Communications

Design considerations in mobile educational games

Norliana Ab Maleh, Chien-Sing Lee

Faculty of Information Technology, Multimedia University
Cyberjaya, 63100 Selangor, Malaysia.

norliana.maleh@gmail.com, cslee@mmu.edu.my

Abstract

The starting point of every reflection upon new teaching methods has to be the comprehension that new technologies applied to learning methodology give us the possibility to arrange a teaching system focused on the real cognitive processes of our brain. The proliferation of the internet in every field of study is inducing new ways of representing, preserving, and passing on knowledge, which has significant consequences to our manner of thinking and processing data. This paper discusses the changes that this new phenomenon could induce to the future of teaching and learning the methodology of law, and presents an analysis of the several tools involved in this process.

1 Introduction

The next step in education involves a move towards ubiquitous learning. Ubiquitous learning enables easy access to educational resources anytime anywhere. Ubiquity helps students to learn wherever and whenever the situation might occur. They are not constrained by schedules and physical spaces; rather learning is pervasive and ongoing. Easy and fast creation of educational resources has therefore become the focus of many researchers. The educational resource of concern in this paper is mobile educational games for working people. The proposed implementation scenario for learning is one of informal learning outside the workplace. Lessons are created based on the company curriculum and participation and scores will be considered as part of the employee's initiative to improve himself or herself in staff assessment. The game that we intend to design follows Khan's (2005) People-Process-Product Continuum or P3 e-learning model.

2 Problem Formulation

According to Garris, many games do not teach nor motivate the learners to learn (Garris, Ahlers, Driskell, 2002). The primary reason is that the designers neglected

the learner's needs in the design process. Learning is no longer engaging. Furthermore, learning is situated in different contexts. Therefore, varied games based on the same concept should be created in order to provide reflection, consolidation and enrichment. However, it is difficult to create games that are easily adaptable, scalable, robust, modular and varied (Soloway, Guzdial, Hay, 1994; Manovich, 2001).

This paper is a work in progress and thus, addresses the first concern: lack of learner-centered design. The proposed solution is participatory design which enables the identification of games characteristics that the students would like to customize in a ubiquitous manner.

The outline of this paper is as follows: a short overview on mobile educational games is briefly introduced in Section 3. Section 4 presents the learner requirements obtained from 30 students on their perceived roles in participatory design, what they would like to be involved in during the design phase and the games heuristics that should be considered to enable generation of mobile educational games dynamically, followed by discussion in Section 5. Section 6 concludes the paper.

3 Overview on mobile educational game

Thomas has identified 5 principles of mobile gaming that provides a conceptual view of relation between development and evaluation games (Thomas, Schott, Kambouri, 2003). These principles are adaptation, challenge and mastery, goals, community, collaboration and context. An adaptive game means it helps the player to adjust and perform well in the game's environment. Besides playing, the player will find appropriate learning information. Challenge and mastery are essential in order to retain the player's interest and excite them to play the game over and over again. Goals need to be stated clearly and meaningfully (Clanton, 1998; Malone, 1981; Malone, 1982). Thomas highlighted an important point -- game goals and learning goals should be similar. Besides long-term goals, games should also provide short-term goals that will direct the player throughout the game. The player can be informed about these goals or be given hints regarding these goals. After achieving these goals, feedback should be given to the player to guide them to achieve the subsequent goal.

According to Aranas (Aranas, 2002), engagement in learning involves rules, goals and objectives, outcomes and feedback, conflict/ competition/ challenge/ opposition, interaction and representation or story. She also points out that the most important factor in games is the role of the teacher in structuring and framing activities for the game itself. They must get involved in developing the game's contents; understand how the game works and how to use the game efficiently.

4 Solution to the problem

Participatory design in standard video games such as *Street Fighter* has proven to be successful in increasing the user's interest. The player is able to choose the place and character. Sometimes, they also can choose their challenger. Participatory design in mobile learning (Danielsson, Hedestig, Juslin, Orre, 2003) serves to provide a means

for all stakeholders to discuss and exchange opinions, better understand each other's concerns, skills and values and collaboratively determine suitable sets of requirements for developing lessons in a mobile learning environment.

Utilizing Aranas's six elements of games, we delegate roles of teachers, designers as well as students according to their capability and expertise. Rules, outcomes and feedback are determined by the games designer. Goals and objectives, conflict/ competition/ challenge/ opposition are determined by the teacher.

The teacher sets the initial setting for learning scenarios. The students will subsequently participate in changing the settings suggested by Aranas to increase learning engagement. Students will determine the level, story, main character, evil character, control/keypress, graphics/color and sound/music of the game. Confirmation of participatory design factors by a group of students will be carried out in a survey elaborated on in Section 4.2.

4.1 Example scenario

Let's take for example the task of creating a game for teaching tenses in the English subject. Goals and objectives in teaching tenses are to familiarize students with different kinds of tenses in English and use them correctly.

Conflict/ competition/ challenge/ opposition will be determined by the teacher. Conflict/ competition/ challenge/ opposition may arise along a journey for one main character. This character has to travel until he or she reaches his or her destination. Along his/her journey, there will be a challenge such as answering a few questions on tenses in order to go on with the journey or to get more "rewards" along his/her journey.

Games designers will determine rules such as initial rewards for the character. As the character goes through with the journey, his/her "reward" might be decreased or increased depending on his/her strategy. When a character completes one task or level, outcomes will be determined for them. The outcomes are typically either to proceed to the next level or to get more "rewards" or revert back. Feedback is given after a student makes a decision.

As for the student, they can modify the difficulty level, story, main character, evil character, control/keypress, graphics/color and sound/music of the game. A few options in each category are given to the student and they can choose their preferred option. Subsequent to the goals and objectives, conflict/ competition/ challenge/ opposition, rules, outcome, feedback and options determined by the student, a game for learning tenses in English will be generated for them.

4.2 A Survey of Learner Requirement in Participatory Design

We polled 30 students from various education levels regarding their requirement in participatory design for mobile educational games. Students' ages ranged from 16 to 25. The questionnaire was divided into 4 sections: general data (ages, frequency of playing games and game type that they prefer); features in games that they like and reasons why they like them, their opinion about mobile games and mobile educational games and possible requirements that they want to be involved in the designing of

mobile games (level, story, main character, evil character, control/key press, graphics/color and sound/music).

First, we found that nearly every student who participated in our survey do play games. We asked students to estimate the number of hours they play games each week. We divided students into 4 categories: never (0 hours a week), occasionally (1-4 hours a week), sometimes (4-8 hours a week) and frequently (8+ hours a week). 48% of them answered occasionally, 31% answered frequently, 14% answered sometimes and 7% answered never.

Next we asked which types of games they enjoy (Fig. 1), features they like in the games and why they like these features.
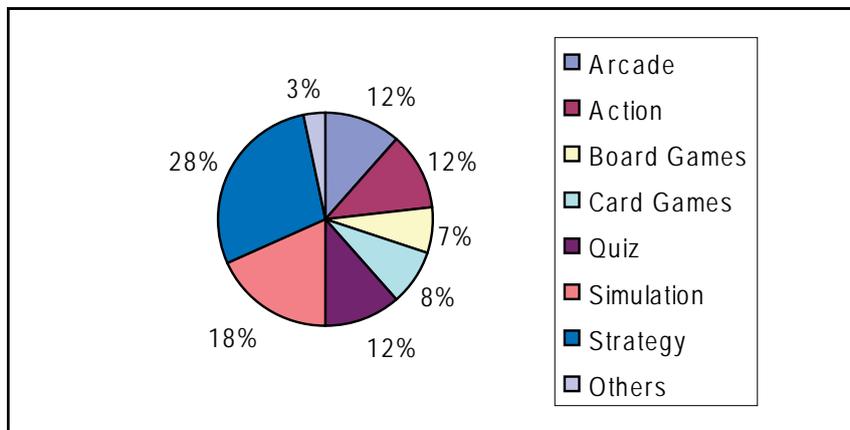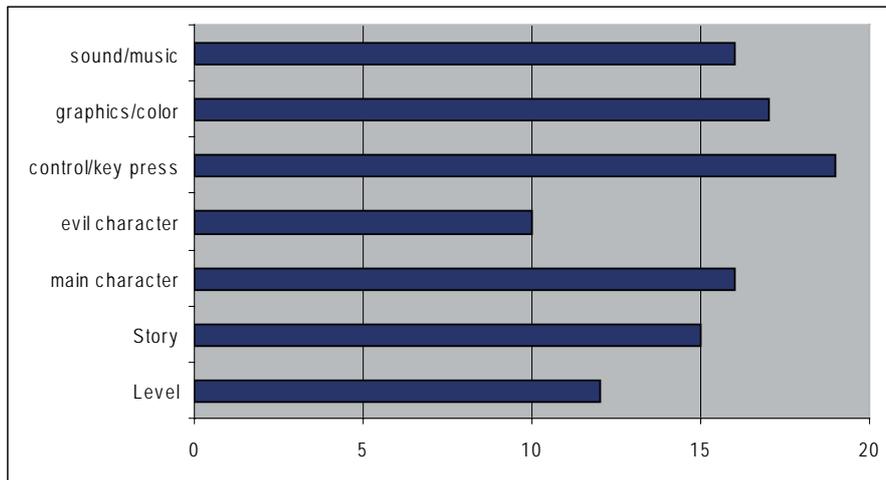

Fig. 1 Types of games preferred

Fig. 2 Elements of game's design which students want to participate in

From Fig. 1, we can see that most students preferred strategy games compared to other types because strategy games are challenging and interesting. It is challenging because in order to win, the player must come out with a good solution or strategy. One student said that "strategy games can train the mind to react fast to the situation". Most of them point out graphics as the features that they like most. This is because graphics makes the game more attractive. Some of them also named storyline or game story as another feature that they find important in games.

Subsequently we asked their opinion about mobile games and mobile educational games. From 30 respondents, 80% of them have strong interest in mobile games although they haven't played any mobile educational game before. They find mobile games a convenient source of entertainment as they can be played anywhere. One of them said that 'when we are far from our entertainment sources, mobile games can keep us occupied'.

Next, we asked whether they would be willing to be involved in the designing of mobile games. 58% responded 'Yes'. For students who were willing to participate in the game's design, we asked them about the preferred element that they would want to modify in the games. Fig. 2 is the results from the survey. 11% reported that they would prefer if they can modify levels, 14% prefer if they can modify the story, 15% on main characters, 10% on evil characters, 19% on control/keypress, 16% on graphics/color and 15% on sound/music. Therefore, we can conclude that control/keypress, graphics/color and sound/music are the most preferred elements that users would want to be able to have a say in the design.

5 Discussion

Based on our analysis from the survey, we found out that our respondents can be categorized into 3 categories. First, those who never play games are not interested in participating in the games design. Second, are those who like to play games but are not interested to be involved in the game design. One student summarized, saying 'I like to play games but getting involved or participating in the design is not an option for me'. This is because he felt that designing games in a limited environment such as the mobile environment will not be satisfying to him. Third are those who really love to play games and would appreciate if they are given the opportunity to participate in the game's design. One of the students participating in our survey stated that he wants to become a game designer in the future, thus this opportunity will be very useful to him.

Although 47% of the respondents are not interested in participating in the game's design, nevertheless they look forward to our approach on generating mobile educational games dynamically based on participatory design. This is because they found that mobile devices can be an effective learning tool. Some limitation on mobile devices such as small screen size should not be a problem for students. Instead, these mobile devices may help them in providing easy access to fun educational material to enrich their studies.

6 Conclusion

We have identified that conflict/ competition/ challenge/ opposition shall be determined by the instructor whereas students would have the prerogative of modifying the difficulty level, story, main character, evil character, control/keypress, graphics/color and sound/music of the game. Out of the elements that can be modified, students are most interested in adapting control/keypress, graphics/color and sound/music for a particular game. We are currently developing game heuristics. Future work will involve development of the mobile educational game and testing on real respondents (teachers and students).

BIBLIOGRAPHY

Aranas, M. (2002), *Electronics Games for Education*, A Literature Review, URL: http://www.outuranus.com/egames.pdf recovered on 1 March 2005.

Clanton C. (1998), *An interpreted demonstration of computer game design,* Proceedings of the conference on CHI 98 summary: human factors in computing systems, *Chi' 98*, 1-2.

Danielsson, K., Hedestig, U., Juslin, M and Orre, C. J. (2003), *Participatory design in development of mobile learning environments. MLEARN 2003: learning with mobile devices*, Attiwell, J., Da Bormida, G., Sharples, M. & Savill-Smith, C. (eds). London.

Garris R., Ahlers R. and Driskell J.E. (2002), *Games, motivation and learning: a research and practice model.* Simulation & Gaming. 33,441-467.

Khan B. H. (2005), *A comprehensive e-learning model*, Journal of e-Learning and Knowledge Society, 1 (1).

Malone T. W. (1982), *Heuristics for designing enjoyable user interfaces: lessons from computer games,* in: Thomas, J. C. & Schneider, M. L. (eds). *Human factors in computing systems*, Norwood, NJ: Ablex Publishing Corporation.

Malone T. W. (1981), *Toward a theory in intrinsically motivating instruction.* Cognitive Science, 4, 333-369.

Manovich L. (2001), *The language of new media,* Cambridge, MA and London: The MIT Press.

Soloway E., Guzdial M. & Hay, K. E. (1994), *Learner-centered design: the challenge for HCI in the 21st century,* Interactions, April, 36-48.

Thomas S., Schott G., & Kambouri M. (2003), *Designing for Learning or Designing for Fun? Setting usability guidelines for mobile educational games*, *Proceedings of MLEARN 2003: Learning with mobile devices*, Attiwell, J. Da Bormida, G., Sharples, M. & Savill-Smith, C. (eds), London.