Games and gaming have always been an influential part of society and culture. Within the last 35 years, due to numerous technology innovations, electronic games in many formats have become ubiquitous in everyday life. This ubiquity has meant that games and gaming have permeated into many fields and disciplines for multiple purposes including teaching and learning. Past research has examined the use of both electronic and non-electronic games, but the field of education still lacks a comprehensive framework for exploring the role of the games for teaching and learning, the relationship of educational games to other fields, and a synthesis of best practice for current and future design, implementation, and research. The purpose of this article is to set a framework for understanding past, current, and future research in educational gaming. In doing so, we also hope to continue a conversation within education as well as with other fields that advance research, development and practice within a common framework.

Introduction

Games and gaming have played influential cultural and social roles throughout the development of civilization. For instance, games have played a role in the establishment of social structures and the transmission of socio-cultural knowledge and beliefs (Mead, 1934). Ancient civilizations used...
war games to develop strategies for engagement (Gredler, 1996). Today, militaries utilize computer-based technologies to provide an efficient, effective way to deliver immersive training and instruction (Herz & Macedonia, 2002; Prensky, 2001).

Games have been an interest area within education long before the electronic age, with research documenting positive learning outcomes in the use of educational games (Betz, 1995; Klawe, 1998; Levin, 1981). However, the current popularity of electronic games in contemporary culture provides a stimulus for research into the use of digital or electronic game-based environments. According to the Entertainment Software Association (ESA), in 2005, 35% of children under the age of 18 consider themselves regular players of computer and console games (ESA, 2005). The research that has been completed has justified this call, providing support of the positive educational benefits of gaming technologies (Gee, 2004; Raessens & Goldstein, 2005; Squire, 2005).

Unfortunately, providing a foundational research base and a framework for the study of educational gaming is difficult for at least two reasons. First, and foremost, a broad net has been cast by researchers in diverse academic fields such as media literacy, psychology, computer science and education; this has resulted in multiple perspectives regarding electronic game research. As with many areas of study, this research – and discourse about this research – has not necessarily been cross-disciplinary. This is not to suggest that game researchers do not attempt to understand the full context of their work; rather, it is to propose that gaming research does not neatly fall into one discipline. Students within this area need to understand the deep, historical context of non-electronic gaming, as well as the breadth of multi-discipline opportunities to examine electronic gaming. Second, although research on play and gaming is not necessarily new, research on electronic gaming is enjoying a rather recent resurgence; we do not have a large research base from which to draw important implications for teaching and learning.

The purpose of this article is to provide a research-based review of the breadth and depth of this field. It would be impossible in one review to document all instances of gaming research. However, the goal is to present a framework that might contextualize the field of educational video game research, and the resulting discussion might inform future research on the development, design, and application of electronic gaming technologies for teaching and learning. In doing so, we would continue to build the cross-discipline conversation as well as providing a research-based call for further study.
Setting the Stage for a Framework

An important task to be addressed before delving into the development of the framework is to define *electronic gaming*, and in doing so, to discriminate between electronic games, non-electronic games, and simulations. It is also important to highlight the role of play in electronic gaming as a theoretical underpinning of the framework.

**Electronic vs. non-electronic gaming.** Certainly, the notion of electronic games is grounded within the context of non-electronic games. In fact, there is an extensive literature base that addresses research within the area of non-electronic games. Yet, electronic games are inherently distinct and have unique features that separate them from their non-electronic counterpart. Jesper Juul (2004) identifies automation and complexity as two of these features. Since play within electronic games includes interaction mediated through electronic hardware such as a computer or gaming console, the application of games rules are applied automatically through the electronic hardware. This, in turn, allows for more complex game worlds.

It is important to note there are distinctions among different electronic hardware. Electronic games can be console-based or computer-based. The latest generation of consoles include Microsoft’s Xbox 360, Sony’s Playstation 3 and Nintendo’s Wii along with handheld devices such as the Nintendo DS and Sony PSP. While some games are console specific, many games can be played across multiple platforms. This framework specifically addresses electronic-based gaming, regardless of whether it is on a handheld, a console, or a PC.

**Theoretical foundations of play.** Most of the research documented within this framework is situated within its own related theoretical backing. However, a common thread within gaming is the notion of play as represented by the work of Piaget, Vygotsky, and Dewey. These theorists are consistently cited in relation to electronic game play, so their work will be used as a basis for making connections between offline and online play (Squire & Jenkins, 2003). The commonalities of these theories of play involve the active nature of the learner within an experience-based learning environment and the goal of negotiating through challenges and obstacles presented in an effort to make meaning. Piaget (1952) discussed the role of play as serving an important function in childhood, providing the learner with an anxiety-free opportunity to utilize existing knowledge to facilitate the acquisition of new knowledge. Electronic gaming environments present learning spaces for children, where their mental states can be challenged and states of disequilibrium resolved to support knowledge acquisition. Activity theory, as
presented by Vygotsky (1978), Cole (1996), and others, illustrates the role of these symbolic devices as mediating tools for individual’s construction of knowledge within society.

Learning that results from the interaction of an individual with their environment is also consistent with Dewey’s (1938) theories of play. Educational gaming environments provide a space where an individual’s function within them results in concrete experiences that are foundational to learning. These environments also support the individual’s subsequent reflection and repeated application of the knowledge to make it concrete. Theories of play rooted in the field of education support the use of electronic gaming technologies by justifying the educational value of play.

The convergence of individual and social development with electronic game play is consistent with their representation in classical theories of play. In order to discuss the value of electronic game play in consideration of classical theories, a foundational definition of play that underpins both must be identified. Roger Caillois (1961) defines play as choice-based, where action is undetermined within an environment that is not based on reality which is simultaneously rule-governed and uncertain. This definition of play provides a context for making connections with classical theories. Skills are developed as electronic game environments encourage dynamic, experience-based activity within the boundaries of the environment. The play-based engagement in electronic game play is reflective of John Dewey’s (1938) stance regarding the relationship of knowing and doing, where play supports this interaction and fosters the development of attributes that are valued not only in education but also in society (Rieber, 1996; Shaffer, 2005).

From the cognitive perspective of play’s value coming from Piaget (1951), symbolic engagement supports the development of abstract thought through the opportunities it affords for practicing mental processes within a non-threatening context (Rosas, Nussbaum, & Cumsille, 2003). The importance of symbolic interaction is expanded on and moves past the internal mechanisms of the individual towards the social constructs influenced. The socio-cultural value of play provides opportunities for the development of shared meaning from the perspective of Vygotsky (1978), where the symbolic system is the mediating device.

In addition, supporting the socio-cultural development of children’s electronic play is also tied to the Vygotskian theory of the Zone of Proximal Development (ZPD) where tasks are presented to challenge and the player must make cognitive adjustments in order to interact (Gredler, 1996; Ko, 2002; Steinkuehler, 2004). The social structure supports the adjustments, whether coming from an electronic agent within the game or a more knowl-
edgeable other in real life to scaffold the experience. The role of challenge, which is considered a critical characteristic of electronic games, is a consistent theme in all of theories presented and supports the cognitive development of children (Malone, 1981a). The connections made here not only provide a means for understanding the value of electronic games as legitimate play spaces but also provide a context for understanding the psychological influences and interactions that are addressed in the preceding paragraphs (Rieber, Smith, & Noah, 1998). From the active learning proposed by John Dewey to the social-cultural effects addressed by Vygotsky, the critical role of play in children’s development has a strong argument behind it – one that can be used to further understand the role of electronic game play in their lives.

Games vs. simulations. As the line between games and simulations continues to blur, we acknowledge that they are not mutually exclusive; but, to focus our discussion, a clear delineation must be made. Malone (1981a; 1981b), Bowman (1982) and Malone and Lepper (1987) begin to make the distinction in their works, identifying the motivational characteristics of educational computer games. Their work establishes a set of characteristics that are consistently referenced in the gaming literature to define games; these include the use of a non-realistic/fantasy environment, scenarios that engage curiosity, present challenges, and are dependent on the player’s control. In addition, the game environment must be goal-directed, rule-governed and contain elements of competition, whether it is between an individual and the game or another individual (Dempsey, Rasmussen, & Lucassen, 1996; Malone, 1981a).

The definition of simulations, in general, is contentious, but for the purpose of this discussion, we define them as reality-based; they provide an individual with an opportunity to interact with a replication of a social or physical element in reality (Seidner, 1975). Thus, the individual’s interaction with a simulation inherits the rules of reality reducing the level of control an individual has when engaging the environment (Heinich, Molenda, Russell, & Smaldino, 1996). Educational research on non-electronic simulation games focus on the development of appropriate pedagogical strategies to support their use and their effectiveness in producing learning outcomes (Cruickshank & Telfer, 1980).

The framework for this article specifically focuses on electronic games. The distinction between games and simulations is to provide a context for understanding the elements of the frameworks we present.
Elements of the Framework

A framework for understanding educational gaming consists of five key elements: pedagogy, psychology, media effects, genre, and design. These elements are contextualized within the subsections of this article. It should be noted that many of these areas overlap. Researchers in pedagogy are interested in psychological concepts; educators looking at genre can be interested in design. The purpose of this framework is not to divide areas of interest as to excommunicate psychologists from pedagogues and designers from literary theorists. Rather, the purpose is to provide a glimpse of the many aspects of game studies. It is to continue a conversation marking specific concepts within cross-disciplinary studies.

Element 1: Pedagogy

Definition. The content of this section presents research focusing on the teaching practices and strategies used in association with the use of electronic games in classrooms.

Current findings. The use of electronic games to support teaching and learning should be considered in the same ways other technologies (whether it is a PDA or virtual reality); their potential impact on learning is dependent on the pedagogical strategies used to frame their use (Ferdig, 2006). The foremost consideration for instructors when thinking about implementing electronic game technology is the potential benefits in terms of the content, the classroom environment and the needs of the students (Amory, Naicker, Vincent, & Adams, 1999; de Freitas & Oliver, 2005). This requires the teacher to have an elementary understanding of not only the various hardware technologies that could be used for gaming, but also the potential gaming experiences they afford (Egenfeldt-Nielsen, 2004).

Current research areas. A cornerstone for using electronic gaming in the classroom is the selection and implementation of pedagogical strategies that support its integration into the classroom culture (De Castell & Jenson, 2004; Din, 2001; Kirriemuir, 2002; Verenikina, Harris, & Lysaught, 2003). The pedagogical strategies a teacher uses must provide support for students during game play and reinforce opportunities for learning outside of the game. A strategy that has been successful in doing this is to have students engage in collaborative game play, in pairs or small groups. Learning is reinforced outside of the game when the teacher follows up the activity with debriefing sessions and whole group discussions about the experience (Klawe & Phillips, 1995; Oblinger, 2004; Simpson, 2005). The use of
teaching strategies that have students playing games collaboratively has an additional benefit of increasing their enjoyment and motivation, particularly for girls (Inkpen, Booth, Klawe, & Upitis, 1995; Pedersen, 2003). The portability of PDAs and console hardware can support students development of knowledge after they leave the classroom, increasing the time spent engaged in learning experiences (Crocker, 2003; Tomlinson, 2003).

A teacher using an existing game is one important research agenda; students actually creating games is a second critical area. Utilizing game design activities can foster a deeper understanding of the content as well as developing metacognition. These practices include the use of scaffolding devices for design including the presentation of examples and specifications in order to allow concentration to be directed towards a task in terms of the content to be delivered (Kafai, 1998). Having students record the process of design also supports metacognitive thinking as well as providing the teacher opportunities for understanding student thinking (Phillips & Klawe, 1995). Additional resources added to either the game, the game instantiation, or the game development, such as literature and other instructional media, can be used to support the best opportunities for students contextualization of the content knowledge (Squire, 2004; Squire & Jenkins, 2003; Squire, Makinster, Barnett, Barab, & Barab, 2003).

Implications. Many factors should be considered when a teacher wants to use electronic games in the classroom. The most important of which are the pedagogical strategies used in conjunction with student game play to provide maximum opportunities for student learning. Those strategies may include simple game play, or it might entail more advanced game development. Additional considerations should be made for the hardware and games selected in relation to the content and student population. After selecting an electronic game, the question of how it will be used must be addressed. A teacher employing methods that provide opportunities for students to re-engage the content when the game play is over can facilitate the deeper understanding of the concepts encountered by making connections to the bigger picture of the content. Utilizing class discussions and collaborative strategies to introduce and integrate electronic games into the classroom reduces the novel effects of its use and can foster student learning.

Element 2: Psychology

Definition. The content of this section presents research focusing on the mental and cognitive processes engaged during electronic game play. This includes investigations into both the individual and social aspects of electronic game play.
Current findings. Research provides evidence that electronic game play impacts and engages mental processes. The cognitive activity supported by electronic game play is a valued attribute of non-electronic environments. The active learning supported by electronic game play is a valued attribute of non-electronic educational environments (de Freitas & Oliver, 2005; Henderson, 2002; Pillay, Brownlee, & Wilss, 1999). Electronic games promote dynamic cognitive activity as a player confronts challenges to be solved and obstacles to overcome that draw upon problem solving, reasoning, and strategizing skills (Dawes & Dumbleton, 2001; de Aguilera & Mendiz 2003; McFarlane, Sparrowhawk, & Heald, 2002). This dynamic process results in the development of higher order processes such as metacognition and justification (Henderson, 2002; Rieber et al., 1998; VanDeventer & White, 2002).

DeLisi & Wolford (2002) and Green & Bavelier (2003) provide evidence that continued game play over time modifies attention processes, as well as perceptual and spatial skills. The maintenance and direction of attention and development of perceptual skills are supported by feelings of immersion. These feelings, produced by a player’s interaction with the environment, engage them in a state of flow where a balance exists between game related information and individual abilities such that homeostasis is achieved (Csikszentmihalyi, 1990; De Castell & Jenson, 2004; Sherry, 2004). This balance is supported by the developed schemas a player uses to direct action and understand the game environment (Douglas & Hargadon, 2001). This role of schema draws attention to potential causes for the inconsistent effects seen when electronic games are used to support learning. An explanation for this is the lack of consideration for the individual differences that can influence the learning potential of electronic game play. The age of the player, prior experience with electronic games in general, and overall cognitive abilities may result in the cognitive concept of interference (Blumberg, 1998; Dempsey et al., 1996). This indicates a need for careful consideration regarding the role of electronic games in any educational environment when the goal is to support learning or develop thinking skills.

Current research areas. Aside from the internal mechanisms of the player, the advent of connected gaming technologies that support player to player interaction via the Internet or wireless networks make the social, external processes associated with an object of study as well. Electronic game communities, wireless PDAs and online/console-based multiplayer games have broadened the scope of agent-environment interaction to include a social dimension. Through collaborative play with connected gaming technologies, internal mental processes such as critical and strategic thinking are demonstrated where players’ social interactions provide the foundation for
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their use (Facer, Joiner, Stanton, Reidz, Hullz, & Kirk, 2004).

These social interactions in connected collaborative gaming spaces also provide opportunities for the development of personal identities (Bers, 1999; Frasca, 2001). The influence of social interaction is not surprising as they reflect those of the real offline world, where social norms, economic systems, and personal identities are based on interactions of and with an external world (Krotoski, 2005; Turkle, 1995). The exploration of these environments to support the development of social skills and behaviors in children and young adults is just in its beginning stages. Raybourn & Wagner (2004) propose that these spaces can provide a space for children to test out and define appropriate social behaviors that could be transferred to offline communities. The exchange of social, cultural, and game-based knowledge supported by online interactions is highly iterative of the role of schools. The development of affinity groups and mentor relationships could further define classroom communities providing networks of support that go beyond the primary teacher. Welcoming these knowledge communities into classrooms could benefit students and teachers by recontextualizing conceptions of active learning environments (Steinkuehler, 2004; Williamson & Facer, 2004).

Implications. Looking at electronic game environments from a psychological perspective provides direction for understanding their potential for supporting student learning. In viewing game environments as a play space where cognitive rehearsals, symbolic interactions, and social structures are utilized, the potential for their educational value comes into focus.

There is a need to develop an understanding related to the interplay of psychology and electronic games in terms of the individual, social and theoretical relationship. The interaction between the individual and an electronic game illustrates the value of the active learning space the environment provides to support the development of important cognitive skills and processes. The social environments that demonstrate the characteristics of the offline social world allow collaborative opportunities that not only provide a space to explore social behaviors but also personal identities.

Element 3: Media Effects

Definition. The content of this section presents research focusing on the effects and impact of electronic game play on players.

Current findings. Investigations that look into the effects of electronic games produce mixed results. Three areas of research, or effects, will be addressed within the context of this section. These effects have significant relevance when thinking about electronic games and learning. A brief over-
view of the medical, gender, and violence effects will assist in understanding the varying nature of this type of research.

**Current research areas.** Physiologically-based effects investigated by the medical community have produced results regarding the use of electronic games as a method for treatment. The effects of electronic game play have been addressed in relation to a disorder that is increasingly prevalent in children – ADD (APA, 1994). The effects revealed are positive, demonstrating that when patients with ADD/ADHD play electronic games, there is a decrease in associated symptoms. After continued game play, patients were able to focus concentration and persist in a task (Houghton, Milner, West, Douglas, Lawrence, Whiting, et al., 2004; Pope, 1996). While the long term benefits of this treatment have not been explored, its potential is supported by results that indicate continued electronic game play alters selective attention and mental rotations skills (Blumberg, 1998; DeLisi & Wolford, 2002; Green & Bavelier, 2003).

The effects of electronic game play on obesity are also a concern within the medical community. Though the correlation between the two is acknowledged, the value of utilizing electronic game play to counteract these effects has also been proposed. The introduction of physically-based games provide a means of reducing levels of obesity through physical activity and present opportunities to develop health related consciousness (Brown, 2006; Dorman, 1997). The effects of electronic game play on the development of conceptual understanding have also been addressed. Another positive outcome occurs when games are used to instruct pediatric patients and parents on informed consent procedures resulting in increased recruitment and retention in clinical trials (Brady, 2004).

Gender effects associated with electronic game play are best illustrated by the existing gap between the numbers of male and female players (Kiesler, Sprouli, & Eccies, 1995). The explanation for this gap in gaming is often attributed to stereotypes identifying a lack of interest by females as the primary influence. This stereotype is being confronted by the identification of game elements that are preferred by female players which have led to the realization that the focus of design towards the male audience is not meeting their interests (Kafai, Franke, Ching, & Shih, 1998; Klawe, 2002).

In addition, the portrayal of electronic game play as a masculine and male-oriented activity in the media results in the intentional concealment of interest by girls in efforts to conform with social norms (Bryce & Rutter, 2002; Walkerdine, Thomas, & Studdert, 2000). Efforts to counteract these effects can come from the classroom environment by encouraging levels of self-efficacy female students have with technology (Hayes, 2005; Inkpen et al., 1995). The influence of stereotypes also affects males, as male pref-
ferences for game play are mischaracterized as geared toward violence and action. Marketing that is geared towards male audiences reinforces these stereotypes, neglecting the reality that male preference leans toward games that provide mental challenge and good story lines (Lawry, Upitis, Klawe, Anderson, Inkpen, Ndunya, et al., 1995).

The male stereotype reinforcing the preference for violence in games is one that has influenced investigations into the role of electronic game play on the development of aggressive characteristics. Meta-analyses conducted on violence and aggression and electronic game play have definitely revealed a correlation (Sherry, 2001; Anderson & Bushman, 2001). However, these analyses also reveal a number of important issues that should be addressed when looking at the results. Changing technologies, methodological variance, and documentation of short term effects have provided a motive for weighing this research as inconsistent (Chiu, Lee, & Huang, 2004; Ivory, 2001; Linderoth, Lantz-Andersson, & Lindstrom, 2002). Baldaro, Tuozzi, Codispoti, Montebarocci, Barbagli, Trombini, et al.(2004) provide a physiological account demonstrating the effects of violent electronic games which result in increased arterial pressure and anxiety levels, but not in hostility levels. There is no determination which can be presented that clearly demonstrates a causal argument for a pro or con stance. Acknowledging the violent and stereotypical behaviors in some games within a classroom environment provides opportunities to assist students in developing critical opinions regarding these issues (de Aguilera & Mendiz 2003; Fontana & Beckerman, 2004; Jenkins, 2004; Kadakia, 2005).

Implications. Looking at the outcomes associated with game play from the various perspectives presented illustrates the need to pay them greater consideration in terms of their potential societal impact. The importance of implementing rigorous methodologies to study the effects of game play is evident, as demonstrated by the skewed results of research on violence. How game play impacts conceptions of gender indicate the influential role of media and social mores. A potential means for alleviating gender-based effects is a reconception of the way games are designed and marketed. Knowledge gained from the medical community demonstrate the potential benefits of electronic games on mental and physical states, providing a means for understanding the ultimate value of electronic game play.

Element 4: Genre

Definition. The content of this section presents research focusing on the structural elements that make up electronic game environments, including their style, form, and content.
**Current findings.** Electronic games serve to engage the player in an experience that fosters feelings of immersion within the environment. The primary origin of establishing these feelings is through the narrative presented through the game. Electronic games present the player with a contextualized environment constructed around a story that requires an interaction with multiple characters in order to achieve a goal. Exhibiting the distinguished elements of characters and setting, electronic games add another dimension to narrative engagement by placing the player in the role of co-constructor as they interact with the pre-defined narrative structure presented through the environment (Eladhari & Lindley, 2004; Wolf, 2002).

**Current research areas.** The narrative story presented within the environment provides a frame for engaging a state of flow within the player (Fabricatore, Nussbaum, & Rosas, 2002; Sherry, 2004). Through this engagement, the player is able to draw from the narrative environment to reflect on the experience. This is a key point for considering the potential use of electronic games to support students’ construction of meaning (Bizzocchi & Woodbury, 2003; Madej, 2003). The narrative structure of a game has particular implications for online gaming environments such as the Massively-Multiplayer Online Role Playing Games (MMORPGs). In these environments the narrative form functions to enhance feelings of community and assist in the development of personal identity as individuals work together making contributions to the environment in efforts to achieve a goal. The development of identity is supported by the player’s role in these online narratives which present a space that Turkle (1995) labeled as “identity laboratories” providing non-threatening opportunities for self exploration.

In addition to self exploration, the narrative structure of electronic games can provide a space for the construction of meaning (Madej, 2003). A player’s visual and textual literacies are developed in an electronic game environment as they interpret the narrative to understand how relevant knowledge is being communicated and get the maximum benefit out of the information (Pelletier, 2005). A critical eye must also be developed for the media, so the user is able to form parameters that will help them define effective and ineffective communications. The learning principles inherently built into electronic games to support their playability scaffold the construction of meaning, and development of game-based literacies (Gee, 2003). The players’ ability to make meaning from the electronic game environment can be valuable outside of play. The game-based literacy a player develops can be used as a foundation for the formation of associated literacy’s and competencies valued by the field of education (Fromme, 2003).

**Implications.** The elements that comprise the electronic game environments form its narrative structure and support the player’s transition
into a flow state. Within the flow state, opportunities for game-based inter-
action increase, allowing the player to have greater control over the action
and chances to reflect upon it. In online environments the identification of
a common goal fosters the development of community and collaboration
where personal investment in the game is influenced by the level of control
that is felt from being able to modify the narrative structure. As players en-
gage in a game space and interact with its narrative structure, personal val-
ues, opinions, and identities can be explored illustrating a synthesis between
player and game. Future work will continue to examine the development of
these literacies in and out of schooling.

Element 5: Design

**Definition.** The content of this section presents research focusing on
the strategies of electronic game design that support playability and player enjoyment.

**Current findings.** The psychological interactions between a player and
a game that motivates and sustains play can be attributed to the elements of
interaction in which the environment affords. The game-based elements that
support a player’s enjoyment and learning are consistent with elements of
non-electronic play such as challenge, fantasy, and the engagement of sen-
sory and cognitive curiosity in the pursuit of a goal (Malone, 1981a; Malone
& Lepper, 1987; Young, 2004). The game-based design elements that sup-
port motivation to preserve play are identified by players as the provision
of feedback, embedded competition, a responsive pace, and elements that
support learning (Belenich, Sibley, & Orvis, 2004; Wong, 1996). Game-sup-
ported learning is directly related to the architecture of the game that bal-
ances what is and what is not known about a new environment (Salen &
Zimmerman, 2004). Training stages and tutorials are examples of architec-
tural design within games that support learning. Training stages at the start
of the games allow players to develop game-based skills that support the use
of strategic planning, and, over time, promote the transfer of skills between
game play experiences (Fabricatore et al., 2002; Oliver & Pelletier, 2004,
2005). Training levels increase a player’s enjoyment of a game as they pro-
vide a contextual frame for navigation through the environment (Desurvire,
Caplan, & Toth, 2004; Malone, 1982). Identifying the basic heuristics ap-
plied to game design that support the enjoyment and motivation of a player
provide the starting point for addressing elements that have particular rel-
evance for learning.
**Current research areas.** A player’s experience with gaming technologies influences his or her expectations of all new game environments encountered. Influenced by this existing schema, as a new game is encountered it is compared to prior experiences which leads to the conclusion that the more consistent a design is with existing schema, the more potential there is for content learning in a game environment (Blumberg & Sokol, 2004; Rosas et al., 2003). The schema developed is a result of the various scaffolding elements built into the game environment. This is consistent with how schema influence learning scenarios that do not implement electronic games. A successful strategy that has translated from traditional learning scenarios into the design of electronic games is the use of directing questions and game-based agents that serve to guide the knowledge developed and scaffold the information presented (Cameron & Dwyer, 2005; Conati & Klawe, 2002; Van Eck & Dempsey, 2002). A critical element of scaffolding is the use of questioning and agent-based feedback that is responsive to the player’s level of knowledge. As knowledge increases, these elements should be adapted by increasing or decreasing the difficulty based on the response (Facer et al., 2004).

Looking at the designed experiences presented through MMORPG environments, additional characteristics can be identified that have particular relevance to pedagogical design. In online multiplayer games, the players are stakeholders where the development of knowledge is rooted within player interaction. As experience is developed and knowledge is shared, skills are refined that support an individual’s reasoning within the environment (Steinkuehler, 2004). In order to develop games that better reflect students’ existing schema and prior experiences, their involvement in the design process to provide end-user feedback has been successfully used. A deeper understanding is developed by those participating regarding how electronic games can be designed that demonstrate effective teaching strategies and the considerations that need to be made in their selection to support learning (Facer & Williamson, 2004).

**Implications.** For a game to be most effective in its delivery of content, it must be consistent with the types of games that students play in order to produce the same types of enjoyment and interest that sustains play. Inclusion of game-based elements that are used in electronic games that do not have educational intentions, such as training levels, assist those students that do not have prior experiences with them. New forms of interaction that reflect effective teaching strategies should be implemented when designing a game with an educational intent, including prompting questions and game-based agents that function as mentors in the environment. It becomes evi-
dent that there is much to be gained from blending the best practices from design with those in education to develop games for learning.

Making an electronic game that is both playable and enjoyable requires an understanding of the psychological, game-based elements and design strategies that interplay during the initial phase of development. A balance must be struck between the challenges presented and the abilities of the player. For the player, when this balance is achieved, it engages them in a flow state, producing feelings of immersion which result in an increased motivation to continue playing. As new technologies emerge to engage players’ senses through pristine graphics and physical responses, existing research outlining the techniques of game design will serve as a foundation for exploring this new level of game-player interaction.

**CONCLUSION**

It is important to remember that in many instances, research within the field of educational gaming can be associated with multiple categories within the proposed framework. Many research topics in the field of educational gaming converge across multiple content categories. For example, Adams’ (1998) study of SimCity 2000 represents just this challenge by offering evidence that gaming can support learning within specific subject areas, in this case, urban and regional planning. Adams’ study could be categorized as a pedagogical initiative, but it could also be regarded by its psychological focus, as student motivation and pleasure are effectively linked to interactions with the game.

Because of the unique complexity offered by research within the educational gaming field, the purpose of this article is to offer the reader the opportunity to consider the multidimensionality and depth offered by this emerging topical area. It is not the intention that a student of game studies would neatly fit within only one of these categories. Figure 1 displays a summary of the areas described in this article; as a summary and a guiding framework, any subheadings were not left out intentionally. We concretely understand that this framework is an evolving framework; future iterations will be based on innovative gaming, initiatives and game projects, and research findings from the various fields and disciplines.
A FRAMEWORK FOR UNDERSTANDING EDUCATIONAL GAMING

Pedagogy
- Teacher’s Use and Development of Games
- Student’s Use and Development of Games

Psychology
- Individual
  - Expertise
  - Cognition
- Social
  - Social Skills; Social Cognition

Media Effects
- Violence & Addiction
- Treatment
- Gender

Genre Studies
- Narrative; Game Literacies
- Media Studies

Game Design
- Design for Usability, Human-Computer Interaction
- Players as Designers (MMORPG)

Figure 1. A framework for understanding educational gaming.
There are various underlying categories, themes, and nuances to each of the areas represented in Figure 1. Some of those areas have been discussed in the introduction to this article. For instance, theories of play underscore research in some or all of the research areas. Additionally, research studies in any of these areas will differ based on whether the game is console-, handheld-, or PC-based, whether it is an educational game or a recreational game used for education, multi-player or single-player, student-used vs. student-created, in class or at home, and so forth. Figure 2 highlights some of the underlying themes that are addressed in each of the framework categories.

**Examples of Consistent Themes:**
- Games Intent: Recreational vs. Educational Games
- Content: content-free vs. content-driven (e.g. social studies or math)
- Gaming Platform: PC, Mac, Unix, Console, Handheld
- Peripherals: joysticks, dancepads, eyewear
- Audience: Children vs. Adults
- Play Style: Single Player vs. Multiplayer
- Location: in school, at home, at work
- Game Genre: shooter, movie-based, adventure, sports, card or board game
- Gender Stereotypes: Barbie™ games
- Timeframe: one-use vs. extended missions
- The role of culture, background knowledge, and experience

**Figure 2.** Examples of consistent themes in the major areas.

The purpose of Figure 2 is not simply to demonstrate or acknowledge that these underlying themes exist. Rather, it is to enhance an existing call. Electronic educational gaming is a relatively new area; as such, the field lacks a strong research base. We need more research, but this research must be structured and rigorous. It is unwise to make broad claims from two studies using gaming to teach history without further examination of the variables, particular if one of those studies used MMORPGs on PCs while another used a stand-alone, single-player game on a console. Items such as those listed in Figure 2 become critical components to understand the potential of games for teaching and learning. The bottom line is to develop research programs and studies that are descriptive enough (Geertz, 1973) to be able to delineate between the study of apples and oranges (Salomon & Gardner, 1986). There is also a need to continue to identify these differences that make a difference.
One final concern is the blurring of the line between game and simulation. For purposes of developing this framework, simple definitions were provided and the focus was strictly on electronic gaming. However, current and future innovations often blur the line between these two categories. A strong research agenda will find a place for both while recognizing and celebrating the affordances and constraints both offer.

The future for educational gaming research looks bright, provided we continue to pursue an open-discussion and conversation within multiple fields and disciplines. An evolving and encompassing framework, even if it provides a simplistic view, provides new students to the area with a glimpse of the complexity; it provides existing scholars with a reminder of the multiple perspectives.

References

Towards a Framework for Understanding Electronic Educational Gaming


