

4 Background research

To start this investigation into computer game-based learning, a background study was undertaken to enable the researcher to find out more about the area by talking to people first-hand, and to examine variation of opinion and perception as regards game playing. More crucially, this study aimed to provide evidence that computer game-based learning would actually be 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 students and individuals who had previously studied in Higher Education, which aimed to examine their definitions of games, their motivations for playing games and their attitudes towards game-based learning in education. The 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.

This chapter describes these two areas of work, first discussing the background interviews, the research methods used and the results, then reporting on the survey that was employed and its findings, and finally discussing the implications of these results for the rest of the research.

4.1 Interviews

A series of interviews were conducted, the main objective of which was to develop a wider understanding of the range of people's attitudes to and 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, which is common in the literature on game-based learning (see, for example, Prensky, 2001; Oblinger, 2004), and sought to discover whether people who were not intrinsically motivated by games were open to the potential of game-based ways of learning and computer-based learning.

Overall, the interviews were designed to attempt to consider how the concept of game-based learning and characteristics of games in the literature match people's perceptions, what factors motivate people to play games for leisure and learning, and whether game-based learning is seen as an acceptable way to learn by people studying at the level of Higher Education.

The method for data collection and analysis of the initial set of interviews was based upon the phenomenographic methodology. Phenomenography is a research approach developed during the early 1970s, with its roots in a series of studies on learning carried out with students at the University of Göteborg in Sweden. It is designed to answer questions about how different people perceive different aspects of reality, particularly in the field of education. Marton (1986) describes phenomenography as "...a research method for mapping the qualitatively different ways in which people experience, conceptualize, perceive, and understand various aspects of, and phenomena in, the world around them". The aim of phenomenography is not to make statements about the world but about people's conceptions of the world. It is interested in investigating how people perceive the world around them and categorising the different conceptions people have about the object of interest, and does not try to characterise reality, but how reality is perceived by an individual (Marton, 1981). This methodology was selected because it provides a structured approach to the analysis of interviews, and focuses on specific outputs, which were considered appropriate for considering the different conceptions that exist regarding game-playing.

The primary outcomes of phenomenographic research are categorisations of description, which look at the range of ways in which people perceive a phenomenon. The primary method of data collection is open-ended interviews, which allow discussion of many possible areas and let the interviewees talk about the subject from their own points of reference. The interviews are then transcribed in full, to provide the source material from which the categories of description are derived. The analysis looks for the most distinctive categories that appear in the data to identify significant differences in the ways that people view some part of the world.

The phenomenon of adult game playing and how it is perceived by different people was thought to be an appropriate topic for the use of phenomenographic methods, but this stage of the research is described as a mini-phenomenography because it was not carried out with the large number of participants normally used for this type of study. It was felt that a small number of participants would be appropriate in this instance to get a feel for the subject, and the initial work is backed up with a quantitative survey with a larger population.

Twelve interviews were conducted, with interviewees selected from colleagues and people known to the researcher, all of whom 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, with the greatest number falling into the 30–39 years age bracket.

Half of the individuals who took part in the study considered themselves 'game players' and half saw themselves as 'non-game players' (i.e. people who play games by choice as a matter of course and those who do not). Whether participants considered themselves to be game players or not was, of course, strongly influenced by what an individual perceived a game to be, which was not the same for all participants, but in all cases fell under the broad definition discussed in Chapter 2 (see Table 4-1). Since the purpose of this initial research was to find out what people perceived the characteristics of a game to be as well as their personal motivations, the important fact is not that there were exact numbers of game players and non-game players but that a range of opinion was represented.

Each interview lasted between 30 and 90 minutes and covered the areas of background information, attitudes to games and gaming, other leisure activities, and attitudes to learning. In addition, a crib sheet of games and activities was used as a memory-jogger to get the participants to think about areas that they may have missed during the main interview (see Appendix 1). Although there

were set questions, the aim of the interviews was for the format to be as unstructured and open as possible, so the actual questions and lines of discussion varied from interview to interview as different themes and topics were brought up by the participants.

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. Example segments from transcribed interviews are available in Appendix 2. The interview transcripts were analysed iteratively, initially examining them to draw out themes and hypothetical categories of description, then re-analysing to test statements in the interviews against the proposed framework, until a coherent set of categories were arrived at that accounted for the perceptions of all individuals interviewed.

4.1.1 The characteristics of games

There is considerable variation in how a 'game' is defined in academic research; therefore an important starting point for this research was to compare the definitions in literature with the definitions derived from the target group, to reach a final definition. Without establishing what a game is for the purposes of this study it would be impossible to distinguish between a game and a non-game.

The analysis of the literature in Chapter 2 discusses a number of characteristics that are common in definitions of a game. These are challenge, difficulty, fantasy, goals, exploration, interaction, outcomes, people, rules, and safety. The interview transcripts were analysed to identify elements of the definitions used by the interviewees that matched the characteristics described in Chapter 2. For example, participant H said:

[a game is] something you do to amuse yourself, and other people... you get bits and pieces and things, and you try and win...

In this example, amusement is mapped to fun, other people are directly referred to, and reference to the concept of winning is seen to imply that an element of competition is necessary. Table 4-1 below shows this mapping of

characteristics of games (taken from Table 2-1 in Chapter 2) against the definitions offered by the interviewees.

Characteristics	Interviewees											
	A	B	C	D	E	F	G	H	I	J	K	L
Competition			x	x	x	x		x		x	x	
Difficulty	x		x	x			x		x	x		
Exploration							x					
Fantasy												
Goals		x								x		
Interaction							x				x	
Outcomes		x							x			x
People		x	x	x		x		x	x		x	x
Rules											x	
Safety		x									x	

Table 4-1: Game characteristics mapped against the perceptions of 12 interviewees (A–L)

It can be seen from this table that the characteristics most commonly cited were competition, a level of difficulty or challenge, and other people. The other characteristic that was most commonly mentioned (by half of the participants), but which was not included in the initial framework of characteristics, was ‘fun’. The only characteristic not mentioned by any of the interviewees is ‘fantasy’, the concept of having a make-believe element. However, it is not altogether surprising that this characteristic was overlooked by the group, as it is a characteristic that may more commonly be associated with children’s games than with adults. Each of the other characteristics was mentioned at least once, providing evidence that these are all factors that people in the group under study associate with games. The combinations of characteristics that were considered to define a game, however, were extremely varied, even in this small sample, which supports the use of an inclusive definition of games in the context of game-based learning.

It appears that there are two ways of looking at the definition of a game: as something intrinsic to the game itself (i.e. this activity is a game) or as a perception of the person engaged in that activity (i.e. this activity is a game for

that person, at that time). If the concept of 'fun' is used to define a game, the second view must necessarily be used, as fun is an individual perception. As interviewee A says:

... it's difficult to say what's enjoyable 'cause it's different for different people ... some people enjoy card games on their own, other people find that deathly dull. So it really depends on the context of the person.

For example, many people would agree that Chess is a game, but for someone with no interest in Chess it may hold no fun. If the second stance is taken, it is questionable then whether Chess can be defined as a game, and in effect, it becomes impossible to actually define any activity as a game. For this reason, this research takes the view that the state of being a 'game' is intrinsic to the game itself and, although fun might be the sole purpose of many games, it is not used as a defining characteristic here. For the people interviewed there seems to be a definite association of games with recreation and not with work or learning, which may influence their willingness to consider computer-based educational games as a valid way to learn. While these interviews were undertaken with a small sample of participants, it certainly provides further evidence that adults may not be as predisposed to find games motivating for learning as is assumed in the literature.

4.1.2 Games and motivation

From the interviews, 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 motivations for playing games emerged, which led to three categories of description. All of the people who considered themselves game players appeared to fall predominantly into one of these categories, although they are not mutually exclusive: Cerebral Gamers, Social Gamers, and Physical Gamers.

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 social facilitation.

Cerebral Gamers play predominantly for the intellectual challenge. They like to solve puzzles and problem-solving games and may also be interested in crosswords and quizzes. For example:

‘I enjoy games with problem-solving in them mainly, quests, finding things, solving mysteries.’ (Participant I)

Social Gamers play primarily for the social interaction and being with other people. They will tend to play team games, board games, and multi-player computer games. For example:

‘...I would play with my friends whereas I wouldn’t play with other people’ (Participant A)

Physical Gamers play primarily for the exercise and physical exertion enjoyed when playing. They tend to be involved mainly in sporting games. For example:

‘...it’s good exercise and at the same time you’re getting something out of it’ (Participant B)

Other reasons for playing games that were mentioned in the interviews, such as a need to win, relaxation, and escapism, are not included in this framework because they were not the primary motivation for game playing, but seem to be secondary motivations that are present across all three of the game player categories.

The participants in the study who perceived themselves as non-gamers tended to only play games in two situations: where the game is used as a social facilitator, perhaps in an awkward gathering or as a way of getting to know people, or when they are looking for an activity to counter boredom, usually for short periods of time. The game players were also motivated to play games for these reasons but they were not their primary motivations.

Motivating and demotivating factors

Six factors emerged during the course of the interviews that appeared to be motivating (two factors) or demotivating (four factors) for games and activities in general, for both game players and non-game players alike.

The two motivating factors were:

- being able to see swift and steady improvement; and
- a perception of being good at an activity.

The ability to undertake an activity and see continual and ongoing improvement was seen as an important motivational factor for adults, which is consistent with some of the key research on what makes games motivating for children (Malone, 1980a).

'[It is good when you can] keep getting your score higher and getting up the levels...' (Participant L)

'I do like the challenge of being able to eventually play something that previously I couldn't.' (Participant E)

As well as a perception of improvement, a perception of being good at something was seen as motivating. This may be associated with a feeling of being in control of the activity (Malone & Lepper, 1987) and providing opportunities for success (Dempsey et al, 2002).

'I'm good at it ... so I like that 'cause I can do it.' (Participant B)

'[I played the game] because I was good at it.' (Participant J)

The four factors that were considered by all to be demotivating were:

- difficulties in getting started;
- getting stuck during the activity;
- lack of trust in the environment; and
- intrinsic boredom with the subject matter or game itself.

A key theme was the importance of being able to start an activity quickly without having to spend too long learning the rules, etiquette and parameters. An activity that is difficult to get into, without proper helpful instructions appears to

be very demotivating. When people undertake an activity for the first time they are more likely to be bad at it, which is demotivating in itself; it is of increased importance that they can get started quickly and see a swift initial improvement. This supports the assertion of Dempsey and colleagues (2002) that clear, concise instructions and early opportunities for success are important.

'I've never got round to actually playing it 'cause it takes a long time to get into and it's probably a bit dull to start off with.' (Participant A)

'I don't like the ones where I can't start, I like to at least have some chance of getting somewhere in the game.' (Participant I)

The issue of getting stuck for a long time at a certain point, for instance plateauing in skill level or being unable to solve a puzzle, and not being able to progress, were seen as very demotivating factors, particularly for this group of adult learners who place an extremely high value on their time and do not want to waste it going around in circles.

'I kept getting chucked back to the beginning and I'd have to go through the whole lot again.' (Participant H)

'I felt I reached a plateau at a very early point and never seemed to get very much better...' (Participant E)

Another demotivating factor, which was mentioned by several of the participants, occurred when an individual felt that he or she had lost trust in the environment of the activity or game itself, that it was perceived to be unfair, or incorrect.

'[Regarding online gambling] I think it'd be fixed for a start.' (Participant A)

'I'm not convinced that the answers in Trivial Pursuit are entirely correct.' (Participant C)

A final demotivating factor, and perhaps one that cannot be addressed or countered by any amount of intrinsic motivating factors is a deep-rooted boredom or lack of interest in the underlying subject of any game or activity.

'I find racing games on computer really, really boring ... partly 'cause I'm really bad at them partly because they're just so pointless ... it's like having to watch sports on telly, they're so boring they make you queasy.' (Participant G)

‘...a lot of it’s about statistics and about, like organising all these things, like how much food the city gets, I don’t really care.’ (Participant A)

In addition to highlighting a number of factors that appeared to be universally motivating or demotivating, a whole range of additional factors were discussed that appeared to motivate some participants but demotivate others. These are not discussed in any depth here but are mentioned as an outcome of the study and also as a framework for possible further research into the nature of individual preferences regarding gaming motivation.

There were 15 factors that emerged during the interviews, each of which can be thought of as a continuum (see Table 4-2). For a factor to be considered in this analysis it had to have been mentioned by two or more of the interviewees (who could exhibit opinions at any point on the continuum).

Continua	Description
Active – passive	The level of involvement in the activity.
Cerebral – non-cerebral	The extent to which an activity is intellectually challenging.
Chance – skill	The degree of random input into the activity.
Competitive – non-competitive	The degree of competition / importance of winning.
Definite end – open end	Whether the activity has a fixed end point.
Easy – difficult	The preferred level of challenge.
Frivolous – serious	The preferred level of playfulness within the activity.
Physical – sedentary	The amount of physical exertion required.
Quick – lengthy	The amount of time an activity takes to complete.
Realistic – fantastic	The amount of realism in an activity.
Relaxing – stimulating	The level of excitement engendered.
Simple – complex	The complexity of the rules of engagement in the activity.
Solitary – social	Whether the activity is undertaken alone or in a group.
Speed-dependent – non-speed-dependent	The degree to which speed of action is important to the activity.
Team – individual	Whether the activity is undertaken collaboratively or as an individual.

Table 4-2: Continua of motivational preferences

It is hypothesised that each individual will have a preference for games at different points along the continua. Some preferences will be static or move little for an individual, and others will be more fluid depending on the particular circumstances and context of the game playing (e.g. mood, purpose, other players, etc.).

While these continua are not used further in this study, they are added here out of interest to highlight the possible range of factors that may influence motivation to take part in games for different individuals, and to highlight a finding from the research on which future studies could be based. Clearly, the factors here are drawn from a small sample and may not be generalisable or mutually exclusive, but they provide an interesting starting point for future research.

4.1.3 Games for learning

It was considered important at this stage of the research to provide some justification – if such evidence existed – for researching further into adult learners and gaming, given that this research does not want to start from the point often used in the literature that games are good for learning because they are intrinsically motivating.

The perceptions of game-based learning were, perhaps surprisingly, positive, even from those who considered themselves non-game players, with all participants saying that they would consider the idea of a game to learn if it was the most effective way to learn something. Many participants added to this saying that they would consider any method if it was the most effective way to learn something.

Even more surprisingly perhaps, only two people out of the twelve said that the fact that they were using a game would be intrinsically motivating. The rest of the respondents 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. Educational games for this group of learners would need to be well designed, have very specific and clearly communicated learning outcomes, and obvious

benefits over other methods of learning. This backs up the theory of adult learners needing to know why they are being taught the way they are and to be self-directing (Knowles, 1998).

4.2 Background Questionnaire

The second part of the study took the results from the 12 in-depth interviews and examined a larger population to see if they still held true. The population used for this study was a group of third-year undergraduate, and Masters-level postgraduate computing students. This group were selected for two reasons: first, the purely pragmatic reason that this was a large group of students that could be easily accessed; and second, it was hypothesised that out of any population of students in Higher Education it was computing students that were most likely to engage with game-based learning. Findings from this group can 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 there would be very little justification for accepting that this was an appropriate way to teach in Higher Education.

A short questionnaire of 11 questions (see Appendix 3) was designed to examine their gaming preferences, 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.

Four classes of students were given the questionnaire, all of whom were taking a Group Project unit: one group consisted of students who had entered the university directly into the third year, and were typically older and had accessed university through a non-traditional route ($n=83$); two groups were studying at postgraduate level ($n=45$); and one group were traditional third-year undergraduates ($n=72$).

The students 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 question, 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).

The majority of people who completed the questionnaire were young men aged between 20 and 29, which is representative of the total population of the programme. This group might be considered to be more likely to engage with games and educational games (Entertainment Software Association, 2007). Table 4-3 shows the breakdown of ages across the three types of students (direct entry (DE), postgraduate (PG), undergraduate (UG)) and Table 4-4 shows the gender split.

		AGE					Total
		Under 20	20–29	30–39	40–49	50–59	
LEVEL	DE	3	56	18	5	1	83
	PG	1	31	8	4	1	45
	UG	4	62	5	0	1	72
Total		8	149	31	9	3	200

Table 4-3: Breakdown of respondents by age

		SEX		Total
		Male	Female	
LEVEL	DE	68	14	82
	PG	34	8	42
	UG	64	7	71
	Missing			(5)
Total		166	29	200

Table 4-4: Breakdown of respondents by sex

The vast majority (98.5%) of the population had played a computer game at some point previously, while 48.5% still played regularly and 38.5% occasionally. 78% said that they play other types of non-computer game and only 7% play no type of game at all now. This provides strong evidence that this is a group that engages with games in their leisure time and, if the assumptions in the gaming literature are to be believed, would be expected to be motivated by educational games.

4.2.1 Preferred types of game

There was a wide range of types of games played within this group. Figure 4-1 shows the percentage of the students in each group (direct entrants, postgraduates and undergraduates) who reported playing that type of game, as well as the percentage of the group as a whole (total). The graph is ordered by highest overall percentage from left to right.

It is interesting to note that while the two most favoured types overall are first-person shooters and multi-player games, there is much variation in the percentage of players between the groups. In particular, the percentage of postgraduate students who played multi-player games is much smaller than in either the direct entrant or undergraduate students. Also worth noting is that a much greater proportion of the postgraduate students play puzzle games than in the other groups.

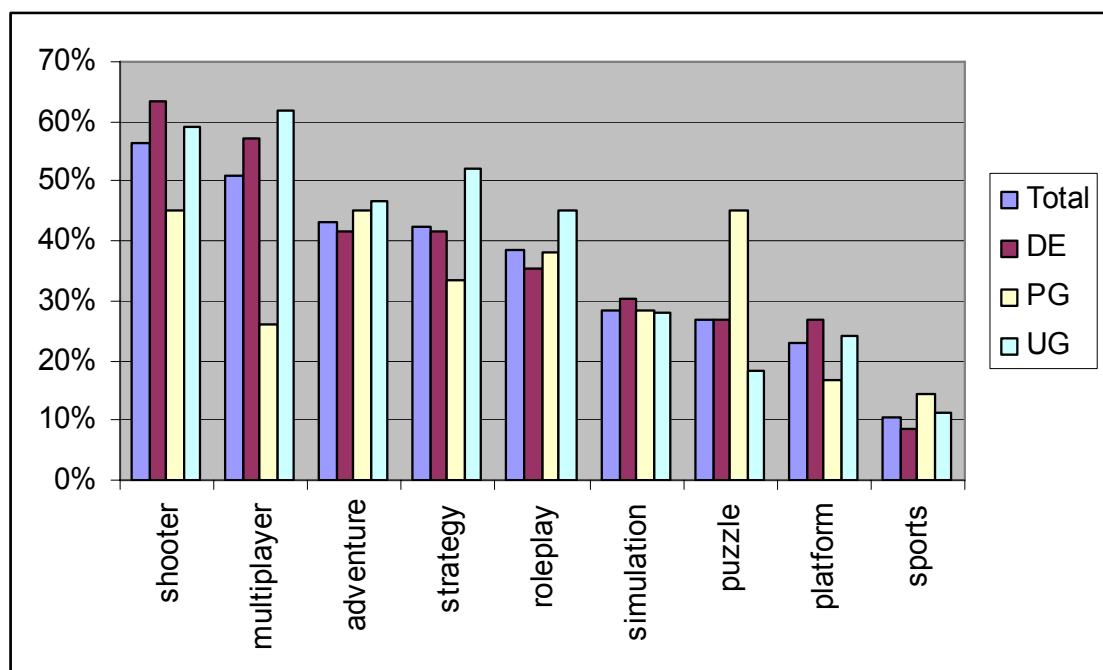


Figure 4-1: Preferred types of game, showing the total percentage and percentage breakdown by direct entrants, postgraduates and undergraduates

So, while the group under study may show a greater propensity to play games, the types of games favoured by students at different levels of study may differ. It is important to note that it cannot be assumed that even when students are motivated to play games, they will be motivated to play the same types of games that might be appropriate for learning, and that there is no guarantee

that the games that the students chose to play in their leisure time are those that they might be most motivated to use for learning.

4.2.2 Motivations for playing games

The students who completed the questionnaire were asked about their motivations for playing games and computer games, based on the types of gaming motivation described in Section 4.1.2. Table 4-5 shows a breakdown of the motivations to play computer games and non-computer games (note that motivations are not mutually exclusive) as a percentage of those students who said that they played that type of game.

	Computer gamers (<i>n</i> =174)	Non-computer gamers (<i>n</i> =156)
Playing with others	59.8%	66.0%
Mental challenge	58.0%	43.0%
Physical challenge	7.5%	34.0%
Boredom	52.9%	38.0%
Ease social situations	6.3%	16.0%

Table 4-5: Comparison of motivations to play computer games and non-computer games

It can be seen that playing with others and mental challenge are the two most common motivational factors for recreational game playing. This provides some evidence to support the idea of development of a game for learning that involves mental challenge and playing with other people.

There were a small number of additional motivating factors for playing games, offered by the respondents. These included relaxation, escapism, addiction and aesthetics, but these were only mentioned a few times within the population so they are not considered as primary motivations here.

4.2.3 Motivation to learn using games

In order to consider whether game-based learning would be seen as an acceptable, or even motivational, way to learn in this population, the students were asked if they would be positively motivated to learn something with a game, whether they would not be motivated either way, or whether they would find a game demotivating. Table 4-6 shows the breakdown of responses.

		Frequency	Per cent (%)	Valid per cent (%)
Valid	Positively motivating	125	62.5	63.1
	Not motivating either way	56	28.0	28.3
	De-motivating	17	8.5	8.6
	Total	198	99.0	100.0
Missing		2	1.0	
Total		200	100.0	

Table 4-6: Motivation to use games for learning

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 the students actually said that using a game to learn would be positively motivating.

It 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. game player/non-game player), a X^2 (Chi-squared) test was used to examine whether the students who were motivated to play games and computer games in their leisure time were more likely to also be motivated to learn with games. Contingency tables for this analysis are shown in Appendix 4.

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 ($X^2=6.482$, $df=4$, $p=0.166$). This was also the case when the numbers of game players were analysed in relation to the numbers motivated to play games to learn ($X^2=0.657$, $df=2$, $p=0.720$). 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.

4.3 Implications

The research described in this chapter has shown that individuals have a wide range of personal definitions of games, largely matching those identified in the literature. This supports the use of the open and inclusive definition of games described in Chapter 2 and used throughout this thesis.

The research described in this chapter also identified primary reasons that people play games; the two most common being for cerebral challenge or social reasons. Since educational games are likely to be collaborative and mentally challenging, it is reassuring that this matches the preference of game players. It is clear from the evidence presented in this chapter that it cannot be assumed that all adults will be motivated by games, or that they will all be motivated by the same types of games, or even that individuals who are motivated to play games in their leisure time will be motivated to learn using them. Of a group who might be considered to be those adults most likely to find educational games motivational, it was discovered that fewer than two-thirds of the group would find them motivational.

In contrast, however, despite it being clear that games were not motivational for all, there is evidence from the interviews conducted that they would still be seen as an acceptable and appropriate way to learn in Higher Education, if they were perceived as being the best and most effective way to learn.

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 and collaborative, immersive and engaging, problem-based learning environments that appropriately map the curriculum. If the 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.

The following chapter starts to investigate the potential of different types of computer game for learning. Through a review of guidelines and an analysis of existing online games, it examines the characteristics of computer game design and interface design that increase usability and support learning, to create two sets of criteria to examine the usefulness of particular games for learning in Higher Education.