MOBILE GAME APPLICATIONS (MGAS) FOR ENGLISH LANGUAGE LEARNING: A GUIDELINE FOR DEVELOPMENT

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Abstract - In the present globalised world, mastery of the English language is highly advantageous in business, politics, academia, and other arenas. Therefore, many non-English-speaking nations strive to develop their education systems to improve their students' English proficiency. However, attempts to teach English to a high level sometimes fail. Amongst the various factors that hinder English language learning, motivation is a significant contributor, and mobile game applications have significant potential to address this challenge. However, there are currently no integrated guidelines for selecting persuasive principles to develop effective mobile game applications; therefore, the objective of this study is to establish such guidelines. We have determined key factors that can enhance students' adoption and continued use of mobile game applications, and we propose comprehensive guidelines for mobile game application development to address the problem of student motivation. This guideline was then validated through an expert review.

Keywords - Persuasive Technology, Mobile Applications, Games, English Language, M-Learning.

I. INTRODUCTION

The teaching of the English language has become a cornerstone of education systems across the non-English speaking world. However, when learning English, students face various problems, such as a lack of well-qualified teachers, absenteeism, cultural barriers, and motivation. Among these factors, lack of motivation has been shown to surpass other reasons for which students leave English language courses before completion [1].

The increasing prevalence of and advanced growth in technology, specifically in the computing, digital, and affiliated domains, has led to the adoption of a technological approach to education [2]. Many of these educational technologies involve computers, electronic learning, mobile phones, and gaming applications. However, research in this area has demonstrated that the applications of these technologies also suffer from limitations. For example, computers have been found to have very little or no influence on learner performance, and electronic learning has failed to sufficiently motivate many students [3]. In the case of mobile phone-based tools, the motivation for learners is of limited duration, and this failure to sustain motivation occurs once the learner becomes familiar with the technology [4]. The learning effectiveness from gaming application-based tools is also questionable because learning content is not always integrated in an appropriate manner, and teachers may be suspicious of the effectiveness of gaming-based tools [5].

Improved game design could potentially address these underlying issues to produce learning tools that are more motivating and therefore more effective. Games, by their nature, are engaging, irrespective of the age group of the learner [6]. As such, games could be used to produce better language outcomes for both teenagers and children. Therefore, by combining these two key technologies, that is, games as learning tools and mobile phones, an enhanced form of English language learning could be achieved [7]. This learning mode uses both the ease of accessibility provided by mobile phones and the motivational drive offered by games [8, 9]. An earlier study demonstrated that mobile game applications (MGAs) sufficiently motivate learners and can positively transform the behaviours and attitudes of the user [10].

Upon undertaking the study of English language learning MGAs, we found that there were no persuasive principles to guide their overall development. Towards this objective, this paper identifies and describes guidelines for the development of MGAs that can deliver effective English language learning. This paper has seven sections. Section 2 presents some of the concepts used on this work. Section 3 explains the method used in our research. Section 4 shows important studies using persuasive principles, whereas sections 5 and 6 show, respectively, the development and the evaluation of our guideline, finally leading to the conclusion.

II. BACKGROUND

In this section, we introduce fundamental concepts and principles that serve as a ground for this work.

2.1. Lack of Motivation

Of the many barriers faced by students who wish to learn the English language, the motivation factor surfaces most persistently [11,1]. This problem is highly relevant to the development of a language

learning course that can effectively motivate students. On the other hand, games can influence user attitudes [12], and when game learning is applied to support students with their studies, the game enhances the students' levels of motivation [13]. Fogg [10] reported that mobile and computer games are particularly beneficial tools for enhancing student learning. Liu and Chu [8] and Kondo et al. [9] also studied computer and mobile electronic games and determined that these platforms offer positive learning possibilities. However, Moldenhauer[5] investigated computer games and determined that teachers are wary of the value the games actually offer. Asabere[14] also identified various issues that must be adequately addressed to make computer games suitable and effective learning tools.

In the context of this study, two of the key issues that can impact learner motivation are the lack of guidelines for language learning-based applications and the disregard on the part of researchers in terms of selecting appropriate techniques and tools based on suitable persuasive principles. These two key issues hinder the development of applications that could enhance learner motivation.

2.2. Mobile Learning

Mobile learning, widely called M-learning, refers to those processes that use mobile devices as learning tools[15]. Mobile phones offer most of the functionality of computers [16]. Furthermore, many learners already possess mobile phones irrespective of their age. In the case of children, their schools or educational institutes may permit mobile phone access once the schools become convinced of the mobile phone's utility for learning [17]. M-learning offers other advantages: it is cheaper than computer learning, it offers privacy and as an interactive form of technology, it enables effective feedback [18].

Mobile-assisted language learning (MALL) aids many language learning domains, including writing, listening, speaking, and vocabulary comprehension. MALL offers many additional advantages such as enabling collaboration, interactivity, blending, connectivity, portability, and spontaneity [19]. Although many studies focus on MALL content, studies are increasingly focussing on design instead [20,21]. However, MALL currently remains in the developmental phase and requires further robust and valid empirical evidence of its efficacy, as well as guidance for establishing which mobile technologies aid language learning [22, 23].

2.3. Mobile Game Applications (MGAs)

Games can be a valuable tool for learning because they can influence human attitudes, as some research has already shown [12]. Game-based learning is therefore being used to support student learning, partly by enhancing their motivation [13]. In comparison with earlier vocabulary-based applications, games offer added value; for example, a mobile learning application (MEL-original) was improved with adaptive intelligence and a gaming context, generating a new version called MEL-enhanced. This version was reported to be more engaging, enjoyable and interactive compared with the former [24]. Other studies have shown that the use of mobile games for student engagement and motivation improves student outcomes [8,9].

2.4. Persuasive Technology

Persuasive technology can be defined as an interactive computing system that is designed to change the behaviours or attitudes of the people who use it. Interactive programs gather information about the actions of users, which aids the users in attaining their respective objectives [10]. This system works by offering individualised suggestions, guides to activities, and/or encouragement.

For instance, in one study, the authors used a game-based application to create a game called Power Agent. This game encouraged families to reduce energy consumption within their houses. The game uses principles such as surveillance persuasiveness, self-mentoring, simulation, praise, cooperation, and competition. The end users were indeed motivated to reduce their energy consumption [25].

Several authors, including Fogg [10], Musa et al. [6], and Mintz and Aagaard [26] have analysed the effects of persuasive principles on encouraging usage and enhancing performance. These authors listed persuasive principles based on the tool [10], technique [6], and domain [26], respectively.

According to Fogg [10], the persuasive principles that could be used to develop mobile applications are as follows: (i) convenience; (ii) mobile simplicity; (iii) mobile loyalty; (iv) information quality; (iv) social facilitation; (v) social comparisons; (vi) social learning; (vii) competition; (viii) cooperation; (ix) recognition; and (x) mobile marriage.

According to Musa et al. [6], the principles of persuasiveness that need to be used for game-based application development are the following: (i) conditioning rewards; (ii) self-monitoring; and (iii) tunnelling.

III. RESEARCH METHOD

As shown on Fig. 1, the literature review conducted for this study failed to discover any existing guidelines for MGA development. Therefore, aiming at creating guidelines for future MGA development, we reviewed the literature on applications that adopted persuasive principles in other fields. The resulting guidelines were posteriorly reviewed by experts.

Health care and medical persuasive applications were reviewed to identify their strengths and weaknesses. This choice was made mostly because most of the studies regarding persuasive technologies have been done for health care.

In this study, four different language learning-based applications that employed persuasive principles to enhance language learning were

identified. However, despite a comprehensive and detailed search, we failed to find any research studies meeting these criteria.

In lieu of literature within the field of education, we present the literature on persuasive systems in the health care field, where this type of technology has been more pervasively adopted [27, 28]. We can then extrapolate the literature from the health care field to adopt it in language learning.

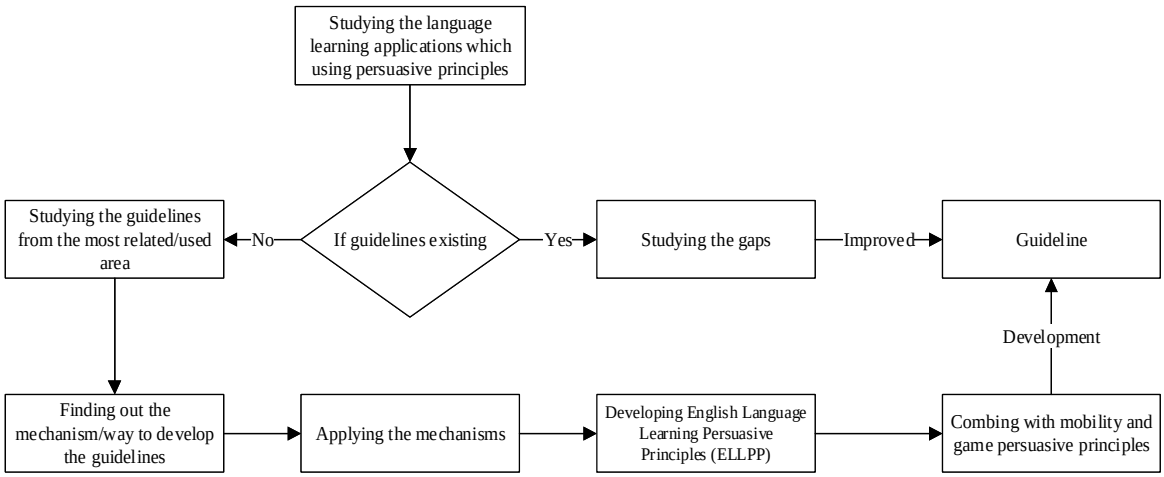


Fig1: Research Method

IV. PERSUASIVE STUDIES AND PRINCIPLES

4.1. Adopting Persuasive Technologies in the Language Learning Field

The educational studies that used persuasive principles in language learning applications are listed in Table 1: (i) the Euro PLOT Project (EPLOT) [29]; (ii) Reading & Writing Application (RWA) [30]; (iii) Malay language for disabled learners (DML) [31]; and (iv) ENGLISCH– Die Sofort Grammatik auf CD ROM (EA) [32].

Persuasive Principles	EPLOT	RWA	EA	DML
Reduction	✓		✓	✓
Tunnelling	✓		✓	✓
Personalisation				✓
Self-	✓		✓	✓
Credibility		✓		
Tailoring	✓	✓	✓	✓
Suggestion	✓			
Conditioning	✓			
Simulation	✓			
Social signals	✓			
Similarity		✓		
Praise				✓
Rewards				✓

Table 1: Comparison of the Principles Employed by the Educational Applications

4.2. Adopting Persuasive Technologies in the Health Care Field

Mobile health (mHealth) applications are widely used across public health and medical practices. Any mobile device can be used in a variety of ways within the field [33]. The persuasive technologies have been used across medical domains since such technologies were first introduced [28].

Many studies have proposed frameworks or guidelines for the use of persuasive systems in the health care domain [34]. However, these studies applied different persuasive principles and failed to consider website or mobile tools. Therefore, our study investigated several MGAs within the health care domain to determine if the principles underlying mobile games can be generalised to learning fields, as well as to identify the strengths and weaknesses of these systems.

V. GUIDELINE DEVELOPMENT

5.1. Establish Guidelines to Develop Language Learning Applications Based on Persuasive Technology

In contrast to the health care field, in the case of educational learning there are no guidelines for the development of language learning applications. Although the health care guidelines have yet to demonstrate utility for the development of health care applications, at least these existing guidelines could be reviewed to determine if they could be useful and applicable to language learning.

The PSD model presented by Oinas-Kukkonen and Harjumaa [35] classifies the persuasive principles in the following categories: social support, system credibility, dialogue, and primary task; these

classifications were applied to 28 different persuasive principles. Unfortunately, the authors failed to use a suitable set of principles with respect to mobility, as was done by Fogg previously [10]. In addition, the PSD model does not indicate by what process developers are to identify the principles relevant to their specific applications.

Guidelines save designers valuable time because they help them select a suitable set of principles for their targeted systems. All the persuasive principles suggested by previous studies could be used to improve user motivation and engagement, even when they are adopted individually. In addition, guidelines can offer a suitable range of principles that are relevant to distinct types of proposals.

5.2 Consider Tools, Techniques, and Domain When Selecting Principles

An application design should be optimised for its intended purpose. Tools, such as computers and mobile devices, have distinct functions and features, as considered by Fogg and other researchers. These researchers identified several principles relevant to tool considerations.

The techniques used to develop applications (e.g., game or non-game) are important because the relevant application will be designed based on the technique through which it is deployed. Most studies, especially those that used MGAs, disregarded mobility and game design and considered only the research problem and domain.

For the purposes of developing MGAs for language learning, it is essential to identify guidelines that provide developers with suitable principles. These principles should enhance the motivation of the learner. Furthermore, the guidelines need to consider the specific tool used (mobile) and technique (game) as well as domain (language learning) in order to select the relevant principles.

5.3 Guidelines for Mobile Game Applications for English Language Learning (MGAELL)

The guidelines mentioned in this study are expected to enhance learner motivation to return to the MGAs repeatedly to complete their specific subjects, as well as to address the security concerns of examiners and teachers. Table 1 illustrates the various principles that are recommended by the ELLPP (English Language Learning Persuasive Principles) study. These various principles are as follows: (i) reduction, (ii) tunnelling, (iii) self-monitoring, and (iv) tailoring.

The principles pertaining to MGAELL combine the game and mobility principles with those of the ELLPP as shown on Fig. 2. In addition, these various principles encourage learners to use educational MGAs (EMGAs).

The sustained usage of a specific application requires the design of compelling visual aspects as well as reward systems pertaining to EMGA. The various security issues need to be addressed to meet the demands of examiners and teachers to encourage their respective acceptance of EMGAs. All together, these principles comprise (i) convenience, (ii) mobile simplicity, (iii) mobile loyalty, (iv) mobile marriage, (v) information quality, (vi) JiTT or kairos, (vii) social facilitation, (viii) social comparison, (ix) social learning, (x) competition, (xi) cooperation, (xii) recognition, (xiii) conditional rewarding, (xiv) reduction, (xv) tunnelling, (xvi) self-monitoring, and (xvii) tailoring.

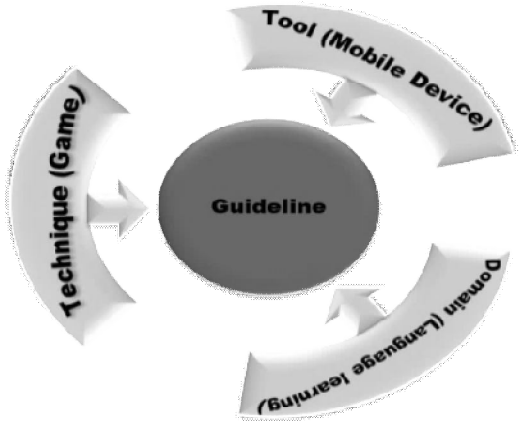


Fig. 2.MGAELL guideline

VI. GUIDELINE EVALUATION

To assure the validation of the proposed guidelines, they were submitted to a survey designed and analysed according to the approach presented by Khowaja and Salim [36].

6.1. Survey's Participants

This survey was distributed to some experts including academic staff, researchers and experts on Mobile Human Computer Interaction (HCI), Persuasive Technology, and Mobile Learning. These experts were found with Google search engine (http://www.google.com) and email invitations were sent to more than fifty of them, with ten confirming their participation in this study. The recommendations from these experts were also taken into consideration.

6.2 Instrument

The instrument used in this study is a questionnaire containing 7 questions. From Q1 to Q4, the experts were asked to evaluate the relevance, clarity and relation of each principle and if it required any additional information. The experts were asked to provide their opinions by choosing one of threeoptions ('agree', 'disagree' or 'not sure'). Information on the need to combine two or more principles together was obtained through Q5. Information about missing principles was obtained through Q6. Finally, Q7 allowed the experts to give remarks – an important feedback for helping us to better understand the experts' views. These questions are presented in Table 2.

Q#	Test	Options			
1	Is principle relevant?	Agree	Disagree	Not sure	For each principle element
2	Is the description of principles clear?	Agree	Disagree	Not sure	
3	Does the name and description of principles match each other?	Agree	Disagree	Not sure	
4	Does it require more details to be addressed?	Agree	Disagree	Not sure	
5	Do you think that some principles should be combined together? If so, please list them down with the description of the combined principles, and how combining them would benefit more than having these principles separated?				
6	Is there any principle that is missing? If so, please list down its name and description.				
7	Remarks (if any)?				

Table 2: Questions for Expert Validation

6.3 Survey analysis

The data provided by the experts was analysed using the frequency of responses in relation to the 4 questions (Q1 to Q4) seen on Table 2. The frequency was calculated as a sum of responses for 'agree', 'disagree' and 'not sure' among the 4 questions. The experts' comments for Q5-Q7 were studied to see if the experts dealt out similar answers. The procedure to check if the principle is valid is shown in Fig. 3.

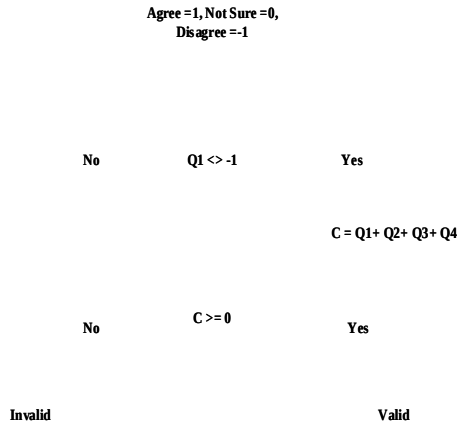


Fig. 3. Processing of Analysis

6.4 Survey result

The next step was to calculate all the experts' answers. The experts confirmed that all the guideline principles are suitable to develop a mobile game application for language learning – except Mobile Marriage principle, as shown on Table 3. Fig. 4 also shows that the guideline is 83% valid to be used for this kind of application. On the other hand, their comments did not add anything new to the guideline because they did not agree on the same answers; moreover, around half of them have not filled up questions Q5-Q7, leaving them empty.

Principle	Acceptance Rate (%)
Kairos	70
Convenience	70
Mobile Simplicity	80
Mobile Loyalty	90
Mobile Influence	60
Mobile Marriage	40
Mobile Quality	100
Social Facilitation	80
Social Comparison	100
Social Learning	90
Competition	90
Recognition	90
Self-monitoring	100
Rewards	90
Cooperation	90

Table 3: Results of Expert Validation

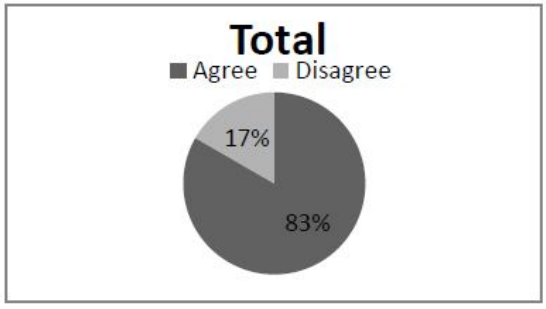


Fig. 4. Guideline Validation Percentage

CONCLUSIONS

This study has determined the key factors that are vital to enhance the adoption of MGAs by those who seek to learn English language to a high level. We have reviewed the previous studies on MGAs and affiliated subjects, and our survey discovered the myriad set of factors that must be considered to design a successful application.

Based on this review, this paper proposed guidelines for the development of successful MGAs by adopting persuasive technology. This study, strengthened by the results obtained from the validation of experts, provides game developers in the field of education with a pathway to evidence-based application development.

It is recommended that further studies be undertaken to apply the proposed guidelines in a real-life scenario through experimentation or other relevant

methods. In this manner, it will be possible to ascertain the validity of the proposed guidelines, as well as to propose suitable improvements and changes.

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