Influence of videogame play on a student's approach to learning?
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Text:

1.1 Abstract

From over thirty years ago when a Pong prototype was first switched on in Andy Capp’s bar in California, computer, arcade and videogames (from here on referred to collectively as videogames) have made a significant cultural, social, economic, political, and technological impact on society (Newman, 2004). Since the launch of Pong in the 1970s, computer and videogames have grown into a $30 billion worldwide industry. Between 2000 and 2004, the UK’s consumption of videogame products and activities grew by over £15 billion, with the recent successful UK and US launches of Microsoft’s Xbox 360 and Sony’s PlayStation Portable (PSP) not yet included in those figures. In recent years there has been an upsurge in the number of researchers studying gaming. Topics have included investigations of the reasons why people play videogames, the potential of games in educational settings, and the effects which these games, and the culture which surrounds them, may be having on society. As videogame playing becomes more widespread, and increasing numbers of videogame playing students enter higher education, educational research into the impact of extensive videogame playing on student approaches to learning and attitudes towards higher education is vital. The chapter begins by presenting an introduction to the culture of videogames and continues with a discussion on the relevant literature in this research area. An overview of our research project currently being carried out in the School of Education at the University of Edinburgh in the UK will be provided. The project is seeking to explore the experience of videogame play among students in higher education, and to identify the differences which might exist between gamers and non-gamers in their approaches to learning and study, and in their attitudes towards higher education. Finally, key results will be presented and discussed in the context of current research.

1.2 “Everything bad is good…”

Videogames represent the fastest-growing sector of the global media and entertainment industry and dominate much of young people's leisure time. Presently, the videogame industry’s revenue surpasses that of the movie industry. In 2004, the average amount of time eight to eighteen year olds spent playing games per day on a computer, console or handheld was 49 minutes, up from an average of 26 minutes per day in 1999. Of the 2000 children surveyed, 22% played videogames for more than an hour per day (Kaiser Family Foundation Report, 2005). By the age of twenty-one the average American has played 10,000 hours of videogames compared to 3,000 hours of book reading (Prensky, 2001a).
From their launch, videogames have attracted widely disparate responses from media, educators, parents, academic researchers, and even religious groups and politicians.

“In America in the early 1980s President Ronal Reagan extolled the virtues of videogames to create a generation of highly skilled cold war warriors, while at the same time the US Surgeon General C. Everett Koop proclaimed videogames among the top health risks facing Americans. To be sure, such extreme cultural reactions to technological and cultural innovations are hardly new; mid twentieth-century critics feared that television watchers would become addicted to television, never leaving their homes, and critics before them feared that film would pervert viewers” (Squire, 2002).

Koop claimed that the sole objective of most videogames seemed to be kill, destroy and eliminate the enemy and that they contained nothing constructive. Koop eventually explained that he was not basing his opinion on any scientific evidence and that it was merely personal opinion, yet the debate continues even today. In the summer of 2005, following the Grand Theft Auto ‘Hot Coffee’ controversy, in which hidden code within the videogames’ programme could be unlocked to reveal pornographic scenes, Senator Hillary Clinton called on the US Federal Trade Commission to instigate a 90 million dollar study on the effects of videogames on children. Steven Johnson, author of *Everything bad is good for you: how popular culture is making us smarter*, responded with an open letter in the *Los Angeles Times* addressed to Senator Clinton, refuting the claim that popular culture is dumbing-down our society. Johnson (2005a) states that on the contrary “popular culture has been growing increasingly complex over the past few decades, exercising our minds in powerful new ways” (p13) and highlights videogames as “the best example of brain-boosting media” (Johnson 2005b). Here in the UK, Prime Minister Tony Blair, under intense pressure from politicians and parents in 2004 following an enormous media frenzy surrounding the content of the videogame ‘Manhunt’, commissioned a new research study into a possible connection between videogames and violence, which is due for publication in 2006.

With his influential book, *What video games have to teach us about learning and literacy*, James Paul Gee (2003a) finally gave intellectual respectability to academic reflection on videogame studies. He points out that “the phenomenon of the videogame as an agent of mental training is largely unstudied: more often, games are denigrated for being violent or they’re just plain ignored” (Gee, 2003b). He describes videogames as media that require deep thinking and complex problem solving skills and which are fun, immersive, and spectacularly successful at engaging players. In his research, Seymour Papert (1996) claims “what is best about the best games is that they draw kids into some very hard learning” (p88). He writes about children using the term ‘hard fun’ to describe videogames, and he immediately explains, “[the kids] don’t mean [the videogame] is fun in spite of being hard, they mean it is fun because it is hard” (*ibid*). Therefore, videogames are played because they are essentially difficult and challenging. As any successful games designer knows, if videogames are too simple and easy they will not be played, and if they are too hard and complicated they will also be avoided. Gee (2003b) states that “each level [of a successful game] dances around the outer limits of the player’s abilities, seeking at every point to be challenging enough to be hard but doable”, never moving so far beyond a player’s comfort zone that they will give up. This he says “is referred to in cognitive science, as the regime of competence principle, which results in a feeling of simultaneous pleasure and frustration” (Gee, 2003b). He believes that “learning works best when challenges are pleasantly frustrating” (*ibid*). He does not appear to be advocating the implementation of videogames in classrooms, but identifies the key design principles within
some of the most popular videogames and presents these as learning principles that should be applied and integrated into educational curricula. Gee’s current research would seem to be foreshadowed by the work of Tom Malone in the 1980s, who argued that the education community had much to learn from videogames, and from the enthusiastic engagement that they motivate in people (Malone, 1981).

1.3 The changing nature of students

Educating our students is a primary goal of colleges and universities. Reaching that goal, however, depends on understanding our learners, which is an essential component in facilitating learning. Gaining an understanding of our students’ behaviours, attitudes and expectations gives us more options for engaging students in the learning process (Oblinger, 2003).

In parallel with the observations of authors such as Johnson, there exists a burgeoning interest in the changing nature of students in higher education, with many researchers attributing this change to the impact of new media (internet, videogames, mobile phones) on students. Students who are engaged with these types of media were born in the 1980s or later and are often referred to as the ‘Net Generation’ or ‘Net Gen’ (Frand, 2000). Today’s students are accustomed to the ubiquitous presence of digital technology in their lives, for example, computers, videogames, video cameras, mobile phones and digital music players, all of which demand ‘new media literacy’. The students currently in higher education are different from their predecessors in many ways, but particularly because they are the first generation to grow up surrounded by digital media. The rate of change between generations is perceived as accelerating, with technology at the heart of that acceleration. Marshall McLuhan (1964) coined the term ‘electric speed’ to describe this phenomenon. Johnson (2005a) explains that

“[technology] introduces new platforms and genres at an accelerating rate. We had thirty years to adapt to the new storytelling possibilities of cinema; then another twenty for radio; then twenty years of present-tense television [...] five years to acclimate to the VCR and video games; then e-mail, online chats, DVDs, [...] the Web - all becoming staples of the pop culture diet in the space of a decade” (p175).

Authors are beginning to claim that as a result of this ubiquitous digital environment, the minds of the students in this generation have literally been altered (‘rewired’ is a popular term often used). Marc Prensky (2001a) claims “people who undergo different inputs from the media and culture that surround them can, and do, think differently” (p43). He describes all students as “native speakers of the digital language of computers, games and the Internet” (Prensky, 2001b, p1), and he uses the term ‘digital native’ to describe these students collectively. He believes that inputs such as computer games, television and mobile phones change the way digital natives think and behave. They make decisions faster, at so-called ‘twitch speed’, and can easily parallel process (the art of taking in information from several sources at once) and multi-task. He refers to those who were not born into and did not grow up in a digital world, as ‘digital immigrants’, those with a foot in the past, and an ‘accent’ they will never lose, which is constantly visible and identifiable through their behaviours, such as going to the internet second rather than first in search of information and the printing of their email. He claims that digital natives, who are empowered in their personal lives by and immersed in interactive
technology, find old teaching methods ‘horribly boring’ and have to ‘power down’ at school. Prensky maintains
that the “single biggest problem facing educators today is that our digital immigrant instructors, who speak an
outdated language (that of the pre-digital age), are struggling to teach a population that speaks an entirely new
language” (Prensky, 2001b, p1). He believes that the best way to ignite this missing ‘spark’ of learning is to
bring computer games into classrooms.

In contrast, Squire (2002) writes “some advocates of digital game based learning imply that developing
educational games is a moral imperative, as kids of the ‘videogame generation’ do not respond to traditional
instruction” and he continues by “cautioning against overexuberance about the potential of digital games to
transform education” (Squire, 2002). He believes that “games are very particular kinds of experiences and that
playing games does not appeal to everyone, and certainly no one game (or more appropriately game
experience) appeals to everyone” (Squire, 2005). It follows that even if students have been exposed and had
access to various new types of media, one cannot presume, that these students will have chosen or choose to
be game players (past or present). The dichotomous metaphor of ‘digital natives, digital immigrants’ seems to
imply a presumption that all young people make up a homogeneous group, a group who are immersed in the
culture of digital technology and videogames, and that therefore, all young people can be classified collectively
as ‘digital natives’, a presumption that we are challenging through our research. The variance that exists within
this generation (i.e. ‘net generation’) needs to be acknowledged and understood.

While research into the ways in which new media affects a young person’s cognitive development is ongoing, it
seems less clear how differences based on previous game experience might impact on students in higher
education. John Beck and Mitchell Wade (2004) looked to young adults within the game generation to observe
the impact of new media (videogames) on their orientation towards business. They point out that the
prevalence of games has shaped how younger adults and children, both males and females, think and learn
(Beck and Wade, 2004). The authors report that people who have intense experiences with digital media, in
this case videogames, in their formative years, will be “a different kind of future employee – people who are
confident with risk and surprise, who regard simulation and fantasy as a useful tool not a distraction, and who
see themselves as at the heroes of their own narratives” (Beck and Wade, 2004).

1.4 Videogame Research in Higher Education

It is against this background and in parallel with Beck and Wade’s research that we are conducting our
research at the University of Edinburgh. We are investigating the gaming experiences of student childhoods to
explore whether there is a relationship between a student’s past experiences of (i.e. engagement with)
videogames and their current approaches to learning and study and their attitudes towards specific aspects of
higher education (e.g. feedback and collaboration). From the research discussed earlier in this chapter further
investigation is needed into the connection between the two elements. In the context of our research we have
defined videogames to be ‘all types of electronic, handheld, console and computer video games’. Our research
question is:
What impact or influence does extensive videogame play in pre-university years have on the attitudes of students to education and specifically does it appear to influence their learning styles?

The method used in the first step of the project's data collection was a survey, which sampled over 1200 full time undergraduate students from a wide range of disciplines (e.g. Archaeology, Nursing, Divinity, Electronics) across every year of their degree (bachelor) courses. An option of online survey or paper-based survey was offered to students in an effort to ensure high completion rates. It was vital to our research that all students in our data analysis were of a certain age category so that they would have had potentially similar media backgrounds; therefore, only young adults between the age of 17 and 24 years old were included in the analysis of the data. For the purposes of our analysis, rather than grouping the students by subject area, of which there were a very large number, we grouped them into four broad cognate areas which we have found useful in the past (i.e. Medicine and Veterinary Medicine, Humanities, Science and Engineering and Social Science).

The survey was designed to gather data from each student on three major themes:

- Videogame play experience
- Attitudes towards higher education
- Approaches to learning and study.

It was clearly not possible to completely capture the rich diversity of students' approaches to learning and study and their attitudes towards higher education within a simple survey and so we focused on some key elements to provide a baseline so that any differences between student groups could be highlighted based on their previous video game engagement. Emerging themes from the analysis of the survey (discussed in the results section) could then be analysed further using qualitative methods. These key elements likely to have an influence on students' approaches to learning and study and attitudes towards various aspects of higher education were identified from previous research (Marton et al, 1997). The majority of responses were elicited using a 5-point Likert scale. The students were asked to rate their general approaches to learning and study, rather than for specific approaches used towards one course or course module.

<table>
<thead>
<tr>
<th>Please indicate your level of agreement with each of the following statements on a scale of strong agreement to strong disagreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>For the most part, I manage to hold my concentration when I attend lectures</td>
</tr>
<tr>
<td>I concentrate on learning just the information I need to know to pass</td>
</tr>
<tr>
<td>In general, I prefer to study on my own rather than with other students</td>
</tr>
<tr>
<td>On the whole, I am quite systematic and organised in my study</td>
</tr>
</tbody>
</table>
Data were gathered on previous videogame play experiences of each student. Judging that it would be difficult for students to recall their exact age when they first played videogames, which for some students could be almost twenty years ago, we asked students to recall at which stage in their childhood they played videogames. Students were also asked to recall how often they played videogames at each of these stages.

**Figure 1 Sample of survey questions**

Can you recall the period(s) in your life during which you played a video game? How frequently did you play?

<table>
<thead>
<tr>
<th>Period</th>
<th>Every Day</th>
<th>Most Days</th>
<th>Most Weeks</th>
<th>Relatively Infrequently</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>During Primary School</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Elementary School)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early Years of Secondary School (Junior High School)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Late Years of Secondary School (Senior High School)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In University</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 2 Sample survey question on videogame play experience**

Questions were included that focussed on other aspects of videogame play experiences, such as how frequently students participated in online gaming communities, how frequently students purchased videogame-related materials and what type of videogame they played most often (e.g. adventure, strategy or sports). To allow for potential constraints of time, parental control and/or monetary issues in relation to the frequency of a student’s videogame play, we also asked the students if they could recall ever having the desire to play videogames more frequently than opportunities (e.g. parents/guardian/teacher or time) allowed. We believe that data gathered on these other aspects of videogame play might play an important role in future research analysis.

1.5 **Emerging Themes**

The sample analysed included 1239 full time, undergraduate University of Edinburgh students aged between 17 and 24 years old. The majority of respondents (64%) were female, and over 60% of all students completed the paper-based survey. Almost half the respondents (46%) were from Science and Engineering, with 14% from Medicine and Veterinary, 24% from Social Science and the remainder from Humanities. Around 40% of students were entry-level undergraduate students and over 35% of students were in the second year of their course.
Table 1  Videogame play (by percentage of gender)

<table>
<thead>
<tr>
<th></th>
<th>All Students</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ever Played Videogames</td>
<td>95%</td>
<td>99%</td>
<td>69%</td>
</tr>
<tr>
<td>Currently Play Videogames</td>
<td>39%</td>
<td>94%</td>
<td>22%</td>
</tr>
</tbody>
</table>

Students were asked had they ever played a videogame and 1182 students (95%) said yes, with an almost even distribution between the percentage of males and the percentage of females. However, when asked if they currently played videogames only 39% of all students said yes, with 69% of all males surveyed currently playing videogames but only a mere 22% of females a fact which requires further investigating using qualitative methods.

One of the key steps for this research is to produce empirically derived definitions of ‘formative years’ and ‘intense engagement with videogames’ that can be used to observe the influence of previous videogame play on students’ approaches to learning and study and their attitudes towards higher education. Drawing on the work of Jean Piaget in the 1950s and through our data analysis, we produced the following definitions. We define formative years as ‘the childhood period up to and including the age of 14 or 15 years old, i.e. the end of a child’s early secondary school period (junior high school)’ and we define a person who has an intense engagement with videogames as someone who ‘played videogames every day or most days at some stage within their formative years (as defined)’. The definitions are, however, still being refined. Using these definitions we assigned each student to one of two videogame player categories: High Gamer or Low Gamer.

- **High gamer** includes all students who at some stage in their formative years (either in primary or early secondary or both) had an intense engagement (played every day or most days) with videogames.
- **Low gamer** includes all students who never played videogames in their formative years and students who played videogames relatively infrequently or most weeks at some stage in their formative years.

Table 2  Videogame player categories (by gender)

<table>
<thead>
<tr>
<th></th>
<th>Total Number</th>
<th>Total Percent</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Gamer</td>
<td>753</td>
<td>61%</td>
<td>156</td>
<td>597</td>
</tr>
<tr>
<td>High Gamer</td>
<td>486</td>
<td>39%</td>
<td>294</td>
<td>192</td>
</tr>
<tr>
<td>Total</td>
<td><strong>1239</strong></td>
<td></td>
<td>450</td>
<td>789</td>
</tr>
</tbody>
</table>

Thirty-nine percent of all students surveyed were classified as high gamers. The majority of male students were high gamers (65% of all males surveyed were high gamers) and the majority of female students were low gamers (76% of all females surveyed were low gamers). As detailed earlier, we also recorded data on various other aspects of their videogame play experiences that might prove influential in future research. When asked if they could recall ever having the desire to play videogames more frequently than opportunities allowed, over 69% of high gamers recalled having a desire to play more often, as compared to 28% of low gamers and 19%
of high gamers recalled having this desire frequently, as compared to a mere 3% of low gamers. Over 25% of high gamers reported having participated in online videogame communities, but less than 6% participated on a frequent basis. Over 50% of high gamers recalled taking part in videogame-related activities (i.e. purchasing videogame magazines and visiting videogame-related websites) with less than 10% of high gamers participating on a frequent basis.

Some of the specific questions used in the survey were detailed earlier in this chapter. During our analysis each question on approaches to learning and study and attitudes towards higher education was ranked with a score between 1 and 5. The higher the student scored the stronger they agreed with the statement given. Through detailed data analysis, key components which focussed on student approaches to learning and study and attitudes towards aspects of higher education emerged: organised approach to study, studying for understanding (relating ideas while studying), exerting minimal effort to pass, attitude towards collaboration (group work), difficulty concentrating in lectures and attitude towards qualitative feedback.

So for example in relation to the component ‘organised approaches to study’, the higher a student scored, the more organised they reported themselves to be in their approaches to study.

During our analysis we compared the means of low gamers and high gamers (using the statistical t-test) in relation to the key elements detailed earlier. We also carried out tests of independence asking ‘is there a relationship between previous videogame play (each videogame category) and each key finding?’ If the test was found to be statistically significant ($p \leq 0.05$) then there exists strong evidence to imply that a relationship may exist between the two. As our project is still ongoing it is only possible at this stage to present key findings from the survey analysis, all of which require further investigating using qualitative methods.

Table 3  Some Key Findings from our survey analysis

<table>
<thead>
<tr>
<th></th>
<th>Low Gamer N = 753 (Mean)</th>
<th>High Gamer N = 486 (Mean)</th>
<th>Difference +/-</th>
<th>% Difference (Low gamer to High gamer)</th>
<th>Tests of Independence (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organised approaches to study</td>
<td>2.98</td>
<td>2.79</td>
<td>-.19</td>
<td>-6.37</td>
<td>P&lt;0.0005</td>
</tr>
<tr>
<td>Exerting minimal effort to pass</td>
<td>3.07</td>
<td>3.25</td>
<td>.18</td>
<td>+5.86</td>
<td>P&lt;0.0005</td>
</tr>
<tr>
<td>Difficulty concentrating in lectures</td>
<td>3.28</td>
<td>3.09</td>
<td>.19</td>
<td>-5.79</td>
<td>P=0.002</td>
</tr>
<tr>
<td>Willingness to collaborate</td>
<td>3.22</td>
<td>3.22</td>
<td>.00</td>
<td>0.00</td>
<td>Not Sig</td>
</tr>
</tbody>
</table>

Low gamers scored higher when reporting how organised they were in their study, which implies that low gamers are more organised in their study, as compared to high gamers. The percentage difference between low gamers and high gamers is 6.37, and the test of independence (detailed earlier) is found to be highly
significant (p < 0.0005), which gives strong implications that a relationship may exist between the two elements and therefore we can state that students who had very low engagement with videogames in their formative years are currently more organised in their study, as compared to students who had intense engagement with videogames in their formative years.

The second finding highlighted in Table 3, refers to another aspect of the student’s approach to study, which we named ‘exerting minimal effort to pass’. The higher a student scores on this factor the more inclined they are to do the least amount of study possible while still passing. When comparing the means of each group, high gamers scored higher than low gamers, with a percentage difference of 5.86. This was also found to be highly significant (p < 0.0005) and therefore we can conclude that students who had high engagement with videogames in their formative years exert the least amount of effort in their study, as compared to students who had low engagement with videogames in their formative years.

When asked if they find it difficult to concentrate in lectures low gamers scored higher than high gamers, with a percentage difference of 5.79. This finding was also found to be statistically significant (p = 0.002) and therefore we can conclude that students who had low engagement with videogames in their formative years find it more difficult to concentrate in lectures, as compared to students who had high engagement with videogames in their formative years, a key finding that would seem contrary to the US based research that was discussed earlier.

Finally, in relation to a student’s willingness to collaborate with their fellow students, no difference, significant or otherwise, was found between the low gamers and high gamers. Both high gamers and low gamers would prefer to work alone that with other students. Essentially it should be noted that students who had high engagement with videogames in their formative years are no more likely to be willing to work collaboratively than students who had low engagement with videogames in their formative years.

During the course of our analysis we also worked with other videogame player categories which we referred to as ‘Hardcore Gamer’ and ‘Non-Gamer’. Hardcore gamer includes all students who at some stage in their formative years played videogames every day. Non-gamer includes all students who had never ever played videogames in their formative years. Assigning students to the categories of hardcore gamer and non-gamer decreased our sample size by over half, with over 700 students not belonging to either category. However when we tested these exclusionary gaming categories against the key elements of the survey (highlighted in table 3) the exact same findings emerged. The percentage difference between the two groups (non-gamer to hardcore gamer) did increase (as compared to the percentage difference between low gamer to high gamer), but the direction of the difference and the significance of each was the exact same. We feel that finding differences between groups that are closer on the videogame player spectrum (i.e. high gamer and low gamer) is more important for the purposes of our research than finding differences between such extreme groups as hardcore gamers and non gamers, where differences might be expected to occur.

1.6 Future Directions
It is important to bear in mind that the research project is still ongoing and that the findings highlighted above are an element in a larger research project. It is possible that larger differences do exist between aspects of approaches to learning and study and attitudes towards higher education that have not been highlighted here. Interviews and focus groups with high gamers and low gamers will constitute the next stage of this research, with the aim of further exploring the survey findings.

1.7 References


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