

Learning History: a gamified activity for mobile devices

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Abstract

This paper presents a gamified activity designed to teach a Portuguese historical event from the 20th century to 6th grade students. This gamified activity is based on data from an ongoing project carried out in Portugal concerning the games most played by students. In our paper we analyse the data related to the students in the 2nd cycle of the Portuguese Educational System (n = 508), collected through a questionnaire. We present the results obtained as well as learning principles and game mechanics identified. Finally, we describe the game that is being developed (according to the game mechanics identified) related to a Portuguese historical event - the Implementation of the Republic in 1910.

Keywords

Mobile Learning, Mobile Devices, Games, Gamification

INTRODUCTION

Although ubiquitous learning has been pointed to as the future of education for more than a decade, it was only with the recent spread of various mobile devices in everyday life that several researchers awoke to the importance of using those devices in the educational field.

“In recent years, mobile learning has undergone a significant transformation due to rapidly growing ownership of smartphones and tablets, accompanied by the proliferation of apps, social networks and mobile-friendly open access resources” (Kukulska-Hulme, 2014, p.12).

Games, which have been applied in education for a long time, have also benefited from these advances in technology and from the portability of multiple devices (Jeong& Kim, 2007). Consequently, it is very common to see today's young people spending their free time playing. And they do it with an enthusiasm they do not show in other school activities. In fact, the possibility that the player may take a certain game with him/her and play it anywhere - because he/she makes the mobile phone an extension of his/her cognition - is quite attractive.

Being aware that games allied with mobile technologies can enhance motivation, we believe they can be used as a powerful mechanism for teaching formal contents, as they are fun and learning occurs in every move without the player even paying much attention (Prensky, 2010).

In this paper, we are going to set out a proposal for a gamified activity for learning History, based on previous research about students' game preferences. For a better understanding, we will present the research conducted and identify students' game preferences, as well as analyse their comprehension of the characteristics each game must have so that they can keep playing it.

RESEARCH

A project carried out in Portugal aims to combine games and mobile devices in learning contexts. This still ongoing project, named "From Games to Interactive Activities for Mobile Learning", sought to identify the games Portuguese students play most, especially on mobile devices. Students from the 5th grade of Basic Education up to Master's degree level completed a survey, with a sample size of 2303 players of mobile games. Overall, results from the study indicated that i) students' preferences change according to their educational level and gender, ii) female students show more interest in casual and simple games, while male students prefer games that involve planning, strategy and cooperative work, iii) females prefer to play alone, while males prefer to play in online communities and iv) older players value the games with impressive graphic effects that engage them in virtual environments (Carvalho&Araújo, 2014).

Within the scope of this project, after the analysis of the favourite games and the identification of the learning principles and the game mechanics, the research team is now designing gamified activities for mobile devices aimed at students of all educational levels and in formal learning situations, which will be evaluated in real learning contexts.

Therefore, in this paper, we begin by presenting the data obtained related to 5th and 6th grade students (N = 508).

1. THE GAMES MOST PLAYED BY 2ND CYCLE STUDENTS

The first phase of the project aimed to identify the most played games, as well as students' gaming habits on mobile devices. To achieve these purposes, we carried out a survey (Babbie, 2003) online in Portugal between May and November 2013. The data collection instrument was divided into four dimensions, namely i) Characterisation of the students; ii) Characterisation of their gaming habits; iii) Preferences about games and iv) Preferences for learning school contents through games. The survey was validated by experts in the field and approved by the Educational Department (DireçãoGeral de Educação) of Portugal.

Sample characterisation

Out of the 649 respondents, 508 were players on mobile devices, of whom 58.7% were males and 41.3% were females (see Table 1), with an average age of 11.2 years. In this study, we corroborate findings related to players' gender already presented in other studies (Lucas & Sherry, 2004; Simons, Bernaards& Slinger, 2012) indicating that male students are more likely to play than female students (see table 1).

Educational Level	Respondents			Respondents playing games			
	Total	Gender	f	Total	Gender	f	%
2nd cycle	649	Male	367	508	Male	298	58.7
		Female	282		Female	210	41.3

Table 1: Number of answers obtained from 2nd cycle students

When asked about the mobile devices on which they played, the respondents indicated the laptop (78.7%), followed by the mobile phone (63.8%), the PSP (46.7%), the tablet (44.7%), the Nintendo 3DS (24.2%) and the smartphone (21.3%). Regarding the mobile device they use most to play their favourite game, the laptop is the device indicated by 45.3% of the respondents, followed by the mobile phone (14.4%), the tablet and the PSP (13.4%), the smartphone (5.1%) and the Nintendo 3DS (2.4%). 6.0% didn't mention which device they used to play their favourite game.

Gaming habits

When asked about the time they devote to games, 41.1% of the respondents indicated a range of 1 to 5 hours a week, 34.3% less than an hour and 13.4% between 6 and 10 hours. 4.7% of the respondents indicated 11 to 20 hours and also 4.7 indicated more than 20 hours per week (1.8% of the respondents did not answer this question). On average, respondents play 4.4 hours per week; male respondents play an average of 5.5 hours and their female peers 2.8 hours.

With respect to the respondents' preference for game partners, the majority of the respondents indicated that they prefer to play alone (57.1%). 42.9% prefer to play with others online, 2.4% with friends and / or acquaintances, 23,8% with colleagues 13.4 % with siblings, 12.4 % with other family relatives, 10.0% with strangers and 2.6% with parents.

Preferences about games

Regarding the games most played by the respondents, we identified 141 games (Carvalho et al., 2014).

Taking into account the great diversity of the games identified by the respondents (N= 508), we present the 5 games most commonly indicated by the students from the 2nd cycle (n=161).

Thus, the 5 most played games correspond to 31.7% of the sample that was part of the project mentioned above. Data highlight that the Pro Evolution Soccer option was only identified by the male students and that Pou and Subway Surfers were predominantly female students' options (see table 2).

Game	Male (n=119)		Female (n=42)	
	f	%	f	%
Grand Theft Auto (GTA)	39	32.8	1	2.4
Pro Evolution Soccer (PES)	26	21.8	0	0.0
Subway Surfers	16	13.4	15	35.7
Minecraft	17	14.3	5	2.4
Counter Strike (CS)	15	12.6	3	7.1
Pou	6	5.1	22	52.4

Table 2: *Top 5 favourite games, distribution by gender (n=161)*

As our sample is mainly male, typically male games stand out, characterisable as violent (GTA, CS), sport (PES) and sandbox (Minecraft) (Terlecki et al., 2010) (see table 2). These highly competitive games require effort and take several hours to complete. It is important to note that some of the games mentioned are not suitably age rated for the students that make up our sample, whose preferences are therefore, at variance with the European standards (PEGI 16 and 18). In addition, 2.3% of the boys play games rated 16, and 23.2% of male and 4.3% of female regularly play games rated 18+ (PEGI18) (Carvalho et al., 2014, p.31).

These data indicate that the major differences are in the gender-related preferences. While male students prefer longer games, which sometimes involve teamwork and group cooperation, female students prefer faster games, which they can play alone without interacting with other players (Carvalho et al., 2014, p.30). We found that the students also give different answers in relation to the themes of the games. The boys prefer action and adventure (GTA), war (CS) or football (as PES, FIFA) games, while girls prefer games about everyday life, where they can take care of an "animal" (Pou) or people (Sims), or where they can test some skills such as speed of reaction (Super Mario and Subway Surfers) (idem) (see table 3).

Position	Male (n=128)	Female (n=80)
1st	Grand Theft Auto (<i>Rockstar Games</i>) (30.5%)	Pou (<i>Zakeh</i>) (27.5%)
2nd	Pro Evolution Soccer (<i>Konami</i>) (20.3%)	Super Mario (<i>Nintendo</i>) (20.0%)
3rd	Minecraft (<i>Mojang</i>) (13.3%)	Subway Surfers (<i>Kiloo Games & Sybo Games</i>) (18.8%)
4th	Subway Surfers (<i>Kiloo Games & Sybo Games</i>) (12.5%)	The Sims (<i>Electronic Arts</i>) (17.5%)
5th	Counter Strike (<i>Valve Software</i>) (11.7%) FIFA (<i>EA Sports</i>) (11.7%)	Stardoll (<i>Stardoll</i>) (16.3%)

Table 3: Top 5 favourite games according to gender (n=208)

Regarding the time spent by students playing each game, we noted that the most common answer is 1 to 5 hours per week (47.2%), followed by less than an hour a week (27.3%) and finally between 6 and 10 hours a week (13.7%). Few respondents marked over 11 hours a week (10.6%).

In the questionnaire the students (n=508) were asked to express their opinion about the difficulty level of the games they play most. The most chosen level is Moderate (40.8%), Easy is chosen by 22.4% and Very Easy by 16.9%. Hard and Very Hard were chosen by 12.2% and 7.7% respectively.

They were asked to indicate the importance of some characteristics of the game for keeping them playing. The differences between male and female students are noteworthy.

Males (n=298) mentioned that these features are very important to them: graphic effects and animations (79.9%), gameplay (78.2%), characters (74.2%), being able to play with others (72.8%), being able to improve one's score (71.1%), the game having many levels (70.8%), scenarios (69.5%), a long game (67.8%), friends playing the same game (64.4%), being able to play online with others (63.4%), storytelling (57.0%) and sounds (55.7%).

On the other hand, females (n=210) indicated that the characteristics most important for keeping them playing were: characters (79.5%), the game having many levels (72.4%), being able to improve one's score (70.5%), graphic effects and animations (70.0%). We conclude, therefore, that the male gender values more the graphics, the gameplay, the characters, being able to play with others, being able to improve one's score, the game having many levels, and the scenarios while the female gender highlights the game characters, the game having many levels, being able to improve one's score, and graphic effects and animations as the factors that make them keep playing.

Learning course content through games: students' preferences

We asked in the questionnaire if the students would like to use games to learn course content, and most of them answered yes (84.6%). Those who answered positively (n=430), were asked to choose the type of game they would like to use in class. Adventure (66.0%), Action (59.1%) and Sport (50.5%) were the types most commonly chosen.

2. LEARNING PRINCIPLES AND GAME MECHANICS IDENTIFIED IN THE GAMES MOST PLAYED

After having analysed the games they play most, based on the 36 learning principles (Gee, 2003), we identified some of these principles as common to the games most played: i) Psychosocial Moratorium; ii) Committed Learning Principle; iii) Amplification

of Input Principle; iv) Achievement Principle; v) Practice Principle; vi) Regime of Competence; vii) Intuitive Knowledge and viii) Affinity Group Principle.

The reasons mentioned by the students for liking the games most played are the opportunities to do violent actions, to drive a car or to fight criminals. These dangerous and morally reprehensible activities are carried out in a safe virtual environment where it is possible to take risks without real consequences (*Psychosocial Moratorium* - by Gee, 2003).

Sport games, mainly football, are a typical boys' activity (Blakemore, Berenbaum, & Liben, 2008; Cherney & London, 2006; Sin, Talib, Norishah, Ishak, & Baki, 2014; Terlecki et al., 2010; Williams, Consalvo, Caplan, & Yee, 2009), for this reason it is easy to understand that in the list of the most played games there is one football game (PES).

On the other hand, Minecraft is a game with its own characteristics where adventure and the ability to build something are very appealing ingredients for male players.

Casual games like Pou and Subway Surfers are more appealing for female players. These are games with short matches, highly rewarding without major punishments; their aim is to collect as many coins as possible to purchase items for avatars, which enables social interaction by sharing through Facebook, SMS or email. This social interaction is mentioned by Terlecki et al. (2010) as important for female players.

However, if we look for common characteristics in these games we can identify that in all of them it is necessary to fulfill tasks - these can be repetitive - (Pou, PES, Subway Surfers) or to complete missions (GTA, CS, Minecraft). Most of these tasks are feasible in short time periods and rewarded as they are performed in the game. Carrying out these tasks in a regular manner makes it possible to progress in the game and to develop the avatar by customising it or acquiring items. It is the *Committed Learning Principle* (Gee, 2003) when students apply their time on a regular basis to doing the tasks that make the avatar development possible, thus feeling a commitment towards this virtual identity.

In all the games we find the *Amplification of Input Principle* (Gee, 2003), because the tasks are set in a simple way that produces feedback without a need to actually do them as in the real world. For instance, a football match can be completed between 4 and 12 minutes and not in 90 minutes as in the real world.

Some of the tasks are repetitive and this makes it possible to improve the player's capabilities (*Practice Principle; Regime of Competence; Intuitive Knowledge* - Gee, 2003). The player repeats similar actions in the game improving his/her capabilities, by driving vehicles in GTA, by playing soccer matches in PES or by running on a railway line (*Practice Principle*). Even if the player cannot complete a task at the first attempt he/she feels that he/she is capable of accomplishing it by trying again and again, improving his/her performance (*Regime of Competence*). For instance when a player helps Jake, the avatar, to run on a railway line jumping and moving between the tracks in every attempt he/she can go further and feels that he/she is capable of doing even better the next time around. Here, practice and experience allow the player an intuitive and tacit knowledge that is highly valued between players who share an interest in the same game (*Intuitive Knowledge*).

Another common characteristic is social interaction with other players, through sharing items (Pou, Subway Surfers), or by using a multiplayer mode (GTA, PES, CS and Minecraft): here we find the *Affinity Group Principle* (Gee, 2003). The player shares the same interest over the same game, enjoys sharing his/her achievements because the other players understand and value them, but it is also possible to learn from the experience of other players or to teach others.

We also identified the common gamification mechanism that can be seen in the games most played (Manrique, 2013):

- World (The whole space where the gamified system takes place);
- Avatar (A representation of the person in the game);
- Customisation (The possibility of personalising our character);
- Equipment (The items that the character wears. A source of power);
- Currency (Any kind of virtual currency that creates an economic market);
- Quest (A mission with an objective that leads to rewards);
- Tutorial (Learning tool to develop the player's skills in that game).

GAMIFIED ACTIVITY

Drawing on the above analysis, an interactive activity was created that we describe below.

Planning

The game has been designed according to two prerequisites: i) allow the formal learning of contents, ii) be a creative game that would attract students' attention in order to make them learn. The mechanics identified in students preferred games were taken into consideration in the design of the game. After the definition of the subject under study, we elaborated a storyboard.

Gameplay

This game is under development for Android system, as this is the mobile operating system most used by the Portuguese population. To interact with the game, the player will need to touch the screen to select the answer he/she thinks to be the right one, or use the drag and drop function. When the player starts the game, he/she will see how the avatar (a journalist) lived from 1890 to 1911. The player must help this avatar to write the best news to be published in the newspaper, by selecting the correct words or choosing the most impressive photos. The game can be regarded as a mission, i.e., helping a journalist to write about the historical events that were part of the history of the republican revolution in Portugal.

Subject theme and Course Content

The History discipline was chosen to make a gamified activity because in the project team we have a History teacher. The course content selected was the Republic implantation in Portugal; this content is delivered in the 6th grade.

The designed game can be used in two different ways. The students play the game out of the classroom, but the teacher knows the students' results by checking the report in an Excel page. It can also be used in the classroom to introduce the new subject or to reinforce a subject already studied.

Theme

In the late 19th century, the Portuguese monarchy faced great difficulties. The Republican Party took advantage of the discredit of the monarchy to attempt to overthrow it. To achieve this purpose, the leaders of that party organized several riots. In 1908, King Carlos I and his heir-apparent, Prince Royal Luís Filipe, were assassinated by revolutionaries. D. Manuel became king of Portugal, struggling with several difficulties. However, he failed to solve the serious economic, social and political crisis that was raging in the kingdom. On 5th October 1910, a revolution established the republic in Portugal with the support of secret associations. After the revolution a provisional government was created, new national symbols were

adopted, elections were called and a constitution was drawn up. The governments of the 1st Portuguese Republic also took several measures to develop education and tackle the difficulties faced by workers. In spite of having failed to solve the kingdom's problems, this historical event is remarkable and is regarded as a crucial aspect to make children and young people aware of the need to value the History of their country, as a way of preserving national memory and identity.

Student's role

The students log into the game. The first time they log in, they are supposed to watch a video that will present them the role they are to play in the game - a journalist in the year of 1890. This journalist's job is to investigate facts / events in order to write news for the newspaper he works for in Lisbon. The game starts when the journalist is in the newspaper office and he is asked to write a news article for the next day's edition. The director tells him that the more the newspaper sells, the higher his salary will be (coins).

Then, we present the interactive activities designed (see table 4).

Year	Episodes	Challenges
1890	1	The player (journalist) sees a news article with some blank spaces to be filled. To complete the article, he/she must use the notes he/she has taken and fill in the gaps with historical information.
1908	1	The player (journalist) is supposed to cover photographically the arrival of the royal family when the regicide happens. The player must choose one of the photographs to illustrate the news article for the next day's newspaper. He/she has to put together a jigsaw puzzle to get the whole picture.
	2	The player is challenged to find some members of a secret society. He must go through an avenue with a code name and look for a person who is able to give him/her a countersign. When the player identifies that person, he/she will be invited to be part of a secret organization. However, to be accepted, he/she must find other members of that organization.
	3	In a café, the journalist listens to a member of the Republican Party, who is stating his political convictions. The player will be faced with several items related to the republican ideals; he must tick the correct ones.
1910	1	The journalist starts a private conversation with a republican and convinces him that only a coup could implant the republic. Then, he shares the plans of Carbonaria (the secret society) with him. The player's task is to drag the names of the places to the correct places in the map. When he/she does it correctly, he/she will be provided with some historical information about each place.
	2	The player is faced with a map displaying the most important places during the revolution. The player must click on the images of those places and read the information provided. At the end, the players are supposed to complete a quiz about these key points.

	3	The journalist must write a new article to inform the country about the republican victory and the new national symbols (anthem, currency, flag). The player should see the national flag uncoloured. Then, he/she must use a brush to tick the respective colours in the flag (some historical explanations will be provided). Then, the player will see the musical score of the Portuguese Anthem and he/she is supposed to drag the title and the verses of the anthem to the correct spaces. At the end, the player listens to the chorus of the anthem. As soon as the player completes the task, he/she will be able to see the coin counter and to notice that the “real” has replaced by the “escudo”.
1911	1	The journalist (years later) organizes a news article to present the measures taken by the republicans. These measures are provided to students in categories, but in a randomly way. The player must match the different measures to the area they apply to.

Table 4: Game Activities

It should be noted that the tasks required from the players are distributed by episodes within a historical period with notable dates (1890, 1908, 1910, 1911). These episodes require a greater involvement of the student according to the increased complexity of the issues analysed. The tasks performed allow the player to unlock the time frames.

According to the reward system used, following the game mechanics identified above, the player gets a specific number of coins for each right answer. To pass to the next level, the student needs to have gained a fixed amount of coins. If the answer is wrong, the player does not get the respective coin but can progress forward till the end of that episode. At the end, the player is given the chance to recover the coins he did not win, by performing the task once again.

Implementation

The design of the game is still ongoing but it will be tested by the end of the school year; therefore we are planning to implement it at school between April and June 2015.

CONCLUSION

Mobile learning may facilitate the implementation of a student-centred learning approach, promoting students' learning through searching online, games, reflection and development of critical thinking.

Our project findings suggest that students are receptive to using games in course activities, to learn school subjects. They mentioned that they would prefer the Adventure (66.0%), Action (59.1%) and Sport (50.5%) types of games to use in class.

Looking at the games most played we find that male players prefer long games that require more effort from the player and have multiplayer functions. Female players prefer shorter games that they can play alone.

When planning gamified activities it is important to allow the repetition of tasks, accumulating any kind of reward that can be exchanged for collectibles, the value of which may depend on the provision held. The repetition of tasks allows for the development of specific skills or motor dexterity in the student. Another factor to consider is the existence of avatars which the player can identify with and customise.

We are building a game for mobile devices in order to promote the learning of an important topic in History, Republic implantation in Portugal, based on the learning principles proposed by Gee (2003) and game mechanics identified in the games we

have analysed. We will test the game that we are developing between April and June 2015.

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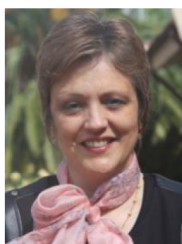
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