Spatializing Social Practices in Mobile Game-based Learning

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Abstract—**The objectives of this paper are to explore the characteristics of patterns of participation in social and game-play spaces outside the classroom of 10 fifteen-year-olds engaging in mobile game-based learning, and to determine whether there are gender differences in their use of social and game-play spaces. The data indicate some evidence of gender differences in their use. The boys in the study tended to engage in mobile game-based learning more than girls in game-play spaces. The girls tended to use the social space more than the boys and were especially more active in their use of the in-game chat system.**

Keywords-mobile learning, game-based learning, space, social.

I. INTRODUCTION

There has been an increasing interest in how mobile devices can support learning as handheld devices, such as PDAs, iPods, tablet PCs and smart-phones, become more popular and widely used [1] [2]. Freitas and Griffiths [3] noted that convergence between games and mobile devices is becoming a topic of interest in the educational context. Instead of regarding the mobile devices as potentially 'disruptive' and a waste of time, educators can harness the potential of supporting learning through the use of a game installed in a mobile device.

In this study, the game-based curriculum proposed is different from that of traditional curricula because the learning is mediated by a mobile game which demands learning across different spaces. This game-based mobile learning requires novel learning skills not present in the mainstream educational context, thereby posing different challenges for students to perform well in this new learning paradigm. The purpose of this study is to characterize the patterns of game-based learning practices in social and game-play spaces of boys and girls outside the classroom.

In the present study, the *Statecraft X* game installed in an iPhone seeks to engage students in learning the principles of governance through game-play. It is a multiplayer strategy game where teams of three to four players compete against one another to assume the leadership in the game kingdom of Velar. Students play the role of a governor and try to win the trust of the people in their own towns and other towns, in order to gain control of the kingdom through collaborating with other governors in their own faction, and competing with governors in other factions. With the use of an iPhone, students can interact continuously with the game content, and chat with other fellow governors through the game chat system across a multitude of spaces, thanks to the portability of the mobile device used.

Thus, the game affords collaboration in both social and game-play spaces. Indeed, we will examine how students utilize space to make sense of the game without specific instruction or guidance from the classroom facilitators. The *Statecraft X* game is different from similar games such as *Civilization* in that the game requires players to collaborate with one another, an important skill in today's workplace, and that decisions made by one player or one team of players affect the game outcomes of other players. Another difference is that the players do not have to be logged in at the same time. They can weave game play into the activities of their daily lives as play among team members can be asynchronous.

In the past, research in space had been under-represented [4]. However, spatial research has become increasing important with the emergence of new technologies such as *Google-Earth* where the virtual and real features are integrated. Mobile phones such as the iPhone give learners the opportunity to interact with other learner in real time anywhere so that learners can communicate with others in spaces other than the classroom. This is especially important in this study because the learners are playing the role of a governor which requires them to be make decisions 24/7. Therefore, having to play the *Statecraft X* game in the iPhone mirrors the social practices of a real governor.

The present data sources of interviews and information from the in-game chat system will provide the data for determining the patterns of social interactions of learners who engage in game-based mobile learning. This is important for the designing of curricula for the use of new technologies as the new curricula should take into account of these patterns to support learning in this new educational context.

The following research questions will be addressed in this paper:
1. What are the patterns of participation in social and game-play spaces outside the classroom?
2. Are there gender differences between the use of social and game-play spaces?

II. METHODOLOGY

A. Participants

Ten 15-year-old students participated in this pilot study. There were altogether 6 girls and 4 boys. They were taken from different classes in a secondary school in Singapore. The boys and girls were grouped separately into three factions to determine whether there are differences in their game play.

B. Materials

The game used in this study, *Statecraft X*, is designed based on the principles of governance in the Social Studies curriculum for secondary three students. These students were each given an iPhone with the *Statecraft X* game installed. In this study, there were three teams who competed against one another in this multiplayer strategy game to rule the fantasy kingdom of Velar. The first game objective is that all the teams must collaborate to ensure that their kingdom, Velar, survives in the face of attackers from other kingdoms. Second, individual teams must consolidate their power and position by winning the trust of the people in their own towns and also the people in the towns of other teams. This game aims to allow students to think as governors and thus appreciate the complexity of the task of nation-building.

Through the game-play, the student governors experiment with different forms of governance to explore alternative models of governance. For example, students may choose to build a welfare state where the state provides all their needs or they may choose to have a state where only certain races enjoy privileges while others do not.

The chat system within the game *Statecraft X* also encourages the players to communicate and collaborate with their team members and other teams and with the helper from the research team. The iPhone also allows students to text or call each other if they choose to do so.

In addition to the game, teacher-facilitated classroom activities and online blogs and forums supported the learning of the *Statecraft X* iPhone game. The final assignment of the 4-lesson study was the presentation of a speech by the students. The purpose of the speech was to assess the learning of principles of governance based on their game experience, in-class activities and outside-classroom activities.

C. Procedure

During the first lesson, these students were each given an iPhone with the game *Statecraft X* during the first of four lessons of this study. The research team taught them how to use the *Statecraft X* game through a tutorial session of town management, trading, movement on the world map, etc.

The first author was the facilitator of the four lessons which took 5 hours and 10 minutes to complete over four days in a week. Immediately after the last lesson, the first and third authors interviewed all students to elicit data concerning their game-based learning, and subsequently transcribed the interviews.

D. Data Sources and Data Analysis

The data sources used in this paper were the interviews, the server-generated chat data, the blog and forum created for the purposes of this study. From these sources, a table was created to explore the patterns of participation of girls and boys in social and game-play spaces. The social space comprised the chat system, the blog, the forum, SMS and MMS. The game-play space consisted of home, travel, school spaces outside the classroom and town. Percentages were calculated based on whether the girls or boys have used a particular game-play or social space. For example, 2 out of 6 girls interviewed said that they used the SMS to communicate with each other and thus it was calculated that 33% of the girls used the SMS.

There was a further analysis of the chat data to determine patterns of communication among all students, and among boys and girls. Due to the small sample size, a non-parametric test, the Wilcoxon rank-sum test, was used to determine differences in the participation rate in the chat system between male and female students.

III. RESULTS AND DISCUSSION

A. Characteristics of Game-Based Mobile Learning Practices

The data (see Table I) showed that the students participated in a wide variety of social and game-play spaces. Overall, the most popular spaces were home and the chat system, followed by travel and the blog. 100% of the students used the chat system and played the game at home. 90% of the students reported using playing the game when walking home, cycling, and travelling on the bus and train. 80% of the students participated in the blog while 40% reported using playing the game in school and 40% participated in the forum. 30% reported using the SMS to communicate with their fellow participants. Only one boy used the MMS and one girl played the game during an outing organized by her friends.

A comparison of the data between the girls and boys (see Table I) indicated that the girls seemed to participate in the social space more than the boys whereas the boys were more engaged in the game-play space. The girls showed a higher participation rate in the blog, forum, and SMS spaces. On the other hand, the boys seemed to be more engaged in mobile learning in the game-play space. The interview data suggest that they constantly interacted with the game at home, when they travelled from school to home, and when they were in school. This finding is in line with earlier work with electronic games where it was reported that boys spent more time playing more electronic games than girls among more than 900 fourth through eighth grades from one American school system surveyed [5].

One boy was so engaged in game playing that he would even play it when he had to stop cycling in front of the traffic lights. Another boy also talked about how he played the game everywhere, when he was eating, reading, on the bus,

on the train. He relished the fact that he had the freedom to play the game in school as well because students who were not playing the educational game *Statecraft X* were not allowed to play mobile games in school. He would log in *Statecraft X* every fifteen minutes to check on the situation of his towns in Velar.

TABLE I.   GAME-BASED MOBILE LEARNING PRACTICES IN SOCIAL AND GAME-PLAY SPACES OUTSIDE THE CLASSROOM

Space	Gender		
	Female (n = 6)	*Male (n-4)*	*Total (n = 10)*
Social Space			
Chat System	100%	100%	100%
Blog	83%	75%	80%
Forum	50%	25%	40%
SMS	33%	25%	30%
MMS	0%	25%	10%
Game-Play Space			
Home	100%	100%	100%
Travel	83%	100%	90%
School	33%	50%	40%
Town	17%	0	10%

B.   Characteristics of Use of In-Game Chat System

The analysis of the data revealed that there were gender differences in the use in the chat system. A Wilcoxon rank-sum test indicated that there were gender differences in the use of chats, $W = 13.5$, $p = 0.069$, but it did not reach statistical significance. The girls ($M = 28.33$, $Mdn = 33$, $SD = 13.95$), used the chat system more frequently than the boys ($M = 11.75$, $Mdn = 8.5$, $SD = 12.37$).

A closer look at the data revealed different patterns of use of the chat system. Boys only chatted with all students while girls used the chat system to communicate on a one-to-one basis. One girl, in particular, used the chat system 19 times, to communicate with another girl, compared to 17 times to all students.   For girls, the topics of conversation were centered both on the game, on the assignment for the *Statecraft X* curriculum and also on personal matters. Boys used the chat system to talk about technical problems with the chat system, the game, or the final assignment. There was no reference made to their personal lives. This finding corroborates Lippa's [5] prior research where he found that "females and males show large differences (d = 1.29) in their placement on the people-things dimension of interests, with women being more people-oriented and men more thing-oriented" (p.639). That is, it could be interpreted that the boys in this study were more concerned with problems faced playing the *Statecraft X* game because they were more thing-oriented whereas the girls participated more frequently in the chat system, and talked more about their personal lives because girls were more people-oriented.

IV.   CONCLUSION

The main aims of this paper have been to study to (1) characterize learners' patterns of participation in social and game-play spaces outside the classroom, and to (2) determine whether there were gender differences in the use of social and game-play spaces. The results suggest that the most important spaces were the home and the in-game chat system. Some gender differences were found in the use of these spaces. The boys tended to engage in mobile learning more in game-play spaces than in social spaces, and vice versa. Thus, the design of the assessment criteria for assessing student performance should take into account these differences to ensure a less gender-biased assessment. It must also be noted that there were limitations in the data sources. A further survey of the frequency with which learner use the game-play and social spaces will be conducted in future studies to further study the use of space by learners when they engage in game play.

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