

Games in Teaching in Singapore Schools

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Abstract.

With the proliferation of entertainment games, supported by heavy industry investment in the underlying technologies, educators all over the world have been led to look closer into cultivating gaming's education values and incorporating games in teaching. In Singapore, the game sector is estimated to be worth S\$285 million in 2008 and gaming is a prevalently engaging activity of the young. In this paper, we report on the concerns of school teachers in Singapore with regards to the use of games and simulations in learning from a study we recently conducted. The objective of the study is to shed light on the usage of gaming activities in learning, perception of adoption and use, and problems encountered in teachers' attempts.

Keywords: Games, learning, teaching, education, Singapore, motivation

Introduction

In Singapore, the game sector is estimated to be worth S\$285 million in 2008 (Luo, 2008) and gaming is a prevalently engaging activity of the young. Moreover, in December 2008, the Singapore government announced the building of a new 19-hectare media hub, Mediapolis to greater emphasize game design, development and use.

With the proliferation of entertainment games, supported by such heavy industry investment in the underlying technologies, educators all over the world have been led to look closer into cultivating gaming's education values and incorporating games in teaching. There are many benefits of games in education, from stimulating students' information assimilation and retention, motivating students to enhancing their motor coordination. Yet games have not been adopted en masse in education. This could be due to the stigma of games being known as "play" as opposed to "work" and gaming's association with violence, although research has not found evidence for such relations (Anderson, 2004; Van Eck 2006). Moreover, there has not been much empirical evidence of game use in teaching and learning, especially in Singapore.

To gain a better understanding of the status of use and perceptions of simulations and games in Singapore education we conducted a survey on teachers from Singapore schools. The result of our findings may shed some lights on the use of simulations and games for education, which has implications on the developmental directions of the media hub.

The term "games" used in this context includes but is not limited to serious games, online games, off-the-shelf games, and board games; these are not necessarily computer-based games. A broad based definition of games is used as the research intends to understand the current state of game adoption in Singapore schools. The research questions for this paper are: what are the teacher's perspectives of game use in the classroom? What factors encourage or inhibit the teacher's use of game-based learning?

This paper begins with a literature review of games in education followed by a description of the research methodology. Next, the findings of the survey and the analysis of the results will be discussed. Finally, the paper concludes with limitations and implications.

Literature Review

Games, though fundamentally different from instruction, have gained attention of researchers and teachers for use in classrooms worldwide (Can et al., 2006; Kumar et al., 2007; Sandford et al., 2006). It is often argued how games are educationally beneficial. Many believe that games help stimulate information assimilation and retention, enhances motor coordination and ability to think quickly and analyze a situation, help with aspects of coordination and concentration on visual details. Csikszentmihalyi (1975) explains that when an individual plays games, he or she is in a state of flow, an optimized experience in which the individual is fully immersed in what he or she is doing. In addition, games are understood to enable teachers to observe their student's problem-solving strategies in action and to assess their performance against problems; it offers teachers' resources they can use to make their subject matter come alive, for example in modeling the scientific process (Beedle et al., 2007; McFarlane et al., 2002). However, disadvantages like children prone to get excited by violence by being over stimulated by games, cannot be ignored (Thomas et al., 2008, Subramanyam et al., 2001). The negative affects of games in the classroom are though generally linked to irrelevance to the content or to excessive play (McFarlane et al., 2002; Prensky, 2001).

McFarlane and colleagues (2002) found that there was recognition across the age range that games support the development of a wide range of skills which are essential to the autonomous learner. Other research has given evidence for gaming's effect on student accuracy, speed of calculations and self-esteem (Miller & Robertson, 2009). Teachers are generally interested in motivational and academic benefits when considering incorporation of games in the classroom. There are three general perceptions among educators - those who understand the potential of games in their teaching, those who prefer only a specific type of game and are reluctant to try other types of games, and those who have not used games at all and are not interested in this approach (Dondi & Moretti, 2007).

Using games in immersive environments requires a 'mindset' independent of traditional beliefs, assumptions, and values about teaching and learning (Kafai, 2001). In addition, there are several implementation issues for instructors or teachers before they consider games in teaching and learning. A significant issue is availability of environment where students can play games i.e. availability of right equipment, their configuration, and technical support. Further, there are issues like professional

training, licensing agreements (FAS, 2006). Van Eck (2006) argues that for game-based learning to be enhanced, documentation and training, technical, financial, infrastructural and research and development support is needed.

Another challenge for teachers is the appropriate integration of gaming into the curriculum (Prensky 2001). To this regard, governmental policies and support is required for such integration. In Singapore, the Ministry of Education, MOE, has outlined, in its third Masterplan for ICT in Education (MOE, 2009), its vision to adopt innovations to enrich and transform the learning environments of students. Five future schools have been selected to showcase these innovations which include virtual simulations and games.

Research Methodology

The survey methodology was chosen as it provides a wide cross-sectional view of respondents from a target population (Babbie, 1995). It also does not take up too much time from the respondents, in this case, time-pressed teachers. Twelve schools in Singapore were selected and forty copies of the paper-based questionnaire were distributed to each of the schools. There were 5 primary schools, 5 secondary schools and 2 junior colleges. Schools were selected based on convenience sampling; however effort was taken to ensure diversity in the school environment and context. For instance, for secondary schools, there was representation from government, government-aided and independent schools.

The questionnaire consisted on items based on the literature review. The instrument included demographic information on the teachers, the teacher's perspective of game use and its effectiveness, the teacher's and school's game and IT use, the teacher's training, the future use of gaming in education. There were 21 quantitative questions, and one open-ended question. In addition, after each question, teachers could add their own qualitative comments.

Data was collected from January to May 2009 resulting in 419 responses by the time this report was written up. This was because not all schools filled out all 40 forms, and some schools took longer to administer and return the forms. 36% of respondents were from the primary level, 45% the secondary level and 19% from the junior college level. 58% of respondents had more than 5 years of teaching experience, 31% had 1-5 years of experience, while 10% had less than one year of teaching experience. In terms of subjects, 32% of respondents taught English, 18% Chinese, 16% Mathematics while 34% taught other subjects. Teachers were able to choose more than one teaching subject as teachers in Singapore may teach more than one subject especially at the primary level.

Results and Analysis

Overall usage of games for education in Singapore schools

From the survey results, 55% of the respondents indicated that they have incorporated games into their teaching. However the frequency of game usage is limited; only 2% of teachers use games weekly in their lessons while the majority rarely employs games (35%). The most popular type of game played is the custom-written game (27%) followed by other types of games e.g. board games, card games, word hunt games, (26%), off-the-shelf (18%) and freeware games (17%). The most common genre of

games played are simulations, related to the content being taught. Other genres played include turn-based strategy and adventure.

Teachers' general perceptions of games

We found that the majority of teachers have a positive attitude towards the use of games for education. The teachers believed that games could lead to higher learning outcomes for students due to clear educational objectives, the novelty and engagement of the game play, interesting content, and the feedback from the game. In addition, computer games were seen as beneficial for trans-boundary interaction (e.g. the interconnectivity of games via the Internet allows students to share their views with other students from other countries.) and explaining concepts (e.g. animation and media helps elaborate concepts). For instance, some teachers commented,

Games can help to enhance learning if objectives learning outcomes are made clear. Most importantly students are assessed and they receive feedback on their performance after playing the games. (A secondary school teacher)

Nowadays lads are very visual. In order to make them understand better, having interactive visual effects does make them be more interested and they will show better understanding. (A primary school teacher)

Overall, teachers agreed that games are "a very useful aid in education" and can be used occasionally for the various benefits. Despite the positive outlook, less than 1 out of every 10 teachers actually incorporates a game in the classroom regularly. From the quantitative and qualitative analysis, this research has identified push and pull factors that explain the present state of game use for education in Singapore.

Push and pull factors of game use

Push factors refer to external forces that encourages an individual to incorporate games for education while pull factors pertains to inner motivations of the individual for game adoption. Based on the data, the research has distinguished two push factors and pull factors. The push factors are policies and curriculum support, and environmental support while the pull factors are the teacher's personal interest and gaming mindset.

Push factor: Policies and curriculum support

Policies and curriculum support are high level reasons that affect the take-up of games in education. First, policies refer to guidelines that teachers receive from the educational authorities. Teachers highlighted the restrictiveness or absence of policies regarding game adoption by the Ministry of Education (MOE; the overall governing body for education in Singapore). This has resulted in schools implementing games "in a piecemeal manner, with inadequate training for teachers", according to a junior college teacher. This is also seen in the lack of time to involve games during curriculum time, which was the highest rated reason why educational games were not prevalent in the classroom receiving 85.68% agreement from the respondents.

In general, games as a learning platform has been promoted by the Ministry. For instance, an initiative called SEED (Strategies for Effective Engagement and Development of Pupils in Primary Schools) encourages innovative teaching to engage students at the primary level (www.moe.edu.sg). Games are one of these methods.

However, as noted by the respondents in the survey, there is no focused effort on the promotion of game-based learning. While there are broad policies for encouraging the use of games, there is no specific or active championing of game adoption in schools.

With regard to the curriculum, generally teachers encountered difficulty finding relevant games to incorporate into their teaching. There seems to be a lack of support for the usage of games to teach the curriculum content. Teachers cited a lack of instructional game material for many of their subjects. A secondary school teacher was *"disappointed to note that the Ministry has not been at the forefront to create curriculum materials for schools to use."* 83.29% of respondents desired that professional game-makers be hired to create fun games that were relevant to the teaching content. The problem seems to be acute with the teaching of subjects such as Science and Mathematics in which there is less gaming software for educational use compared to Languages.

Push factor: Environmental support

The environment the teacher is in is also salient to game use. Environment support concerns the training received by the teacher, lesson time, IT resources, and community support.

The awareness and knowledge of games is important for teacher's use of games. However, this lack of knowledge is clearly evident in the survey as most respondents communicated their poor knowledge and awareness about any form of games. Training is certainly warranted. Many respondents desired such training in order to be equipped to use games to teach their students. A junior college teacher highlighted the significance of game skills training,

Teachers must be skilful in facilitating gaming lessons, or else students can make it a chaotic lesson.

Teachers also wanted clear and easy-to-read game documentation so that they could master a game without taking much time with regard to the existing games in the market (59.90% agreed to this).

Lesson time refers to the period which teachers teach a lesson. Teachers indicated that time allocated to play a game in the classroom was limited. Teachers felt that if they played a game instead of teaching the content, there would not be enough time to cover the curriculum required. For instance, a secondary teacher commented,

There will never be enough time to cover the exam syllabus as any extra time could be spent on revision. This is due to the assessment mode of the secondary school system. In order to introduce gaming as a teaching tool, the game must be able to achieve the instructional program objectives.

As many games are now IT based, IT resources in many schools were cited as being inadequate to meet the demands of new and emerging interactive games. 75.18% of respondents found that these limited resources restricted the use of games. For instance, a secondary school teacher remarked that *"our classrooms are not installed/equipped with desktop/laptop"* while another teacher commented on the *"slow computers"* in the computer laboratories.

The last environmental support factor is with regard to community support. A teacher advocated the need for such community support within the school i.e. *"a school wide*

culture" while others suggested the "*sharing of resources among clusters*". In Singapore, schools are divided into clusters based on geographical location; within each cluster, schools share resources and information, and organize community-level events. The survey showed that 71.12% of respondents were in favor of building inter-school communities to share their knowledge and experience of game use. The interaction could spur further usage of games and create a buzz over game use, and lead to the effectiveness of the game-based learning approach.

The research also found two intrinsic factors that encouraged teachers to incorporate games in their teaching - personal interest and the gaming mindset.

Pull factor: Personal Interest

An influential factor that will spur game adoption in schools is the teacher's own personal interest in using games. Intrinsic motivation is usually a pre-eminent reason for an individual's actions. As one teacher remarked,

If the teacher does not have the interest to create gaming as a tool for education, there is no option in spending so much time in acquiring the skills when he can put the time to better use such as improving delivery, coming up with better lesson plans, test questions and showing concern for students.

Indeed, although there can be external support through the form of MOE and environments, the teacher himself should have the willingness to use games in the classroom. As seen from the survey results, 12.17% of respondents were unconcerned about using games in education saying that "games are unproductive" although the majority (59.19%) disagreed with the statement. Other teachers were more willing to incorporate games. 67.3% of respondents felt that gaming could stimulate curiosity in the learning of content. Their motivation was spurred by being able to help students learn better with the game. This can be a very powerful inner drive that leads to the adoption of games for education.

Pull factor: Gaming mindset

A gaming mindset refers to the teacher's experience and attitudes towards the use of games. As noted earlier, teachers generally perceived gaming as a good form of learning for students. However, many teachers also noted that a balance is needed as students can get easily addicted to games. To the statement "Too much gaming will lead to addiction, current usage of gaming is enough", 47.97% of respondents agreed. Teachers seemed wary of students' lack of self-discipline when it comes to playing games, especially computer games and cautioned the need for teacher facilitation in game play. They also highlighted the need to teach game responsibility to students. This attitude led us to deliberate on the actual gaming mindset of teachers and we realized that there is a stigma attached to games, be it educational games or pure entertainment games. It seems that game playing is akin to doing something wrong. The majority of teachers seem to be fearful of the use of games. In addition, teachers do not wish to get into misunderstandings with parents, who already perceive game-playing as negative.

Nevertheless, there were a few teachers who had a positive gaming mindset and firmly believed in the benefits of games. 17.90% of respondents disagreed with the earlier statement that too much use of educational games will lead to addiction. A primary school teacher elaborated,

Being addicted to learning a subject via gaming is hardly a bad thing. How many will complain about their child being addicted to news and educational programs or books?

A positive gaming mindset of teachers can also be seen from the responses to the survey question "Most suitable age to start game use". 37% of respondents said that students can start as young as possible to use games in learning while only 4% preferred games to be learned when students were above 16.

The paper posits that having an open and positive gaming mindset could enhance a teacher's willingness to use games in the classroom. Thus, the teacher's gaming mindset and personal interest are instrumental pull factors that will encourage game adoption in the classroom.

Implications and Conclusion

Gaming has many potential benefits for teaching and learning. If used in tandem with curriculum, and in moderation, benefits of gaming outweigh the negative impact. Based on the data and analysis, two push factors (policies and curriculum and environmental support) and two pull factors (personal interest and gaming mindset) of game adoption have been identified. These factors have implications on the various stakeholders in the education system. This paper elaborates on challenges for policy-makers, principals, and teachers.

For policy-makers or people in a position to shape educational direction, policy guidelines regarding game-based learning needs to be enhanced. These policies should be made more explicit and highlight more examples of how gaming can be incorporated into the curriculum. In addition, game activities could already be pre-planned into the curriculum. In this way, the curriculum would have integrated the use of games which would promote student learning outcomes. This calls for a mindset and attitude change in the curriculum planning division which incorporates games. At the same time, it calls for an investment of resources into game development that is relevant for the teaching curriculum.

Schools and principals can also do their part to encourage game adoption. Schools could provide more opportunities to train teachers in game-based learning such that teachers are equipped with the skills to utilize games. In addition, schools need to plan their budget such that adequate funds are allocated for ICT infrastructure. These will have ripple effects besides the benefits from the use of computer-based educational games. Lastly, schools could organize educational game-based competitions among clusters to foster an educational game community.

Schools or communities of teachers may also collaborate on building a nation-wide resource library about educational games. A knowledge-based support of such a library, such as SGX (Lin et al., 2008), developed over time could benefit teachers in providing guides over appropriate selection of games as well as building expertise in use of specific games.

Teachers as key educators play a key role too. As highlighted from the study, personal interest and gaming mindset are internal pull factors. Teachers can cultivate a personal interest in games by participating in more gaming activities and going for

courses in game-based learning. By gaining more experience through playing these games and learning about the games, teachers would be more interested and also have a more positive mindset about them. In addition, teachers can also keep an open mindset about gaming. Nonis (2006) recommends practical ways in which teachers can introduce games into the classroom.

A possible limitation of the study is that the concept of games was broad. It included all forms of games such as serious games, online games, off-the-shelf games and board games. Moreover, the interpretation of the different types and genres of games was left to the teachers. In addition, due to media publicity about digital game addiction, many respondents were not able to disassociate digital games from physical games. It may have been clearer to separate the two types of games in future studies. Another weakness could be the inconsistency in which the survey was conducted; various administrative methods were utilized by schools to fill in the survey. This could have led to a wider variance in the data.

In conclusion, through substantial quantitative and qualitative data from a wide variety of respondents and schools in Singapore, this paper has conceived of two push and pull factors that affect game adoption in Singapore schools. Implications for the incorporation of games in the classroom for three levels of stakeholders have been discussed. This study hopes that the research will be pivotal to examining the greater role that games can play in engaging students in the Singapore education landscape.

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