



## Local content game: The preferred choice for mobile learning space

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Two studies to find out Malaysian students' preferences towards learning using mobile space are conducted. This first study is a survey gathered from 591 secondary school students, age 13 to 17 years old. The main objective of the survey is to acquire relevant data to support a mobile game-based learning (mGBL) development. The outcome of this survey indicates that almost 60% of the students prefer mobile phone as the chosen platform for game-based learning rather than other devices. Further finding suggests that, in order to provide successful learning environment for students; both entertainment and education values should be embraced, suggesting mGBL as the possible solution. Also, 83% stated that they preferred local designed characters with local culture based contents. Next, the second study determines what types of game characters appeal to the students. From this, two points are concluded, which are (i) local, appealing and well-developed characters are important elements to motivate students and (ii) local uniqueness must always be incorporated to increase mGBL acceptance.

Keywords: Mobile space, mobile learning game

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### Introduction

Mobile phones have become a part of personal accessories and are used extensively for communication and entertainment. Currently, mobile phones supports a wide variety of applications, which range from occasional uses of conversation and messaging system (text and multimedia) to taking pictures, playing games, listening to music, watching video, and getting information from the internet (Adobe, 2008), depending on the capability of each mobile phone technology and services offered. Newer developments in mobile phone technology are also beginning to offer the potential for rich multimedia experiences and a lot more extensive applications.

With the capabilities and popularity of mobile phone usage around the world, many research findings (for instance Naismith et al., 2006; Pachler, 2007; Cheung, 2004; Cochrane, 2005, 2006) show a global trend to incorporate mobile phones as well as other mobile technologies to increase the efficiency, cost effectiveness and quality of learning through mobile learning. Indeed, learning through mobile games is the most growing research area as identified by de Freitas (2006) whose discusses the uses of games for learning with adult learners.

Mobile game for learning or mobile game-based learning (mGBL) is a game specifically employed for learning which is also played on a mobile devices such as mobile phone, smart phone, PDA or handheld devices. The key aspect of mGBL is to use game play to enhance learning motivation, engage in knowledge acquisition and improve effectiveness of learning content transfer.

Mobile games are one of the fastest rising sectors of the game industry (IGDA, 2005) which can support the variety of game-based learning environments. Despite the various mobile learning examples provided through mobile phone services, more studies on mGBL need to be undertaken in order to comprehend the needs and requirements of the mobile phone users. Many information related to mobile game as a learning mode are left under utilized due to lack of literatures in developing mGBL.

Analyzing students' demographic characteristics, and their perceptions and thoughts in relation to playing mobile games is important. In the literature, several studies have been conducted to explore the educational potentials of games (in general, not for mobile platform) from students' points of view. For example, some researchers have concluded that gender differences have different expectations of computer games (Quaiser-Pohl et. al, 2006), and they also prefer playing different types of computer games (Chou & Tsai, 2007; Fromme, 2003). Therefore, in a quest of catering for the learning needs of students, this study seeks to understand their preferences in learning through mobile environment.

The paper is further divided into four sections. The first section reviews the current state of mobile phone subscriptions in Malaysia. The next section highlights the key aspects of the method used in this research. The results of two studies and key findings in relation to the objective of this study are analyzed and discussed. Finally some concluding comments are then offered.

## Current state of mobile phone subscriptions and contents in Malaysia

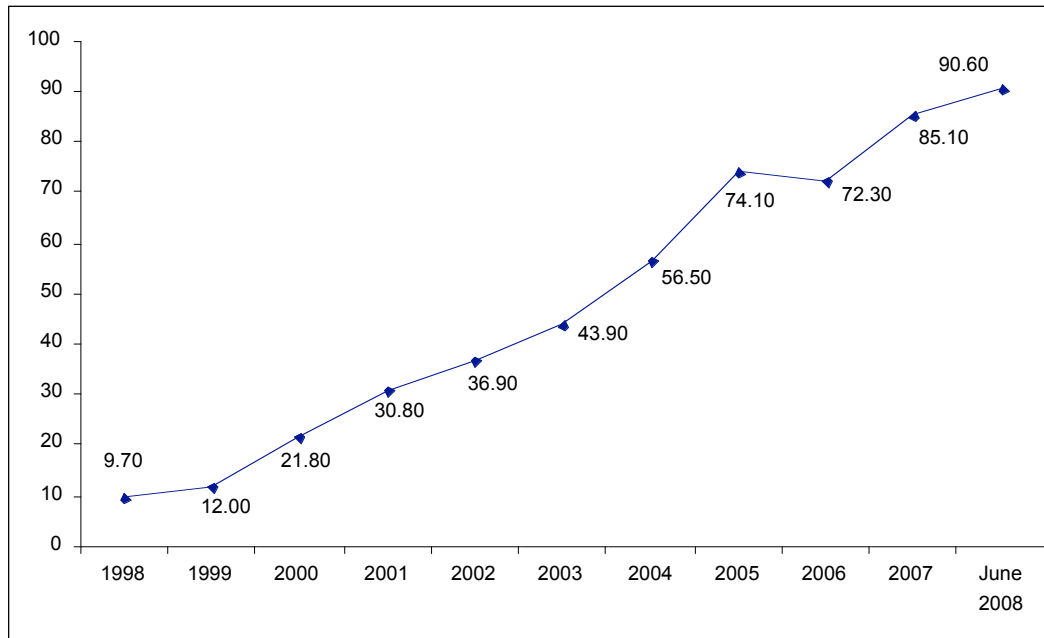
International Telecommunication Union (ITU) Telecommunication/ ICT Indicators Report (ITU, 2008) found evidence that ICT, broadband and mobile phone uptake foster growth and development in Asia Pacific region. In Malaysia, mobile phone subscriptions have reached 25 million in the second quarter of 2008. According to the research conducted by the Malaysian Communications and Multimedia Commission (MCMC), the number of wireless phone users has also exceeded those of the fixed lines (MCMC, 2008). Table 1 shows the statistic number of mobile phone subscriptions in Malaysia from 2005 to the second quarter of 2008.

**Table 1: Mobile phone subscriptions in Malaysia (MCMC, 2008)**

Year	Quarter	Postpaid ('000)	Prepaid ('000)	Total ('000)	Growth Rate (%)	Penetration Rate (%)
2005	1	2,628	13,201	15,829	8.3	60.9
	2	2,787	13,764	16,551	4.6	63.3
	3	2,896	14,655	17,551	6.0	66.8
	4	2,925	16,620	19,545	11.4	74.1
2006	1	2,983	17,607	20,590	5.3	77.7
	2	3,162	18,358	21,520	4.5	80.8
	3	3,292	18,561	21,853	1.5	81.6
	4	3,368	16,096	19,464	-10.9	72.3
2007	1	3,392	17,427	20,819	7.0	77.0
	2	3,485	17,734	21,219	1.9	78.2
	3	3,689	18,380	22,067	4.0	80.8
	4	3,905	19,442	23,347	5.8	85.1
2008	1	4,137	20,116	24,253	3.9	87.9
	2	4,451	20,635	25,086	3.4	90.6

As of the first quarter of 2005, there were 15 million mobile phone subscriptions on all mobile networks operating in Malaysia. In the first quarter of 2006, the number had increased to 20.5 million, a 5.3 percent growth rate and 77.7 percent penetration rate nationwide. This number has continually increased up to 25 million subscriptions and 90.6 percent penetration rate in the second quarter of 2008. This number shows that there has been a dramatically increased in the usage of mobile phones among Malaysian.

Whilst in Figure 1 shows the trend of penetration rate of mobile phone subscriptions in Malaysia. In general, the graph indicates that there is an increasing trend of the rate from in 1998 to 2008 except in the 2006. The percentage of the penetration rate in Malaysia rose from only 9.7 percent in 1998 to 90.6 percent in 2008.



**Figure 1: Penetration rate of mobile phone subscription in Malaysia (MCMC, 2008)**

Similarly, mobile growth rates have been high across almost all regions and the number of subscribers has grown between 20 to 30 percent globally since 2000 (ITU, 2008). Some of the reasons of resulting to this trend are the decreasing prices of mobile phone and variety of services provided by the operators.

Based on the empirical evidences, there is a huge potential of usage in mobile learning environment. Hence, in tapping the thriving mobile business, a study on mobile content development, specifically local content is urgently required. The Malaysian government has come up with a strategy called MyICMS 886, which dictates a number of strategies for the growth of local content and these are promoting awarenessbuilding competencies in higher education and forming strategic alliances. The goals are to encourage local creativity, address new content demands and also export content. In achieving these goals, the Malaysian government together with a number of key industry players have provided many funding incentives specifically for local content production. This is expected to provide adequate local contents that reflect Malaysian culture and values. It is also expected the contents should be sold as additional services by mobile operator to broaden phone usage (Pelkonen, 2004).

In the Malaysian local scene, Roslan (2007) reports that a highly wanted local content development is indeed for education, entertainment, and games. Moreover, IGDA (2005) also indicates that over the last several years there have been two significant changes in the landscape for mobile gaming. First, the potential size of the market for mobile gaming has grown considerably since 2000 and second the quantity of mobile games available nowadays.

In the effort to ensuring this potential mode of enriching the learning environments is seized, two studies to find out students' preferences towards learning using mobile space are conducted, and these are discussed in the following sections.

## Study 1: Survey

A survey was conducted as a preliminary study which would act as a feeder to the main research on mGBL development. The main objectives of this survey are to find out:

- the specific target audiences for mGBL
- the preferred learning mobile devices
- the preferred learning topic

Basic statistical method was used to assess the student responses which were based on descriptive technique. Two months (between Augusts to September 2008) were allocated for the data collection period.

### Research instrument

The research instrument used is a questionnaire with 19 questions which includes demographics profile, close and open-ended type questions. The main questions investigate whether students own mobile phone and play mobile games, whether they think games can be used in education, whether they prefer learning a subject through mobile game or game on special device, and whether they prefer local designed content or else. The questionnaire was developed in simple phrases of Malay language questions targeted at respondents of age 13 to 17.

### Sampling and data collection procedure

The targeted samples were among students at Malaysian secondary schools. They were randomly selected in different background of school types which range from urban to rural areas and ordinary schools to boarding schools. The questionnaire was distributed in 3 states. Total distribution for the data collection is 680 sets, where 591 respondents completed the questionnaire which gives a response rate of about 86.91%. This is considerably a high response rate and makes the result more relevant to the findings of this study.

### Findings and discussion on survey

This section presents the findings of the survey and analysis of the main results. The discussion is intended to highlight the key issues that arise from the responses obtained. First, the demographic profile of the respondents is illustrated in Table 2. About 61.9 % of the respondents are female and the remainder male. As for race composition, the majority of the respondents were Malay (81.4 %), while the rest were Chinese (9.1 %), Indian (8.1 %) and other races (1.3 %). Other races which were also taking up this survey are Aborigines and Siamese.

**Table 2: Demographics profiles of respondents**

		Gender		Total
		Male	Female	
Ages	13	71	95	166
	14	12	94	106
	15	30	62	92
	16	65	65	130
	17	47	50	97
Total		225	366	591
Race	Malay	182	299	481
	Chinese	22	32	54
	Indian	18	30	48
	Others*	3	5	8
Total		225	366	591

**Table 3: Having access to mobile phone**

		Gender		Total
		Male	Female	
Yes	169	268	437 (73.9%)	
No	56	98	154 (26.1%)	
Total	225	366	591	

Next, the main findings of this study are discussed. First, the respondents were asked whether they have access to mobile phone. As depicted in Table 3, majority of the respondent with 73.9 % have access to mobile phone. This result supports previous statement by Lee (2006) that in the year 2005, more than two million hand phone users in Malaysia were 19 years old or younger and this number is increasing much faster than among others. A study done by Norbayah and Norazah (2007) also shows similar results. However, it was noted that fewer respondents aged 13 did not have access to mobile phone as compared to other group of ages.

Second, regarding whether they play mobile games, 437 students answered (see Table 4). Most of them (69.8 %) reported that they play mobile games (n = 305); of these, 40 % players were males, and 60 % were females. From this table also, about 72.6% males and 68.3% females play mobile games. Here, it shows that female students like playing mobile games too. This result supports the survey conducted in 2004 by The Yankee Group United States (Business Wire, 2004), and a study by Hafizullah (2007). Both studies found that female prefers playing mobile games.

**Table 4: Play mobile games**

	Gender		Total
	Male	Female	
Yes	122 (72.6%)	183 (68.3%)	305 (69.8%)
No	47 (27.4%)	85 (31.7%)	132 (30.2%)
Total	168	268	437

Next, when the students were asked about the purpose why they play games (in general), they were given three items from which to select: entertainment, education, and both. 577 students responded to this question.

**Table 5: Purpose for playing games**

	Gender				Total	
	Male	Female	Male	Female		
Entertainment	115	176	52.0%	49.4%	291	50.4%
Education	7	15	3.2%	4.3%	22	3.8%
Both	99	165	44.8%	46.3%	264	45.8%
Total	221	356			577	

As seen in Table 5, most of the students stated that they play games for entertainment (50.4%); the next highest category is both (45.8%). Very few students reported playing games for education only. A comparison of males' and females' aims in game playing reveals some differences. For example, males play games more than females for entertainment: 52.0% of the males played games for entertainment, while only 49.4% of females did so. On the other hand, 46.3% females reported that they play games for both reasons; while 44.8% of the males cited this reason. This suggests that, in order to provide a successful learning environment for students; both entertainment and education values should be embraced, suggesting mGBL as the possible solution. Playing games just for educational purpose is not well accepted by the students.

In addition, the students were also asked what device they prefer for learning either through mobile phone or other special devices, and 591 students replied to this question. As shown in Table 6, the highest response category among the students was that they prefer learning through mobile phone (56.5%). Broken down by gender, the females (66.7%) considered mobile phone to be a more preferred device for learning than males did (48.9%). Henceforth, it may be deduced that in general, mobile game is suitable and mobile phone is the most preferred device for learning.

Lastly, when asked whether they prefer local designed contents (i.e. characters that are based on local people, storyline and game concept that are based on local culture) or else, more than 83% stated that they preferred local designed characters with local culture based contents.

**Table 6: Preferred device for learning**

	Frequency	Percent	Gender	
			Male	Female
Mobile phones	334	56.5	48.9%	66.7%
Special devices	257	43.5	51.1%	56.7%
Total	591	100.0	100.0	100.0

## Study 2: mGBL content

In the first study (the survey), it was found that mobile game is suitable and mobile phone is the most preferred device for learning. This statement is supported by a number of studies that have indicated that mobile technologies can be effective tools in catering for students in a digital age and there are signs of the motivating potential and possible learning gains of games played on mobile devices with young adults (Fabricatore, 2000; Massie, 2005; Cogoi, Sangiorgi & Shahin, 2006). So, a mGBL was planned to be developed to cater for the survey findings.

Mobile game development involves five main stages: (i) Characters development (ii) Game conception (iii) Game plan and storyline design (iv) Integration of characters, game plan and storyline and (v) Porting and testing of game. The contents of the game must first consider the characters as they are very important in any game. Thus, to determine what types of game characters appeal to the students, a second study was conducted.

### Characters development

The main cast was decided to be a male stick figure that portrays a Malay ethnic group. The character was named LidiMan which comes from two words “Lidi” and “Man”. “Lidi” is a Malay word which means stick. A stick figure is a very basic type of drawing which is two dimensional (2D) perspectives; generally all parts of the figure are represented by single straight lines. There are many interesting animations that have been done using this kind of animation such as Stick Page (<http://www.stickpage.com>), Stick Figure Ninja (<http://www.stickfigureninja.com>) and Stick Figure Productions (<http://www.stickfigureproductions.com>). LidiMan was designed in 2D perspective so that it can be broken down into smaller pieces, reused, recombined to form new elements, borrowed by other project and enhanced to other fields.

Character development is the stage where the personality of the animation characters are designed, characterized and constructed. The basic principles involved in character development are the use of spheres, cylinders, basic perspective, anatomy, and proportions of the character. The LidiMan character was developed using the steps proposed by Ward (2005) and Kneunster (2004). These steps are: (a) research, (b) preparation, and (c) design.

In the research step, information about the main character such as biography and personality traits is gained. From this step, the personality types of the main character as well as the others are identified for various character personalities.

In the preparation step, the information and sources of images related to the character are compiled. The rules of 2D perspective are used to produce solid designs. Besides, costumes are also created by employing a diverse range of techniques and processes to synchronize with the game concept. Identifying the appropriate costume designs for the character is based on cultural and historical reference. In our case, these are Malay, Chinese and Indian; the main ethnic groups in Malaysia.

In the design step, character is sketched, drawn and coloured until satisfied. Figure 2 illustrates the early sketches of the character development. The early sketches as suggested by Agustin et al. (2007) can give a clear illustration which is intended to provoke more discussion about the character development. These sketches can then be used as a starting point for further refinement or as a reference for the development. This is true, because one can have the overview of different perspectives (body proportions) of that particular character.

Thus when the final sketches are completed, using an animation software, the characters are given 'life'. Figure 3 shows the detail steps involved in LidiMan character development with different facial expressions and body positions. Although the sketches are designed nicely, the restriction on the file size for the game needs to be considered next at the production stage.

Once all characters have been designed, an approach to cast them to potential audience was planned. This is important to see whether the characters meet the requirements of appealing to the audience. So, during this stage, a field test was carried out for the purpose of determining whether characters designed meet the appealing dimensions. At this point, an animated electronic book (eBook) containing characters and similar storyline to the game was produced. It was shown to 40 school students, age 13 to 16. This age group was selected as a representation of the research target group. A three-point scale instrument was developed and utilized. The dimensions of appealing (attractive, pleasing, inviting, interesting and fascinating) are based on its definition as found in a number of well-recognized dictionaries. Figure 4 illustrates one example of the question in the instrument. The three-point scale was matched and represented by "smiley faces" to better relate the scale to students (Ransley, 1991). In addition to the main character, LidiMan, 8 more characters were evaluated for their appealing dimensions. These characters are illustrated in Figure 5.

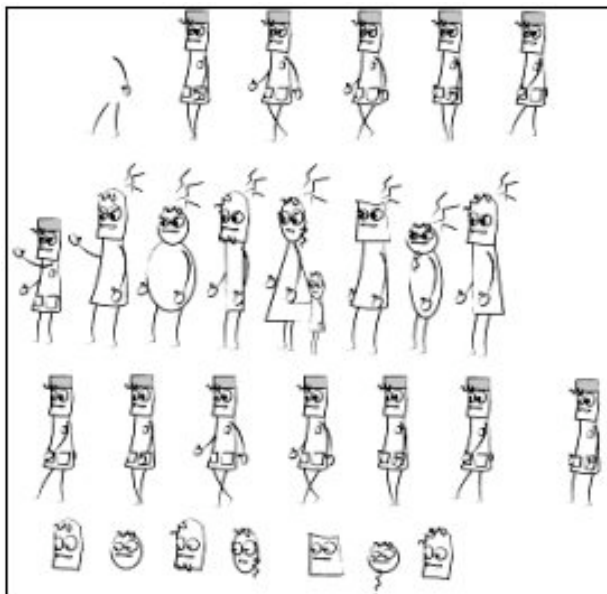


Figure 2: Early sketches

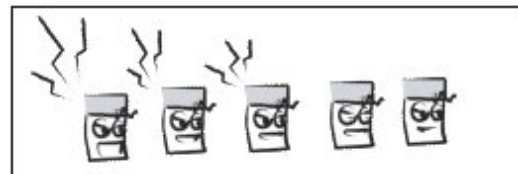


Figure 3: Facial expression of LidiMan

### Findings and discussion on mGBL Content

Table 7 and 8 indicate the findings of the appealing dimensions. Table 7 shows that majority of the students in this study were Malay, followed by Chinese and Indian.

Table 7: Findings of school students participated in answering the appealing instrument

Age group	No. of students	Gender	No. of students	Race	No. of students
13	10	Male	20	Malay	24
14	10			Chinese	10
15	10	Female	20	Indian	6
16	10			Others	0
Total	40	Total	40	Total	40

Tick ✓ on the face that shows how you feel

	Appealing		
	Unlikely	Fairly	Highly
Attractive			
Pleasing			
Inviting			
Interesting			
Fascinating			

Character A

Figure 4: Instrument utilized to check appealing dimensions of game characters

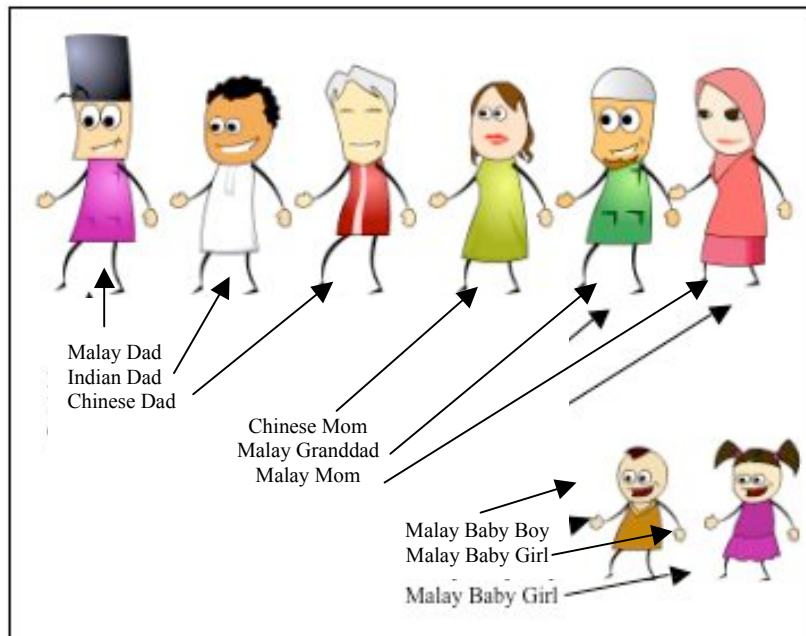


Figure 5: Development of other characters

As can be seen from Table 8, it can be concluded that a huge majority of the students see all characters, except the Chinese Mom, as highly appealing. The Chinese Mom was not considered highly appealing because the students did not see her reflecting as a Chinese woman.

As stated in the survey, when asked whether the students prefer local designed contents (i.e. characters that are based on local people, storyline and game concept that are based on local culture) or else, more than 83% stated that they preferred local designed characters with local culture based contents. This conclusion is supported by the second study, where almost all the well-thought designed characters were found to appeal highly to the students. Therefore, from this second study, two important points to stress can be concluded, and these are that



**Table 8: Findings of appealing dimensions**

Appealing Dimensions Character Name	Attractive			Pleasing			Inviting			Interesting			Fascinating		
	U	F	H	U	F	H	U	F	H	U	F	H	U	F	H
LidiMan			40			40			40			40			40
Malay Dad			40			40			40			40			40
Indian Dad			40		10	30		3	37		4	36		11	29
Chinese Dad			40			40		5	35			36		22	18
Chinese Mom		40			40		14	26		40			40		
Malay Granddad			40			40			40			40			40
Malay Mom			40			40			40			40			40
Malay Baby Girl			40		7	33			40			40		3	37
Malay Baby Boy			40			40			40			40		3	37

Note: U – Unlikely F – Fairly H – Highly Likely

(i) local, appealing and well-developed characters are important elements to motivate students and (ii) local uniqueness must always be incorporated to increase mGBL acceptance.

Although as stated earlier mobile game development involves five main stages, we only describe one stage: the characters development. The rest of the stages are not the focus of this article.

## Conclusion

This work is an initial study of a mobile game based learning development for students at secondary schools in Malaysia. Two studies are described. The main objective of the first study is to acquire useful information and relevant data to support the future research on mobile game-based learning (mGBL) development. Students' preferences on mGBL and their perceptions were examined where the responses show positive feedback. Generally, the results of this study are consistent with previous studies in the literature (Lee, 2006; Norbayah and Norazah, 2007; Business Wire, 2004; Hafizullah, 2007; Duncan-Howell & Lee, 2007). The results reveal that a majority of the surveyed students have access to mobile phone. Most of them played mobile games, and female student played games too. The finding also disclosed that, in order to make the mGBL successful in a learning environment, it should embrace both entertainment and education purposes. In addition, students preferred learning through mobile phone rather than other devices (consoles). Moreover, 83% stated that they preferred local designed characters with local culture based contents.

The second study is the first step in developing the game concept. The contents of the game must first consider the characters as they are very important in any game. Thus, to determine what types of game characters appeal to the students, a number of characters were produced. From this second study, two important points to stress can be concluded, and these are that (i) local, appealing and well-developed characters are important elements to motivate students and (ii) local uniqueness must always be incorporated to increase mGBL acceptance.

In conclusion, before considering mGBL into a learning environment, many requirements need to be considered in order to obtain the maximum benefits from the mGBL. Further research should be aimed at investigating several aspects of mGBL such as learning components and game contents which are best suited to mobile space.

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