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Motivation, Engagement and Learning through Digital Games

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ABSTRACT

Digital games can be powerful learning environments because they encourage active learning and participation within "affinity groups" (Gee, 2004). However, the use of games in formal educational environments is not always successful (O'Neil et al., 2005). There is a need to update existing theories of motivation and engagement in order to take recent game-related developments into account. Understanding the links between why people play games, what keeps them engaged in this process, and what they learn as a result could have a significant impact on how people value and use games for learning. This paper examines key research that relates to motivation, engagement, and informal learning through digital games, in order to highlight the need for empirical studies which examine the activities that occur in and around everyday gaming practice.

Keywords: *Computer Games, Digital Games, Engagement, Game-Based Learning, Gaming Capital, Informal Learning, Involvement, Motivation, Video Games*

INTRODUCTION

"Press Start," the familiar command appearing to players before they can begin to play almost any game. If faced with this screen, the choice to play has already been made, so can this really be the start of the game-play experience? Why this game? Why now? Why keep playing and what does all this have to do with learning? This paper raises the concern that there is much about the player experience yet to be understood and seeks to further explore the questions just raised by discussing motivation and engagement in relation to the informal learning that occurs through playing digital games.

The paper begins by considering research relating to games and learning, and argues for an empirical examination of the context and socio-cultural factors around every-day game-playing, in order to provide greater insight into the effectiveness of learning through games. The concepts of gaming capital and paratexts (Consalvo, 2007) are highlighted as being of potential use in such analysis. The paper goes

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on to look at traditional conceptualisations of motivation and engagement in the research literature, in the light of new kinds of games, interfaces, online interactions and new audiences of players. It is suggested that work by Calleja (2007a, 2007b) on involvement offers the potential for a fuller account of how contextual aspects relate to the gaming experience. Consideration is also given to the suggestion of Boyle and Connolly (2008) that reversal theory can be helpful in understanding certain emotional flips that people can experience whilst playing games.

A number of methodological challenges are raised, and it is suggested that a multi-method case study research approach—including interviews, surveys, game-play recordings and physiological measures—could help address some methodological limitations of previous research. The paper concludes with an illustration of the kind of research that could be useful.

GAMES: FORMAL AND INFORMAL LEARNING

Academic interest in gaming and learning seems to stem from the fact that digital games are considered to be effective motivational tools and learning environments (Kirriemuir & McFarlane, 2004; Mitchell & Savill-Smith, 2004; de Freitas, 2006). Games can promote "active" and "critical learning" both within the game and the "affinity groups" of players that surround specific titles and genres (Gee, 2004). However, the literature often fails to explore the potential links between what motivates players to play a game (motivation), what keeps them engaged in the game (engagement) and the learning that occurs as a result of game-play and participation in gaming practices (informal learning). This is important because when games are used within formal educational environments, the links can break down. For instance, de Castell and Jenson (2003) argue that educational games have "not been hugely successful at taking up and exploiting the resources digital technologies make available for learning" (p. 656) since there is often only a tenuous connection between the game-play and the learning tasks within the game. Furthermore, learners do not all agree that they find games intrinsically motivating within an educational context (Whitton, 2007) and it has also been found that when commercial games are used to support learning in educational environments, the games used do not always appeal to all students (Squire, 2005).

In the area of games and learning, a distinction is often made between formal and informal learning. This distinction usually refers to the context in which the learning takes place, as opposed to whether the game in question has been explicitly designed for educational purposes. There are several different ways to classify informal learning but Vavoula (2005) presents a typology which focuses on defining formal and informal learning in terms of control over the processes and goals of learning, and also with respect to the intentionality of the learner. For instance, when using a commercial game in the classroom, the teacher would have explicitly prescribed both the process and goals, while the student is there for the purpose of learning; so this can be seen as an example of intentional, formal learning. However, when the focus of research is on the learning that occurs whilst someone plays a game in their spare time at home during game-play—usually a voluntary, leisure time activity—this could be classified as focusing on unintentional, informal learning.

In relation to the use of games for formal learning purposes, O'Neil et al. (2005) reviewed the literature and found a total of 19 studies that met their criteria for review. The studies included had to be peer-reviewed published journal articles which used adult participants and also contained some quantitative or qualitative information about the effectiveness of the games used. O'Neil and colleagues concluded that "the evidence of potential is striking, but the empirical evidence for effectiveness of games as learning environments is scant" (O'Neil et al., 2005, p. 468). However, the authors note that learning outcomes seem to depend on how instructional strategies around the game are

employed. Similarly, Pivec (2009) in a report commissioned by BECTA, agrees that the evidence for the effectiveness of game-based learning is mixed, suggesting that it is not just the game but how it is used within a specific environment (what he terms the "meta-game") which helps lead to effective learning.

It seems likely, then, that at least some of the issues that affect formal game-based learning are due to the context in which the game-play occurs. Further, it is also possible the lack of empirical support in the area "may indicate that learning through immersive worlds involves a more complex understanding of learning, one that is not so easy to tie to specified learning outcomes" (de Frietas, 2006, p. 18). This suggests that there is a need to further our understanding of what occurs during everyday game-play practices in order to examine how and what players learn when playing games during leisure time. By taking the context and socio-cultural factors around the game into account, as researchers such as de Castell and Jenson (2003), Squire (2005), Pelletier and Oliver (2006) suggest, we can identify how successful commercial games support learning within and around game-play and start to think more about how to support learning in more formal contexts.

An account of informal learning that attempts to consider the context around game-play in more depth is provided by Gee (2004) in his book '*What video games have to teach us about learning and literacy*.' Gee (2004) describes how people learn to play games from their individual efforts to master the progressive challenges provided by the game to their participation in "semiotic domains" and "affinity groups." This could be described as an account of how people learn informally, through games, since Gee (2004) is discussing game-play in terms of people playing commercial games outside of educational environments. Egenfeldt-Nielsen, Smith, and Tosca (2008) describe Gee's (2004) approach to the analysis of game-play activity as socio-cultural since digital games are viewed as "tools for constructing viable learning experiences" that "mediate discussion, reflection and analysis" (p. 216). Gee (2004) argues that "critical learning" occurs when people learn to play new video games as they are actually learning a new literacy. This literacy includes multi-modal texts and graphical representations. Through gaming, players learn to participate in "semiotic domains" made up of words, pictures, and/or anything that is used to communicate different types of meaning. These domains are associated with specific "affinity groups" of players whose knowledge, skills, tools and resources contribute to form complex systems of distributed parts. These essentially make up a community of practice (Lave & Wegner, 1991; Wegner, 1998) where players can gain resources from fellow members to help them to solve problems within, and sometimes outside of, the specific domain. Gee (2004) sees this as evidence of "critical learning" which occurs when a player thinks about "the domain at a meta-level as a complex system of interrelated parts" (p. 23).

Further, Gee (2004) points out that his ideas fit in well with the view that "learning is a change not just in practice, but in identity" (p. 190), as researchers such as Lave and Wegner (1991) suggest. With respect to games, Gee (2004) talks about learning that occurs from the adoption of and experimentation with different identities, as well as being able to reflect upon the relationship between old and new identities. While Gee (2004) argues that all deep learning is tied in with the notion of identity, "critical learning" will only occur when the player is willing to see him or herself as someone who can learn, use and value the new semiotic domain. This can only happen in the space where the learner can "transcend the limitations both of the virtual identity and the learner's own real world identity" (p. 66) resulting in a more powerful learning experience.

However, Gee's (2004) writing is based mostly on his own experiences and observations, so there is a need for further empirical research to substantiate his account. It is not clear whether everyone who plays games engages with them in the same sort of way and whether they would all get the same benefits from doing so. It can be argued that further studies are

needed to examine the different ways in which games are played in practice. In addition to finding out more about why players choose to play different games and what happens when they do, it would also be useful to explore what motivates players to put more effort into their game-playing experiences.

Gaming Capital and Paratexts

In understanding the socio-cultural aspects associated with games, the concept of "gaming capital" may be a useful one, not just in relation to game-play but also in relation to the activities that occur around it. Consalvo (2007) developed this concept from Bourdieu's (1984) notion of "cultural capital" in order to: capture how being a member of game culture is about more than playing games or even playing them well. It's being knowledgeable about game releases and secrets, and passing that information on to others. It's having opinions about which game magazines are better and the best sites for walkthroughs on the Internet. (Consalvo, 2007, p. 18)

Consalvo (2007) discusses how "paratexts" can help players to acquire gaming capital. Paratexts are external resources that can "surround, shape, support, and provide context for texts" (p. 182). With respect to gaming, games themselves can be considered to be the primary texts, whereas some examples of paratexts include walkthroughs, previews, YouTube videos, blogs, reviews, magazines etc that relate to games. Players can thus increase their knowledge about games and game-play practices by using different forms of paratext. Some of this knowledge may also translate to greater competence within specific games. Both the concept of gaming capital and the idea of paratexts could be helpful for considering motivation and informal learning in relation to community membership. They could also be useful for discussing game-related activities that occur outside the experience of play e.g., consulting a game guide.

MOTIVATION AND ENGAGEMENT

It has been suggested above that there is a need for empirical examination of the context and socio-cultural factors around everyday games-playing, in order to provide further insight into the effectiveness of games used for learning e.g., Squire (2005). It can also be argued that socio-cultural factors are important in relation to research into aspects of motivation and engagement associated with games.

In terms of theories about what makes games motivating, the most influential work comes from Malone and Lepper (1987) Malone proposed a theory of intrinsic motivation in games, based on experimental manipulations of different games, which suggested that games are rewarding due to a combination of challenge, fantasy, and curiosity (Malone, 1981). "Fantasy" refers to the way players can imagine themselves in contexts using vivid realistic images provided by the game. A distinction is made between extrinsic or exogenous fantasy (where the fantasy depends on the skill) and intrinsic or endogenous fantasy (where the skill and fantasy depend on each other). "Challenge" depends on the degree of difficulty and level of uncertainty to drive players. The four attributes of challenge are goals, uncertain outcome, self- esteem and toys vs. tools (where toys are used for their own sake with no external goal and tools are used to achieve an external goal). In order for the challenge to be an effective motivator, a balance must be struck with the game being neither too difficult nor too hard. Finally, "curiosity" refers to the way players continue to play a game in order to find out what will occur after certain actions are taken. A further distinction is made between sensory curiosity (attention-attracting changes that involve our senses) and cognitive curiosity (driven by a desire to bring coherence to our knowledge structures).

In order to take into account the impact that social factors have on motivation, later work added the element of control, and three

interpersonal motivators; recognition, competition and cooperation (Malone & Lepper, 1987). Games can give players a powerful sense of control though it is worth noting that it is the player's perceived control that can increase motivation, as opposed to the level of control they actually have. To increase a sense of control the game needs to be contingent on the player's responses, provide the player with a number of choices, and enable the player's actions to have "powerful effects," where the difference in outcomes between choices is obvious. The three interpersonal motivations (cooperation, competition and recognition of our efforts by others) help motivate players by increasing their sense of satisfaction through helping others, comparing themselves favourably to others, and/or having their efforts recognised by others. Malone and Lepper (1987) do note that these can be decomposed into individual motivations (e.g., competition can be used to increase a sense of challenge) and that they can sometimes be considered extrinsic (e.g., recognition). However, they also point out "these interpersonal factors do provide intrinsic motivations that would not be present in the absence of other people" (p. 242).

Empirical research carried out by Malone and Lepper (1987) provided support for this theory of intrinsic motivation in games (Malone & Lepper, 1987; Cordova & Lepper, 1996). However, Habgood, Ainsworth, and Benford (2005) question the claim that intrinsic fantasies are "more instructional than extrinsic fantasies" (Malone, 1981, p. 361), regarding this as an untested hypothesis, noting Malone (1981) did not measure any learning outcomes in his original study. Moreover, Habgood et al. (2005), question the usefulness of the concept of endogenous fantasy for understanding the differences between games in relation to learning. As an alternative to intrinsic fantasy, Habgood et al., suggest that the experience of flow (Csikszentmihalyi, 1988), how the information is represented and how players make meaningful decisions within the game, are factors more likely influence the integration of motivating factors and learning content within educational games.

Egenfeldt-Neilsen et al. (2008) also argue that despite the later inclusion of interpersonal motivators, in Malone's (1981) work, there is too narrow a focus on the structure of the game itself, without sufficient attention being paid to the social dynamics and context that occur around it. For instance, the theory would have trouble explaining any data substantiating the claim that video games "are surrounded by strong social networks, which facilitate the learning experience" (Engenfeldt-Nielsen et al., 2008, p. 216). The theory would also have difficulty considering the role paratexts and gaming capital might play in creating and sustaining motivation to play different games. Further, Egenfeldt-Nielsen (2006) points out that Malone's (1981) theory resulted from his research on how children responded to manipulations of drill and practice type games, which arguably look very different to the commercially available titles available today, especially in terms of graphics. In addition, as Jenson and de Castell (2008) note, the recent introduction of new games controllers such as dancemats, motion sensitive controllers and guitar shaped peripherals, have led to very different forms of game-play. Arguably, such improvements in graphical realism and the new interaction techniques could result in different experiences of engagement and learning that have yet to be determined.

In addition, gaming is now seen as "normal" activity, one that is culturally acceptable on a large scale, since more people are playing them (Juul, 2009). Juul argues that part of this is due to the rise of casual games that require less of a time and energy commitment from games players. Many of these games are easy to access on PCs or mobile phones (e.g., downloadable casual games such as Bejewelled) and others use mimetic interfaces (such as the guitar shaped controllers mentioned earlier for Guitar Hero) which are easier to learn how to use since players are already familiar with how the controllers are supposed to work, thus lowering

the barriers of access. Juul highlights the fact that many games that are played casually tend to include a social component, which also seems to have broadened the general appeal of games. It is also interesting to note that companies such as Nintendo have purposefully aimed to broaden their market by finding ways to make games more mainstream. For instance, in his keynote address during Nintendo's 2008 fall conference, company president Satoru Iwata refers to Nintendo's basic mission to expand the gaming population by making games that everyone can enjoy (regardless of age, gender and experience) (Iwata, 2008)

One model of motivation and engagement that allows for greater emphasis to be placed on how the social aspects influence the gaming experience is presented by Calleja (2007a, 2007b). In seeking to explain player involvement within Massively Multiplayer Online Games (MMOGs), Calleja (2007a, 2007b) notes that two meanings of the term "immersion" are often conflated: sometimes labelling an experience of intense engagement or deep absorption, and sometimes labelling a powerful sensation of being located within a virtual environment (often called "presence"). Instead of "immersion," Calleja (2007a, 2007b) drew on ethnographic research involving participant observation and interviews to propose a Digital Game Experience Model (DGEM). The DGEM portrays players' "involvement" with reference to six "frames"; where "each frame represents a modality of meaning through which the role-playing experience is interpreted and performed" (pp. 236-237). The player experience can be described with reference to how the tactical, performative, affective, shared, narrative and spatial frames come together in different ways during instances of play. A brief description of each frame is provided below:

1. *Tactical involvement* refers to any form of decision-making and strategy formation within the game that relate to how the player interacts with the rules, the game environment and other players.
2. *Performative involvement* depends on how the player exerts agency within the game world and it is in this frame where the player actualises the strategies they have formed within the tactical phase. This relates to game piece control and movement within the game, the player's view of the world and mastering the controls.
3. *Affective involvement* deals with the way the game affects the player's moods and emotional states through a cognitive, emotional and kinaesthetic feedback loop. The mode of representation is often important in this e.g., audio, visual.
4. *Shared involvement* relates to how a player interacts with other agents within the game-world (either AI controlled or human in multiplayer games).
5. *Narrative involvement* helps to provide the other frames with a sense of context. A growing personal narrative can still heighten affective aspects of the game even if there is a lack of engagement with the designed narrative, by making the game personally meaningful.
6. *Spatial involvement* relates to how the player is able to locate themselves within the game world. A growing sense of familiarity here leads to feelings of comfort and belonging which can make the player feel more involved.

Each of the frames describes experiences that range on a continuum from conscious attention to internalized knowledge, which will eventually lead to "incorporation" as the player internalises each of the frames. This is described as "the subjective experience of inhabiting a virtual environment facilitated by the potential to act meaningfully within it while being present to others" (Calleja, 2007a, p. 257). Calleja (2007a) states his focus was on the "various forms of engagement with digital games, ranging from their general motivations and attractions to a detailed analysis of moment by moment involvement in game-play" (p. 6) using the terms "macro involvement" to refer

to player's "general motivations for engaging with games" and "micro involvement" to refer to "the moment by moment instance of game play" (p. 9).

The DGEM is primarily a descriptive framework that allows for qualitative comparisons between different instances of play and can be used to discuss long term motivations as well as episodes of engagement. Further, the description of how a player incorporates the different frames is especially interesting from a learning perspective as it gives researchers a way of understanding how the relationship between the learning and involvement is experienced by game players. It also has the potential to distinguish between involvement that occurs on both a micro and macro scale. This could allow for a discussion of specific game-play episodes but also about how activities outside of the moment of game play, such as looking at a walkthrough or discussing a game with friends, might affect longer term motivations to play games.

However, the DGEM was based on the study of massively multiplayer online games (MMOGs) so it would be interesting to see how it can deal with instances of single and co-located play. For instance, Iacovides (2009) applied the DGEM in order to explore the informal learning that occurs within game play and how this learning relates to the experience of player involvement during episodes of play. A qualitative case-study approach was adopted where participants were first observed playing a game of their choice and then interviewed about their experiences using a recording of the game-play as a cue. Five case studies were carried out with four male participants and one female participant (age range 24 to 52 years). In usability testing, critical instances are defined as "an event that has a significant effect, either positive or negative, on user task performance or user satisfaction with the interface" (Gabbard et. al, 1999, p. 54) and this definition was adopted as a guideline for selecting which game play instances or themes should be analysed further. The DGEM was then used to analyse these instances and themes in terms of what was being learnt and what kinds of involvement were being experienced, through describing the process of internalising the relevant frames. It was concluded that the DGEM did prove useful for identifying how deeper levels of involvement actually depend on internalisation (i.e., learning) as incorporation can only take place once the relevant frames have been internalised successfully.

It is worth noting that this was a short term study though with only five participants and the game-play took place inside a lab as opposed to a more natural game-play environment. In addition, further work is required to explore whether the metaphor of incorporation is relevant to all forms of digital game play. Iacovides (2009) was also focusing on micro involvement, so there is also need to consider how the DGEM might be used to account for longer terms motivations for game-play.

Work and Play

Research in the area of games and learning often reveals a potential tension between being motivated to play a game and being motivated to learn (Whitton, 2007). This seems similar to the idea that work and play are mutually exclusive activities, with Calleja (2007a) arguing that "pinning motivation for game-playing on the notion of fun risks missing important dimensions of the game experience" (p. 136). As Yee (2006) points out, players often engage in activities that feel a lot like work because of the time and energy they have invested in them, as part of their routine game-playing experiences. It seems that the relationship between work and play is more complex than is often assumed.

While it has not been applied extensively to the study of motivation in games, Boyle and Connolly (2008) suggest that Apter's reversal theory may have particular relevance when it comes to explaining the blurred distinction between work and play. Reversal theory discusses motivation and emotion with reference to eight pairs of opposing states which occur within four different domains of experience: telic/paratelic, conformist/negativistic, master/sympathy and

autic/alloic (Apter, 2007). The telic and paratelic states occur within the means-end domain and refer to the serious minded and playful states respectively. Within the domain of rules, the conformist and negativistic states relate to our desire to conform or rebel. The mastery and sympathy states occur within the transaction domain, and where the former refers to power, and the latter to likeability. Finally, within the relationship domain, the autic or alloic states are experienced, where the person is either concerned with themselves or with others. Though they are mutually exclusive, people can and often do "reverse" between the states, sometimes quite rapidly.

Instead of presenting a u-shaped curve for the relationship between performance and arousal, Apter (2007) proposes that the y-axis should represent hedonic tone (or valence i.e. how pleasant or unpleasant something is experienced as being) instead of performance and that two curves be used to represent the opposing states, such as telic and paratelic. The theory can thus account for high levels of arousal which are experienced as being pleasurable, and for low levels of arousal which are experienced as being unpleasant. It also helps explain how people switch between these different states within the same activity depending on whether they are in arousal seeking, or arousal avoidance mode.

Boyle and Connolly (2008) suggest the theory, and the telic/paratelic states specifically, can account for the emotional flips that people experience whilst playing games. In telic mode, the player is serious and forward looking, with a focus on achieving goals. Paratelic mode is the playful mode where the focus in on the activity itself. Excitement is supposed to occur in the telic state, whilst relaxation occurs in the paratelic. Whilst the modes do not occur at the same time, one will be in the focus while the other is in the background. This would suggest that different game-play activities could be experienced as either fun or serious depending on whether the player is within telic or paratelic mode. This switching between states may help explain why different parts of the game-play experience can be considered as either work or play.

METHODOLOGICAL ISSUES

Some key research relating to motivation, engagement and informal learning through digital games has been outlined, and it was suggested that there is a need for empirical studies examining the kinds of learning that occur in and around everyday gaming practice. However, it is worth noting some of the methodological challenges for such studies by first outlining some of the different methods that have been used to examine different aspects of the game play experience.

In terms of eliciting the different reasons why people play games and their conceptions of game play, interviews are often used while the data collected is then used to develop a questionnaire that can be used to survey larger populations (Yee, 2007; Whitton, 2007). Meanwhile, analysis of paratexts (Consalvo, 2007) offers the potential to identify the development of gaming capital and community values, and thus gain insight into why certain games are chosen, why hardcore gamers might play them differently to casual games, and into the informal learning processes that occur both inside and outside of game-play.

In terms of analysing experiences during game-play, there has been a recent move within Human Computer Interaction (HCI) research towards evaluating the user experience as a whole, rather than purely focusing on performance outcomes (Mandryk & Atkins, 2007). This parallels recent interest in considering affective issues (including motivation) in relation to the use of technologies for learning (Jones & Issroff, 2005).

For instance, Pelletier and Oliver (2006) focus on the learning process that occurs during game play itself and without looking for specific learning outcomes. They developed a method based on Activity Theory (AT) which focused on the influence that "contradictions" (i.e.,

breakdowns) have on learning within instances of observed play. An example from a gaming context would be making the same mistake more than once due to misunderstanding how an object within the game works. Pelletier and Oliver were specifically interested exploring how these breakdowns influence learning within instances of observed play and used Kuuti's (1996) further refinement of AT to analyse these instances. The three levels of analyses proposed by Kuuti (1996) are:

- Activities (high-level plans e.g., building a house).
- Actions that contribute to the activity (e.g., building a wall).
- Operations that contribute to each action (e.g., laying a brick), which are routine or automatic unless something goes wrong (a contradiction arises).

The method consisted of analysing video recordings of game-play in conjunction with a table used to record player activities, where the activities were broken down into actions and operations. The table was also used to keep track of any contradictions and any evidence of learning. Three case studies (with three players playing one of two games) were carried out in order to test this Players were observed and recorded playing either Harry Potter and the Chamber of Secrets or Deus Ex for a time period of 25 minutes to two hours (depending on the participant). While the authors suggest a general description of the game-play session is useful, they were particularly interested in any failures or mistakes that occurred and any evidence they could find of the player having resolved these contradictions e.g., being successful after trying a different strategy.

Pelletier and Oliver (2006) do note however, that while the method allowed them to document the learning that occurred, they needed to make inferences about the reasons behind the operations carried out. As a result, they attempted to come up with a set of rules based on these proposed explanations of player behaviour that can be viewed as a set of strategies the player turns to when learning a new game e.g., "spot unusual objects and click on them" (p. 335). The authors conclude the method helped them to analyse the process by which players learn game strategies, while they see the method developed as being useful for helping educators consider which specific game might be useful to use under different circumstances. However, it could be argued that by not taking the player's perspective into account, it is not clear how far the inferences made actually govern player behaviour.

Using a very different approach, Mandryk and Inkpen (2004) decided to test the efficacy of physiological measures as a way of evaluating player engagement with collaborative entertainment technologies. The authors give an overview of various physiological measures e.g., galvanic skin response (GSR), electromyography (EMG) and carried out an experiment to test whether these sorts of measures could be used to provide an objective account of the player experience. Five pairs of players were observed and recorder playing a computer game either with another co-located player or against the computer for a period of five minutes. The authors conclude that the method did reveal that there is a physiological difference between playing a friend or a computer (as indicated by GSR), where playing with a friend is more enjoyable than with a computer, but that further improvements to their methodology were required and further testing in order to validate their findings.

There are some difficulties when gathering physiological data that should be pointed out. For instance, measures such as GSR are not consistent across experimental sessions and subject to other physiological happenings (e.g., digesting) which can make it difficult to make between groups comparisons (Mandryk & Inkpen, 2004). It is also worth noting that EMG measurements can also be disrupted by talking or laughing (Mandryk & Atkins, 2007). While physiological data could allow for concrete comparisons to be made between different cases, the collection and analyses of such data requires an in-depth and complex

approach. This is in part due to the fact that it is not always clear what emotions are being measured through such readings (Mandryk & Atkins, 2007). Further, while the method did pick up differences between conditions, it is not clear whether a play period of only five minutes is really long enough for the players to become truly immersed in an activity. However, Mandryk and Atkins (2007) do suggest that the data might also be useful when used in combination with video data to identify incidents when a change in emotion occurs.

It could be argued that in order to fully understand what is really occurring during an episode of game-play, a multi-method case-study approach needs to be adopted. Barr (2007) for instance, used a collective case study approach (with five people, who each played the same set of five games) to examine the relationship between the interface and the "values" expressed during play. Values are defined as "a sustained belief that one mode of conduct is preferable to other potential modes of conduct" (p. 3). Barr (2007) used a variety of data collection methods to do so including the researcher gaining prior knowledge of the games (gained by playing each game for at least 20 hours and taking notes on it), taped observation and concurrent think aloud during game-play, DVD capture of game play, semi-structured post-play interviews and analysis of game documents. Activity Theory was used to analyse instances of game play, especially in terms of contradictions, while grounded theory was used to uncover the values expressed during play. Barr wanted to maximise differences between cases in order to get the most generalisable results while also emphasising the importance of the researcher having first-hand knowledge of the games when using a case study approach.

There are a number of disadvantages of such an exploratory approach. Firstly, a great deal of time is required to collect and analyse all the data. Secondly, it may be difficult to make larger scale generalisations on the basis of a small number of case studies. Thirdly, most of the data was gathered from a lab environment, with little attention being paid to activities occurring outside the episode of game-play. Nevertheless, the approach offers the opportunity to gain a richer understanding of what occurs during the game-play, while allowing for the generation of hypotheses that could be tested by subsequent studies. As Yin (2009) points out, while case studies do not allow for statistical generalisations they can be used for analytic generalisations in terms of helping to develop and provide support for theories. Though Barr (2007) was not interested in explicitly identifying learning, it would be interesting to see whether similar techniques could be used to establish what and how people learn from games and whether this has any relationship to their experiences of motivation and engagement.

DISCUSSION

It seems then that there is mixed evidence concerning the successful implementation of games within educational contexts. Factors might include the environments within which games are played; differences in design between games designed for leisure and games designed for learning; difficulties inherent in tying game-play to required learning outcomes; aspects of choice, control, intention and mood of individual players; and the social dynamics associated with playing games.

So while the work of Malone and Lepper (1987) has been hugely influential in the area, there is a need to update our ideas in order to really understand why people play different games and what they get out of the experience. The literature indicates that there are different motivations behind various forms of game play, and that engagement can be affected by factors such as the player, the game itself, how the player interacts with the game and the context in which the game is played; all of which will also affect the process of informal learning occurring within and around periods of game-play. There are also a variety of methods that can be used to examine aspects of game-play so some thought needs to be given to which

methods would be most suitable to answer a specific set of research questions.

What the area would benefit from is a greater understanding of the relationship between motivation, engagement and learning within different game-play contexts as there is very little research that tries to explain how these processes relate to each other. In fact, the relationship is often seen as implicit and rarely questioned by those that refer to theories of motivation (Whitton, 2007). First we need to develop methods that can capture the complexity of what occurs within and around episodes of game-play. This will help further our understanding of how learning occurs and what is learnt when people engage in gaming and gaming-related activities within a leisure context (i.e., within contexts that are genuinely intrinsically motivating). This will help us to further appreciate the value that these activities offer and will also be useful for considering how to support game-based learning in more formal contexts.

DIRECTIONS FOR FURTHER RESEARCH

Current research being carried out at the Institute of Educational Technology, Open University, UK, has been using the following methodology to investigate games based learning. The aim of the research is to address some of the issues highlighted in the paper by first finding out more about the game-playing and game-related activities that different people engage in during their leisure time. This was achieved through carrying out a series of email interviews with different game-players. The DGEM and a thematic analysis are being used to analyse the data. By finding out more about the everyday activities different players engage in, we can start to build a picture of how motivation, engagement and informal learning come together in practice. The findings will then feed into subsequent research that aims to explore these processes in more depth through using a combination of methods such as gaming diaries, interviews, and observational data including the use of physiological data.

The interview study currently being analysed is examining what motivates people to play games, what factors affect engagement during play, and how players describe learning within the context of gaming. Thirty participants, aged 22-58, were interviewed. The asynchronous nature of using email meant participants were able to answer in their own time and to be more reflective about their answers (Bampton & Cowton, 2002). The DGEM used as an overarching framework for analyses, in which motivation and engagement are re-conceptualised as macro and micro involvement respectively.

Thematic analysis indicates that there are varying levels of participation within the types of communities Gee (2004) describes and that these levels may be dependent on how much the player identifies him or herself as a "gamer." Consalvo's (2007) work on gaming capital and paratexts has also proved useful in terms of considering the relationship between informal learning and identity.

In order to illustrate how players can differ in terms of their game-play activities and experiences, two player profiles are provided below:

The Casual Player

Rosie is a 29-year old Ph.D. student who mainly plays games socially. She does not own a games console but does play on consoles at her friends' houses or in the shared space at the campus library. Her stated reasons for playing games are "mainly because my group of friends would be playing, but I think essentially they're fun." Graphics can grab her attention but the feeling of progress and competition tend to keep her playing. The games she plays tend to depend on whatever her friends are playing, with recent titles including Big Brain Academy, Wii Sports, Lego Indiana Jones and Halo. She does not play games very often (less than once a month) and usually for about a couple of hours each time, but in the past she has spent a lot of time playing them. She prefers to learn how to play from observing and watching others around her

but while she can see how games might help hand-to-eye coordination and problem solving skills, she does not think she has personally learnt much from playing them, apart from perhaps "learning to progress."

The Gamer

Marco is a 28-year old Assistant Portal Manager who works in the games industry. He uses a variety of gaming platforms (though the Xbox 360 is his platform of choice) and plays a wide variety of games on a daily basis. Some games he has recently played are: Modern Warfare 2, Counter Strike, Streetfighter IV, Final Fantasy, Left 4 Dead and Fat Princess. His main reasons for playing are "general escapism, sometimes just to relax and de-stress after a hard day." He plays different games for different reasons, for instance he enjoys the stories in role-playing games (RPGs), and the release of frustration he experiences when playing action titles. He often plays with other people, including going to the arcade with colleagues during lunch time and playing first-person shooters (FPS) online. While he jokes about the issue of violence in games he does think that games keep his mind "sharp" and that they have helped him learn how to work in a team and how to be a good person. He sees helping others as part of being a "good gamer" and has opinions about debates within the gaming community.

The preliminary analyses suggest that one of the main differences between Rosie and Marco is in terms how they identify themselves. Though Rosie does say she used to play games more regularly, it seems to be an activity she has moved away from due to "priorities changing and energy" as well "access to games" being easier when she was a child (as her parents would pay for games consoles). Now it's just an activity she shares occasionally with her friends. In contrast, gaming is something Marco engages in every day, for long periods, and he considers it a main social activity. While Rosie is put off by other players being better than her, Marco is good enough at games to help others improve. Marco does refer to paratexts in relation to how the reviews of new games affect his expectations, while he also expressed his concerns about the effect of political correctness within the games industry. For instance, his interview response also contained a link to an article about a song being removed from Little Big Planet for containing a verse from the Quran (thus postponing the game's release date). So while he uses paratexts as a way of gaining knowledge about games, this use also indicates how involved he is within debates that are relevant to a wider gaming community.

It would seem then that identity and community are both important themes, as are knowledge of games and being competent, and these all seem to relate to the concept of gaming capital and how it might be established. While shared involvement is important to both players, it is clear that Marco pursues gaming and the activities around it as an active hobby, while Rosie sees it as a social activity which happens occasionally with friends. The issues of identity and community may help explain why Marco is willing to engage in activities and debates around gaming and Rosie is not; engaging in these practices (and potentially a community of practice) is part of what it means to be a gamer and part of the gamer community. All these factors seem to indicate that Marco is a hardcore gamer while Rosie is a more casual player. Further, while Marco's experience seems to fit in well with Gee's (2004) description of how people learn through games, it is less clear how well Rosie fits into this account of learning and whether she would benefit from games to the same extent. It would be interesting to investigate these differences and communities further, especially in relation to considering the implications they might for have the design and use of educational games.

Building and comparing profiles of players in this way is has useful for considering the reasons people have for playing games and the ways in which they engage in the activity, thus helping us to understand more about how motivation, engagement and informal learning come

together in different ways. The DGEM can help researchers describe how these processes occur, while the concept of gaming capital indicates that the notions of community and identity are important ones to consider as they may have an impact on both learning and involvement in this context. However, a limitation of this interview study is that it relies on participants' retrospective accounts of their experiences. So it would be interesting to see whether similar findings result from observations of player behaviour.

While Iacovides (2009) used a case based approach to observe participants playing a game of their choice and interviewed them about their game-play experience afterwards, the participants only came into the lab on one occasion and it could be argued that the lab was not set up to be a natural game-play environment. Further work is needed in which players are observed playing games in as natural a context as possible over a sustained period of time, in order to tap into what actually happens when people play games during their leisure time. In addition, it would also be useful to explore methods for keeping track of what happens outside instances of game-play in order to consider the influence of different game-related activities that players take part in.

Physiological measures may be able to provide an objective measure for evaluating the game play experience as Mandryk and Inkpen (2004) suggest but further work is needed to identify what emotions are being experienced during play. Another way to use these measures would be during real-time observation to indicate when significant events have occurred, as suggested by Hazlett (2008), or in conjunction with video data post-play, as suggested by Mandryk and Inkpen (2004). While some work is being carried out to explore how physiological measures can be used to identify different forms of engagement (Mandryk & Atkins, 2007; Lindley, Nacke, & Sennersten, 2008), there is little research that considers whether these measures would be useful for considering the learning that occurs in this context.

CONCLUSION

This paper highlights some of the issues concerning motivation, engagement and informal learning in relation to playing digital games. It is clear that the links between these concepts are not well understood and there is a need for further empirical studies to assess how they relate to each other. There is also a need for studies that do not look at people playing games in isolation but as part of a larger socio-cultural activity (de Castell & Jenson, 2003; Squire, 2005; Pelletier & Oliver, 2006) to fully understand how players participate within affinity groups and semiotic domains. Further, methods and frameworks need to be developed to aid researchers in exploring these issues.

If educators want to try and replicate people's enthusiasm for games within a formal educational context, then there is a need to first understand how this enthusiasm occurs in everyday gaming practices. This will not only lead to a greater understanding of how to design more involving commercial games but will also have implications for the design of educational games. By exploring how this process varies across individuals, we can also consider the implications for how educational games should be designed and used within different contexts.

It is possible that educational games may never be as motivating as ones played for leisure purposes, since making the activity compulsory reduces the voluntary aspect of play (de Castell & Jenson, 2003), but there is still much we can learn from gaming about how motivation to play and improve is created and sustained. Further research is needed to explore how this occurs, what factors influence the process and how this knowledge can be used to design more effective and enjoyable learning environments.

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