

Players, features, and enjoyment: Entertainment games as models for educational games

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Abstract: This study examines reviews of some of the highest and lowest ranked video games on VideoGameGeek.com in order to determine what features video game players see as contributing to or detracting from enjoyment in games as well as how these features align with an established taxonomy of game features. Results suggest that players perceive features like control, challenge, and immersion to have more of an effect on enjoyment than a game's story or such features as interaction with and feedback from the game. The data also suggest that players consider factors outside of previously-identified categories to play an important role in their enjoyment of video games. A better understanding of the connections between specific game features and reported enjoyment may enable educational game designers and teachers to design and select games that are more likely to engage learners.

Modern educators are beginning to embrace games for their ability to engage students more than traditional readings, lectures, and discussions. However, it is popularly held that many games designed for educational purposes are unappealing to their target audience. That is, educational games often contain features that players identify as less enjoyable than corresponding features in entertainment games. This does not necessarily mean that educational games are lacking in quality, pedagogy, or affordances for learning; however, if games fail to pique learners' interest, these features will likely remain dormant. Assuming that educational games are well thought out and provide solid pedagogical content, then what is still needed for the larger scale adoption of educational games may be *enjoyment*.

In response to this gap, some advocates for game-based learning suggest that the educational game community take cues from entertainment games. Some researchers go so far as to suggest that educators adapt and implement commercial games in educational contexts (Charsky & Mims, 2008). However, Van Eck (2006) describes this as a temporary solution, maintaining that games designed specifically for education remain "the future of DGBL [digital game-based learning]" (p. 21). Gabe Newell of Valve Software, calls instead for blurring the distinction between entertainment and educational games (Gilbert, 2011); he envisions a middle ground where all game designers more sincerely address educational content and educational game designers make games more appealing to learners. Regardless, members of the educational gaming community need to understand what makes entertainment games appealing in order to know how to follow their example (Wang, Shen, & Ritterfeld, 2009).

In this study, we collected reviews from the games website *VideoGameGeek* and analyzed the language in those reviews to help educators better understand what features may contribute to (or distract from) students' enjoyment of educational games. We organize our discussion of game features using a taxonomy proposed by Bedwell, Pavlas, Heyne, Lazzara, & Salas (2012). Their study used card sorting activities and surveys with a group of subject matter experts to develop the following set of nine non-overlapping categories that describe the attributes of serious games:

Action Language, the means of communication by which a player makes their intent known to the system;
Assessment, the nature and content of feedback given to the player during game play;
Conflict/Challenge, the nature and difficulty of obstacles in the game;
Control, the amount of agency and interaction afforded to the player;
Environment, the physical location where the game takes place;
Game Fiction, the story or plot of the game;
Human Interaction, any human-to-human contact within the game;

Immersion, the player's perception of and affective response to the game world and its story; and *Rules/Goals*, the clarity of a game's objectives and rules.

To explain this study, we first discuss the various ways in which the concept of enjoyment is interpreted. Then, we list our research questions and describe the methods we used to collect and analyze our data. We then report and interpret our results. We hope an understanding of how game features relate to game enjoyment may benefit not only teachers as they evaluate educational games but also designers as they create those games. Evaluating and designing educational games with an emphasis on these features may then help facilitate their adoption by making them more enjoyable.

Literature Review

Player enjoyment is a complex and personal issue. In this section, we describe a number of existing conceptions of *enjoyment* and define our use of the term in this study. We then discuss the theoretical relationship between player enjoyment and specific game features. Because our goal is to describe how specific game features correspond with player perception of enjoyment, we conclude by reviewing previous efforts to classify the features of a game and explaining how these efforts relate to our study.

Enjoyment in Games

The existing literature on *enjoyment* is characterized by its variety. The concept of enjoyment itself is often associated with a number of other concepts: Wang et al. (2009) equate enjoyment with the concept of *pleasure*, and Boyle, Connolly, Hainey, and Boyle (2012) relate enjoyment to *motivation*, *engagement*, *affect*, and *attitude*. Researchers have used a number of psychological theories to explain when players experience enjoyable feelings (Boyle et al., 2012). For example, self-determination theory (SDT) posits that intrinsic motivation, "the inherent tendency to seek out novelty and challenges" (Ryan & Deci, 2000), is ultimately responsible for whether players experience enjoyment. On the other hand, flow theory suggests that only specific kinds of game challenges lead to player enjoyment: those that are optimized for player skills (Boyle et al., 2012) or that push players to (but not beyond) their limits (McGonigal, 2011). This variety of explanations for player enjoyment is complicated by the diversity of player types that is theorized to exist. Simply put, different players are interested in different things (Yee, 2006) and will therefore likely enjoy different things. Given this variety, we have found the most helpful definition of enjoyment to be one synthesized from previous research by Wang et al. (2009): "positive responses of individuals toward media technologies and content" (p. 25). While players may engage for different reasons, concentrating on "positive responses" to games captures a broad swath of motives.

Enjoyment and Game Features

Although Wang et al.'s (2009) definition of enjoyment is compatible with psychological theories of enjoyment, it shifts the emphasis away from psychology to "technologies and content" (p. 25), suggesting that game attributes—not just player attributes (or types)—influence enjoyment. This aligns with arguments that certain features may make games better or worse suited for specific learning outcomes (Foster & Mishra, 2009; Tobias, Fletcher, & Wind, 2014) and that particular features such as aesthetic appeal (Schell, 2008) or immersive game worlds (Van Eck, 2006) can contribute to enjoyment. Although we acknowledge the importance of psychological explanations for player enjoyment, we found that feature-centered explanations are generally more practical. When educators can identify the specific features, affordances, and constraints of games (or any educational technology), they will be empowered to effectively evaluate and properly integrate them into their classrooms (Mishra & Koehler, 2006).

Organizing Game Features

Scholars recognize that they need a common language if teachers and researchers are to analyze and compare educational games by specific features (Bedwell et al., 2012; Wilson et al., 2009). However, efforts to establish a common vocabulary have met with considerable difficulty: Even the definition of *game* is enthusiastically debated (Koster, 2010; McGonigal, 2011; Salen & Zimmerman, 2003; Wilson et al., 2009). There is similar debate over terms related to specific game features, such as (game) *mechanic* (Sicart, 2008) and *genre* (Foster & Mishra, 2009). Despite these difficulties, researchers have pressed forward in trying to establish more consistent terminology. A number of proposed taxonomies focus specifically on establishing a common language for educational games. For example, Wilson et al. (2009) proposed eighteen attributes of games that might contribute to learning. Recognizing that some of these attributes might overlap, making them potentially difficult to discuss individually, the second author of that study recruited subject matter experts to streamline those attributes into a taxonomy of nine game attributes related to learning (Bedwell et al., 2012). This taxonomy has since been referenced in a number of studies (e.g. Lamb, Annetta, Vallett, & Sadler, 2014; Sedano, Leendertz, Vinni, Sutinen, & Ellis, 2013); however, these studies merely acknowledge the existence of this work or borrow its terms rather than put the entire taxonomy into practice.

Purpose and Research Questions

The purpose of this study is to determine which game features players perceive to contribute to (or take away from) their enjoyment of a game. We draw on the work of Wang et al. (2009), who conducted a content analysis of published video game reviews from GamePro.com and IGN.com to identify game features that contribute to overall enjoyability. We apply a similar research approach to the reviews posted by users of the VideoGameGeek (VGG) gaming website. We likewise draw on the work of Bedwell et al. (2012) in recognition of the importance of their call to action regarding the need for a common language in the literature. We also recognize the importance of applying their proposed taxonomy to existing data, thereby testing its utility in research. Our ultimate goal in identifying these features is to provide evidence to inform educational game designers and educators who use games in learning activities so that they may design and select games that are more likely to engage learners. Our study seeks to fulfill this purpose by answering the following research questions:

1. Which features in Bedwell et al.'s taxonomy do players most often perceive as affecting their enjoyment of games?
2. Which features in Bedwell et al.'s taxonomy are players most likely to see as either positive or negative influences on their enjoyment?
3. Do players perceive different features in Bedwell et al.'s taxonomy as affecting their enjoyment if they are playing a highly-rated or poorly-rated game?
4. Do players consider features in their reviews that are not addressed within Bedwell et al.'s taxonomy of game features?

Methods

To answer these questions, we conducted a content analysis of game review data from VideoGameGeek.com, a videogame rating and review website offering a publicly available application programming interface (API). We first determined the 10 games with the highest Bayesian average user rating; we also determined the 10 lowest-rated games that had at least 10 *comments*—brief reviews that accompany user ratings. We then randomly selected 10 comments for each of these games, resulting in a sample of 200 game reviews from 20 different games. We then began coding these reviews for the presence of the nine game attribute categories identified in Bedwell et al.'s (2012) taxonomy.

In addition to merely coding for the presence of each of these elements, we coded whether the reviewer identified an element as having a positive, negative, or neutral effect on the player's enjoyment of the game. For example, a review of *The Legend of Zelda: Ocarina of Time* contained the evaluative statements, "The dungeons are often banal in their demands," and "Rarely is there any mortal risk." These statements were both coded as references to *Conflict/Challenge*, and as negatively affecting enjoyment. Another review of the same game described it as a "juggernaut of storytelling," which was coded as a positive reference to *Game Fiction*. Additionally, we noted any

factors that reviewers identified as affecting their enjoyment but did not seem to fit within the nine pre-established categories. For example, the comment “simply one of the best RPG stories ever” suggests that this reviewer not only enjoys the game but that the game’s genre (i.e., role-playing games or RPGs) influenced that enjoyment.

The three authors of this study served as game review coders. We began by establishing inter-rater reliability through three rounds of independent coding, using the reviews for a single game included in the study for each round. After each round, we compared results, identified points of disagreement, and engaged in discussion to come to a consensus on the categorization of selected reviews. We calculated the overall average Fleiss' kappa for each of these initial rounds of coding (Round 1 = 0.88, Round 2 = 0.52, Round 3 = 0.53, for an average of 0.64) as well as the Fleiss' kappa for each of the nine categories. Raters tended to have high agreement in the categories of *Action Language*, *Game Fiction*, and *Human Interaction*, and moderate disagreement in the *Assessment* category; where disagreement was present, coders came to a consensus through discussion. As an additional interrater reliability measure, we calculated overall percent agreement for each initial round (Round 1 = 95%, Round 2 = 89%, Round 3 = 89%, for an average of 91%). Taken together, these statistics reflect a relatively high overall index of agreement.

After establishing inter-rater reliability, we proceeded to code all of the reviews included in our sample. We preserved the consensus coding from initial Rounds 2 and 3 (a total of 20 reviews), and each author coded 60 of the 180 remaining reviews. Because of changes to our coding sample, we re-coded all of the reviews included in Round 1. Despite having established high levels of inter-rater reliability, we felt the need to establish greater alignment in our coding. Therefore, each coder reviewed the work of the other two authors and consensus regarding categorization was reached for each review. At this point, we also identified factors appearing to influence enjoyment that were absent from Bedwell et al.’s (2012) taxonomy; through further analysis and discussion, we synthesized these factors into two major trends.

Results

In this section, we present data corresponding to our four research questions and begin interpreting this data.

Frequently Appearing Features

Our first research question asks which of Bedwell et al.’s (2012) proposed game features are most often perceived as affecting player enjoyment. Table 1 indicates the proportion of game reviews that included references to each category of features proposed by Bedwell et al. (2012) at least once. The fact that each of these proportions is above 0 indicates that players perceived all of these features as either contributing to or detracting from player enjoyment; however, it is clear that some of these features appear more frequently than others.

The popularity of *Conflict / Challenge* and *Control* may indicate that players are primarily concerned with their agency in games and their ability to use that agency to solve in-game problems; however, if this is the case, we might expect *Assessment*, *Action Language*, and *Rules / Goals* to appear more frequently, since they all touch on players’ ability to act and deal with challenges. This discrepancy may indicate that players’ enjoyment is closely tied to their level of agency and the quality of the problems they face but is less dependent on the particulars of how those are realized. This interpretation is further supported by our finding that players mention *Conflict / Challenge* significantly more often than *Game Fiction* when reporting their enjoyment in games ($z = -2.81, p < .01$). That is, players appear to be more concerned about the problem solving presented by a game than by the story that frames those problems.

Action Language	Assessment	Conflict/ Challenge	Control	Environment	Game Fiction	Human Interaction	Immersion	Rules/ Goals
0.04	0.01	0.2	0.125	0.045	0.11	0.05	0.175	0.045

Table 1: The proportion of all game reviews containing each game feature at least once.

Positive and Negative Features

Our second research question asks which of Bedwell et al.'s (2012) game features players most frequently spoke of in a positive or negative way. That is, which game features are more likely to be perceived as contributing to, irrelevant to, or detracting from player enjoyment? Table 2 summarizes the number and proportion of times that each game feature appeared in either a positive, neutral, or negative context. Although many features appear a similar number of times in both positive and negative contexts, some features appear more often when players are praising them than when players are criticizing them. For example, players mentioning *Game Fiction* are significantly more likely to see it as adding to a game rather than taking away from one ($z = -3.85, p < .001$). This may suggest that while a well-crafted *Game Fiction* can contribute a lot to players' enjoyment, a missing or poorly-implemented one does not necessarily have a negative impact.

	Action Language	Assessment	Conflict/ Challenge	Control	Environment	Game Fiction	Human Interaction	Immersion	Rules/ Goals	total
pos.	3 (.38)	1 (.5)	14 (.32)	14 (.48)	4 (.44)	17 (.74)	8 (.8)	24 (.67)	3 (.33)	88
neu.	1 (.13)	0 (.0)	7 (.16)	5 (.17)	2 (.22)	2 (.09)	0 (.0)	2 (.06)	0 (.00)	19
neg.	4 (.50)	1 (.5)	23 (.52)	10 (.34)	3 (.33)	4 (.17)	2 (.2)	10 (.28)	6 (.67)	63
total	8	2	44	29	9	23	10	36	9	170

Table 2: The number and proportion of times that each game feature appeared in a positive, neutral, or negative context.

Features in Highly- and Poorly-Rated Games

To answer our third research question, we explored whether players' perceptions of which of Bedwell et al.'s (2012) game features affected their enjoyment differed between highly-rated games and poorly-rated games. Table 3 compares the proportion of the top 10 games containing each game feature to the proportion of the bottom 10 games containing the same features. Similar to Table 2, while players mention many of these game features in similar proportions of highly-rated and poorly-rated games, some features stand out for how often they appear in the top 10 games as compared to the bottom 10 games. Also like in Table 2, *Game Fiction* was mentioned significantly more often in reviews of positively-regarded games than in reviews of negatively-regarded games ($z = -4.07, p < .001$). This seems to imply that *Game Fiction* has an important effect on player enjoyment in high-quality games but does not play as large a role in games that players consider to be of poor quality.

	Action Language	Assessment	Conflict/ Challenge	Control	Environment	Game Fiction	Human Interaction	Immersion	Rules/ Goals
top 10	0.03	0.00	0.15	0.11	0.06	0.2	0.03	0.23	0.05
bottom 10	0.05	0.02	0.25	0.14	0.03	0.02	0.07	0.12	0.04

Table 3: The proportion of reviews of the top 10 and bottom 10 games as ranked on *VideoGameGeek* containing each game feature.

Other Features Affecting Enjoyment

Our fourth research question asks whether players' perceptions of enjoyment take into consideration features outside of Bedwell et al.'s (2012) taxonomy. We noticed two distinct trends of comments in game reviews that appeared to address enjoyment but that Bedwell et al.'s taxonomy could not account for; we referred to these trends as *predisposition* and *return on investment*. In this section, we explain each of these trends, provide examples

of the comments that we coded in these ways, describe how often they appeared in the game reviews and begin interpreting the presence of these trends.

The *predisposition* trend refers to comments by game reviewers in which they explained that their enjoyment of the game was mediated by some other aspect of the game. That is, they were predisposed to enjoy or judge the game because of the brand or series to which it belonged (e.g., “Disappointing in a great many ways as a sequel”), the game genre it was a part of (e.g. “a solid puzzler”), the attention it had gotten in the gaming community (e.g., “hugely over-rated”), nostalgia or hindsight associated with the game (e.g., “It didn't disappoint in 1998, but now I think it's too childish”), or some sort of meta-level consideration of the gaming community (e.g., “Not much of a game... More of a critique of... many modern games”). The importance of *predisposition* is clear from its appearance in 48% of the reviews—this is more prevalent than any of the features included in the original taxonomy.

The *return on investment (ROI)* trend refers to comments by game reviewers on whether they felt that playing the game was worth the money, emotional investment, or time spent on the game. Reviews coded with references to *ROI* included comments on the amount of game content (e.g., “I wished the single player portion were a bit longer”), how much of that game content was enjoyable (e.g., “after a couple of in-game months, I find the combat too repetitive”), whether that content could be enjoyed more than once (e.g., “It... has very little replay value”), or whether the game merited purchasing (e.g., “This is more than worth its weight in money spent to own the game”). We identified *return on investment* comments in 7.5% of game reviews, which is more prevalent than half of the elements included in the original taxonomy.

These themes do not align perfectly with Bedwell et al.'s (2012) categories in that they are not “game attributes” per se; *predisposition* and *return on investment* are more nebulous, subjective factors that developers may not be able to explicitly design into a game and that teachers may not be able to easily identify. It might be argued, in fact, that these factors intersect with or encompass some existing categories—for example, a fan of the original *Portal* game might be predisposed to enjoy the *Game Fiction* or *Immersion* of its sequel, while a player who prefers massively multiplayer online role-playing games (MMORPGs) may expect a title of that genre to deliver boundless hours of exploration and *Conflict/Challenge* in a sprawling, beautifully-rendered *Environment* in order to consider the game to have a good *return on investment*.

What is clear is that there are factors beyond the strict design (that is, the distinguishable features) of a game that account for player enjoyment. In terms of *predisposition*, players tend to approach genres, themes, and franchises with certain expectations. An appropriate fit between predispositional expectations and actual play can reinforce the experience; conversely, a mismatch between them can lead to disappointment (Koster, 2010). By way of example, fans of the action-based, first person shooter *Halo* series were likely to have been predisposed to purchase *Halo Wars* when it was released in 2009 simply because it belonged to the same series. Many fans were surprised—and even disappointed—to discover that it was a strategy game, since the standard mechanics and conventions differ dramatically between the action and strategy genres (Johnson, 2012).

Players also seek value from their gaming experiences. A good *return on investment*, from a player perspective, tends to mean that a game is worth the expense and continues to be engaging and enjoyable over time. While these factors may be less distinct and more difficult to isolate than those previously identified by Bedwell et al. (2012), the results of our analysis indicate that they exert a considerable influence on player enjoyment. Accordingly, teachers and designers may benefit from considering them in the selection and design of games for learning.

Limitations

We acknowledge several limitations to our research. The results of this study are somewhat limited by the source of our data. We chose VGG because of its large existing data set, publicly available API (allowing easy access to relevant data), and affiliation with an established gaming community. However, many of the randomly selected reviews contained little in the way of evaluative content; for example, it is relatively common for VGG reviewers to use reviews to qualify their game ratings rather than explain them. That is, they simply post the platform on which they played the game and that they “beat” the game rather than explaining why they gave a game an 8 out of 10. As a result, these reviews provided little insight. We also noted that certain types of games tend to elicit references to particular categories by their very nature (for instance, reviews of multiplayer games are more likely to refer to Human Interaction than single-player games). Infrequent reference to some categories, therefore, could be symptomatic of the games we happened to cover in this study. Further, VGG contains far fewer reviews for

poorly-rated games than for highly-rated games. We chose to focus on comment-based reviews because the VGG API allows for easier data collection, but the website also contains reviews posted in discussion forums which—though they might prove to be valuable sources of data—were prohibitively complex and therefore not analyzed in this study. Finally, it is possible that registered members of VGG who choose to post ratings may not be typical of all video game players. More research is necessary to extend the generalizability of this study.

To address these limitations, future research might incorporate user reviews from VGG forum posts into a similar content analysis. Additionally, since there are several larger, more popular video game review websites that could potentially offer more robust data relating to our research questions, future research might investigate whether our findings can be replicated using such sources. Future research should also try to incorporate more statistical tests into the analysis of this data. This particular kind of content analysis does not lend itself easily to statistical analysis; for example, Wang et al. (2009), whose study we emulate, provided only descriptive statistics associated with their data. Although we have taken steps to draw conclusions from our quantitative data, future research should identify ways to perform further statistical analyses, thereby increasing the conclusions we can draw from this (and similar) studies.

Conclusion

In this study, we examined data from the video game website VideoGameGeek to draw conclusions about what game features contribute to or detract from player enjoyment. The results suggest that players perceive the *Conflict/Challenge*, *Immersion*, and *Control* categories of features identified by Bedwell et al. (2012) to have the greatest impact on whether or not they enjoy a game; in contrast, categories such as *Action Language* and *Assessment* are perceived to have little influence on players' enjoyment. We also determined that features associated with the *Conflict/Challenge* category appeared in reviews significantly more often than even relatively frequently-appearing features like *Game Fiction*; we further determined that players mentioned features related to *Game Fiction* significantly more often when praising them and discussing highly-rated games than when criticizing them or discussing poorly-rated games. In addition to contributing to our understanding of player perceptions of enjoyment, we feel that these results demonstrate the utility of Bedwell et al.'s taxonomy in that we were able to discuss the relationship between game features and enjoyment using their vocabulary. However, it is also important to note that players also appear to associate their enjoyment with factors such as *predisposition* and *ROI*; while these factors are more nebulous and subjective than the game attributes Bedwell et al. pointed to, they do merit attention in future research.

The conclusions of this study have implications for practice. Educators concerned with learner enjoyment may wish to give features related to problem-solving more weight in their selection and development of games for the classroom. Furthermore, although features related to the game story can contribute to a player's enjoyment, players spend relatively little effort criticizing their flaws or absence. This relationship should not be oversimplified as a matter of pure gameplay taking precedence over what Koster (2010) refers to as "dressing" (p. 85). Nor do our findings suggest that the features associated with *Game Fiction* should be ignored: Tables 2 and 3 indicate that these features are frequently mentioned in a positive light and when discussing well-regarded games. Furthermore, *Immersion*, which includes the quality of voice-acting and graphics (and is therefore a category of "dressing" features), is also frequently mentioned in player reviews. However, the fact that *Game Fiction* appears significantly more often in positive contexts than negative ones may suggest that it is appreciated when it is well done but not necessarily missed when poorly done. While the exact nature of this relationship will ultimately be explored through further research, one thing appears clear: Educational games are likely to be more enjoyable when they feature solid gameplay and little story than when they feature weak gameplay with a "sugar coating" (Bruckman, 1999, p. 75) of story that tries to compensate.

References

- Bedwell, W. L., Pavlas, D., Heyne, K., Lazzara, E. H., & Salas, E. (2012). Toward a taxonomy linking game attributes to learning: An empirical study. *Simulation & Gaming*, 43, 729-760. doi:10.1177/1046878112439444
- Boyle, E. A., Connolly, T. M., Hainey, T., & Boyle, J. M. (2012). Engagement in digital entertainment games: A systematic review. *Computers in Human Behavior*, 28, 771-780. doi:10.1016/j.chb.2011.11.020
- Bruckman, A. (1999, March). *Can educational be fun?* Paper presented at the Game Developers Conference, San Jose, CA.

Charsky, D., & Mims, C. (2008). Integrating commercial off-the-shelf video games into school curriculums. *TechTrends*, 52(5), 38-44. doi:10.1007/s11528-008-0195-0

Foster, A. N., & Mishra, P. (2009). Games, claims, genres & learning. In R. E. Ferdig (Ed.), *Handbook of research on effective electronic gaming in education* (pp. 33–50). Hershey, PA: Information Science Reference.

Gilbert, B. (2011, June 23). Newell sees no distinction 'between games and educational games.' *Joystiq*. Retrieved from <http://www.joystiq.com/2011/06/23/newell-sees-no-distinction-between-games-and-educational-games/>

Johnson, S. (2012). Theme is not meaning: Who decides what a game is about? In C. Steinkuehler, K. Squire, & S. A. Barab (Eds.), *Games, learning, and society: Learning and meaning in the digital age* (pp. 32-39). Cambridge, England: Cambridge University Press.

Koster, R. (2010). *A theory of fun for game design* [Amazon Kindle version]. Retrieved from <http://amazon.com>

Lamb, R. L., Annetta, L., Vallett, D. B., & Sadler, T. D. (2014). Cognitive diagnostic like approaches using neural-network analysis of serious educational videogames. *Computers & Education*, 70, 92-104. doi:10.1016/j.compedu.2013.08.008

McGonigal, J. (2011). *Reality is broken* [Amazon Kindle version]. Retrieved from <http://amazon.com>

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108, 1017-1054. Retrieved from <http://www.tcrecord.org>

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55, 68-78. doi:10.1037/0003-066X.55.1.68

Salen, K., & Zimmerman, E. (2003). *Rules of play: Game design fundamentals*. Cambridge, MA: MIT Press.

Schell, J. (2008). *The art of game design: A book of lenses*. Amsterdam, Netherlands: Elsevier/Morgan Kaufmann.

Sedano, C. I., Leendertz, V., Vinni, M., Sutinen, E., & Ellis, S. (2013). Hypercontextualized learning games: Fantasy, motivation, and engagement in reality. *Simulation & Gaming*, 44, 821-845. doi:10.1016/j.compedu.2013.08.008

Sicart, M. (2008). Defining game mechanics. *Games Studies*, 8(2). Retrieved from <http://gamestudies.org/0802/articles/sicart>

Tobias, S., Fletcher, J. D., & Wind, A. P. (2014). Game-based learning. In J. M. Spector, M. D. Merrill, J. Elen, & M. J. Bishop (Eds.), *Handbook of research on educational communications and technology*, (4th edition, pp. 485-503). doi:10.1007/978-1-4614-3185-5_38

Van Eck, R. (2006). Digital game based learning: It's not just the digital natives who are restless. *Educause Review*, 41, 16-30. Retrieved from <http://www.educause.edu/>

Wang, H., Shen, C., & Ritterfeld, U. (2009). Enjoyment of digital games: What makes them "seriously" fun? In U. Ritterfeld, M. Cody, & P. Vorderer (Eds.), *Serious games: Mechanisms and effects* (pp. 27-48). New York, NY: Routledge.

Wilson, K. A., Bedwell, W. L., Lazzara, E. H., Salas, E., Burke, C. S., Estock, J. L., . . . Conkey, C. (2009). Relationships between game attributes and learning outcomes: Review and research proposals. *Simulation & Gaming*, 40, 217-266. doi:10.1177/1046878108321866

Yee, N. (2006). Motivations for play in online games. *CyberPsychology & Behavior*, 9, 772-775. doi:10.1089/cpb.2006.9.772