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Students' attitudes toward playing games and using games in education: Comparing Scotland and the Netherlands

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ABSTRACT

Games-based learning has captured the interest of educationalists and industrialists who seek to exploit the characteristics of computer games as they are perceived by some to be a potentially effective approach for teaching and learning. Despite this interest in using games-based learning there is a dearth of empirical evidence supporting the validity of the approach covering the wider context of gaming and education. This study presents a large scale gaming survey, involving 887 students from 13 different Higher Education (HE) institutes in Scotland and the Netherlands, which examines students' characteristics related to their gaming preferences, game playing habits, and their perceptions and thoughts on the use of games in education. It presents a comparison of three separate groups of students: a group in regular education in a Scottish university, a group in regular education in universities in the Netherlands and a distance learning group from a university in the Netherlands. This study addresses an overall research question of: Can computer games be used for educational purposes at HE level in regular and distance education in different countries? The study then addresses four sub-research questions related to the overall research question:

- What are the different game playing habits of the three groups?
- What are the different motivations for playing games across the three groups?
- What are the different reasons for using games in HE across the three groups?
- What are the different attitudes towards games across the three groups?

To our knowledge this is the first in-depth cross-national survey on gaming and education. We found that a large number of participants believed that computer games could be used at HE level for educational purposes and that further research in the area of game playing habits, motivations for playing computer games and motivations for playing computer games in education are worthy of extensive further investigation. We also found a clear distinction between the views of students in regular education and those in distance education. Regular education students in both countries rated all motivations for playing computer games as significantly more important than distance education students. Also the results suggest that Scottish students aim to enhance their social experience with regards to competition and cooperation, while Dutch students aim to enhance their leisurely experience with regards to leisure, feeling good, preventing boredom and excitement.

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1. Introduction

Before investigating whether computer games can be used as a suitable mechanism for educational purposes in Scotland and the Netherlands at either distance or regular HE level it is appropriate to attempt to define what games-based learning actually is and discuss where it fits in relation to other relevant terms in the literature such as games, simulations, computer games, video games, simulation games and serious games. Hainey, Connolly, Stansfield, and Boyle (2011a) point out that defining the term "game" is very difficult as there is no real consensus on shared terms and as a result of the term "game" covering a wide range of activities. A large number of definitions of games have been proposed. For example, Juul (2005) states "A game is a rule-based system with a variable and quantifiable outcome, where different outcomes are assigned different values, the player exerts effort in order to influence the outcome, the player feels emotionally attached to the outcome, and the consequences of the activity are optional and negotiable." Crawford (1984) states that a game is a "*closed formal system that subjectively represents a subset of reality.*" On the other hand, Dempsey, Haynes, Lucassen, and Casey (2002) define a game as "… a set of activities involving one or more players. It has goals, constraints, payoffs, and consequences. A game is rule-guided and artificial in some respects. Finally, a game involves some aspect of competition, even if that competition is with oneself." When considering all of the definitions of games proposed, the main characteristics of games are that they are voluntary, generally enjoyable, activities (mental, physical or both). They have particular goals and various methods of achieving these goals which are subject to rules and constraints. Games can be played cooperatively or competitively in groups, in pairs or individually. Games generally do not have any real life consequences outside the boundary of the game.

Complexity can be added when attempting to define a game when the term is prefixed with other terms such as "computer" or "video" to make the terms "computer game" and "video game". The term "computer game" generally refers to a game that is played on a computer and the term "video game" generally refers to a game that is played on a console. Smed and Hakonen (2003) define a computer game as "*a game that is carried out with the help of a computer program.*" Esposito (2005) defines a video game as "*a game which we play thanks to an audio-visual apparatus and which can be based on a story.*"

The term "simulation" generally refers to a representation of a real system, an abstract system, an environment or a process that is electronically generated. Crookall and Saunders (1989) view a simulation as a representation of a real world system that may focus on a specific aspect of reality. Grendler (1996) suggests that simulations can either be symbolic or experiential. Experiential simulations involve the participant being immersed in a complicated, ever altering environment where they play and active part and assume a particular role that requires them to execute problem solving strategies. Symbolic simulations are more for the purposes of prediction and projection. The learner may perform a number of tasks such as predicting the outcome of a particular course of simulation but are external to the events that evolve.

As the name implies a "simulation game" encompasses aspects of simulations and games and the overlap produces the term 'simulation games' although Kriz (2003) provides a more precise definition of simulation games as "*representing dynamic models of real situations (a reconstruction of a situation or reality that is itself a social construction). Simulation games help to mimic processes, networks, and structures of specific existing systems. In addition to mirroring real-life systems, simulation games incorporate players who assume specific roles*."

The terms "games-based learning" and "serious games" are sometimes used synonymously; however games-based learning is really a subset/branch of serious games. Kaufman and Sauve (2010) define a serious game as "*a mental contest, played with a computer in accordance with specific rules which uses entertainment to further government or corporate training, education, health, public policy and strategic communication objectives.*" Tang, Hanneghan, and El Rhalibi (2009) generally define games-based learning as "an *innovative learning approach derived from the use of computer games that possess educational value or different kinds of software applications that use games for learning and education purposes such as learning support, teaching enhancement, assessment and evaluation of learners.*" Hainey et al. (2011a) discuss some of these previous definitions and others in more detail to provide a useful diagram to disentangle the terms surrounding games-based learning in the literature and show where games-based learning and serious games fit in relation to games, simulations, computer games, computer simulations, simulations games and computer simulations. The diagram is presented in Fig. 1.

The potential of video games for education has captured the interest of academics and industrialists. Amplified by the successes of the video game industry, educational games have gained in volume and influence (Klopfer, Osterweil, & Salen, 2009). Games have demonstrated that they can provoke active user involvement through exploration, experimentation, competition and co-operation. According to Garris, Ahlers, and Driskell (2002) the gamer gets 'hooked' in a series of triggered cognitive processes that have been proven to be beneficial for learning. Games support learning because of increased visualisation and challenged creativity. Importantly, games have become widely adopted by new generations of users, the so-called digital natives, who have grown up immersed in new communication technologies (e.g. Aldrich, 2004; Connolly, Boyle, MacArthur, Hainey, & Boyle, 2012; Garris et al., 2002; Gee, 2003; Prensky, 2006; Quinn, 2005; Salen &

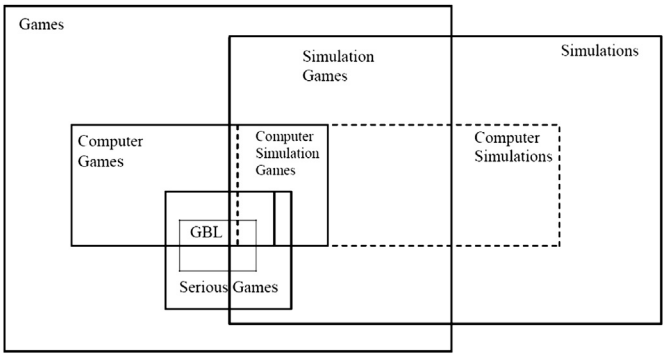

Fig. 1. Position of games-based learning and serious games in relation to related terms in the literature.

Zimmerman, 2004; Westera et al., 2008). Playing a game becomes meaningful and supports learning when the relationships between actions and outcomes in a game are both discernible and integrated into the larger context of the game. Research into games for education often takes the pragmatic form of best practices development, viz. the development and implementation of a particular game in a practical learning context, including the formative and summative evaluation of learning outcomes and attitudes of end-users. Although the involvement of end-users may help to enhance the game's appropriateness, the evaluations often have a narrow scope, e.g. are limited to a particular game, to a particular domain, or to a particular educational institute. By neglecting the wider context of education and human behaviours, the outcomes tend to be of local significance only and are difficult to transfer to other contexts. This is partly compensated for by large scale surveys, but still it is difficult to obtain a consistent nation-wide or global picture about the relevant issues for games in education, because weak links with either education or gaming, and incompatibilities of questions, target groups, gaming categories and other key parameters hinder valid high-level comparisons.

The present study is a large scale gaming survey, involving 887 students from 13 different Higher Education (HE) institutes in Scotland and the Netherlands, which examines students' characteristics related to their gaming preferences, game playing habits, and their perceptions and thoughts on the use of games in education. We have collected a consistent set of end-user data that is 1) particularly targeted to students in HE, 2) deals in depth with their explicit motivations and gaming behaviours, 3) collects their opinions about games for education, and 4) uses identical questionnaires in the two countries for enabling cross-national comparisons. As a reference group contrasting the face-to-face nature of regular HE, the sample includes a group of 317 distance education students, which is markedly different from the regular group of students by 1) the fact that distance education is arranged as an online study rather than classroom-based study, and by 2) their substantially different characteristics with respect to age, career, experience, job, family and social position.

2. End-user behaviours and opinions

Much of the early research on computer games focused on negative impacts such as violence in video games (Anderson, 2004; Anderson & Bushman, 2001). After violent incidents such as Columbine High School and Westside Middle School shootings (Smith, Lachlan, & Tamborini, 2003), playing violent video games was suspected as a contributing factor to aggressive behaviours. Indeed, several studies found a strong correlation between violent video game use and subsequent aggression (Slater, Henry, Swaim, & Anderson, 2003). Also gender issues are extensively studied, covering both gender bias in game play and differences of user preferences. A survey among 206 college students in the U.S. revealed that males were likely to play more video games than females (Ogletree et al., 2007). Also participants rated female video game characters as significantly more helpless and sexually provocative than male characters and as less likely to be strong and aggressive. The researchers suggest that gender differences in both participation and in character portrayals potentially impact the lives of youth in a variety of ways. Green and McNeese (2008) found that gender, race and the need for social gratification are significant predictors for the amount of time spent playing digital games. Young males spend more time gaming than young females. This is explained by the fact that many games contain violence, which is more appreciated by male players, and by the fact that female characters are underrepresented in game play and play a minor, subservient role.

Data from 535 Taiwanese high school students revealed that boys prefer role-playing games, followed by strategy games, action games, and sports games, while girls most frequently play puzzle games (Chou et al., 2007). Karakus, Inal, and Cagiltay (2008) studied a sample of 1224 vocational high school students in Turkey with respect to preferences, playing habits, expectations and thoughts concerning computer games. In agreement with Chou et al. (2007) they found that males prefer playing sports games and car race games, including competition, action and entertaining 3D attributes, while females prefer adventure games, puzzles or card games, reflecting instructive attributes. Male students were more likely to agree on positive statements about the effects of playing computer games (e.g. increased creativity, eye-hand coordination, personal relationships) while female students agreed on negative statements (e.g. aggressive behaviours). Inal et al. (2007) recorded that males prefer the challenge and complexity of games and are attracted by the competition, while females prefer to emphasise the importance of narratives and storytelling parts of games. These differences suggest that selecting educational games for combined classes of males and females requires careful consideration.

Both female and male students agreed that games can be useful for educational aims, e.g. for history, mathematics and mental abilities like critical thinking. Many student surveys are devoted to technology usage at large, but largely neglect the motives and considerations for playing video games (Kennedy et al., 2009; Salaway, Katz, & Caruso, 2006; Sandford, Ulicsak, Facer, & Rudd, 2006). Sobkin et al. (2004) reported extensively on the motivations of school children for playing video games. From a sample of 796 Russian children the main motives for playing video games were boredom, entertainment, emotional release and the desire to beat the opponent (the latter received significantly higher appreciations among boys). Yee (2006) carried out a factor analysis for extracting key motivational dimensions in Massively-Multiplayer Online Role-Playing Games (MMORPGs). Based on data of 2300 users he identified ten independent, nonexclusive player motivations, grouped into achievements (advancements, mechanics, competition), social (socialising, relationships, teamwork) and immersion (discovery, role-playing, customisation, escapism). These dimensions partly coincide with the original framework of Malone and Lepper (1987) that we used in the current study. Hainey, Connolly, Stansfield, and Boyle (2011b) performed a study looking at the differences in motivations of online game players and offline game players. The study was a combined analysis of three studies at Higher Education (HE) level and involved 2226 participants from 2005, 2007 and 2009. The study found that challenge was the top motivation and recognition was the lowest ranking motivation for playing games in general. Challenge was also the top ranking motivation for playing games in HE while fantasy and recognition were the lowest ranking motivations for playing games in HE. Multiplayer gamers derived more competition, cooperation, recognition, fantasy and curiosity for playing games and online gamers derived more challenge, cooperation, recognition and control from playing games. Multiplayer gamers and online gamers ranked competition, cooperation and recognition significantly more important for playing computer games in HE than single players and offline participants. Bekebrede, Warmelink, and Mayer (2011) carried out a survey about the use of games in HE among 1432 students in the Netherlands. The group contained about 25% representatives of the so-called Net-generation, a generation that has grown up with computer games and other technology affecting their preferred learning styles, social interaction patterns and overall technology use. Hypothesised differences of attitudes of the Net-generation towards games for learning could not be confirmed. In general the respondents preferred collaborative and technology-rich learning and deemed games a valuable teaching method. This aligns with a wide range of literature on best practices of games in education (e.g. Aldrich, 2004; Prensky, 2006).

Few data are available from international surveys. The Nielsen Games report (2008) collected data about gaming motives and habits in 15 European countries. Main motives for playing video games are fun (80%), relax/de-stress (55%), boredom (41%) and challenge (36%). Separate data from Scotland and the Netherlands are not available. However, there are some data about the UK and the Benelux (Belgium, Netherlands, Luxemburg) that could be used as an acceptable replacement. In the UK the percentage of respondents playing more than 5 h per week is 55%, whereas in the Benelux it is 37%. In the UK there are more heavy gamers: 22% of UK players spend more than 10 h per week, against 11% in the Benelux. Likewise, the International Gamers Survey (2009) allows for a partial comparison between the UK and the Netherlands. Percentages of people that play games are almost equal (72% versus 70%), whereas weekly time spent on gaming is 5.1 h in the UK against 4.1 h in the Netherlands. In many respects the economy, demography, government system and culture of Scotland and the Netherlands are very similar: both countries are located in western Europe, they offer the same life expectancy and show equal expenditures on education per pupil. The gross domestic product per capita is 20% lower in Scotland. A major difference though is population density, which is about 7 times higher in the Netherlands. Since there are no clues that the gross domestic product per capita and population density are critical variables for playing games, we hypothesise that responses of students from Scotland and the Netherlands to our survey will be very similar.

3. Research questions

The aim of our survey is to approach a large group of HE students (who are the main stakeholders in HE) and investigate their involvement in playing video games, their motivations, preferences and their thoughts about using games in HE. We will build on the motivation framework of Malone and Lepper (1987), who particularly advocated the link between learning and games. They identified four individual motivational factors: challenge, curiosity, control and fantasy, and three interpersonal motivating factors: cooperation, competition and recognition. These factors were complemented with practical motives like avoidance of other activities and prevention of boredom which are based on escape theory (Baumeister, 1990), pleasure, relaxation, leisure, and excitement, which all directly refer to the concept of play (Salen & Zimmerman, 2004), and relieve stress, release tension and emotional stimulation, which in particular address the player's mental states (Mandler, 1984). In addition, we collected data about the students' opinions about using games in HE, and we asked for the students' general attitudes toward games. The independent variable is the student context covered by two dimensions: country (Scotland versus the Netherlands) and education system (regular versus distance HE), yielding three different student groups (cf. Table 1).

Our main research questions are:

- Overall Research Question: Can computer games be used for educational purposes at HE level in regular and distance education in different countries? We expect that with the popularity of computer games that this answer will be yes. However this research question effects all others in the sense that if there is insufficient interest in computer games being used for educational purposes at HE level then there is very little point of investigating the four research questions following as there will be no justification for future development.
- Research Question 1 (RQ1): What are the different game playing habits of the three groups? Existing studies, although not focused on students suggest that Group 1 would spend more time gaming. We hypothesise that students from Group 3 spend less time gaming because these students will be older and tend to combine study, work and family.
- Research Question 2 (RQ2): What are the different motivations for playing games across the three groups? We assume differences between groups will be negligible.
- Research Question 3 (RQ3): What are the different reasons for using games in HE across the three groups? This question is about instructional methods for HE. Because all students will have detailed knowledge about this, it is assumed that there will be no differences between groups.
- Research Question 4 (RQ4): What are the different attitudes towards games across the three groups? Beforehand there are no indications for differences between Group 1 and Group 2. As for Group 3 (because of age and life stage) one might expect less enthusiasm for games.

For identifying specific predictors and substantiating possible explanations a number of user characteristics were collected; e.g. age, gender, study domain, time spent gaming, gaming experience. Due to the impact of gender issues, the data from this survey will also be analysed for gender differences.

4. Methods used to collect the data

4.1. Materials

A questionnaire was developed comprising 24 questions. From the English version an identical version in Dutch was constructed. Questions asked for gender, age, institution, country, domain of study, learning style, playing habits, time spent playing computer games, playing experience, and gaming preferences. Participants were required to consider each possible reason for playing computer games and rate how important it was for them by using a 5-point Likert scale (very unimportant; unimportant; neutral; important; very important).

Table 1
Three different student groups of our survey.

Higher education system	Country	
	Scotland	The Netherlands
Regular education	Group 1	Group 2
Distance education		Group 3

Also the option "I don't know" was offered. In addition students' ratings of the importance of these reasons for using computer games for learning in University were examined. Participants were required to respond to the question: "If you had the opportunity to use computer games for learning in your programme at University, how would you rate each of the following reasons in terms of importance in learning?" The same Likert scale as before was used, applied to 10 statements. Participants were also asked about their general attitudes to computer games and they were asked to rate how strongly they agreed with each of 10 example attitudes. The attitudes included whether they considered playing games to be: sociable, a waste of time, useful for developing skills, time consuming, interesting, worthwhile, enjoyable, lonely, valuable and exciting.

4.2. Procedure

The surveys were made available through the online questionnaire package SurveyMonkey for a two-week period during March 2011 at the University of the West of Scotland (UWS) and for a two-month period from May 2011 across 12 HE institutes in the Netherlands. Participation was voluntary. At UWS participants were notified of the availability of the questionnaire through email and a login notice posted in the BlackBoard Virtual Learning Environment (which the majority of students use). Notices were also posted across the University. Access to the questionnaire was controlled using the students' BlackBoard usernames and passwords, and the students' unique banner identification number was used to ensure a student only completed the questionnaire once. In the Netherlands the questionnaire was publicly announced and distributed by the institutional ICT coordinators of the 12 participating institutes. Respondents completed the questionnaire online at their convenience during the respective periods.

4.3. Sample procedures

A self-selecting sample procedure was adopted to achieve preliminary results quickly with no screening process. An advertisement was simply sent to potential participants via their University email system. The advantages of using this particular approach is that respondents can be identified quickly, however there is a bias associated with the results as self-selecting participants are different from those who do not participate.

4.4. Methods

The questionnaire was constructed around Malone and Lepper's (1987) framework of intrinsic motivation containing the following interpersonal factors and individual factors:

Individual factors:

- Challenge – an appropriate level of difficulty and challenge, multiple goals for winning, constant feedback and sufficient randomness;
- Fantasy – an appropriate level of immersion by assuming a particular role and dealing with related responsibilities;
- Curiosity – providing sensory stimulation to ensure prolonged participation; and
- Control – the ability to select choices and observe the consequences of these choices.
- Competition – compare their performance to the performance of other players;
- Recognition – a sense of satisfaction when accomplishments are recognised.

Other motivational aspects such as pleasure, relaxation and avoidance of other activities were added in through discussions with a number of Psychologists. The attitudes were also derived from discussions with a number of Psychologists to ascertain what they would find interesting to attempt to measure.

4.5. Data analysis

The statistical data analysis techniques selected for this study were non-parametric statistical tests given that the data did not adhere to the three pieces of criteria required for the use of parametric tests: normal distribution, homogeneity of variance and rational or interval data. The primary statistical analysis technique used to compare different groups were Mann–Whitney *U* tests (the non-parametric equivalent of the independent *t*-test).

5. Results

5.1. Participants

Respondents who completed the questionnaire are listed for each group in Table 2. Total numbers may vary across different items because not all respondents completed all questions. The table shows minor age differences between Group 1 and Group 2 and substantially higher ages in the distant learners group (Group 3). Age differences between gender are small.

5.2. Overall research question: can computer games be used for educational purposes at HE level in regular and distance education in different countries?

Before collecting data on the motivations for playing computer games in regular and distant HE level in two separate countries it is important to ascertain if computer games would be considered suitable for educational purposes by students. The results are as follows:

Table 2
Participant characteristics.

	Group 1 Scotland Regular education	Group 2 Netherlands Regular education	Group 3 Netherlands Distant education
Respondents (Male/Female)	415 (197/188)	155 (109/46)	317 (116/196)
Mean age	26.50 (9.41)	22.90 (6.92)	37.87 (10.49)
Mean age males	26.29 (9.05)	22.46 (6.36)	37.62 (10.06)
Mean age females	26.50 (9.56)	23.93 (8.08)	38.03 (10.77)

- Of the 264 participants who answered the question of "Do you believe that computer games can be used to learn in an HE environment", 74% of participants believed that computer games could be used for Regular HE in Scotland and 26% believed that they were not suitable.
- Of the 130 participants who answered the question of "Do you believe that computer games can be used to learn in an HE environment", 67% of participants stated that computer games could be used for Regular HE in the Netherlands and 33% believed that they were not suitable.
- Of the 238 participants who answered the question of "Do you believe that computer games can be used to learn in an HE environment", 74% of participants stated that computer games could be used for distant education in the Netherlands and 26% believed that they were not suitable.

The three separate groups were very valuable to the research as they have established that there is a high majority of students that would be interested in the application of computer games within HE. If this result had turned out to be exceptionally low and computer games were not considered to be a suitable educational mechanism then collecting data about game playing habits, motivations, reasons for playing computer games in HE and attitudes in the different groups would have been interesting, however it would have shown that educational computer games were not worth developing at this level of education whether regular or distant. This preliminary finding has also raised another interesting research question which could be addressed in future studies of this nature: "are educational computer games more suited to distant, online or regular education?" This is a question that could be investigated at all educational levels such as Primary Education, Secondary Education and Tertiary Education.

5.3. RQ1 What are the different game playing habits of the three groups?

The questionnaire asked participants to indicate how many hours they played a game per week. For this it offered 5 h intervals (1–5, 6–10, 11–15, 16–20, 21–25) and "more than 25". To calculate the mean time spent playing games the time bands used as responses were recoded with their mean value (e.g. 1–5 h was recoded as 3), while less than 1 was coded as 1 and more than 25 was coded as 26. Using this recoded data the average number of hours played per week is listed for each group in Table 3. Also the number of years of gaming experience is listed. In all cases males spent more time and have more experience at playing games than females do. Time spent gaming is substantially less for the distant learners. This is in agreement with literature data that indicate that time spent gaming gradually decreases with age (Nielsen, 2008).

5.4. RQ2 What are the different motivations for playing games across the three groups?

Participants were asked to rate the importance of different reasons for playing computer games in general. Table 4 shows the rankings of the motivations by respondents for playing computer games in general for leisure. Here the symmetrical 5-point Likert scale is pragmatically interpreted as a linear scale allowing for parametric statistics (Norman, 2010).

In Table 4 the top 5 in each group is emphasised in bold italics. Pleasure, relaxation and challenge receive unanimously highest scores. Leisure time is supported by Group 1 and Group 2. Group 3 (distance education) does not particularly appreciate games for leisure time. Single votes, that is, a top-5 ranked reason for playing games in one group that doesn't co-occur as in the top-5 of the other groups, are for excitement (Group 1), prevention of boredom (Group 2) and relieve stress and curiosity (Group 3). Overall the 15 top 5 positions require only 8 categories of motivation. Control, avoidance of other activities and recognition were rated as the least important ranking motivations.

Statistical comparison of Group 1 and Group 2 shows that Group 1 assigns significantly higher rates to competition ($Z = -2.664$, $p < 0.008$) and cooperation ($Z = -2.447$, $p < 0.014$) and significantly lower rates to leisure ($Z = -2.874$, $p < 0.004$), feeling good ($Z = -4.255$, $p < 0.000$), preventing boredom ($Z = -2.242$, $p < 0.025$) and excitement ($Z = -4.637$, $p < 0.000$). The results suggest that participants from

Table 3
Gaming experience and time spent for three groups.

	Group 1		Group 2		Group 3	
	Mean	SD	Mean	SD	Mean	SD
Hours spent per week	9.22	7.46	9.80	7.97	3.93	4.84
Hours spent per week (males)	11.35	7.97	11.94	7.55	5.22	5.36
Hours spent per week (females)	6.49	5.69	4.05	6.01	3.08	4.27
Years of gaming experience	15.31	6.77	12.28	4.45	13.86	8.14
Years of gaming experience (males)	16.50	7.15	12.95	4.07	17.41	7.53
Years of gaming experience (females)	13.83	5.91	10.41	4.98	11.28	7.65

Table 4
Ranking of motivations for playing computer games (*top 5* emphasised).

Motivation	Group 1		Group 2		Group 3	
	Mean	SD	Mean	SD	Mean	SD
Pleasure	*4.31*	0.81	*4.37*	1.04	*3.82*	1.26
Relaxation	*4.20*	0.93	*4.13*	1.11	*3.68*	1.36
Excitement	*4.13*	0.92	3.54	1.27	2.86	1.43
Challenge	*4.08*	0.89	*3.96*	1.12	*3.23*	1.47
Leisure time	*4.02*	1.02	*3.61*	1.30	2.60	1.32
Prevention of boredom	3.95	1.07	*3.61*	1.33	2.44	1.42
Relieve stress	3.79	1.15	3.59	1.34	*2.98*	1.51
Curiosity	3.72	1.09	3.47	1.28	*2.92*	1.56
Feeling good	3.95	0.86	3.41	1.21	2.80	1.39
Release tension	3.72	1.20	3.37	1.29	2.63	1.48
Fantasy	3.37	1.34	3.41	1.44	2.66	1.56
Emotional stimulation	3.21	1.17	2.94	1.32	1.92	1.27
Competition	3.16	1.24	3.47	1.22	2.35	1.40
Cooperation	3.15	1.08	3.38	1.29	2.04	1.32
Control	3.05	1.20	2.92	1.31	2.30	1.37
Avoidance of other activities	2.81	1.30	2.78	1.43	2.09	1.37
Recognition	2.61	1.22	2.78	1.32	1.93	1.29

Group 1 view computer games as more of a social experience and participants from Group 2 view computer games as more of a leisurely experience to reduce boredom and facilitate excitement.

When comparing Group 1 (Scottish Regular Education) and Group 3 (Netherlands Distance Education), Mann–Whitney *U* tests indicated that students in Scottish Regular Education rated every motivation and reason to be significantly more important for playing computer games than Netherlands distance education students. This suggests that Scottish students see playing computer games as a more important leisure activity than Netherland students and that regular education students view computer games as a more important leisure activity than distance education students.

When comparing Group 2 (Netherlands Regular Education) and Group 3 (Netherlands Distance Education), Mann–Whitney *U* tests indicated that Netherland Regular Education students rated every motivation and reason to be significantly more important than Netherland distance education students. This suggests that regular education students consider computer games to be a more important leisure activity than distance education students. This is possibly due to the fact that the distance education students are notably older on average than regular education students. Another factor which may influence this is that distance education students may have to spend more time on a computer getting access to lectures and tutorial materials and may not wish to spend additional time on a computer playing games.

Table 5 extends Table 4 by differentiating between gender. Standard deviations are omitted for presentational convenience. The shaded cell pairs refer to significant differences.

Once again top 5 scores in each column are indicated by bold italics. In all six cases pleasure and relaxation are in the top 5. Challenge is in the top 5 in five cases, excitement in four cases. Notably, seven reasons never reach a top 5 ranking. These are avoidance of other activities, recognition, emotional stimulation, control, cooperation, feeling good and release tension. Within each group Mann–Whitney *U* tests were carried out to assess the significance levels of the gender differences. Significant differences between gender in each group are indicated in Table 5 by the shaded cell pairs. Gender differences in the non-shaded cells are not significant. Although some agreements occur between groups, the overall pattern is a bit random. Importantly, however, there are nine occasions that two groups show significant gender differences for the same motivation argument and in all these cases except one (relieve stress) the differences are in the same direction, which is highly consistent.

Table 5
Average motivation scores for playing computer games in relation to gender (top 5 emphasised).

Gender	Group 1		Group 2		Group 3	
	Male	Female	Male	Female	Male	Female
Reason						
Pleasure	*4.32*	*4.29*	*4.57*	*3.80*	*3.99*	*3.68*
Challenge	*4.17*	3.98	*4.17*	*3.37*	*3.53*	*3.00*
Excitement	*4.15*	*4.10*	*3.83*	2.71	*3.26*	2.59
Relaxation	*4.11*	*4.31*	*4.25*	*3.80*	*3.82*	*3.57*
Prevention of boredom	*4.11*	3.76	*3.83*	3.00	2.51	2.41
Leisure time	4.04	*4.01*	3.78	*3.11*	2.82	2.42
Feeling good	3.94	3.97	3.60	2.86	2.96	2.67
Release tension	3.68	3.77	3.53	2.91	2.84	2.50
Relieve stress	3.64	*3.98*	3.79	3.03	*3.20*	*2.84*
Curiosity	3.57	3.91	3.59	*3.11*	3.13	*2.74*
Cooperation	3.32	2.94	3.66	2.60	2.20	1.90
Emotional stimulation	3.28	3.14	3.12	2.43	2.19	1.73
Competition	3.27	3.02	*3.83*	2.43	2.46	2.26
Fantasy	3.24	3.53	3.48	*3.20*	3.00	2.40
Control	3.16	2.93	3.13	2.31	2.27	2.32
Recognition	2.69	2.54	2.96	2.29	2.06	1.83
Avoidance of other activities	2.68	3.00	2.86	2.57	2.14	2.05

Table 6
Answering the question about usefulness of games for learning in HE.

Reason	Group 1	Group 2	Group 3	Total
Yes	195 (47%)	87 (56%)	177 (56%)	459 (52%)
No	69 (16%)	43 (28%)	61 (19%)	173 (20%)

5.5. RQ3 What are the different reasons for using games in HE across the three groups?

There were 632 responses in total across all of the groups to the question: "Do you believe that computer games can be used to learn in a Higher Education environment?" Each response was categorised as "Yes", believing that computer games could be used or "No", claiming that computer games did not have a role to play in learning. Table 6 displays the answers for each group:

Participants who selected 'Yes' gave some of the following reasons why:

- Computer games (particularly multi-player games) can encourage the importance of cooperation and team work between students and thus enhance their communicative skills.
- Games work on a reward basis – beat the challenge, learn the pattern, master the technique and you can progress. If done right this can be very compelling. This is a form of learning and I suppose could be harnessed for educational purposes.

Participants who selected 'No' gave some of the following reasons why:

- We're not children anymore; education doesn't need to be made 'exciting' in order for us to learn. If you need your education to be turned into some kind of game for you to apply yourself you have no place in HE. Your ambition and interest in the subject alone should be enough to encourage you to soak up the information. There are skills that I've learned/honed using video games that help in now as an adult in HE, but when I am actually on campus I would much prefer traditional teaching methods – what you do in your leisure time and what you do at work/school should be kept separate anyway.
- They would be too distracting and less time would be spent actually studying and more time playing.

In addition, participants were asked to rank the importance of reasons for playing computer games in HE. Table 7 lists the scores for each group based on gender (standard deviations are all around 1.40).

The top 5 ranked motivations are indicated with bold italics. Coherence across groups is substantial. The main motives for both males and females to use games in HE are challenge, curiosity, cooperation, pleasure and relaxation. Likewise all groups agree on the irrelevance of control, leisure, recognitions and fantasy. Differences between males and females are scarce (shaded cells). A Mann–Whitney U test in Group 1 indicated that males rated competition ($Z = -2.255$, $p < 0.024$) and cooperation ($Z = -3.437$, $p < 0.001$) as significantly more important for playing computer games in an HE context than females. Males in Group 2 showed higher ratings than females for competition ($Z = -2.796$, $p < 0.005$), cooperation ($Z = -2.478$, $p < 0.013$), recognition ($Z = -2.848$, $p < 0.004$) and control ($Z = -2.752$, $p < 0.006$). Males in Group 3 rated fantasy as significantly more important for playing computer games in an educational context than females ($Z = -2.129$, $p < 0.033$). In Group 1 and Group 2 the arguments of cooperation and competition as a reason for using games in HE show similar gender differences.

When comparing Scottish regular education (Group 1) and Netherlands regular education (Group 2), the latter rated the following motivations significantly more important for using computer games to learn in an HE context: cooperation ($Z = -2.404$, $p < 0.016$), fantasy ($Z = -2.084$, $p < 0.033$), pleasure ($Z = -3.262$, $p < 0.001$) and relaxation ($Z = -2.050$, $p < 0.040$). No significant differences were detected in terms of the following motivations: challenge, competition, recognition, control and curiosity. The results suggest that participants from the Netherlands view playing computer games in an HE context as more relaxed and social than participants from Scotland.

When comparing Group 1 (Scottish regular education) and Group 3 (Netherlands distance education), Mann–Whitney U tests indicated that students in Scottish Regular Education rated the following motivations as significantly more important for playing computer games at HE level: challenge ($Z = -3.958$, $p < 0.000$), competition ($Z = -5.571$, $p < 0.000$), cooperation ($Z = -3.240$, $p < 0.001$), recognition ($Z = -3.632$, $p < 0.000$), control ($Z = -3.095$, $p < 0.002$), fantasy ($Z = -2.305$, $p < 0.021$), leisure ($Z = -3.664$, $p < 0.000$) and relaxation ($Z = -2.949$, $p < 0.003$). There were no significant differences detected between the two groups with regards to curiosity and pleasure.

Table 7
Motivations for using computer games in an educational setting split by gender (top 5 emphasised).

Motivations	Group 1		Group 2		Group 3	
	Male	Female	Male	Female	Male	Female
Challenge	***3.91***	***3.72***	***3.85***	***3.67***	***3.55***	***3.38***
Curiosity	***3.74***	***3.48***	***3.81***	***3.34***	***3.61***	***3.46***
Cooperation	***3.73***	***3.22***	***3.94***	***3.39***	***3.25***	***3.01***
Pleasure	***3.49***	***3.29***	***3.98***	***3.61***	***3.40***	***3.24***
Competition	***3.38***	3.04	3.43	2.72	2.57	2.46
Relaxation	3.34	***3.16***	***3.70***	***3.22***	***2.98***	***2.84***
Control	3.10	3.03	3.17	2.44	2.68	2.70
Leisure	3.04	2.92	3.45	2.94	2.68	2.40
Recognition	3.02	2.91	3.19	2.47	2.55	2.48
Fantasy	2.71	2.79	3.04	3.09	2.70	2.27

Table 8
Skills that can be obtained from computer games (top 3 highlighted).

Skill	Group 1		Group 2		Group 3		All groups	
	No.	%	No.	%	No.	%	No.	%
Problem solving	*245*	*59*	*102*	*66*	*308*	*97*	*655*	*74*
Creativity	*181*	*44*	*94*	*61*	*251*	*79*	*526*	*59*
Collaboration/teamwork	*181*	*44*	*86*	*55*	*221*	*70*	*488*	*55*
Critical thinking	*182*	*44*	55	35	196	62	433	49
Analysing/Classifying	178	43	54	35	197	62	429	48
Recollection	102	25	56	36	193	61	351	40
Management	112	27	53	34	138	44	303	34
Leading/motivating	124	30	50	32	100	32	274	31
Reflection	110	27	33	21	115	36	258	29

When comparing Group 2 (Netherlands regular education) and Group 3 (Netherlands distance education), Mann–Whitney *U* tests indicated that Group 2 rated the following motivations as significantly more important for playing computer games at HE level: challenge ($Z = -2.052$, $p < 0.040$), competition ($Z = -4.984$, $p < 0.000$), cooperation ($Z = -5.082$, $p < 0.000$), recognition ($Z = -3.492$, $p < 0.000$), control ($Z = -1.917$, $p < 0.05$), fantasy ($Z = -3.796$, $p < 0.000$), leisure ($Z = -5.239$, $p < 0.000$), pleasure ($Z = -4.014$, $p < 0.000$) and relaxation ($Z = -4.486$, $p < 0.000$). There were no significant differences between the two groups with regards to curiosity ($Z = -0.656$, $p < 0.512$).

Table 8 shows responses to the question "What types of skills do you think can be obtained from computer games that would be relevant to Higher Education?" The top 3 skills that can be obtained according to the students by using computer games are problem solving, creativity and collaboration/teamwork. Differences between groups are negligible.

5.6. RQ4 What are the different attitudes toward games across the three groups?

The questionnaire also asked the respondents for their personal attitudes to games. Participants in Group 1 (Scottish regular education) and Group 3 (Netherlands distance education) who played computer games had significantly more positive attitudes to computer games than those who did not with the exception of computer games being a time consuming activity (Group 1: $Z = -0.873$ $p < 383$; Group 3: $Z = -1.079$, $p < 0.0281$). In Group 2 no significant differences were found with regards to any of the attitudes when compared to those who did not play computer games. This result is most likely because only a small number of participants in this group did not play computer games. Table 9 lists the average scores of the attitudes for each group, split by gender.

Generally males display more positive attitudes to games than females. Regarding the scores within each group Mann–Whitney *U* tests showed that many of the gender differences are significant (shaded cells). In almost all cases males assign higher scores than females, except for the negative attitudes (waste of time and lone activity). From the top 4 rankings (emphasised with bold italics in Table 9) it can be concluded that games are regarded to be exciting (6 times top 4), enjoyable (6), interesting (5) and time consuming (5). In all cases lowest scores are for a waste of time and lone activity.

Participants in Group 2 (Netherlands regular education) rated computer games as significantly more of a social activity than participants from Group 1 (Scotland regular education) ($Z = -4.262$, $p < 0.000$), which is consistent with previous results. Participants from Group 1 (Scotland) viewed computer games as significantly more time consuming ($Z = -3.839$, $p < 0.000$), more of a lonely activity ($Z = -2.879$, $p < 0.004$) and more exciting ($Z = -2.112$, $p < 0.035$).

When comparing the attitudes of participants in Group 1 (Scottish regular education) and Group 3 (Netherland distance education), Scottish participants found playing computer games to be more of a social activity ($Z = -4.334$, $p < 0.000$), helpful for developing useful skills ($Z = -4.373$, $p < 0.000$), time consuming ($Z = -2.659$, $p < 0.008$), interesting ($Z = -7.292$, $p < 0.000$), worthwhile ($Z = -3.613$, $p < 0.000$), enjoyable ($Z = -6.737$, $p < 0.000$), valuable ($Z = -3.994$, $p < 0.000$) and exciting ($Z = -5.942$, $p < 0.000$). Distance education students from the Netherlands rated playing computer games as much more of a waste of time ($Z = -4.304$, $p < 0.000$) and much more of a lonely activity ($Z = -3.511$, $p < 0.000$).

A similar pattern was found when comparing Group 2 and 3: participants in Group 2 (regular education) found playing computer games to be more of a social activity ($Z = -7.763$, $p < 0.000$), helpful for developing useful skills ($Z = -2.644$, $p < 0.008$), interesting ($Z = -5.322$,

Table 9
Attitudes to computer games split by gender (top 4 emphasised; shaded pairs indicate significant differences between males and females).

Attitude	Group 1		Group 2		Group 3	
	Male	Female	Male	Female	Male	Female
Playing games…						
is enjoyable	*4.42*	*4.10*	*4.36*	*3.85*	*3.91*	*3.73*
is interesting	*4.22*	*3.98*	*4.22*	3.45	3.65	*3.49*
is exciting	*4.19*	*3.91*	*4.04*	*3.52*	*3.71*	*3.51*
is time consuming	*4.11*	*3.83*	3.56	*3.62*	*3.77*	*3.80*
is a sociable activity	3.93	3.52	*4.45*	*3.67*	3.44	3.19
is a worthwhile activity	3.80	3.57	4.02	3.36	3.54	3.33
helps to develop useful skills	3.74	3.69	3.76	3.35	3.41	3.37
is a valuable activity	3.48	3.34	3.62	3.09	3.08	3.06
is a lonely activity	2.39	2.90	2.15	2.85	2.86	3.04
is a waste of time	2.12	2.31	2.02	2.67	2.58	2.64

$p < 0.000$), worthwhile ($Z = -4.465$, $p < 0.000$), enjoyable ($Z = -4.955$, $p < 0.000$), valuable ($Z = -4.054$, $p < 0.000$) and exciting ($Z = -3.015$, $p < 0.003$). Participants in Group 3 (distance education) rated playing computer games to be more of a waste of time ($Z = -3.734$, $p < 0.000$) and more of a lonely activity ($Z = -5.455$, $p < 0.000$).

6. Discussion and conclusions

Overall research question: "Can computer games be used for educational purposes at HE level in regular and distance education in different countries?" Overall the results have shown that a large number of participants believe that computer games can be used as an educational mechanism in HE in both regular and distant education in both countries investigated. There are certainly enough positive results to justify large scale, extensive research into game playing habits, the motivations for playing computer games, the motivations for playing computer games in HE and attitudes/perceptions towards computer games. If computer games are going to be a potential vehicle for learning in the future, then we must know more about what motivates people to play them and what particular people they are most suited for. It is also extremely useful in an educational context to understand cultural differences and gender differences to ascertain if computer games are not suited to particular groups because of such factors. One interesting additional research question that has become apparent through the course of this research study is "are educational computer games more suited to distant, online or regular education?" This question could be investigated at all educational levels: Primary Education, Secondary Education and Tertiary Education.

Research Question 1 "What are the different game playing habits of the three groups?"

Overall the results suggest that Group 1 and 2 in Scottish and Netherlands regular education spend a significant amount of time of approximately 9–10 h playing computer games per week. Group 3 (Netherlands distance education) played computer games for significantly less. This may have been due to the fact that participants in Group 3 were on average 10–15 years older than participants in Groups 1 and 2.

Research question 2: "What are the different motivations for playing games across the three groups?"

In terms of motivations for playing computer games, pleasure, relaxation and challenge receive unanimously highest scores. When comparing Group 1 and Group 2, Group 1 assigns significantly higher rates to competition and cooperation and significantly lower rates to leisure, feeling good, preventing boredom and excitement. This suggests that participants from Group 1 view computer games as more of a social experience and participants from Group 2 view computer games as more of a leisurely experience to reduce boredom and facilitate excitement. When comparing regular education students (Group 1 and 2) with distance education students (Group 3), the regular education students rated every motivation and reason to be significantly more important for playing computer games than distance education students suggesting that the former see playing computer games as a more important leisure activity than distance education students. This is possibly due to the fact that the distance education students are notably older on average than regular education students and are engaged in jobs and family lives, have children etc., all of which are absent for the regular education students.

Research question 3: "What are the different reasons for using games in HE across the three groups?"

When comparing Group 1 and 2, participants from regular education in the Netherlands rated the following four motivations significantly more important for using computer games to learn in an HE context: cooperation, fantasy, pleasure and relaxation. No significant differences were detected in terms of the following motivations: challenge, competition, recognition, control and curiosity. The results suggest that participants from the Netherlands put more emphasis on playing computer games in an HE context as a contribution to making education more relaxed and social than participants from Scotland. Note that this outcome is opposite to the general motivations for playing games as dealt with in research question 2, where the Scottish students were motivated to play games by the social experience. It seems to suggest that Scottish students aim to enhance their social life, while Dutch students aim to enhance their leisure experience. Comparing both regular education groups to distance education produced similar results; i.e. there were significant differences in terms of all of the motivations with the exception of curiosity and pleasure. This indicates that motivations for playing computer games in HE regular education are generally consistent regardless of country, however, are totally different in terms of comparing regular and distance education.

Research question 4: "What are the different attitudes toward games across the three groups?"

In terms of attitudes towards playing computer games, the attitudes across the three groups were generally positive. Males display more positive attitudes to games than females. Participants in Group 2 (Netherlands regular education) rated computer games as significantly more of a social activity than participants from Group 1 (Scottish regular education). Thus, these personal attitudes are exactly reversed to the findings about motivation. This need not be a conflict though, because it is quite possible that the personal attitudes are different from personal views on the topic. Participants from Group 1 viewed computer games as significantly more time consuming, more of a lonely activity and more exciting. When comparing both groups of regular education students to distance education students, the regular education students' attitudes were significantly more positive than those of the distance education students. In both comparisons distance education students regard playing computer games as significantly more or a waste of time and a lonely activity.

One major limitation associated with the findings of this study is that the participants were a self-selecting sample meaning that while results could be obtained relatively quickly and efficiently, there is also a bias associated with a self-selecting sample as participants who choose to do the survey are different from participants who choose not to do the survey. Due to the fact that the data collected was on an ordinal scale and that a normal distribution or homogeneity of variance could not be adhered to, it was necessary to perform non-parametric statistical tests which are statistically less powerful than parametric tests.

Another major limitation of this research is that surveys/questionnaires are generally considered to be methodologically weak, however given that this questionnaire has been translated into two languages and if the research is viewed as preliminary exploratory study to ascertain general interest in using computer games for educational purposes – it is still valuable. It is valuable in the sense that some empirical evidence has been reported comparing two countries and two different methods of HE. It is also thought provoking in the sense that it will make other researchers about to undertake this kind of study consider particular aspects, such as sampling, methods and statistical tests more closely in future studies.

This paper has presented a comparison of students' motivations for playing computer games in general, playing computer games in HE and attitudes towards playing computer games from two different countries in regular education and distance education. The paper has presented empirical evidence with regards to motivations for playing computer games in general and in HE. Future research will entail

translating the questionnaire into different languages for difference countries at different educational levels and attempting to generate further empirical evidence in the field of games-based learning and gain a deeper insight into the motivations for playing computer games in an educational context in a broader sense.

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