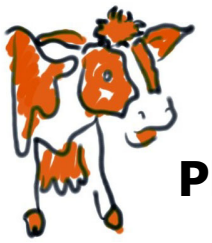

Playing the Game: A Model for Gameness in Interactive Game Based Learning

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ABSTRACT

This paper proposes a model for describing the requirements for digital interactive games for education. The focus is on describing the amount of 'gameness' to facilitate discussions between developers and educators. Gameness is broken into four dimensions: the underlying model; interface model; interactivity and narrative. It is shown that while these dimensions are not independent, they are useful in highlighting aspects of games for educators interested in including game based learning in their teaching.

Keywords: instructional technology, game-based learning, interactivity,

1. INTRODUCTION

This paper proposes a model for describing the requirements for digital interactive games for use in education. We focus on separating the elements of "gameness" into four dimensions: underlying model; interface model; interactivity and narrative. This model is aimed at providing clarity for understanding requirements and giving direction to development. The goal is a model for "E-learning, not e-boring" (Klaila 2001).

Most instructional technologies consist of a repository for lecture notes with a possible feature of a message board discussion forum. Prensky (2001) described the movement to online training as "enormous step backward" (p13) while Klaila (2001) described the "worst of all possible alternatives—they deprive participants of interaction while reducing them to reading 'green screens' of scrolling text". These descriptions of an environment could not be further from that used to describe gaming environments. It is not surprising therefore that requests for help with the development of instructional technologies usually involve the concept of games. It is hoped that a basis in games will bring an addition of the fun, interactivity and challenge.

Many authors (eg Henderson 2000, Lyman 1995) have discussed the role of the teacher in constructing digital game-based learning experiences (DGBL). This takes the form of structuring and framing the activity of the learner in DGBL in achieving learning outcomes, integration of the DGBL into classroom activities and post-game discussion of scenarios. An imaginative and well-produced game may be flexible and complex enough to offer a range of educational opportunities. It is then critical that the teacher and the developer are able to reach a common understanding of what is implied by the word "game".

We are regularly approached by educators seeking assistance with the development of instructional technologies:

- "our software…how cool and fun it is compared to boring old school"
- "a journey of discovery, an interactive visit to your own brain"
- "Aliens as your allies help you develop positive attributes to fight off the evil forces."

Others are more focussed on learning outcomes: "The main benefit would be increased involvement with the material and maybe collaborative learning in the case of multi players…A community is great and possible". Some clients have an understanding of the technologies involved, "maybe a VRML-based dog", or the engine required to produce the gameplay; "I like the model of many doors/pathways with choices within, like the interactive story books for kids…MYST is the model". Perhaps the most challenging request was for "an interactive decision simulation, where students would have to take the consequences of the decisions made" yet this educator was adamant she did "not want a game…this is a serious thing, no fun".

In this paper we contend there needs to be a model of 'gameness' to facilitate our discussions with clients who would like to incorporate DGBL into their instructional technologies. We need to decide whether a DGBL approach is appropriate, and how to effectively incorporate the clients' requirements into the game model.

2. DIGITAL GAME BASED LEARNING

Digital Game Based Learning is used to describe the application of games to learning. Ignoring the learning part for the moment, what is a game?

Gredler (1992 p13) gave a traditional definition of 'game': "any contest (play) among adversaries (players) operating under constraints (rules) for an objective (winning) - to describe a game as a contest fails to address the essence of the activity". Unfortunately, as Gredler continued, just considering the competitive exercise fails to address the "essence of the activity". To competitiveness needs to be added a set of rules that are not replications of real life and the consequences (eg of losing) do not extend to real life. Prescribed paraphernalia are used and winning the game involves taking any course of action allowed by the rules to thwart or defeat other players. Sawyer (2002) adds that both the rules and strategies need not be apparent at the start of the game as discovery is an important component. Games can be played where speed is important, Prensky's "twichspeed" (2001) or Joesphson's (1996) "thumb candy" but there are numerous other styles of game, mostly simulations of some sort (Kirriemuir, 2002).

There are many successful examples of DGBL, particularly in the fields of business simulations, military war games (Prensky 2001) and procedure based manipulations such Prensky's Monkey Wrench Conspiracy (2001) or medical procedures such as ResusSim (Sophus Medical 2002). Prensky (2001, p156) gives a useful table for aligning the content with the style of game. Where behaviours are to be learnt, roleplaying games are suitable, procedures: timed games and reflex games, observation: concentration games and so on. Unfortunately the wider experience is not so positive. Kirriemuir (2002) writes "when gaming-oriented entertainment and learning or educational material are combined the result has often been disappointing; the educational value is debatable or irrelevant, and the gaming and engagement qualities compare poorly to those of pure games".

There is little systematic experimental academic literature on the benefits of including a DGBL games approach in learning. There are a large number of anecdotal papers on the benefits derived from a particular implementation. Kirriemuir (2002) bemoans the overall poor performance of DGBL but points to the positive features of games in general. He writes "there are obvious lessons here" with a potential to "combine game techniques (contributed by games designers) and proven learning techniques (contributed by teachers)". For this to happen, there needs to be a common understanding.

Unfortunately there is little theory in game design to lean on. While technically advanced, games design theory and practice (eg Rouse 2001, Rollings and Morris, 2000) is a long way behind the level of theory found in other computer based disciplines. They are, according to Braben (2002), stuck in the 1920's when compared to movie making. This may be part of what Lowe and Hall (1999 p14) described as a general "crisis" in hypermedia, the lack of discipline putting hypermedia "30 years behind". Game developers recognise this limitation, for instance Falstien and Barwood (2002) discuss practices such as pattern

analysis and complain, “we don’t use this language” and Kim (2001) argues that a lack of an infrastructure will inhibit the use of games in wider business. Even Prensky (2001 p96) recognises that DGBL is in “a period of putting together the infrastructure”.

Games are a new medium and still in flux. To some extent, this is exciting. Game genres “remain fluid, open-ended. The rules and expectations for computer games are not yet set in stone. Each new game must rethink how it should engage the player, and the best games succeed by discovering new structures of interaction, inventing new genres” (Friedman 2002). We have then a situation where we are attempting to apply games to education without a strong basis, at least at the games end.

Prensky (2001 156) gives a table aligning game types with different forms of learning, but gives little guidance on how much game is appropriate. He does recognise that it is not always necessary to create “huge visual extravaganzas” although his reasoning is based on time and resources: “games we need to create are often much simpler, at least initially…They essentially involve putting some good ‘gameplay’ around interactions that are helpful to learning.”

3. GAMENESS

We argue that DGBL “needn’t be actual games” to benefit from game ideas (Sawyer 2002). In talking to teachers about developing instructional technology, a key question then is how much game do you want? Just what is Prensky’s “good gameplay?”

Our proposed gameness concept describes games in terms of four dimensions:

1. interface model; (look and feel)
2. underlying model; (degree to which uses a model)
3. interactivity; and (gameplay)
4. narration (goal of story and of playing).

4. INTERFACE MODEL

The game industry uses cutting edge technology to deliver a high quality experience to the consumer.

Does it look and feel like a game? How is the game-world graphically represented? Most users would agree with Sawyer’s statement “with their exciting visual and audio power, computer and video games take the competitive and fun nature of games to an entirely new level” (2002). In contrast, much instructional technology has a minimal interface, or an academic feel that has little user appeal.

In addition to the graphical approach, we include in the interface the humour aspects of fun. Engagement aspects are separated into the gameplay dimension.

To some, the role of fun in DGBL is obvious and required. “The underlying idea is that students learn better when they are having fun and are engaged in the learning process “ (Spectre and Prensky 2001 p1). Clients may ask the question Prensky posed in his book “DGBL”: “Do we trivialise important material by incorporating a games approach?” One of our clients argued “the simulation must not be presented to the student as “play” but as a simulation of a placement (a serious thing, no fun!)”.

One of the questions raised by the interface dimension is the appropriate amount of realism. Powerful graphics, sound and physical models provide high fidelity environment but Low (2001) argues that such realism may distract from the interaction rather than enhance it and argues that games “don’t fail because they look unrealistic… they fail when they don’t make sense”.

5. UNDERLYING MODEL

Making sense is to a large part driven by the underlying logic model that is the heart of the game (the game ‘engine’). The decisions that are made in response to the player’s actions may be random, or generated by sophisticated algorithms. There is a continuum in the degree of underlying model, from a static model (ie hyperlinked pages) to a functional world such as that which drives the Sims, described by Woodcock (2001) as the “inspiration for what AI could be”. For DGBL, exciting developments halfway along this continuum include systems such as Porter’s (2001) “Cocktails and Conquests”.

Increasingly, AI is used to create a fantasy world which responds realistically to the player’s decisions. Rouse (2001) explains the role of AI in games using parallels between the world of AI games and the theatre: “If game is improvised theatre, where the players get to be the director of the primary character or group of characters, then all the other actors in the play are controlled by AI”. The role of the game designer, according to Rouse, is to “direct those AI controlled actors to create the most stimulating experience possible for the player”.

The goals of the underlying model are to challenge the player by displaying mastery over skills that seem obvious to human players, yet being unpredictable enough to keep the player on his toes, since "irrationality keeps life interesting". The AI should assist the storytelling by developing the personalities of the non-human players.

A key distinction in gameness is a turn-taking system that is more than simple branching. Such simple branching leads to an exponential increase in work for each level of interaction and a "fallacy of choice" (Dove 1994 see narrative). This then requires a underlying model that responds to the game world and actors within it or provides a structure so that the community of learners provide the intelligence themselves.

6. INTERACTIVITY AND GAMEPLAY

Interactivity allows the user to exert some control over the outcomes of the game, to actively change the course of events. In the gaming literature this is described in terms of the gameplay. Rouse (2001) defines gameplay as "the degree and nature of the interactivity that the game includes, i.e., how the player is able to interact with the game-world and how that game-world reacts to the choices the player makes."

Included in interactivity is the pace of the game, much focus is on "twitchspeed" (Prensky 2001). This, however, is only part of the story and perhaps less important than gameplay, a fast pace may not be appropriate for those learners who do not fit descriptions of Prensky's 'Nintendo Generation' (Kim 2001).

This gameplay is paramount in a game. Shelley (2001) argues "our priority is to create fun, engaging gameplay" the rest are merely "props". What creates this engagement, Shelley argues is interesting decisions.

The role of engagement is at the centre of most claims for the benefits of DGBL, it gives intrinsic motivation that promotes the desire for recurrence of the experience and can "motivate learners to engage themselves in activities with which they have little or no previous experience" (Bisso and Lucker 1996 p109). How students interact with the information is critical: "this enables a more satisfactory integration of that information into what the student already understands and facilitates the creation of a more credible and robust body of knowledge by the student" (Winn 1995).

Mount (2002) describes the gameplay elements which, "when implemented in an interactive environment, ensure that the end user can make interesting choices, thus leading to a vicarious experience which is both memorable and fun". Mount's elements of gameplay for a successful game include: challenge vs frustration; risk vs reward; polymorphism - allowing different styles of play.

High levels of gameplay and interactivity can be generated by quite different means. Kindley (2002) describes scenario learning, where the learner follows success and failure paths through a realistic situation. Kaufman and Kline (2001) on the other hand describes immersive entertainment space. Kartouche (Immersive Education 2002) and Stage Struck (Emlab 2002) allow students to recreate scenes from various plays, thereby improving their understanding of the narrative. These imaginative, immersive, manipulable environments are a very different interaction than a first person shooter approach to gaming.

Henderson *et al.* (2000) found that whether students internalised concepts embedded in a science computer microworld simulation as opposed to treating it as merely a game to be played depended on the integration of the game into an integrated thematic curriculum. An important consideration in gameplay therefore is the extension of the gameplay beyond the digital environment. The gameplay and interactivity considered should include consideration of the development of team, social, communication and resource sharing skills through the playing of multi-player and (user) team-oriented games and simulations and stimulating curiosity and encouraging experimentation in a safe "virtual" environment.

7. NARRATIVE STRUCTURE

A challenge in DGBL is the role of narrative, the storytelling element. Traditional authors deal with character, setting, and plot; and so too must the game designer (Bates 2001). This is analogous to education where we reveal, layer and sequence information presented to students. The concept of narrative is linear: a story must have a beginning, middle, and an end and follows a structure of increasing tension, climax and resolution. Character development in linear media is often accomplished

by putting people in stressful situations and showing who they truly are by the choices they make. But in games, there is a direct conflict between freedom we must allow the player, and the linearity necessary to any well-constructed story.

It is tempting to do this with branching structures, to string to areas of choice together in a linear series. This though has two significant problems. First, it gives the fallacy of choice (Dove 1994), people can make choices but to get to the good bit of the story they can't really affect the outcome, meaning their choices are trivial. Second, is the exponential workload needed to create alternative structures.

There are approaches that attempt to overcome this conflict between narrative and interactivity (Porter 2001, Murtagh 2001). The key point here is that the role of the story, the narrative, be considered in the development of DGBL.

8. CONCLUSION

The incorporation of game based learning into educational software is a worthwhile goal. Clients may have somewhat naïve views of what constitutes a game. This paper has attempted to provide a model for describing the 'gameness' of an DGBL application. The four model components: interface; engine; interactivity and narrative are closely woven but allow us to dissect a proposed application into areas of relevance to the client, providing clarity for understanding requirements and giving direction to development. Further research is continuing into the development of the model and the application to educational application developments.

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