Is Game-Based Learning an Effective Instructional Strategy to Engage Students in Higher Education in Singapore? A Pilot Study

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Abstract

Today’s Internet Generation is accustomed to multi-tasking, graphics, fun, and fantasy. Educators in Asia are finding it increasingly challenging to engage and motivate students with traditional modes of teaching. One tool that may help them in this endeavor is game-based learning, which is beginning to catch on in K-12 schools and higher education. This paper examined whether game-based learning is an effective instructional strategy for engaging and motivating students in higher education in Singapore. Findings indicate that game-based learning can be a useful strategy to motivate students, because the challenge of a game fosters competition between groups and collaboration within groups.

Keywords

Blended Learning; Game-Based Learning; Pedagogy

Introduction

“Good teaching is open to change: it involves constantly trying to find out what the effects of instruction are on learning, and modifying the instruction in the light of the evidence collected” (Ramsden, 2003, p. 102).

Educators in the 21st century are in the midst of a paradigm shift. They are recognizing the growing need to redesign pedagogical practices to engage 21st century students who are accustomed to multi-tasking, graphics, fun, fantasy, and the Internet, and are incredibly bored by traditional modes of teaching (Jukes, McCain, & Crockett, 2010). Today’s students prefer to construct their own learning and gather information, tools, and feedback from multiple sources. They prefer technological and collaborative experiences that exhibit clear goals, enhance motivation, and involve authentic activities (Brown, 2000; Frand, 2000; Oblinger, 2003). In view of this, educators are increasingly seeking to tap the potential of game-based learning to engage and motivate learners.

This paper seeks to examine whether game-based learning is an effective instructional strategy for engaging students in higher education in Singapore. It examines whether instructional games can stimulate student interest and boost their learning motivation. It also investigates what aspects of game-based learning are engaging to students in Singapore.
Recent research suggests that students who are growing up in a digital environment are neurologically different from the generation of baby boomers who have not (Small & Vorgon, 2008). This is caused by the fact that the digital world offers a direct connection between the effort expended and the immediate reward received. In contrast, rewards in class are often deferred until formal assessments or examinations are conducted. Students find such distant rewards as being too far in the future to motivate them to learn. Instead, digital learners prefer learning that is relevant, active, instantly useful, and fun.

Renowned psychiatrist William Glasser asserted that there is a strong connection between fun and learning. Glasser’s Choice Theory identifies fun as a basic need that drives human behavior. Students learn best when they enjoy what they are being taught, as they have a strong need to connect and have fun (Glasser, 1998). Strauss (2010), in an article in the Washington Post, noted that brain researchers have suggested that fun is required for authentic learning and long-term memory. Neurologist and educator Judy Willis has also highlighted the learning benefits of fun. She noted that when joy, comfort, and spontaneity are replaced by homogeneity and conformity, students’ brains are disengaged from effective information processing and long-term memory storage. The joy of learning and discovery is the well-spring for the highest-level of executive thinking, making of connections, and “aha” moments (Willis, 2006).

In the educational context, computer games have been known to offer several related benefits, such as engaging learners in learning environments, increasing motivation, intensifying retention of information, and improving problem-solving skills. In addition, computer games allow groups of learners to share knowledge, skills, resources, and to cooperate for solving problems (Chiong, 2010). Keller and Kopp (1987) posited that motivation plays an important role in learning as it stimulates learner interest. In this regard, games have an important role in promoting engagement and intrinsic motivation in instructional settings, as observed by Malone (1981), Bowmann (1982), Provenzo (1991) and Rieber (1996). Instructional games offer the opportunity for the learner to learn by doing and to become engaged in authentic learning experiences (Garris, Ahlers, & Driskell, 2002).

Advocates of computer game-based learning argue that computer games have the potential to transform the way in which students learn, and can motivate and engage a new generation of learners in ways that traditional education does not. Richard and Oblinger (2003) noted that games are motivating as players need to seek out data and information to successfully complete its challenges, in contrast to the traditional classroom approach of being given facts and figures and then figuring out how they may be relevant. Lin, Liu and Shih (2010) showed that many students found digital games to have a positive effect on their learning motivation, attitude and flow experience.

According to Foreman (2003, p.15), “Games expose players to deeply engaging, visually dynamic, rapidly paced, and highly gratifying pictorial experiences that make almost any sort of conventional schoolwork (especially when mediated by a lecture or text) seem boring by comparison”. A recent study by Patrick Felicia (2010) concluded that games are effective in motivating and engaging students. Felicia’s research highlighted three key elements which contribute to the motivational outcomes of games: the design of the game, the medium used to deploy the game, and environmental scaffoldings such as support from teachers. The study further observed that games which produce motivational outcomes have clear goals, rules, multi-sensory cues, narratives and a good balance between the educational and entertaining features. Active support from teachers in the introduction and running of the game also increased student motivation.

A large body of literature supports the notion that games can facilitate learning and motivate learners when they are well-designed. Such digital games are appealing and incorporate challenges, clear goals, variety, choice, error toleration, fun, social interaction, feedback and recognition (Richards & Min, 2011; Spitzer, 1996). According to Marc Prensky (2001), there are six key characteristics of games which lead to strong engagement of students: rules; goals and objectives; outcomes and feedback; conflict/competition/challenge/opposition; interaction; and representation or story. Rules provide structure. They

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are needed so that players know what’s expected and allowed within the boundaries of the game. Goals and objectives foster motivation, as they give players something to strive for. Outcomes and feedback provide players with information regarding progress towards these goals and objectives, and can be both inside and outside of the game. They are most effective when they are immediate. Conflict, competition, challenge, and opposition are the in-game problems that need to be solved to be successful. Interaction relates to the social aspect of games, i.e. players often interact with each other while playing. This is especially the case for online games like World of Warcraft. Finally, representation means that a well-designed game needs to have a story; it needs to be about something.

Kirriemuir and McFarlane (2004) highlighted two key themes common to the development of games for education, namely "the desire to harness the motivational power of games in order to ‘making learning fun’ and a belief that ‘learning through doing’ in games such as simulations, offers a powerful learning tool” (p. 10). In such games, players (sometimes in cooperation with others) are actively solving challenging, situated problems. In addition, well-designed games are consistent with constructivist, situated learning and collaborative learning theories (Tham & Tham, 2011), which stress that learning is an active social process in which meaning emerges from experiences while solving situated, realistic problems.

Some universities around the globe are beginning to utilize game-based learning to motivate students. This is evidenced in the recent work of Ebner and Holzinger (2007) and Virvou, Katsionis, and Manos (2004), who used competitive games and virtual reality games to support the learning and practice of civil engineering and geography, respectively. Game-based learning is also catching on in schools and institutes of higher education in Asia. A study conducted by Zhi and Zhang (2008) showed that students at a large university in Nankai, China learned more from quasi-game-based learning than from purely face-to-face classroom instruction. The study involved 150 third-year undergraduate computer majors (aged between 19 and 22) enrolled in the software engineering course.

In Singapore, however, the use of game-based learning as an instructional strategy to engage students is largely confined to K-12 schools. Two recent studies (Chee & Lee, 2009; Gwee, Chee & Tan, 2010) showed the effectiveness of game-based learning to engage students aged 14 and 15 in deeper learning. Chee and Lee (2009) noted that the use of well-designed game-based learning promoted learning and the acquisition of problem-solving skills and collaborative knowledge building skills among students.

Universities in Singapore are just beginning to explore new ways to engage students in learning. Three large, local universities - National University of Singapore, Nanyang Technological University, and Singapore Management University - have introduced the use of student response systems, using handheld, palm-sized devices, in their weekly graded lecture quizzes (Lei, 2011). Multiple choice quizzes are flashed on a screen and students select an answer using their individual ‘clickers’. Lecturers noted that the clickers made lessons more fun and encouraged students to become more involved during lessons, as students felt they were playing a game during the ensuing quizzes. The reason for this is that the use of clickers in lecture quizzes incorporates two essential elements of games in education which motivate student learning, namely, “making learning fun” and “learning through doing” (Kirriemuir & McFarlane, 2004, p. 10).

In short, while the literature provides evidence of the potential of game-based learning as a useful strategy to increase student motivation to learn, institutions of higher education in Singapore have barely begun to implement this pedagogical tool. Therefore, this article examines, in a small way, whether instructional games can stimulate student interest and boost their learning motivation, and which aspects of game-based learning are engaging to students. The reader should note here that there are many definitions of game-based learning. For purposes of this study, the author adopted the definition of game-based learning used by Carson Learning Services (2006): “Game-based learning is the process of taking an idea and creating an activity to deliver that idea in a manner that is motivating, challenging and fun, and has a measurable learning objective as a foundation” (p. 1). Game-based learning tools can include digital games, simulations, educational videos (where students watch a video and discuss answers to questions), and in-class group competitive games such as quizzes and crossword puzzles.
Methods

The author was invited to teach a course at an institute of higher learning in Singapore on the historical and economic developments of two major Asian countries. The author was informed that previous cohorts that had studied this course found the lectures boring and consequently class attendance was poor. Against this backdrop, the author decided to introduce game-based learning to trigger student interest in the subject, to boost class attendance, and ultimately to achieve improved student achievement.

To engage the students, the instructor introduced game-based learning using a blend of multimedia tools such as educational videos (where students watch a video and discuss answers to questions that follow to facilitate understanding of concepts taught), as well as team competition in solving quizzes, puzzles and games that required students to search for information using Internet sources. They were designed according to the best practices described in the literature. The games usually lasted about half an hour and were intended to engage students in the subject taught, enhance retention of information, and improve problem-solving and team skills. Scores were awarded to each team and the winning team was awarded a mystery prize. Before the game-based learning session, students were briefed on the goals and rules of the game. The content for the lesson was then introduced following the game-based learning activity.

A focus group interview was conducted at the end of the course, with a group of 20 young adult Singaporean full-time students, aged between 17 and 18 years and enrolled at an institute of higher learning in Singapore. The students were in Year 2 of their studies and the group was composed of 11 females and 9 males. They attended the same class and thus knew each other well.

The following questions were posed to the focus group:-

1) Did you enjoy the game-based learning introduced in this course? Please provide reasons for your reply.
2) Which aspect of game-based learning do you find most effective in engaging your interest: challenge, fun, or reward?
3) Has the game-based learning triggered your interest in the subject taught?
4) Does game-based learning motivate you to engage in self-regulated learning?
5) Apart from game-based learning, what other factors would motivate you to study and do well in this course?

Findings

The first author acted as the interviewer and the interviews were recorded, transcribed, coded, and entered into the computer for processing and analysis by the second author. Student responses can be summarized as follows:

a) Sixteen of the 20 students said they enjoyed game-based learning. They liked being involved in finding their own answers and learning from peers during group discussions. They felt that the instructional games provided an enjoyable learning experience compared to merely listening and taking notes during a lecture. Four students, however, felt that the games did not affect their motivation to study for the course. They said that achieving good grades was the key motivator. They would be attentive in class even in the absence of games;

b) As for which aspects of game-based learning were most engaging, all students agreed that it was the team work, inter-team competition, instructor feedback, and recognition. They deemed game-based learning enjoyable in that it connected them socially with other students and provided a new, stress-free environment for learning. Students enjoyed the collaborative team work in solving puzzles and quizzes as it gave them a higher sense of social belonging;

c) The game-based learning approach acted as a good trigger for getting students interested in the lessons. Students felt that the use of games stimulated their interest in the subject. Active
participation in games and related activities reinforced their learning and helped sustain their interest in a “boring” subject. A related outcome was good class attendance throughout the 13-week course. Students said they looked forward to the class;

d) Students felt that the 30-minute game session was sufficient as an interest trigger. It would, however, not affect their motivation to engage in self-regulated learning, which is determined more by the need to achieve good academic results to enhance future career prospects;

e) Apart from games, students said that their personal aspirations and ambitions played a vital role in motivating them to study hard. Some students mentioned that gaining their parents’ approval and recognition were the most important factors motivating them to study and perform well academically.

To provide more detail, some of the students’ comments/views on game-based learning as introduced in the course are shown below:

My perception of the course has changed. My initial view was that this course will be dry and boring. It is about learning facts and figures – so boring! I was pleasantly surprised that the course can be so interesting and enjoyable. Through the instructional videos cum case study, puzzles and quizzes as well as competitive games, I found myself enjoying the lessons. The instructional games motivated me to read up more about the 2 countries and formulate knowledge through self-discovery. The group discussions were also interesting and I learnt from my peers.

I must say that the course is really fun. I looked forward to attending class and did not miss any lessons. I found myself more actively involved as we were required to solve problems together in class and online. It has certainly helped me to be more engaged in studying the course.

My friends and I enjoyed the games. We enjoyed the instructional games. We were actively participating in the games as there is a prize for the winning team. It caused us to be interested in the subject taught.

I enjoyed the team work in solving a case and in finding the answers to the cross-word puzzles. The experiences in collaboration give me a higher sense of social belonging.

Discussion

This paper examined whether instructional games can stimulate student interest and boost their learning motivation and identified aspects of game-based learning which are engaging to students. One major finding of this research is that competition or challenge plays a major role in making instructional games enjoyable (Csikszentmihalyi, 1990) and motivating (Malone, 1981; Malone & Lepper, 1987). Our instructional games required students to interact and compete as a team. The competitive element created a lively atmosphere in class; there was enthusiasm, attentiveness, and excitement among students. This friendly and lively atmosphere and the rapport built set the right mood for the instructor to introduce the content at the end of each game session. Students said that the recognition gained in winning the game enhanced cooperation within their teams. The findings of this research are in line with the observations of Malone and Lepper (1987) that games appear to strongly motivate players to engage in problem solving and critical thinking, due to three interpersonal motivating factors: cooperation, competition, and recognition. Learners would be much more highly motivated if the success of independent tasks (highly desired) would be dependent on the efforts of group members. Endogenous competition and recognition are also strong motivators in fostering learning.

In our study, students found the instructional games beneficial, as they were able to garner new information or knowledge on their own. At the same time, game-based learning activities were scaffolded by instructor guidance, support, and feedback as necessary. Students also expressed that the pre-game briefing, clear learning goals, and appropriate difficulty level of games were important. In addition, debriefing and instructor feedback at the end of each game session were valuable, because students
could learn from their mistakes and gain new knowledge through the activity as a whole, and not just play
games for the sake of fun alone. The importance of instructional support and debriefing is also discussed
by Crookall (1992), de Jong and van Joolingen (1998), and Garris, Ahlers, and Driskell (2002). Debriefing
and feedback give learners the opportunity to reflect on their experience with a game and understand
how this experience supports the instructional objectives of the course or program of instruction.

The literature also notes that student profiles and learning styles have a bearing on their participation in
games. In this study, some students showed less interest in games or did not get immersed in them. In
this regard, several researchers have emphasized that some important considerations in assessing
cognitive tools are learner profiles, including academic ability and personality type (Bredemeier &
Greenblat, 1981; Dempsey, Lucassen, Giley, & Rasmussen, 1993; Gardner, 1983; Jacobs & Dempsey,
1993; Seginer, 1980). Characteristics of learners, such as the preference to work in a group or alone, can
affect their experience with a game, especially when the game is designed with a very open structure
(Hogle, 1996).

Conclusion

In sum, this study showed that game-based learning can be an effective instructional strategy in engaging
students in learning. The competitive element of instructional games such as the ones used in this
research is able to trigger the interest of students in an otherwise “boring” subject. Student interest in the
course increased as evidenced by good class attendance and active participation. As noted by Oblinger
(2006), games carry an enormous potential to create immersive, experiential learning environments, draw
students into a project, and enhance their capabilities in information processing, decision making,
knowledge application, problem solving, and group collaboration.

Ignoring the educational power of games dismisses a potential valuable learning tool, as games can be
used as a useful learning resource to initiate or sustain the learning process. Game-based learning is a
transformative pedagogy that motivates students to engage in learning at a deep, personal level (Chee &
Lee, 2009). It is however, important to ensure that instructional games embody sound educational
principles and offer learners an experiential, immersive, and engaging, problem-based learning
experience.

Future work is needed to examine which instructional design aspects of game-based learning motivate
students to engage in this deep, personal learning. One limitation of this study is that learning gains were
not measured. While students were able to provide the right answers during the game-based learning
activities, the degree of learning was not established. In addition, the findings of this study are based on
one group of students in a tertiary institute in Singapore. Future studies involving larger cohorts of
undergraduates from different universities in Singapore (and across Southeast Asia) will provide more
conclusive evidence on whether game-based learning is an effective instructional strategy to engage and
motivate students in learning, and how this, in turn, impacts student achievement.

References

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