

Motivation and computer game based learning

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It is commonly assumed in the research literature that computer games are a useful educational tool because students find them motivating. This paper questions this assumption and describes a study that was undertaken to examine the motivational potential of using computer game-based learning with students in Higher Education. A series of twelve in-depth interviews were carried out to explore individuals' perceptions of, and motivations for, game-playing for leisure and study. These interviews were followed by a larger-scale survey, examining student motivations to play games and to learn with games; data from 200 students were collected and analysed.

The results of this study indicate that a large proportion of the students who took part in the study do not find games motivational at all, and that there is no evidence of a relationship between an individual's motivation to play games recreationally and his or her motivation to use games for learning. These findings indicate that employing games for their motivational benefits alone is not justification for their use. However, certain computer games may provide other pedagogical benefits and there is evidence from the study that while individuals may not find games intrinsically motivational, they may be motivated to use them for learning if they are perceived as the most effective way to learn.

Keywords: game-based learning, motivation

Introduction

Computer game-based learning is emerging as a hot topic in education. In recent years, there has been increasing interest, both in the potential of computer games as learning and teaching tools, and in research into their use. The inception of educational gaming dates back to the 1950s with the integration of war-gaming, computer science and operations research, coupled with the emergence of constructivist educational theories that emphasise active, experiential learning and reflection. The first computer games were developed in the late 1960s and it was not long before computer games were also being used and developed for educational purposes (Wolfe & Crookall, 1998). Play is a powerful influence on learning that is fundamental to the development of both adults and children (Rieber, 1996), promoting engagement and mastery of developmental tasks (Colarusso, 1993). Koster (2005) argues that games are a fundamental part of the evolving human experience and the way in which we learn, providing the opportunity to practise and explore in a safe environment, teaching skills like aiming, timing, hunting, strategy and manipulation of power.

The perceived change in learning needs of the 'Games Generation' (Prensky, 2001) or 'Net Generation' (Oblinger, 2004) coupled with the ongoing growth in use and acceptability of a range of communications technology has precipitated a growing interest in the potential of games and computer games for learning. In a recent survey, 36% of primary school teachers and 27% of secondary school teachers said that they had used games to teach (Sandford et al, 2006). There are many examples of different and innovative ways in which computer gaming has been used to support learning and teaching in recent years, both with children and in Higher Education. For example, recent research with school children includes the use of bespoke science games (Magnussen, 2005), off-the-shelf historical games (Squire & Barab, 2004), and multi-user gaming environments (Barab et al, 2005). Examples of recent research in Higher Education include the use of games to support the learning and practice of civil engineering concepts (Ebner & Holzinger, 2006), a competitive game to teach programming (Lawrence, 2004), and virtual reality games used with geography students (Virvou & Katsionis, 2006).

Advocates of computer game-based learning argue that computer games have the potential to transform the way in which students learn, and motivate and engage a new generation of learners in a way that traditional education does not. Throughout the literature, in the case of both adults and children, an assumption is commonly made that the rationale for using games for learning is that games are intrinsically motivating (e.g. Grice & Strianese, 2000; Alessi & Trollip, 2001; Becker, 2001; McFarlane

et al, 2002). There is often no consideration of the fact that students' preferences are not homogenous and that computer games may not be intrinsically motivational for many people, particularly older students in Higher Education.

From this supposition, it is often then concluded that if computer games are intrinsically motivational, then they can be exploited to make learning more motivating and learning will happen almost without the individual realising it. For example, Oblinger (2004) says:

Games also offer advantages in terms of motivation. Oftentimes students are motivated to learn material (e.g., mythology or math) when it is required for successful game play – that same material might otherwise be considered tedious. (Oblinger, p 13.)

Prensky (2001) provides an example of the argument concerning incidental learning with game play:

We would build a fantastic game – one the target market couldn't resist starting or put down once they began. The learning would happen almost without the learners' realising it, in pursuit of beating the game. We would give them "stealth learning". (Prensky, p 24.)

Even if it could be assumed that games are motivational, the belief that learning can be undertaken as an incidental additional effect of game play seems to be wholly inappropriate to adult learners, for whom an understanding of and engagement in the learning process is fundamental (Knowles, 1998).

There are several possible explanations for these widely held and little-questioned assumptions regarding the motivational aspects of games. Games researchers tend to be highly motivated to play games themselves, and do not consider those individuals for whom game playing is not motivating, or indeed is actually demotivating. It is also self-selecting games enthusiasts who often participate in gaming studies, which only serves to propagate the assumption. In addition, much of the research literature in this area is based around studies carried out with children, a population who are more likely to be motivated to play with games, from which the results are generalised to adults.

The study described in the paper questions examined the question of how motivational is computer game-based learning for students in Higher Education. It consisted of a series of in-depth interviews followed by a larger-scale survey. The method of the study and results are presented and discussed in the next section.

A study into gaming motivation

The work described in this paper comes from an initial study into the motivations of students to use computer game-based learning, which was carried out as part of a larger programme of doctoral research into the potential of computer game-based learning in Higher Education. This background study was undertaken to enable the researcher to find out more about the area of interest by talking to students, and to examining the variation of opinion and perceptions as regards game playing. More crucially, it aimed to see if evidence existed for computer game-based learning being perceived as an acceptable way to learn by students in Higher Education.

The first part of this study consisted of a series of interviews with current and ex-students, which examined their perceptions of games, their motivations for playing games and their attitudes towards game-based learning in education. These interviews were followed up by the use of a survey questionnaire with 200 undergraduate and postgraduate students, with the intention of examining how representative the opinions expressed in the interviews were in a student population, and examining whether an evidential link exists between a motivation to play games for recreation and to play games from learning.

Method

In the first part of this study, twelve in-depth interviews were conducted, the main objective of which was to develop a wider understanding of the range of people's perceptions of games and computer gaming. These interviews also aimed to investigate the veracity of the assumption that a majority of people find games intrinsically motivating, and sought to discover whether people who were not intrinsically motivated by games were open to the potential of computer game-based learning.

The series of semi-structured interviews were conducted with people who were known to the researcher and who were either currently studying in Higher Education or who had previously studied to at least first degree level. Twelve was felt to be a sufficient number to draw out themes and opinions without making the amount of interviews unmanageable. There were an equal number of male and female participants, with the ages of the participants falling into all categories from 20–29 to 60+ years. Half of the interviewees were people who considered themselves to be ‘game-players’ (i.e. people who play games by choice in their leisure time) and half who were ‘non-game-players’.

Each interview lasted between 30 and 90 minutes and investigated perceptions of games playing and leisure activities, and attitudes to learning. Although there were set questions, the aim of the interviews was for the structure to be as open as possible, so the actual questions and lines of discussion varied from interview. The interviews were transcribed so that data would not be lost during the analysis, and so that there would be less reliance on the memory and initial interpretations of the individual carrying out the analysis. These interview transcripts were analysed iteratively, initially examining them to draw out themes and then re-analysing statements in the interviews against the analysis until a coherent picture emerged.

The second part of the study took the results from the interviews and examined a larger population to see if the findings held true. The population used for this study was a group of third-year undergraduate, and Masters-level postgraduate computing students. This population were selected for two reasons: first, the pragmatic reason that this was a group of students that could be easily accessed by the researcher; and second, it was hypothesised that out of any population of students in Higher Education it was computing students that were most likely to be motivated by computer game-based learning. Findings from this population can clearly not be generalised to other groups of students, but if it could not be shown that game-based learning was perceived as an acceptable and appropriate way to learn by this group, then it is very unlikely that results would be more positive in other discipline areas, and this would provide evidence that there is little justification for accepting game-based learning as an appropriate way to teach in Higher Education.

A short questionnaire of eleven questions was designed to examine the gaming preferences of the students, their motivations and attitudes towards the use of games in education. This questionnaire was pre-tested with a small number of individuals to ensure question clarity and unambiguity, and revised before being used with the final group of students. Students were asked whether they played computer games never, regularly or often and whether they played other types of games at all. They were also asked if they had previous experience of using games for learning and whether they felt that they would be positively motivated by games for learning, not motivated either way, or would find them negatively motivational. It was felt that this degree of sensitivity (i.e. a three-point scale) was sufficient at this stage of the research to differentiate between positive and negative perceptions of the motivational potential of games for learning.

Two hundred students participated, all of whom were taking a Group Project unit, and were asked to complete the questionnaire at the end of a lecture. They were first given a short talk about the nature of the research, provided with the opportunity to ask questions, and advised that completion of the questionnaire was entirely voluntary. The questionnaire was administered on paper and collected during the same session, and it appeared that there was a nearly 100% response rate (although without attendance data it is impossible to be accurate).

Results

The interviews were carried out with six individuals who considered themselves to be game players and six who said that they were non-game-players. It was clear, and perhaps unsurprising, that the participants who considered themselves to be game players had different motivations for playing games than those who did not. Among the game players, three distinct primary motivations for playing games emerged: the mental challenge; the physical challenge; and the social experience. The people who did not consider themselves to be game players, did not, however, never play games. There appeared to be two circumstances in which they would play games: boredom and to ease social situations. Only two people interviewed said that the fact that using a game would be intrinsically motivating. The others were more cautious and the overwhelming opinion was that a game would be considered and, while it might not motivate in itself, it would certainly not put people off if it were seen to be an effective way to learn.

The results of the questionnaire showed the same trend, with 65.5% of the respondents who said games would be motivating, 28% who said it would not be motivating either way and 8.5% who said that games

would be de-motivating. It is interesting to note that even in a group of predominantly male, predominantly young computing students, who you might expect to be more motivated than other groups to learn with computer games, fewer than two-thirds of students actually said that using a game to learn would be motivating in itself.

There is also an implicit assumption in much of the gaming literature that those people who are motivated to play games in their leisure time will also be motivated to use them to learn. In order to test this assumption, a statistical analysis was carried out to see if there was any link between motivation to play games recreationally and motivation to play games to learn. Since nominal categories were used (e.g. regular player/occasional player/non-player), a χ^2 (Chi-squared) test was used to examine whether the students who were motivated to play computer games, or other games, in their leisure time were more likely to be motivated to learn with games.

When the numbers of students who play computer games recreationally were analysed in relation to the numbers of students who would be motivated to play games to learn, no significant relationship was found ($\chi^2=6.482$, $df=4$, $p=0.166$). This was also the case when the numbers of game players were analysed in relation to the numbers motivated to play games to learn ($\chi^2=0.657$, $df=2$, $p=0.720$). It was not possible to gain any insights from the effects of age or gender because the majority of the population were male (83%) and aged between 20 and 29 (75%). However, there was also found to be no significant relationship between computer game playing and motivation to use games to learn when the sample was split into those with previous experience ($\chi^2=4.232$, $df=4$, $p=0.376$) or those without ($\chi^2=5.339$, $df=4$, $p=0.254$). Therefore, there was no evidence from this survey that there is any relationship between a motivation to play games or computer games for leisure and a motivation to use them for learning.

Conclusions

The results of this study show that it is clearly not the case that all individuals find computer games-based learning to be motivational, even in a key demographic of game players. However, despite the lack of intrinsic motivation, the perceptions of game-based learning were, perhaps surprisingly, positive, even from those who considered themselves non-game players, with all interview participants saying that they would consider the idea of a game to learn if it was the most effective way to learn something. Despite finding little evidence for the motivational rationale for using games to teach, there may be sound pedagogic reasons for employing computer games-based learning. If games are experiential, active, problem-based and collaborative then they have the potential to be effective environments for learning, not specifically because they are games but because they exhibit the characteristics of constructivist learning environments. It is important therefore that games-based learning applications are designed for the learning context and outcomes, otherwise there is no guarantee that any engagement in the game will lead to subsequent engagement in learning. In terms of the rationale for using games, the research described here has shown that simply to rely on the fact that games are motivational is not in itself a sufficient rationale for using a game. Nevertheless, this is not to say that games should not be used in teaching, only that the sole reason for using them should not be because they are perceived to be motivational. The rationale for using games to teach must be that they can embody sound educational principles and have the potential to create experiential, immersive and engaging, problem-based learning experiences that appropriately map the curriculum. If a game is perceived as being the most effective way to learn something then students will be motivated to use it to learn, not simply because it is a game.

Future work in this area could be carried out to examine how replicable these findings are to other student populations – particularly those that are more representative of the general student population in terms of gender balance, age, and computer literacy. It would also be interesting to investigate the affect of novelty on those students who were positively motivated by games and examine the characteristics of games that were considered motivational to inform the design of other learning activities to increase engagement.

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