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When is a Game Not a Game?

Considering Player Perceptions of An Educational Game Through Reality, Meaning, and Play

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Abstract

Educational games are designed with playful affordances, yet have the serious purpose of supporting players' learning. Given this, how players perceive these activities may influence how they interact with them, and therefore, whether they actually learn from them. We present player perception of an educational game through the triadic game design framework. Selected cases are presented here from one educational game teaching Newtonian physics to better understand the relationships between player perceptions and the nature of their game experiences, in terms of *reality*, *meaning*, and *play*. The findings we present indicate that players' perceptions of educational game affordances as school-like or game-like contribute to divergent experiences with the same design.

Introduction

Serious games are designed for a purpose beyond play (Harteveld, 2011). Games are designed to promote empathy, values, or in the case of educational games, learning. Despite this simple definition, there has been an extensive discussion about what constitutes a "serious game" (Deterding et al, 2011), also in relation to what is defined as a "game" (Juul, 2005; Salen & Zimmerman, 2004), considering that some games are repurposed entertainment games, others are more like gamified experiences, and then various games are considered borderline cases because they are more like "simulations" or "virtual environments." The aim of this paper is not to contribute to this discussion. Rather, the aim is to investigate in the context of educational games how the players themselves perceive the games they play and what effect this has on the impact the game attempts to achieve.

Inspired by the triadic game design framework (Harteveld, 2011), we posit that given players' perception of what they are doing, the interactions with the design may differ widely. In other words, the game is more than the designed affordances intended by the designers—the *enacted design* is, in fact, the interactions players have with that game in a particular context. This means that games can be taken up in ways that their designers may not have intended: "the meaning that people attribute to games is not necessarily intended by the designers" (Harteveld, 2011, p. 56). In fact, game design is considered a "second-order problem" (Salen & Zimmerman, 2004) because designers can only indirectly influence how players experience their game.

Within educational game experiences specifically, the goal of supporting players to learn something cannot be considered separate from the meaning attributed to the game by those players. How players attribute meaning is influenced by their previous attunements to affordances (Gibson, 1986) that are represented in the game they are playing: “Players are first real people in the world” (Harteveld, 2011) and their real life experiences will impact both how they make sense of game play and the meaning they draw from it (Dervin, Foreman-Wernet, & Lauterbach, 2003). Players have goals, intentions, and perceptions related to the act of playing games, and a particular game. Therefore, in evaluating educational games it is of importance to consider the idiosyncrasies of players, and not treat the game as a universal artifact that is experienced similarly to all of its users.

In short, we see games as ecologies (Salen, 2008), which can be redefined by the experiences of players and the context in which they are played. The initial perception of a game may impact the meaning players attribute to game affordances and their game interactions. This paper investigates an implementation of *SURGE: Fuzzy Chronicles*, a simulation game that teaches Newtonian mechanics (Clark et al., 2011), to see how player perception affects player experience. In this exploratory analysis we present player talk of several cases as they interact with *SURGE*. Below we discuss some relevant literature, our analytical framework, details of *SURGE*, and then the cases that illuminate reality, meaning, and play within student talk before discussing our conclusions and future work.

Background

While the literature on games, serious games, and game design is growing substantially, there is limited work investigating players, the diversity of player experience, and, specifically, how players perceive educational or serious games. Nacke et al. (2009) describe this as a difference between playability research (focusing on a game design) and player experience research (focusing on the player and their perceptions and experience before and during game play). The lack of understanding of how users perceive educational games is a main driver for this paper and the discussion it prompts. A sample of relevant findings are included here to support our discussion.

One factor that might influence player experience is their previous game play. For example, Christou (2013) found that game experience impacted perceptions of usability. Essentially, more frequent gamers saw games as more usable, more accessible, and more appealing. Given this, things like perception of learning how to play a game and the difficulty or enjoyment of an initial game experience might be impacted by previous game experience. This is supported by findings that suggest navigation and other game play dynamics are tougher for those who are not used to playing games (Tawfik, He, & Vo, 2009). Players’ personal histories (Mayra, 2007) may be important through other measures than game experience. Player understanding must “take into account the historical perspective, as well as the public and private contexts of digital play” (p. 814) For example, through taking personal histories of players into consideration, it is clear that playing with a friend is different from playing with a stranger.

Further, the physical context in which a game is played matters. One might imagine that placing a game within a classroom context might necessarily communicate to players that what they are doing is educational. Similarly, Verdercruysse et al. (2013) found that many players saw what they were doing as educational despite the activity being described as “a game.” In their study, they called the task a “game” for some players and an “instructional activity” to others, and they found that those who were in the “game” group reported higher interest, enjoyment, and perceived competence after playing. While player perception of a game can differ, the framing of a game-like task also matters. In fact, Lieberoth (2014) compared environmental discussions through a list of questions, a competitive discussion board game, or through a discussion using the game pieces but not game mechanics. They observed that simply framing an educational activity as a “game” (in both game conditions) and use of game artifacts increased interest and engagement, whether or not the activity actually had game mechanics.

Despite the potential of games for learning (Gee, 2003), previous research has suggested that educational videogames do not work as an ideal instructional method for all users. For example, Squire (2005) found students who were traditionally successful in school tended to dismiss the potential value of their success in playing educational games, while academic underachievers in particular, or the students who resisted mandated traditional school curricula, were more enthusiastic about game play and developed better conceptual understandings of the content. Similarly, those who self-identified as “gamers” had trouble connecting that identity to their play within an “educational game.” Failure within the genre of educational gaming upset and frustrated these students. Squire suggests that these users “may be inclined to reject educational games out of hand if such games challenge or compromise their identities as gamers” (p.4).

The triadic game design framework (Harteveld, 2011) helps to explain these experiences in the context of playing serious games. This framework posits that the successful design of a serious game requires the consideration of three different paradigms: reality (e.g., domain, subject-matter experts), meaning (e.g., outcome, learning scientists), and play (e.g., activity, game designers). Each paradigm consists of specific people, disciplines, aspects, and criteria that need to be considered as part of the design process. A game will be applied successfully only by carefully considering and balancing each paradigm (much like any other technology in the classroom, see (Mishra & Koehler, 2006). In practice this means that the game’s educational setting, goals and challenges, and content will have to match and reinforce each other. This triadic framework is not only useful for designers, it can also be used to characterize players and understand their play experiences. Using this framework, players can be identified as people (Reality), as meaning makers or learners (Meaning), and as players (Play). Each player has a particular personal background that may shape their experience in addition to how they are inclined to learn about the world and what games they prefer to play. During their interactions, players might be attuned to affordances (Gibson, 1986) related to school (reality) or a game (play), resulting in different learning (meaning).

Methods

The design used within the study was a Newtonian mechanics simulation game called *SURGE: Fuzzy Chronicles* (Clark et al., 2011). Players navigate their ship safely to reach the exit portal in each level by dragging forces onto their spaceship with a chosen direction and amount of force (in Newtons). The trajectory may require passing through green speed gates of a certain magnitude (e.g., 3 m/s), picking up “fuzzies” along the way, or passing through purple mass gates (which require the ship to have a fuzzy as cargo). If the player uses too much or too little force to propel themselves through a speed gate, their ship will explode, and the player will be required to try again to pass the level.

Figure 1. Screenshot of level Blue 3 with the ship (a), a fuzzy (b), green speed gates and a purpose mass gate to navigate to the exit portal (c).

Players progress through red levels, blue levels, and green levels, which each emphasize a particular concept of Newtonian mechanics (e.g., the relationship between force and speed, the relationships between mass, force, and speed, and the concept of opposing forces). The level pictured in Figure 1 is in the blue set of levels. At the end of each set of levels are "warp levels" which require a minimum score of 80 to be earned to pass onto the next set. Both level performance (reaching the goal) and response to a multiple-choice question count toward the warp score. The questions that pop out for players (Figure 2) ask about an action they took in that particular level, or what they might do in a similar hypothetical situation.

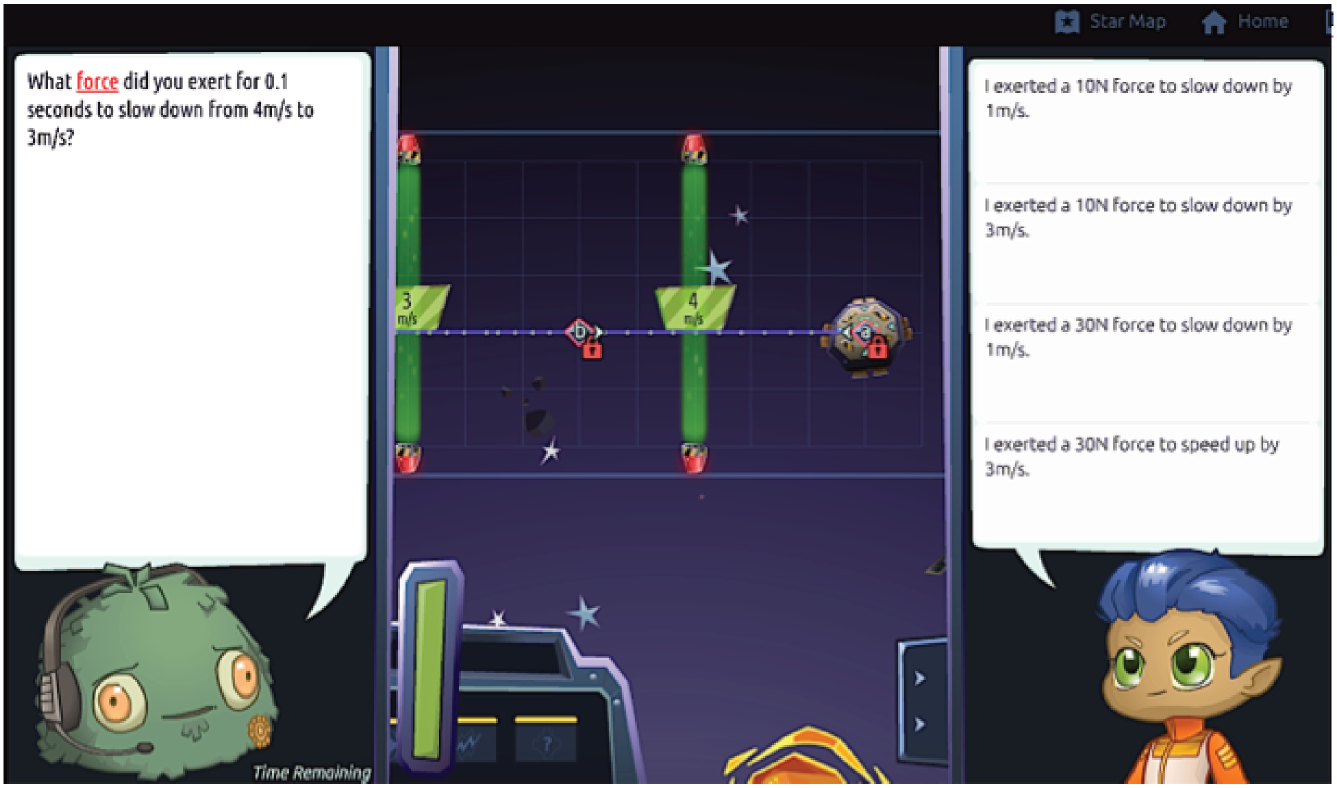

Figure 2. Example question at the end of the red warp missions.

The fuzzy on the bottom right reacts to the player's response and if players choose an incorrect answer, they are prompted to try again. Each attempt makes the warp score decrease. At the end of the question, they are shown their total warp score for that level. We verbally instructed students in the classroom that they needed a score of 80 to move on, and that the score was impacted by the number of attempts and whether they answered the question correctly.

SURGE was taken to and examined within a 7th grade STEM class. The players were 97 students, across four class periods. Researchers were present in the approximately 75 minute classes for a period of five days. Case studies, whose talk is included in this paper, were selected among the participants on the basis of whom had their consent form turned in the first day, as the priority was to document the trajectory of learning over the course of all days of implementation, with the aim of keeping even distribution across classes and gender. The activity was introduced as a playtesting session in which the students were encouraged to give feedback about the game for its improvement. In this way, they are positioned as "experts in the use of their own media culture" (Marsh, 2011, p. 105). Students were encouraged to share game strategies. They were told that they would not be given a class grade on the activity, but were asked to try their best because their participation would help us improve the game.

All participants were given a pre and posttest of 21 questions that assessed physics content presented in a way similar to game dynamics but in a more traditional format. For example, a question might ask how much force is required to push an alien weighing 1kg at a velocity of 2 m/s (no friction). Participants also completed an engagement survey at the end of the study. Lastly, screencaptures recorded the screen and talk of the 20 case studies each day, including their interviews. In this paper, we focus on the interview data and player talk, but reference other data where appropriate. A complete description of the data and results is described in Barnes (2015).

Findings

In the discussion of the selected cases we illuminate players' perception of game affordances (Gibson, 1986) according to the three paradigms of triadic game design. Considering reality, or the content being represented in the game, players perceived the physics content as structured and unfamiliar. Considering meaning, or the educational nature of the game, one player elaborated extensively that *SURGE* is a "learning game" and what qualified it as such. Considering play, we consider whether *SURGE*, in this context, counted as a game at all, reporting players' perceptions of game affordances as "academic" or "playful."

Reality

Some students verbalized perceptions of the physics content in the game, either describing it as a "physics game" or to indicate that they are unfamiliar, or have not learned, physics. Here we present two cases who had relatively successful experiences, as measured by their game engagement survey and posttest. Steven was within the top 4 pretest scorers (71%) and top 4 posttest scorers (95%), and rated himself as a gamer (5 to 7 hrs/wk). At the start of a conversation with Steven on the second full day of game play, he was prompted "Tell me about the game so far." He responded by describing how he thinks the physics content in the game is hidden from players: "It's pretty good, but uh, I think it will help people, like, not recognize that it's actually physics. Because usually it will say 'PHYSICS GAME', or something, and people won't try it, because they know it's going to be something where they have to learn." Here Steven articulates what counts as physics as something that people are tentative to enter into, and something that will require the uncomfortable experience of learning.

Another player, Cal, who has a similar profile to Steven, with relatively high pre (57%) and post (90%) test scores and game experience (5 to 7 hrs/wk), did not seem to connect his achievement or progress in the game to knowledge about "physics and stuff like that." Cal separates what he is doing from "physics" but also points out that the content of the game was totally new to him. When asked whether he's seen any of the words and symbols in the game previously, he says, "The force, not as much. Not really… We haven't really learned much about the physics and stuff like that." Despite being very successful in the game, in terms of game progress and learning, Cal doesn't appear to consider what he is doing as "physics." He also states that the physics is something he hasn't learned previously. However, Cal did quite well on the pretest. Understanding of the content the game doesn't appear to map to Cal's perception of it as physics, perhaps through the interactive nature of the experience,

Meaning

A second conjecture of this paper is that it is consequential whether a player perceives the educational nature of *SURGE*, or whether they treat it as they would any other game. Here we present a less successful case, respective to engagement and learning, to understand the player's experience and perception of the "learning game." Lamia had a pretest score slightly below average (29%) and a relatively low posttest score (43%). She did not get very far in the game–5 levels before the average level all cases reached. Lamia rated herself as a heavy gamer, playing more than 10 hours per week. She frequently told researchers about her skill with The Sims and other games. However, she described *SURGE* as a "learning game" rather than a "for real game." When Lamia was asked to think about the game critically, asking what she would change as the designer, she suggested two solutions for her frustration: "What I would change is, if you lose, after one time you lose, there's a superguide to do the whole thing for you! Or… I'd make, when you complete a level, there'd be a non learning game, so somebody would look forward to completing it." When asked by a researcher what makes it a learning game, to her, she responds, "The questions it tells you at the end of the level. The QUIZ questions!"

Even here, she used academic language, calling the review questions "quiz" questions. When her friend suggested that it must be a learning game because they are required to do it, she agreed by saying, "Yes! Because school doesn't let us play any for real games. Plus, if I'm at home, and I can't pass a level, of ANYTHING, videogames or any game in particular, Google is always helpful. Google. Type in the game, and cheat, and done. I'm awesome."

Lamia considers herself an avid gamer, yet she contrasts what she is doing to "for real games" that would not be allowed in school. She reported playing *The Sims* and "killing games" in conversation with researchers. So, for this gamer, who has a lot of strategies for getting through games on her own terms, this game was very saliently a "learning game."

Lamia also participated in social talk about grades and demarcation of "geek," "nerd," and "dork" categories with her friends while playing. They made a chart indicating the differences in these groups. During the conversation, Lamia put herself squarely into the category of "geek," because "that just means you're not good at school but like sci-fi." The self perception of being not so great at school, coupled with Lamia's perception of *SURGE* as not a "real game" may have increased her frustration when trying to understand the Newtonian mechanics within *SURGE*.

For Lamia, the *SURGE* experience shows her complicated relationship to both games and school. When she encountered trouble, she elaborated her usual gaming strategies of quitting, wishing she could use cheats. Conversely, she also expressed that she gets frustrated when she is unable to complete a game. She labeled *SURGE* as a learning game multiple times, and described that it was because players cannot quit or cheat. When she completed the level again and saw score of 58, she growled "AGH. I'm going to do with every game I don't like. Quit. Hey, there ain't nothing wrong with quittin'!"

Play

Typically, players of games act with some basic assumptions, influenced by their previous experience with and attunement to, game affordances. However, whether or not players perceive *what they are actually doing* as game play is important. In particular, the context of play–taking place within a classroom, for example–might impact players' perception of playfulness in the activity. During interviews on the 3rd day of game play, case study participants were asked if what they were doing felt more like a game, or school. Some of the qualities that attune players to the game-like nature of *SURGE* are the platform (i.e., being on a computer rather than a workbook) and its interactive nature. Those who saw it as a game described how the task was sort of like a puzzle they had to figure out. One stated, "It kind of felt like a pattern. That's what it kind of feels like. It's like a pattern, when you know the number, you know what comes next.” Another said it was game-like because if it was school, “it would have a bunch of math problems and you would have to imagine stuff.” For this student, the virtual simulation they could interact with was different than prompts to imagine situations common to traditional STEM assessments, and for him, signalled that he was playing a game. Similar to this, multiple students reported the physical context as an indicator that they were playing a game, saying “the fact that it’s on a computer and we’re interacting with stuff” and “because you are on a laptop and not like in a workbook” made it feel more like a game to them.

Players described *SURGE* as like school because it told them information, but also because it included intellectual work. One student said “I think the school part of it is that you have to guess at which size or speed and which direction it’s going, so that makes you think.” Another echoed this description, saying “it’s sort of like school, in that you have to figure it out.” One player pointed out the “questions that it asks of me” as making it feel like school, to her.

Players could pick out specific game affordances related to either play or academics. Here, we see that the games genre was signaled through specific affordances, but not universally. Given this, question of whether or how *SURGE* counts within the traditional categories of a game, and specifically how an educational game is conceptualized, is one for further discussion.

Discussion

This paper asked how educational game players perceive the games they play and what effect this has on the impact the game attempts to achieve. We aimed to understand these dynamics through looking at reality, meaning, and play in the talk of players of *SURGE*. Our findings show that the physics content of *SURGE* was something unfamiliar to most players, but also was something that signaled to players that the game was educational. Conversely, a heavy gamer, who may have been attuned to typical game affordances in first person shooter or simulation games, labeled *SURGE* as a “learning game.” These instances, and the specific affordances which players categorized as academic or playful prompt additional questions that we plan to explore further.

Overall, we conjectured that when games are played within classroom contexts, it is consequential whether a player perceives them as academic or playful. Also, the way researchers framed the game, as “a game” and encouraged sharing strategies, as well as the inclusion of a pretest, may have influenced players’ perceptions related to games or academics, or both, and their personal moment-to-moment goals for playing each day. Contextual factors can influence the play or meaning components of an educational game experience when perception of a task is altered. Similarly, if a player thinks *SURGE* is about spaceships and aliens that is something quite different than a player who assumes the content (reality) of the game is physics.

The implications of using games in classrooms requires more reflection on how these games are both designed and framed when introduced to students. Whether considered *students* or *players,* educational game users form relationships between themselves and the affordances of a game, given their gamer or academic identities. While educational games have been shown to be beneficial for learning when compared to non-game alternatives, it is yet to be understood whether those findings are due to the interactive nature of the task, the playful perception of players, or another reason. Future work will address these questions while investigating the diversity of player perceptions and experience in educational games. Specifically, it will explore relationships between players previous attunement and perception of the task in terms of four general quadrants: those who are highly attuned to school, those who are highly attuned to games (and the opposing cases) and looking at how those groups perceive an educational game as "game" or "school."

Lastly, additional work in progress is looking into comparisons of why designers, researchers, and educators, respectfully, define and evaluate educational games. We feel that these investigations will both contribute to a comparison of rubrics of quality, but also illuminate differences in how these different audiences decide what truly *counts* as a game.

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