exciting and intriguing computer game and then continue to communicate their educational needs and training provided in a game that repeatedly creates learning situations for them. On the one hand, this process creates a lot of motivation for the learner and on the other hand, it increases satisfaction by reinforcing the learning objectives presented in various situations. Jung (2014) refers to innovation and computer self-efficacy as having significant effects on satisfaction with ubiquitous learning and positively affecting student expectations.

The Design of the App

The objective of the present study was to create a smartphone app to teach English components embedded in the course material with an easy-to-use, user-friendly interface. Using the touch technology on smartphones, the researchers attempted to teach the necessary materials quickly, and easily, without complex interfaces. Also, using the Java programming language and the Android Studio environment as the development environment for Android apps, the researchers created a simple application designed to motivate the students toward the learning objectives with the help of the computer engineering department. The design model included four steps: planning, designing, production, and assessment. Every step was followed carefully in order to come up with the final version.

Several forms were used in the final version of the app. The welcome page (figure 1) pops up when the app is run. This is followed by the main menu (figure 2) in which the course

content is organized into four sections: vocabulary, grammar, and sensational sentences (titles in Persian).

Figure 1. Splash screen form

Figure 2. The main menu

Touching the vocabulary section will lead to the vocabulary list form (figure 3) where the learners can see the phonetics alphabet and listen to the correct pronunciation of each word.
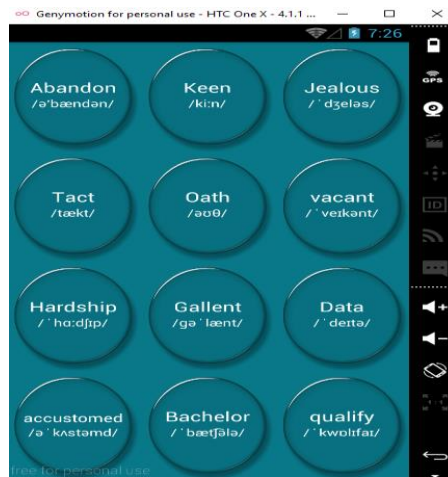
Figure 3. Vocabulary list form

Words are presented with their Persian equivalent as well as sample sentences and related images for a concrete lexicon. It is also possible to search for specific vocabulary items using the word search form (figure 4).
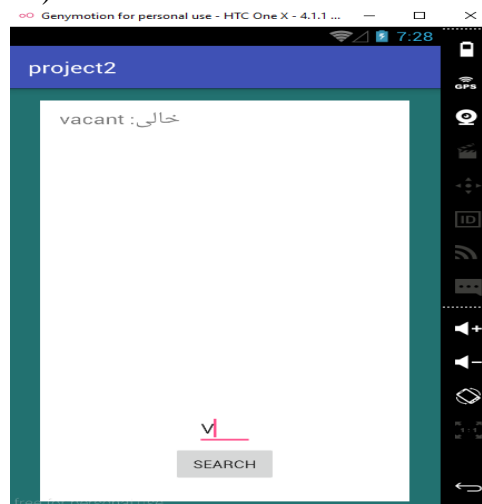

Figure 4. Word search form

The grammar of each unit is explained in simple terms using the students' native language (Figure 5). The students can read over the instances for which a specific grammar point is used.

Figure 5. Sample grammar page

Finally, to increase involvement and motivation, sensational sentences accompanied with pictures are included based on the lexical items involved in chapters (figure 6).

Figure 6. Sensational sentences form
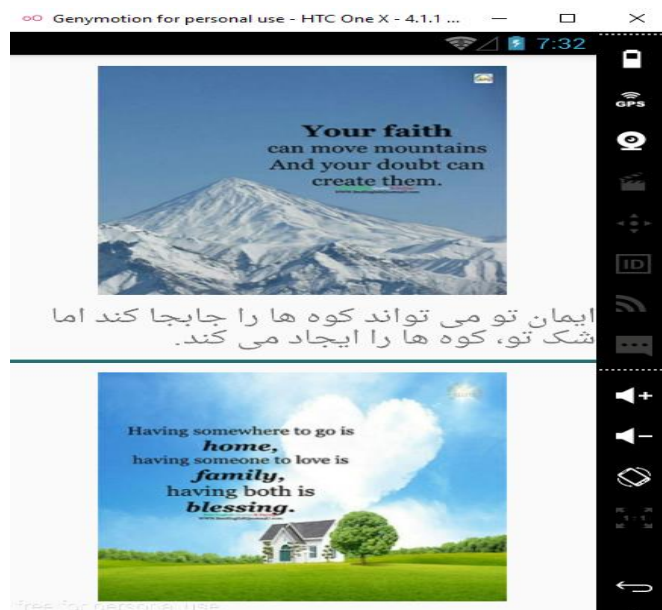
METHODS

To test the effectiveness of the designed app, 60 intermediate language learners (21 males and 39 females) enrolled in EFL classrooms in Tarjoman language institute were selected to participate in this study. These students who were homogeneous in terms of their language proficiency based on the required language proficiency test run earlier by the institute,and had

no previous experience practicing their English outside of an EFL context were then randomly assigned to an experimental and a control group separately.

Participants' motivation were assessed using a questionnaire (see the appendix) developed by examining and deriving items from similar questionnaires mainly used in studies of psychology, such as the one by Elliot and Church (1970), and insights gained from textbooks on how to design questionnaires namely the one by Dornyei (2003). This 16-item questionnaire uses a 1 to 5-point scale showing the extent it corresponds to the participant's goals for working on their English. There are two subscales: mastery and performance goals. Each subscale contains eight items, and the internal consistency of each subscale in the present study is found to be fairly high (mastery: Cronbach alpha= .84; performance: Cronbach alpha= .96). The mean score on each subscale then showed the intensity of the goals which students adopted in their classroom. The overall reliability of the questionnaire was found to be .91 for the present study and context.

The questionnaire was administered as both the pre-test and post-test at the beginning and also a week after the final session of the course. Before the questionnaire was administered, students were provided with an explanation of the purpose of the study and assured that the results would have no influence on the course outcomes. Students were also encouraged to ask questions and seek clarification if needed. Later, the items and students' responses to the questionnaire were codified and entered into the SPSS program.

The collected data from pre-test and post-test were analyzed to investigate the effect of the developed app on language learners' motivation. Mann-Whitney U test was used to compare the means of pre-test and post-test scores in each group and between the two experimental and control groups. The independent variable in this study was the use of the developed app, intervention was carried out as a process of twenty sessions in the experimental group and the dependent variables are the motives for advancement which could be either mastery or performance.

RESEARCH FINDINGS

Descriptive statistics for the pre-test scores of the mastery and performance motivation types

Achievement motivation questionnaires with two subscales (mastery and performance) were administered to both groups to evaluate the possible initial differences between the two groups concerning the level of motivation prior to the study (Table 1). The non-parametric Mann-Whitney U Test was used to examine the possible differences between the two groups on their levels of mastery or performance motivation at the beginning of the study. In other words, it was run to determine if the control and experimental groups differed in terms of the levels of mastery and performance types of motivation.

Table 1: *Medians of the Groups for the Pre-Test of Mastery and Performance*

Groups			Mastery	Performance
Control (Regular teaching group)	N	Valid	70	70
		Missing	0	0
	Median		2.7681	2.7523
Experimental (App group)	N	Valid	65	65
		Missing	0	0
	Median		2.8237	3.1384

Concerning the pre-test of mastery motivation, the median for the control group was 2.76 and for the experimental group equaled to 2.82. Similarly, with respect to the pre-test of performance motivation, the median of the participants in the control group was 2.75 and for the experimental group amounted to 3.13. Mann Whitney U Test examined if these differences in medians were statistically significant for the mastery and performance scores at the beginning of the study. The results are available in Table 2 below.

*Table 2: Mann-Whitney U Test for the mastery and performance motivation of
the Control and Experimental Groups (pre-test)*

	Mastery pre-test	Performance pre-test
Mann-Whitney U	91.000	61
Z	-.595	-1.470
Asymp. Sig. (2-tailed)	.617	.103
Exact Sig. [2*(1-tailed Sig.)]	.612b	.103b

a. Grouping Variable: groups
b. Not corrected for ties

The Z value and the significance level can be observed in the above output. In Table 2, for the mastery motivation, the Z value was –.595 with an asymptotic significance level of sig=.617 two-tailed. The probability value (p) was greater than .05, so before introducing the specific treatment to the experimental group, the differences between the two groups were not statistically significant in terms of mastery motivation. In addition, for the performance, the Z value was –1.470 with asymptotic significance level of sig=.103 two-tailed. The value of P was greater than .05, so again it can be concluded that at the beginning of the study, the differences between the two groups were not statistically significant in terms of performance motivation, either. This means that, the "control and experimental groups" are nearly the same in terms of their mastery and performance motivation levels at the beginning of the study.

Descriptive statistics for the post-test scores of the mastery and performance motivation types

At the end of the study, the motivation questionnaire was administered to both groups once more to inspect the possible changes in the measures of mastery and performance levels. In other words, it was re-administered to examine the possible differences between the two groups with respect to the extent of mastery and performance motivation types after implementing the specific treatment to the groups. The results of descriptive statistics for the post-tests of mastery and performance subscales are presented in Table 3 below.

Table 3: Medians of the Groups for the Post-Test of Mastery and Performance

Groups			Mastery (post-test)	Performance (post-test)
Control (Regular teaching group)	N	Valid	70	70
		Missing	0	0
	Median		2.5123	2.0970
Experimental (APP group)	N	Valid	65	65
		Missing	0	0
	Median		3.1118	2.5700

When it comes to the post-test of mastery motivation, the median for the control group was 2.51 and for the experimental group equaled3.11. Moreover, concerning the post-test of performance motivation, the median of the participants in control group was 2.09 and this amounted to 2.57 for the experimental group.

App integration and mastery motivation

To examine if the app's integration had any statistically significant impact on Iranian intermediate EFL learners' mastery type of motivation, the non-parametric Mann-Whitney U Test was used and reported in Table 5 below.

Table 5: Mann-Whitney U Test for the mastery motivation of the Control and Experimental Groups (post-test)

	Self-confidence (post-test)
Mann-Whitney U	61.320
Z	-2.012
N	135
Asymp. Sig. (2-tailed)	.021
Exact Sig. [2*(1-tailed Sig.)]	.013b

For the mastery motivation, The Z value was –2.012 with a significance level of p=.0121 two tailed. The probability value was lower than .05, so the result was statistically significant. Therefore, it can be suggested that there was a statistically meaningful difference in the degree of mastery motivation between the control and experimental groups at the end of the study. Thus, it can be implied that the integration of app had a statistically significant impact on Iranian intermediate EFL learners' levels of mastery motivation.

App integration and performance motivation

Similarly, in order to determine whether the integration of the app had any statistically significant impact on intermediate EFL learners' performance motivation, the non-parametric Mann-Whitney U Test was used. In other words, it was run to determine if the experimental group differed from the control group in terms of their performance motivation after receiving the specific treatment on app integration. The results are presented in Table 4 below.

Table 6: Mann-Whitney U Test for the performance motivation of the control and Experimental Groups (post-test)

	Performance (post-test)
Mann-Whitney U	79.600
Z	-2.009
N	135
Asymp. Sig. (2-tailed)	.041
Exact Sig. [2*(1-tailed Sig.)]	.037b

Based on the table, the Z value was –2.117 with a significance level of p=.034 two-tailed. With a probability value lower than .05 we can come to the conclusion that the result was statistically significant. In other words, there was a statistically meaningful difference in terms of the level of performance motivation between the control and experimental groups after the treatment. Thus, one can come to this conclusion that app integration had statistically significant impact on improving intermediate EFL learners' performance motivation.

CONCLUSION

Based on the results of this study, we can conclude that integrating an app to help language learners master language components such as vocabulary and grammar can bring about motivation both in terms of mastery and performance. As the treatment in the experimental group evolved, it was seen that learners were eager to participate more and more in classroom tasks. Results showed that they were more motivated than before and showed fewer signs of inertia and passiveness. There is a relationship between motivation subscales and the willingness to talk and participate in classroom activities. A learner suffering from low motivation levels either mastery or performance, was seen to be reluctant to get involved in classroom activities. These results are in line with previous studies in which technology attributes are found to facilitate and keep the students motivated (Boling& Lee 1999; Huang et al. 2010; Kang 2012) and that they can have significant effects on satisfaction (Jung, 2014). This conclusion is also congruent with the views of Olleveno and Taylor (2000), who also found that the use of technology, such as software and computer games provide opportunities for students and stimulate and motivate them to make significant progress toward their educational objectives.

Bringing about mastery motivation suggests that the use of the app motivates language learners to master new things to the best of their ability and increase their competence. The sense of satisfaction with the work is less affected by external performance indicators, and participants do not work on their English solely to avoid negative judgments from others. In line with these findings, the use of app in this study encouraged the students to attempt for higher order levels of understanding or for the general sense and value of the course material, rather focusing on surface-level understanding.

Similarly, app integration also motivated the language learners to remember facts and details so that they can avoid performing poorly in the classroom and examination. They were also concerned about how they would perform in comparison with their peers in the classroom. As they find it easier to practice language components, they are inclined to prove themselves and demonstrate their abilities in comparison to others.

One argument for making these conclusions is the intrinsic motivation which is brought about by the use of apps. In fact, one can discern the three pillars of motivation in integrating apps as language learning tools namely, autonomy, mastery and purpose. Language learners are allowed to work on their grammar and vocabulary in their convenience instead of practicing language within the traditional teaching contexts. Autonomy is considered as a basic element in bringing about motivation (Gillard, et al. 2015). In addition, learners approach the learning task with the purpose of mastering the content to the best of their ability which can be a much greater incentive for them than studying to pass a compulsory language course. Additionally, the mobile app makes the learning experience more interesting and fun for language learners compared to traditional classrooms that rely mainly on the textbook. Therefore, teachers can use mobile apps as educational tools to support classroom language learning.

However, the kind of feedback provided by students as they work with the app is an area which needs more exploration. Most students in this study believed that the app was very useful in helping them broaden their understanding of the new language items. The main reasons that students cited for their perceptions on the usefulness of the app were the autonomy that the application provided them with. Of course, using this approach seems to be more appealing to some of the learners with specific learning style preferences which could be a topic for further research. Future research, moreover, should examine the specific grading practices used by EFL instructors and their expectations and conceptions of good versus poor foreign language learners with a focus on several different apps.

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APPENDIX

Motivation Questionnaire

Gender: MALE ☐   FEMALE ☐   Student Number: ……………

- Dear respondents; below are some general statements regarding your goals for working on your English. For each item please indicate your response by ticking the appropriate box.

1. Strongly agree   2. Agree   3. Neutral   4. Disagree   5. Strongly disagree

	1	2	3	4	5
1. I work on my English because*I want to learn new things as much as possible.*					
2. I work on my English because *I always want to be better than other students.*					
3. I work on my English because*I want to understand the contents of my courses as thoroughly as possible.*					
4. I work on my English because*I want to show other students that I am smarter.*					
5. I work on my English because*It is what makes me think.*					
6. I work on my English because *I want to show others that I am good at it.*					
7. I work on my English because *I want to increase my level of competence.*					
8. I work on my English because*I want to make my classmates have a high opinion of me.*					
9. I work on my English because*of the excitement I feel when I am engaged in it.*					
10. I work on my English because *I want to outperform my peers in the classroom.*					
11. I work on my English because*of the satisfaction I experience when I am perfecting my abilities.*					

12. I work on my English because *I want to look good in my teacher's eyes.*					
13. I work on my English because *I like the challenge of the course work.*					
14. I work on my English because *I want to demonstrate my ability relative to others.*					
15. I work on my English because *I want to improve my language skills.*					
16. I work on my English because *I want to get better grades than most of other students.*					

Mastery: 1, 3, 5, 7, 9, 11, 13, 15

Performance: 2, 4, 6, 8, 10, 12, 14, 16