

# The MOBO City: A Mobile Game Package for Technical Language Learning

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**Abstract**—In this research we produced a mobile language learning game that is designed within a technical context. After conceptual analysis of the subject matter i.e. computer's motherboard, the game was designed. The action within the game is consistent to the theme. There is a story, simplifying and exaggerating real life. Elements of control, feedback and sense of danger are incorporated into our game. By producing an engaging learning experience, vocabularies were learned incidentally. Deliberate vocabulary learning games were also added to our package to help students solve their common errors.

**Index Terms**—Mobile learning, Educational games, Language learning, Vocabulary learning

## I. INTRODUCTION

Mobile learning offers the potential for radical change, not only in learning itself [1], but also in relation to the digital enfranchisement of previously-excluded populations in the developing world. In Iran, as a typical developing world country, there is massive pressure for educational development, in order to underpin industrial and economic development. The penetration of cabled access is low, reaching only a modest proportion of the population. Ownership of personal computers is also very limited, economic factors being compounded by problems of unreliable electricity supplies. On the other hand, access through the mobile phone system has the potential to be far more propitious, since the terminal hardware is far cheaper than a PC, has a more reliable power supply, avoids cabled connections, is already very widely deployed and has the great virtue of familiarity to a substantial proportion of the target audience. Following a study of opportunities for mobile learning in Iran it was recognized that most students in urban areas possess mobile phones and the only mode of communication available for rural students is that of mobile phones [2]. In the survey it was obvious that mobile phones are facilitating access to information amongst Iranian students. However, it is still not recognized as a training tool. In this paper we examine possibilities of using mobile games in language learning classes. References [3] and [4] developed several innovative projects using mobile phones to teach English by SMS. Unfortunately, problems with SMS teaching include its limited features and lack of students' engagement. It is not possible to keep students motivated. According to reference [2] 89% of students had WAP 2 enabled mobile phone and the use of Java mobile games is growing in Iran. Using games that

increase students' interest and simultaneously increasing their amount of practice of language is very appealing. Game-based learning can be viewed as a particular form of incidental learning where the learner is engaged in an activity that may not be directly tied to the task at hand. A detailed analysis of game playing and digital games for education has been provided in references [5] and [6]. Game-based learning has been proposed for Higher Education to motivate assignments, curricula, and undergraduate research [7]. A number of games, however, have been proposed and used for teaching English as a second language [8]. Mobile language learning games have been also designed, for example crossword game [9]. The research in this paper revolves around a Language Learning project using game for Iranian University students. The authors demonstrate that it can facilitate students' learning motivation and engagement in the interactive learning environment.

## II. THEORY

Modern linguistic theories of and instructions for second language acquisition emphasize greatly on the use of language for *meaningful* communication [10]. They argue, students can usefully be taught some non-language related subjects, such as history or computing, in a second language. The assumption is that the learners *would* acquire the second language simply by using it to learn the subject matter content, without the second language being the focus of explicit instruction. In this research we produced a scheme that pursues this line of theory. To teach technical English vocabulary to students, we chose to teach a technical subject (motherboard components), and we introduced necessary vocabulary indirectly during our instruction. Concept maps were used as a kind of *template* or *scaffold* to help us to organize computing knowledge. As a result the subject was divided into small units of interacting concept and propositional frameworks. This follows from Novak, who believes concept maps facilitate meaningful learning and the creation of powerful knowledge frameworks [11]. It seems evident from diverse sources of research that our brain works to organize knowledge in hierarchical frameworks and that learning approaches that facilitate this process significantly enhance the learning capability of all learners [12], [13].

Obviously, our brains store more than concepts and propositions. While the latter are the principal elements that make up our knowledge structures and form our cognitive structure in the brain, other forms of learning

exist such as *iconic learning*. This involves the storage of images of scenes we encounter, people we meet, photos, and a host of other images. These are also referred to as *iconic memories* [14]. While the alphanumeric images Sperling used in his studies were quickly forgotten, other kinds of images are retained for much longer periods. Our brains have a remarkable capacity for acquiring and retaining visual images of people or places, but soon forget the details [15]. To teach about computing, we integrated various kinds of images into our concept maps. The idea was to enhance iconic memory via conceptual frameworking. Therefore we used both visual and verbal mental imagery to relate a word to be memorized. By this stage the context is created in an organized structure but what is missing is the motivation of our students to use our materials. Most m-learning content tends to consist of summarized PowerPoint files, PDFs, WAP sites “gussied up” with graphics, photos and in advanced cases, videos. Providing some verbal or visual material to students without keeping them immersed and interested in context is not as useful as it could be. If we make the educational content more interesting, we can make it more effective. At its best, learning should be a wildly enjoyable experience. There should be joyous discoveries, satisfied completions and sudden recognitions. We need to address the emotional side of learning as well as the knowledge side. The other important factor in instruction is the “normal flow of learning”. Several researchers defined flow as “*the state in which we are so involved in something that nothing else matters*” [16]. Cleverly designed educational games can provide such a flow for an individual learner and keep them simulated throughout instruction. Interaction is another important aspect of educational games, which is proposed in game learning theories and models [17], [18] and [19]. The learner’s interaction with game is essential as it defines how could the learners control the game and learn from it. The interaction element adopted in our game uses the Interaction Cycle suggested by Barendregt and Bekker where the interaction between a user and a computer game happens in terms of cognitive and physical user actions. [18]. At the first stage, learners understand the rules and goals of each task in the game then they decide the actions to be taken to accomplish the task. After taking appropriate actions to complete the task, the game provides feedback to learners. Based on the feedback, learners evaluate whether the task is completed successfully or not. This is useful in deciding whether the learners have conceived the correct information. Learners will then repeat the interaction cycle on the same task or proceed to the next task. Motivation here is a key aspect for effective learning and is sustained through feedback responses, reflection and active involvement in order for designed learning to take place. Other factors that has an impact upon learners’ motivation in educational games relates to sense of challenge, game realism, opportunities to explore or discover new information. According to the researchers these motivational variables should be considered in game development and use [20], [21], [22] and [17]. These elements could greatly facilitate the learning process and has been incorporated in our game.

### III. METHOD

Our mobile game was designed to teach technical English to Iranian students in the University of Qom. The

package was produced as a platform-independent application. The chosen development environment was Java 2 MicroEdition (J2ME). After organizing the sources about motherboard components into concept maps, their corresponding environments and characters were designed and then the necessary vocabulary was inserted inside the game as a kind of verbal feedback and guide throughout the game.

MOBO city stands for Motherboard City because the game’s main theme is that of a motherboard. The metaphor is of a city where at different locations, electronic components are located, just like in a real motherboard. The complex task for the motherboard is to move data in the right order and right manner, to the right recipient. Our main characters are a red bus and its driver (Fig. 1 and Fig. 3). The bus represents a ‘motherboard bus’ whose its duty is to transfer information across the relevant components. The bus driver’s name is OS which is abbreviation for operating system. An operating system manages hardware and guides the flow of data; hence what drives and directs the bus of data is called OS. In the game the OS will do the paper work for data bus passengers in each station (Fig. 3 and Fig. 4).

Our game is an adventure where the player assumes the role of a character within a world of fantasy (Mobo City). The player can control his character and thereby cause the character to move about in the fantasy world, investigate and interact with whatever is encountered in the world. The character can, for example carry out dialogues with other characters in the fantasy, for example security men. The story begins when our red bus receives a new task, for example “There is some data just arrived from scanner ship, pick them up from USB port and take them to monitor theatre, where they have to perform a show that has been organized by Viewscan Corporation” which illustrates how scanned data is shown in a monitor, using Viewscan software. There is a clear goal that the player will be trying to achieve, i.e. to successfully send data to its destination, the monitor. This goal will provide a motivation for the action and a metric for attainment. The questions normally asked in the game are related to the computer’s common processes, such as accepting input, executing instructions, generating output and displaying or storing results. However it must be in accord with the game story, providing a task for the city bus. The bus has to move data through MOBO City passing through different components in the right order. For each question a flow diagram is produced.

The bus must reach its destination in order for a player to win a game. The game displays pertinent information related to the state of the game such as life points, which is initially 5, and the score, which is initially 0, in the information bar displayed along the top of the game screen (Fig. 1 and Fig. 2). The game finishes when the player loses all their life points. The game is not static; other characters such as virus ships can move about and act on their own. The bus must be aware of virus ships at all times, because they try to destroy the data bus (Figure 1). If hit, the player loses 1 life point. The game consists of a network of distinct physical *contexts* such as the rooms of an office or bus stations of a city. On the motherboard, next to each main component, there is a bus station or bus stop. A congratulatory message will be shown each time the bus passes through a correct bus stop, the player scores 5 and the bus moves on. Some

components have the sign of a station next to them which mean that some tasks which need to be done (Fig. 4). If the bus passes through the wrong component a ‘you are not allowed!’ message will be shown and the player loses 2 points. If the player passes through a component too early, a ‘come back later!’ message will be shown. Passing through a correct station produces a congratulatory message and the player gains 5 points (Fig. 1 and Fig. 2)

When a message page appears all virus ships will stop. We limited the message pages to a few seconds in order to avoid the players losing the game flow. In each different bus station, the physical feature such as background and characters are changed according to the kind of work that particular component involves. We made a concept map for each component, questioning: What parts does it consist of and what do they do? The graphic inside each component is produced according to its concept map. The bus driver OS moves inside the component. The component consists of rooms inside which there are different characters, each responsible for different kinds of jobs. The driver has to meet all of them, but in the correct order. The security men in front of each room help the player to get an idea of what job characters in each room are involved in. However, the player is constantly being followed by spy viruses that have escaped from the security men, in front of the station. If he is attacked by one of viruses, the player loses 5 points. Each time the player meets the correct character, he or she scores one point. The environment inside a CPU and the dialogue where the bus driver gets involved with different characters is shown in Fig. 3.

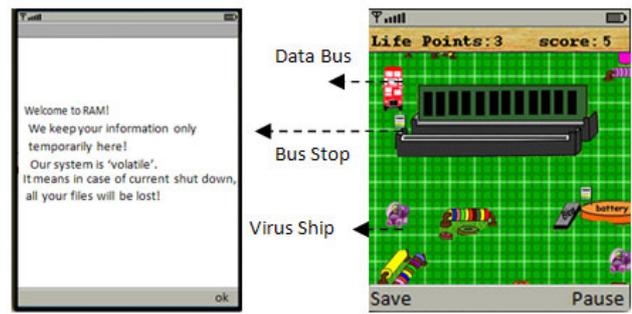


Figure 1. The game shows an appropriate message when the bus arrives at RAM bus stop.

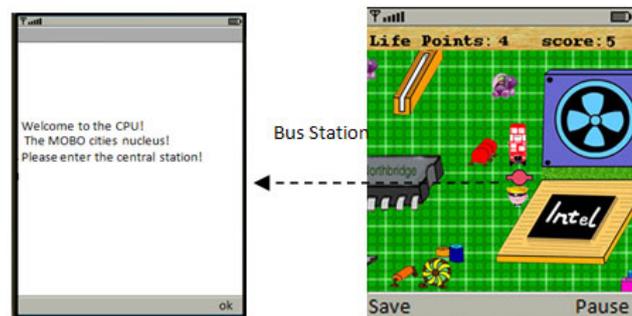


Figure 2. The Game shows an appropriate message when the bus arrives at CPU bus station.

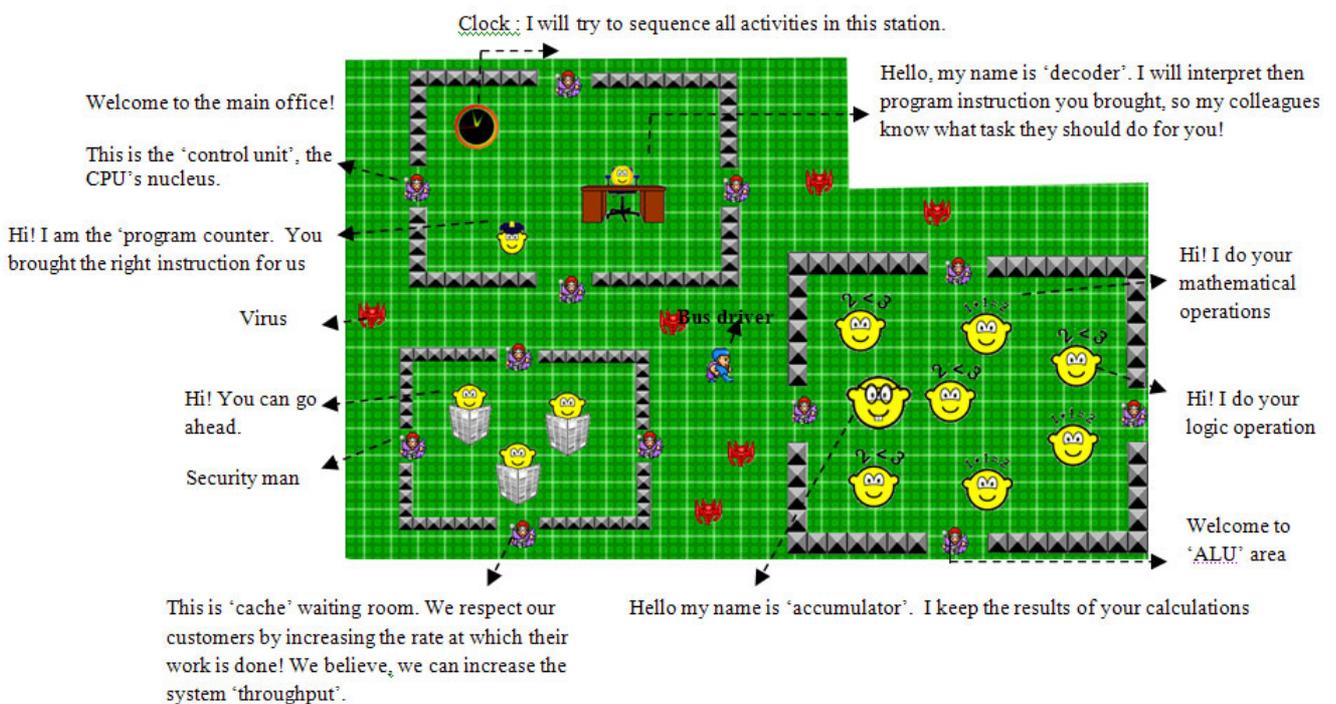


Figure 3. The game background inside the CPU

## IV. EVALUATION

Technical English course units are very important for computer engineering students because relevant textbooks are mainly written in English. Due to the nature of their field of studies, they have to extensively use the Internet, which is also dominated by English. The role of English in passing MSc and PhD entrance examinations is significant. Despite its importance, it is offered for only one semester during the student's four years of study and its lecture time is very limited, only 2 hours per week. On the other hand there are few lecturers that are both competent in English Linguistics and Computer Engineering. In addition to all this, the students' attitude towards these classes is that of weariness and it has very little appeal for them. 15 students from the third year of computing Engineering whose levels of English were as equal as possible were selected. We divided them into three groups, the first 5 tried to read a comprehension describing motherboard components without using a dictionary. The second 5 were asked to use the dictionary and to memorize a list of vocabularies and the last 5 were asked to play with our MOBO city game (Table I). Then, a list of vocabularies that all three groups have encountered in their tasks was presented to them and their level of vocabulary understanding together with spelling was examined.

The results show that students reading skill is very low, using the dictionary does help (Table 1). However it has two main drawbacks; first, it is a tedious job and students are often reluctant on using it; secondly they often only learn the first meaning and consequently it produces out of context learning. For example in this study the word 'nucleus' referred to 'a central part about which other parts are grouped or gathered' but in some dictionaries it is described as 'usually spherical mass of protoplasm encased in a double membrane' in other dictionaries as 'the positively charged mass within an atom' and others as 'a mass of nerve cells in the brain'. This is the result when the vocabulary is taught out of context. Computer students in our evaluation not only had a problem with second language learning, they also lacked some technical concepts of the motherboard and this made understanding the related comprehension very difficult for them. For example they were not familiar with vocabularies such as: AGP , PCI, Bios, expansion slot. MOBO city, by helping them learn the subject matter, helped them greatly in learning technical vocabularies. Below are listed the remarks of students' observations of the game:

*"The objective of the game was clear, we knew what was expected from us."* A basic rule of instructional design put forward by Gagne in 1965 seems far too

commonsense but still, inordinately, relevant today: to inform learners of objectives and goals [23]. These goals need to be presented early [20], need to be clearly stated and should be personally meaningful, obvious and easily generated [20].

*"The storyline was both fun and educational."* Designers need to tune the educational message to the content, in other words, game goals which are fun and learning goals need to be in harmony with one another.

*"It felt real, we got feedback for what we did and we should have been ready for dangerous surprises from viruses."*

In the real world we can control events and get perceptual feedback concerning what we have done, we must constantly be ready for dangerous surprises. Perhaps, when this sense of vulnerability in usual online learning is absent, our whole experience is sensed as unreal. By means of educational games we can invent virtual worlds that simulate this sense of reality for students.

*"The learning experience produced by game was neither too difficult nor too easy!"* The degree of difficulty is an important feature in games; for players to enjoy playing, the game must be neither too difficult nor too easy [24].

*"When playing the game I lost track of time."* What makes game learning so distinctive from other types of learning is its essence of flow, context, control and in brief immersion and engagement in learning, which is difficult to achieve with other types of learning.

*"After playing a game I could easily produce its concept maps, the learning really sticks in."* On the other hand, when the learners' 'heart and mind' are captured they are cognitively and effectively connected to a learning experience.

*"For the first time I was exposed to such a vast number of vocabulary at once, I really got to learn many words"* In a first language , as the learner encounters most words on a frequent basis in a wide range of contexts, the words are often learned incidentally in an incremental way. In a short space of time, a large number of words are thus learned and this lexical repertoire then forms the basis for learning other new words. In this research we tried to simulate the process of implicit vocabulary learning. A selected number of high frequency words were chosen and integrated in the game to help students learn incidentally. They were exposed to a large quantity of input, a condition that otherwise was impossible to achieve for non-native speakers. We provide a cumulative learning environment; different vocabularies were continuously encountered to allow the learning of each word to become stronger and to enrich the knowledge of each word.

TABLE I.  
RESULT OF HOW TO SPELL...? AND WHAT DOES...MEAN? FROM 46 VOCABULARIES.

Students No.	Group using reading comprehension					Group using dictionary					Group playing games				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Spelling Results	22	28	24	25	25	26	26	25	27	30	26	25	29	23	22
Meaning Results (answers in context)	9	15	16	19	13	30	25	12	20	35	41	35	43	37	31
Meaning Results (answers out of context)	-	-	-	-	-	15	12	10	12	10	-	-	-	-	-

However, they also showed that the learners continued to make certain persistent spelling errors, even after playing quite a few times (Table 1). In other words, a communicative approach helped learners to become fluent but was insufficient to ensure comparable levels of accuracy. It seems as if a certain amount of explicit instruction focusing on language form may be necessary as well. As a further refinement to our package we added a few word games and dictionaries to the package, focusing only on technical and non-technical vocabularies that students encountered in MOBO city games.

1. A word search game that comprised seemingly random letters arranged in a rectangular grid. A list of 10 hidden words is provided. The object of the game is to find and mark all of the words hidden in the grid. The first letter of each word provided the cue which was accessible by the command 'Cue' at the bottom of the screen.

2. A 'Butterfly shooter' game was created where a butterfly represented the player. The meaning of a random word was given at the bottom of the screen. By shooting the red bullet towards the rolling balls, one could choose one's desired letter. Each time a bullet hit the wrong letter, the butterfly lost a wing. On losing all its 6 wings, the game terminates. A bilingual single-field dictionary was produced that narrowly covered computer engineering terms, in Farsi and English.

## V. CONCLUSION

Effective learning cannot be achieved by only introducing different modes of learning, but also requires increasing students' motivation and keeping them motivated and engaged until the educational goals are achieved. In educational games, the learner will be immersed in the context which is achieved by designing a suitable theme appropriate to learners. Elements of control and a sense of danger were incorporated into our game and thematic feedback was delivered as appropriate. For example, if the learner has made an incorrect choice, dialogue from a character provided a feedback mechanism. All this produced an immersive experience that helped students learn vocabulary incidentally, as they were having fun. Deliberate vocabulary learning was also added to our package to help students solve their common errors. In this game we illustrated a simplistic illustration of components and different processes of computers. It is possible to elaborate on extra features and expand this game for the future. For example other kinds of buses such as control bus, address bus and power bus could be described. The motherboard has different components, and some motherboards are designed for multiprogramming and multiprocessing. There are many other examples that can be thought of. When adding new features and new components, new environments and characters must be designed. In the process, different storylines will evolve. Further learning content such as this can help to enrich the game further and to teach students even more vocabulary. Future work on this project will attempt to provide social interaction between students while playing. By adding Bluetooth capabilities, we are aiming to produce multiplayer version of this game. The shared experiences could greatly increase the appeal and longevity of the game and works as a powerful motivator to engage girls within the educational content.

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