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Games & Simulations for Learning: Course Design Case

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Research on games and simulations for learning in the last decade has expanded the instructional design knowledge base to such an extent that degree programs in instructional design and technology are beginning to develop and offer courses on games and simulations as learning technologies. This design case chronicles the context, design decisions, and designer/instructor observations from the pilot implementation of a graduate course on Games & Simulations for Learning for a masters program in educational technology at a regional university in the southwestern United States.

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INTRODUCTION

Although the relationships between learning and play have been a subject of inquiry for many decades, the emergence of digital games in recent years has fueled the rapidly growing interest in and research on games and simulations *as learning technologies*. Research on these technologies in the last decade has expanded the knowledge base to such an extent that degree programs in instructional design and technology are beginning to develop and offer courses dedicated to studying games and simulations as learning technologies. Moreover, shifts in the field of educational technology from an emphasis on delivering instructional content to a focus on designing learning environments that facilitate the construction of knowledge (AECT, 2008), have further fueled this interest in games and simulations, as well as how we design courses on learning technologies of all types. This design case chronicles the design decisions from initial analysis to pilot implementation of a course on games and simulations for learning, designed for a masters program in educational technology at a regional university in the southwestern part of the U.S. A major emphasis in the course design was to provide a learning-centered environment in which students co-constructed understandings through their interactions with each other, with games, and with game designs.

CONTEXT

Significant contextual considerations for this design case include the initial impetus for the design, as well as the personnel available to contribute to the design. However, it is also important to consider the broader context for the design, including the program for which the course was designed, the students the program serves, as well as the evolving field of educational technology itself.

Initial Impetus

Following the annual call for curriculum changes in early fall (the beginning of the academic year), the coordinator of Educational Technology (ETEC)

programs was prompted by her department head to propose new program courses because program curriculum had not been changed in recent years. The ETEC coordinator was hesitant to make major curriculum revisions being only a few weeks in the coordinator position. However, the university curriculum approval process takes an entire year, so waiting a year to propose curriculum revisions meant waiting two years to implement changes. Thus, course proposal development had to occur quite rapidly and without an in-depth evaluation of the entire program; a constraint which is not uncommon in the instructional design field (Thiagarajan, 1993).

Course Design Team

Primary responsibility for curriculum and course design in the ETEC program falls to the sole, full-time ETEC faculty member, who holds a doctoral degree in learning technologies. Prior to fall 2012, teaching, program coordination, and advising were distributed among two to three full-time, tenured or tenure-track faculty. However, following the departure of both full-time faculty in the previous spring and unprecedented enrollment growth in educational administration programs, budget lines for two faculty were reallocated to those programs, leaving one full-time faculty line for ETEC.

However, in order to ensure that program curriculum is relevant, meaningful, and up-to-date with current trends (and to avoid modifying the curriculum into a boutique program, largely serving her own interests), the program coordinator routinely consults with two K-12 school technology directors, who also teach program courses part-time. Both directors hold doctoral degrees in learning technologies, have served as school technology directors for 3-8 years, and have also published research on learning game design. These team members participated in initial ideation for this course: analyzing the program inventory, creating the course description, drafting the primary learning objectives, and identifying key concepts and topics. However, design and development of course activities, instructional materials, and means of assessment fell to the sole, full-time ETEC faculty member because the university does not provide compensation to adjunct faculty for course design work.

The Program

As previously mentioned, this course on games and simulations for learning was designed for a masters program at a regional university in a southwestern state. With few exceptions, students in the ETEC program are practicing teachers in K-12 schools across the state. All courses and other program requirements are provided online. Moreover, all courses in the program are offered in a compressed format: 7-weeks in the fall and spring semesters, 5-weeks in the summer. This format allows students to complete two courses each semester while only taking one course at a time: one in the first, followed by another in the second subterm of a full semester.

The stated mission of the ETEC program is “to prepare students for leadership roles in K-16 education, training, service, industry, and government and corporate settings.” Specifically, the program focuses upon the “development of a philosophy of educational technology that incorporates literacy, integration, and research related to best practices in the use of current and emerging technological trends.” The student learning outcomes for the program expect that graduating students will be able to:

1. Develop a philosophy of educational technology that shapes their vision reflected in a variety of areas from the role of technology in personal and professional settings.
2. Utilize best research practices in order to make informed decisions regarding the effectiveness/impact of technology integration.
3. Demonstrate an effective integration of communication, media, information, and technological literacy skills.
4. Effectively design, develop and integrate a variety of technological applications that are appropriate within professional settings.

To earn the masters degree, students complete 18 semester credit hours (6 classes) of required courses and 12 semester credit hours (4 classes) of elective courses selected in consultation with their advisor.

The Field

The field of educational technology has evolved with changes in technology itself. Definitions of educational technology crafted by the Association for Educational Communications & Technology (AECT) have shifted from an emphasis on “design, development, utilization, management, and evaluation of processes and resources for learning” (Seels & Richey, 1994, p. 1) to “the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources” (AECT, 2008, p. 2). The key philosophical difference between the two is the move from designing and delivering instruction to facilitating learning and improving performance.

Moreover, the International Society for Technology in Education (ISTE) has identified national educational technology standards (or NETS) for students, teachers, and administrators. The standards for

teachers include (a) facilitating and inspiring student learning and creativity; (b) designing and developing digital-age learning experiences and assessments; (c) modeling digital-age work and learning; and (d) promoting and modeling digital citizenship and responsibility (ISTE, 2008). Much like the shift in definition of educational technology, these standards describe the overarching purpose or aims of technology integration: a shift from teacher-centered to learning-centered instructional approaches in which technology is used to facilitate learning or support knowledge construction as opposed to delivering instructional content.

Much of the perceived value in games and simulations as learning technologies is that they allow learners to construct knowledge through play: trying out various actions, leveraging different resources, and testing alternative strategies to see what impact each will have in reaching a goal. Well-designed digital games and simulations are also thought to provide a more situated context than the classroom for developing understanding in that learners/players are not only "transported" into a virtual environment, they also take on a role other than student, such as fighter pilot, roller coaster tycoon, clan leader, healer, super soldier, or even candy crusher. Of course, many learning games aren't designed to create these kinds of player experiences. However, guiding educators to distinguish learning technologies that merely drill learners/players on foundational knowledge from those that support knowledge construction is a central goal in the educational technology field.

INITIAL ANALYSIS

Analysis began with a review of the ETEC course inventory and grouping or categorizing of courses. The categories that emerged from this review roughly parallel the phases in the instructional design process represented by the acronym ADDIE: analysis, design, development, implementation, and evaluation. These categories and the number of courses in the program inventory for each are listed in Table 1.

Category	Number	
	Required	Elective
Analysis: Foundations of the Field	2	0
Design: Learning Theories, Methods, & Models	1	2
Development: Tech Apps & Tools	1	5
Implementation/Integration: Issues & Considerations	1	3
Evaluation & Research	1	1

Table 1. Categories and number of ETEC courses.

Although the core required courses that all students take were nicely balanced among all categories, elective courses were heavy on technology applications. We found the number of elective courses in analysis and evaluation categories to be acceptable. We expect elective courses to provide more advanced concepts than foundations of the field, and evaluation is woven into all courses (much like it is in all phases of the ADDIE process). However, we found too few course offerings on design/learning theories and methods. The two design/learning theories courses in the inventory were on instructional design/development, which broadly surveyed the major learning theories in the field, and distance education design, which focused solely on the distance learning segment of learning design. Given the shift in the field from *delivering instruction* to *facilitating learning* and the gap in course offerings in this category, particularly learning/design theories that support a learning-centered approach, we resolved to propose two new courses on learning/design and remove two technology applications courses that hadn't been offered in recent years.

A course on Games and Simulations for Learning was one of these two new courses, along with a course on Technology & Inquiry-based Methods. Neither of these subject areas are new; indeed, both address well-established areas of interest in the field of educational technology. Problem-based learning and other inquiry-based approaches are typically "covered" in courses surveying a broad range of instructional methodologies. Similarly, the affordances of games and simulations for supporting learning are given treatment in survey courses on available media technologies, such as video, audio, weblogs, wikis, electronic portfolios, and other digital tools, both proprietary and available for free. However, a mere decade ago, widespread implementation of either inquiry- or game-based approaches was limited by the ratio of students to computers in the majority of schools. Often, information seeking could only occur during time in the library; testing a certain maneuver or approach in a simulation or game was relegated to time in the computer lab. However, the emergence of tablet computers in the last 5-7 years has allowed many schools, including those with very limited resources, to provide 1 to 1 access to computing devices or implement BYOD (bring-your-own-device) policies. This has prompted a need for more in-depth understanding of the instructional methods and media that can leverage this access to differentiate instruction and engage students with diverse learning needs. Again, although both subjects (learning with games and simulations, as well as inquiry-based learning) have long-standing research support and practitioner interest, the viability of masters level

courses dedicated to deep exploration of them is a much more recent development, brought about by the decreasing ratio of students to computers in even the most under-resourced schools.

In addition to exploring games and simulations as technologies for knowledge construction, the design team wanted learners to be able to distinguish games and simulations from other digital learning environments. They also felt it was critical that learners explore the relationships between learning and play. Indeed, all three members of the team agreed that designing a playful learning experience would be a commendable course project, and one that was more likely to be completed in the short 7-weeks of the course, than a game or simulation. However, they ultimately decided to give students the option of designing either a game or playful learning experience, but that design should be based on a thorough analysis of instructional needs, learner characteristics, and school context.

The resulting course description and objectives follow:

> This course examines games and simulations as learning technologies, including defining qualities and characteristics, as well as theories of learning and play. Emphasis is placed on processes for designing and selecting appropriate games and simulations based on analysis of instructional needs.

The learner will . . .

1. apply defining key characteristics to distinguish games from simulations and other virtual learning environments.
2. reflect on and discuss relationships among theories of learning and play.
3. analyze instructional needs and create a learning game or simulation design.

The above justification, course description, and student learning outcomes were reviewed through the university curriculum process and approved for course design and development. Following this approval, course design proceeded with only one designer, the full-time ETEC faculty member, who also taught the course, because of limited resources and time.

COURSE DESIGN

In keeping with the theories underscoring the use of games and simulations for learning, as well as shifts in the field of educational technology (AECT, 2008; ISTE, 2008), course design followed a learner-centered or constructivist approach. Constructivist learning theories uphold the following primary principles:

- Learning results from a personal interpretation of experience.
- Learning is an active process occurring in realistic and relevant situations.
- Learning results from an exploration of multiple perspectives (Richey, Klein, & Tracey, 2011).

However, the course designer's main goal or vision was to design a learning experience that challenged student's thinking about teaching and learning in an environment that supported exploration and play, whether or not students subscribed to the epistemological foundations of constructivism. Thus, the overarching design approach followed Land, Hannafin, and Oliver's (2012) conception of grounded design, which emphasizes "the alignment of core foundations and assumptions, and the linking of methods and approaches in ways that are consistent with their corresponding epistemological perspectives," as well as "alignment among psychological, pedagogical, technological, pragmatic, and cultural foundations of a learning environment" (p. 6). Moreover, grounded *student-centered* or constructivist learning environments are intended to "support learners as they negotiate multiple rather than singular points of view, reconcile competing and conflicting perspectives and beliefs, and construct personally-relevant meaning accordingly" (Land, Hannafin, & Oliver, 2012, p. 6-7). Thus, in addition to providing resources representing multiple points of view, they also represented a variety of media formats: scholarly and popular. Moreover, course activities were designed to support learners wrestling with and making meaning of various concepts through interaction with each other, as well as with games and game designs.

Course Content & Resources

Although the course title was Games & Simulations for Learning, the "big idea" or "umbrella topic" of the course was theories of and relationships between learning and play, particularly what Salen and Zimmerman (2004) call "meaningful play." Students also explored definitions of and distinctions between games and simulations, as well as key elements or features of well-designed games, particularly those that support knowledge construction in comparison to those that support drill and practice.

Because interest in digital games spans a variety of fields, media, and interests, course readings and resources came from a variety of sources: a noted game design textbook, instructional design web pages and blogs, journal articles, articles from popular media/magazines, and online videos—particularly TED Talks. The designer wanted to expose students

to several of the key theorists and researchers in educational games without limiting the course resources to research articles alone. After first drafting a "wish list" of all the important contributors, the designer pared the list down to those most critical to supporting the course learning outcomes. She then searched for those that might be available in media other than academic journals. For example, since Csikzentmihalyi shares his ideas on flow in a TED talk, but Vygotsky departed long before video was invented, students were able to watch Csikzentmihalyi, but read Vygotsky. The textbook for the course was Salen and Zimmerman's (2004) *Rules of Play: Game Design Fundamentals*, a book that introduces readers to core game design concepts as opposed to "how to" instructions. Table 2 details the course topics and resources for the first 5-weeks of the course.

Week	Topic	Readings/Resources
1	Features of game and learning design	Ch. 1-2 & Knizia essay in *Rules of Play*; Instructional Design Fusions (2011) Video and Article Round-up on Games for Learning
2	Exploring and defining play	Ch. 3, 4, & 22 in *Rules of Play*; National Institute for Play (2013) Patterns of Play; Vygotsky (1978) The Role of Play in Development
3	Defining Games & Sims	Ch. 7 & 8 in *Rules of Play*; Becker & Parker (2009) "A Simulation Primer"; Gredler (2003) "Games and Simulations and their Relationship to Learning"
4	Core Design Concepts	Ch. 5, 6, & 9 in *Rules of Play*; Csikzentmihalyi (2004) TED Talk on "Flow, the secret to happiness"; Wasik, Avrich, Johnson, Koster, and De Zengotita (2006) "Grand Theft Education"
5	Goals, Rules, and Outcomes	Ch. 11-13 in *Rules of Play;* McGonigal (2010) TED Talk "Gaming can make a better world"

Table 2. Weekly topics and resources.

Weeks 6 and 7 were dedicated to completing an instructional/game design document (the capstone project for the course), peer reviews of student game designs, and a reflection on learning in the course.

Spirit or Mood for the Course

Beyond the course content or the cognitive knowledge and skills targeted in the course, the designer also wanted to foster a spirit of playfulness in the course. Although many characterize games as "fun," playing games evokes a much richer array of emotions than simply having fun. Playing can be challenging, frustrating, rewarding, and euphoric. Indeed, games are thought to make *failure* fun. Thus, the aim wasn't simply sense of fun, but a spirit of playfulness in which failing was as much fun as succeeding. Moreover, the spirit of playfulness was intended to support flexible thinking, a bit of comfort with uncertainty, risk-taking, and perseverance--a willingness to make mistakes and learn from them rather than giving up too soon.

There were two ways this spirit was designed into the course. The first was selection and use of avatars by the instructor and students. On the "Welcome" page or "Course Home" in the course management system, students were provided the course description and outcomes, along with some key features of the course. They were also introduced to the instructor's "snarky avatar," an online presence who typically made wry comments about the more formal [stuffy] elements of the course. The snarky avatar's comments were denoted by brackets and green font throughout the course. Figure 1 provides a screenshot of the course "Welcome" page with comments from the instructor and her snarky avatar.

In the forum for introductions, students were invited to post a photo of themselves and of their avatars, explaining how they came to select or identify with their avatar. They were also invited to select a font style or color to represent their avatar when they wished for their comments to be represented by a persona other than themselves as learners or scholars.

The second design feature intended to induce a spirit of playfulness was a weekly dose of humor included with the readings and resources each week. Long before course design began, the designer knew she wanted to include a couple of humorous videos from *The Onion* in the course. One was particularly well-suited for the first week. However, once she began developing the course, she realized students might begin expecting or missing a bit of humor in later weeks, if she only included humor offerings in the first few weeks. Because the subject of the course lent itself well to playfulness, she decided to find a relevant, humorous resource for each week of the course.

However, in the search for humor offerings, she found several that were highly appropriate to the topic and concepts for each week, but that could be deemed inappropriate for educational settings because they contained profane language or suggestions of nudity. The designer knew that the majority of students in the program, all of whom were adults, would appreciate the weekly humor, but didn't want to offend any students who might object to such content. Thus, she made these offerings optional, clearly indicated when one of these resources contained objectionable content, and cautioned students to avoid them if they found such content offensive.

Welcome, game designers!

I am excited to learn with you this term. Take a few minutes to explore the course resources and tools on the left navigation menu and the tabs across the top of this page. You'll also find comments from my snarky avatar throughout the course--these are in brackets and green, italicized font. *[hi! snarky avatar, here. don't let Dr. D fool you into believing that my comments aren't worth consideration.]*

Be sure to order your textbook right away. I've made electronic copies of this week's readings while you are acquiring your book, but I can't do so each week.

Course Description

This course examines games and simulations as learning technologies, including defining qualities and characteristics, as well as theories of learning and play. Emphasis is placed on processes for designing and selecting appropriate games and simulations based on analysis of instructional needs.
[but the epic fail of this academic description is that it does not say anything about how much fun we'll have]

Student Learning Outcomes

1. The learner will apply defining characteristics to distinguish games from simulations and other virtual learning environments.
2. The learner will analyze instructional needs and create a learning game or simulation design.
3. The learner will reflect on and discuss relationships among theories of learning and play.

[We'll also play a game and watch some goofy videos. :0)]

A word on the goofy videos . . .

First and foremost, you don't have to watch them! In the readings and resources posted for each week, the last item on the list is introduced with the words "Just for fun." These items are intended to introduce a little humor and a spirit of playfulness to the topics of study and discussion in a class of adult learners. However, one contains some pixelated nudity, another some profanity, while another is a video game parody of a rather scandalous television show. Either I or my snarky avatar have indicated which ones contain the objectionable content, so you can avoid them if any of these things offend your values and sensibilities.

Figure 1. Course Welcome page.

The course "Welcome" page explained the intended spirit behind the humor offerings, as follows:

> "In the readings and resources posted for each week, the last item on the list is introduced with the words 'Just for fun.' These items are intended to introduce a little humor and a spirit of playfulness to the topics of study and discussion in a class of adult learners. However, one contains some pixelated nudity, another some profanity, while another is a video game parody of a rather scandalous television show, *Breaking Bad*. Either I [the instructor] or my snarky avatar have indicated which ones contain the objectionable content, so you can avoid them if any of these things offend your values and sensibilities."

These offerings included videos, graphics, cartoons, and game parodies from *The Onion*, as well as http://www.collegehumor.com/, http://phdcomics.com/, and elsewhere on the web.

Support for Knowledge Construction

Also in keeping with constructivist learning environments (Duffy & Cunningham, 1996; Savery & Duffy, 1995), the primary learning activities were designed to provide students with opportunities to develop personal interpretations of experiences, engage in active problem-solving in realistic situations, and explore multiple perspectives. The primary learning activities in which students engaged were a two-week game playtesting activity, weekly reading discussions, and a semester-long project-based game/learning design, which included a few design discussions as well as peer review.

Game Playtesting

During the first two weeks of course, students were required to play a free, web-based game—Gamestar Mechanic--designed to teach kids the guiding principles of game design and systems thinking. Although students in this graduate level course were no longer kids, the purpose of the exercise was to learn key concepts of game design by playing a game. The activity was also intended to help learners

get a sense of whether, how, and what students might learn from designing a game (as opposed to merely playing one). It also introduced them to a free tool that they could use in their teaching, along with an accompanying website dedicated to teachers that provided additional resources for teaching with the game (http://gamestarmechanic.com/teachers). Moreover, the designer also intended this course activity to further support the spirit of playfulness described previously. However, since the purpose and learning goals for this activity were to discover key concepts of game design, assessment of learning for this activity was based on students' reflections on their experience rather than the scores they earned in the game. In this sense, students were asked to do more than merely play the game. They were also asked to reflect critically on their game play experience. Typically "playtesting" involves such a critique that is then used to improve the game. Although this "playtesting" activity in this class was not intended to improve or modify Gamestar Mechanic, we called the activity game playtesting, because of the critical reflection component. In this activity, students' role was that of "player/tester"; later in the course, they were asked to conduct a playtesting session for the game that they designed as "designer/tester." This early activity helped set up the later one, and gave students the opportunity to experience playtesting from the perspective of player and of designer.

Students were asked to play at least the first 2 quests of the game in Week 1 and then to reflect on their play experience: how they felt, and what they learned. The reflection prompt follows:

> "Games are about evoking feelings—all kinds of feelings! Joy, frustration, tension, success, fun. Reflect on how you felt and why. Also reflect on what you learned from playing Gamestar Mechanic about games, game design, or *game play.* You don't need to follow the order in which these are listed here, just be sure to address both in your reflection."

Students played the remaining quests (3-5) in the second week of class and reflected on their play experience using the same prompt. Students were invited to share their reflections with others by posting them in a discussion forum so that others might learn from their experiences. However, recognizing that some students aren't comfortable sharing their feelings, they also had the option to submit their reflections to the instructor in a private journal.

Reading Discussions

Weekly discussions took place in a threaded discussion forum in the course management system (CMS) and prompted learners to reflect on and wrestle with key concepts from the readings and resources, in some cases applying those concepts to their design projects. Participation requirements guided students to make an initial post or thread, providing their response to the discussion prompt, by the fourth day of each week. They also were required to post responses to 3-5 classmate's posts by the seventh or last day of the week. The instructor occasionally posted comments responding to individual student posts, but made an effort to avoid commenting frequently as instructor posts are often viewed as "the final word" or "right answer" and can end the conversation. Instead, she composed and provided a discussion commentary, drawing upon key ideas or themes from students' posts, offering clarification when needed, and sometimes introducing new ideas or unexplored perspectives. These commentaries were in some ways the instructor's "lecture," except they followed a more *inductive* or "just-in-time" approach. As Bransford points out, "There are times, usually after people have first grappled with issues on their own, that 'teaching by telling' can work extremely well" (cited in Prince & Felder, 2006, p. 124).

Design Project

The major project for the course was an instructional design project that integrated a game or simulation into a learning experience for students. Students were given an array of options for this project:

- **analyze** an existing game/simulation to incorporate into the design of an instructional unit;
- **create** a new game/simulation for an instructional unit;
- **modify** an existing game/simulation for an instructional unit; *OR*
- **design** an instructional unit that required students to **analyze** a game, **create** a new game, or **modify** an existing game/simulation as a means of constructing knowledge.

The final product for this Design Project was an instructional design document (IDD), which also included a game design document (GDD) as a component. Weekly exercises, some of which involved peer feedback via the Design Discussions described below, helped shape students' thinking and their designs. However, these exercises served only as checkpoints in the design process. Students were expected to synthesize findings and feedback from those exercises into their design documents as they developed them throughout the term.

Design Discussions

In addition to discussions about the readings and resources, students worked through exercises and

activities facilitating development of their Design Projects. They were asked to post the products or results of four of these activities to a discussion forum for comments/feedback on their design. The topics/products of the four design discussions were as follows:

1. Select and complete one of the Game Design Exercises for game Creation, Modification, or Analysis in the second chapter of *Rules of Play.*
2. Create a rough draft of the game design/analysis document.
3. Develop a prototype of the game, playtest it, and reflect on the initial playtest.
4. Redesign and revise the game design/analysis document.

Design discussions took place in weeks four through seven. The final discussion was a peer review of the game design project.

Assessment

In keeping with best practices for the assessment of thinking and learning in general, as well as student-centered learning designs more specifically, the course designer provided a variety of assessments and opportunities for reflection. The primary course activities described in the previous section provided many of these opportunities. Table 3 lists these activities and how they were weighted in calculating students' course grades.

Assessment/Activity	Weight
Game Playtesting Activity	10%
Reading Discussions	25%
Design Discussions	25%
Design Project	40%

Table 3. Course assessments and grade weights.

These activities involve varying thinking moves or intellectual skills, and were intended to provide a combination of opportunities for learning with others and learning alone. The evaluation rubrics for each were selected or adapted based on the intellectual skills required for each activity. The Association of American Colleges & Universities (AAC&U) has identified core intellectual skills and abilities for undergraduate education, such as critical and creative thinking, ethical reasoning, teamwork, and problem solving. Called the VALUE project (Valid Assessment of Learning in Undergraduate Education), the effort involved assembling teams of faculty members from colleges and universities all over the United States to develop rubrics for assessing these intellectual skills (www.aacu.org/value/). These rubrics articulate fundamental criteria for each learning outcome or intellectual competency, with performance descriptors demonstrating progressively more sophisticated levels of attainment from "Benchmark" or *beginning* to "Capstone" or *accomplished*. Although the rubrics are designed for assessment of undergraduate education, the highest levels of attainment represent the expected competencies of those who have completed an undergraduate degree and thus can appropriately be expected of graduate students. The course designer makes use of these rubrics at every opportunity in order to "position learning within a basic framework of expectations" using a "common dialog and understanding of student success" that is "shared nationally" (AAC&U, 2008).

Reading and Design Discussions

Since weekly discussions of readings and resources required students to make an initial post responding to a prompt as well as respond to classmates' posts, the rubric for discussions needed to include criteria pertaining to written communication and to constructing knowledge with others. Thus, the rubric designed for reading discussion adapted criteria from four VALUE rubrics, as follows:

- **Purpose and Context** from the "Context of and Purpose for Writing" criterion on the Written Communication rubric.
- **Individual Contributions** from the "Individual Contributions Outside of Team Meetings" criterion and **Facilitates Contributions of Others** from the "Facilitates the Contributions of Team Members" on the Teamwork rubric.
- **Learning from Others** from the "Diversity of Communities and Cultures" criterion on the Civic Engagement rubric.
- **Taking Risks** from the Creative Thinking rubric.

Although prompts varied each week, the **Purpose and Context** criterion addressed how well a student composed posts that were relevant to the discussion prompt, while the **Taking Risks** criterion encouraged seeking out or following through on "untested and potentially risky directions or approaches to the assignment." The remaining criteria related to the intellectual skills involved in co-constructing knowledge in dialogue with others. This same rubric was applied to evaluate student participation in the Design Discussions (see Appendix A for the evaluation rubric for reading and design discussions).

Playtesting Reflections

Game Playtesting Reflections required a different set of intellectual moves: playing a game and then reflecting on the experience. Since students' were reflecting on their experiences, there were no "wrong" answers; however, there were expected standards for exploration and reflection. The rubric designed for these reflections made use of four of the criteria from the Foundations & Skills for Lifelong Learning VALUE rubric and one criterion from the Reading VALUE rubric as detailed below:

- **Curiosity, Initiative, Transfer,** and **Reflection** from the Lifelong Learning rubric.
- **Comprehension** from the Reading rubric.

The **Curiosity** criterion rated the depth and richness with which students' explored their play experience. The **Initiative** criterion rated the extent to which they went beyond minimum requirements to expand their knowledge, skills, and abilities. The **Transfer** criterion rated the clarity with which students made references to previous learning or play experiences, and the reflection criteria rated the depth of change in their perspectives from the play experience. The **Comprehension** criterion rated their recognition of the implications of the game and its design for contexts outside of our class, such as what others might learn, or how it might be used in other class settings (see Appendix B for the evaluation rubric for playtesting reflections).

Design Project

The rubric for the design project made use of criteria from four VALUE rubrics, as follows:

- **Scope & Information** from the "Determine the Extent of Information Needed" from the Information Literacy rubric.
- **Theoretical Perspectives** from the "Application of Ethical Perspectives/Concepts" criteria on the Ethical Reasoning rubric.
- **Problem Solution** from the "Solving Problems" criteria on the Creative Thinking rubric.
- **Innovative & Transformative Thinking** which combined the "Innovative Thinking" and "Connecting, Synthesizing, Transforming" criteria from the Creative Thinking rubric.
- **Content Development** from the criteria with the same label on the Written Communication rubric.

The **Scope & Information** criterion rated the extent to which the student defined the scope of the design question, determined key concepts, and selected appropriate information. The **Theoretical Perspectives** criterion evaluated the students' application of theoretical perspectives to their design question/issue. The **Problem Solution** criterion rated the logic and consistency of their design in addressing a learning need/problem, and the **Innovative & Transformative Thinking** criterion evaluated the novelty or uniqueness of the design solution. The **Content Development** criterion rated the use of appropriate, relevant, and compelling content/details in describing their design (see Appendix C for the evaluation rubric for design project).

PILOT EVALUATION

As discussed previously, the design of the course followed principles of grounded student-centered design. As Land, Hannafin, and Oliver (2012) point out, "grounded design methods have been evaluated in instances, cases, and research," but they argue that grounded designs "transcend the individual instances in which isolated success may be evident, and can be adapted or adopted by other designers" (p.8). Although many dispute the validity of claims to "transcendence" or "generalizability" based on a single case or instance, the key assertion here is that others may either adopt, adapt, or reject the principles themselves, how they were applied in a given instance, as well as the designer's evaluation of the designed experience. With this caveat in mind, I—the designer and instructor of the course—offer my observations during pilot implementation of the course along with student responses pertaining to three aspects of the course: the spirit of playfulness in the course, the design project, and the final course discussion.

Playfulness in the Course

For the most part, the game playtesting activity went as anticipated, but it did yield some reactions that weren't expected. I expected some students would struggle with the game; indeed, I intended for them to experience some difficulty in order to also experience the thrill of overcoming a challenging obstacle. I had also anticipated that students might not experience a true state of play, given that a defining characteristic of play is that it is a voluntary activity (Garvey, 1977; Huizinga, 1955; Weininger, 1979) and thus cannot be compelled by a class assignment. However, the assignment was designed for students to explore the conditions that allow play to happen. For the most part, students did identify those conditions along with the array of emotions that one experiences in play beyond the most common and oversimplified descriptor: "fun."

Although I expected that some students would struggle more than others, what I didn't anticipate was

a sense of competitiveness that emerged in student dialogue about their experiences. The activity was not designed as a competition. Each student played Gamestar Mechanic individually, not in competition with each other. Their reflections on their experiences were intended to represent the differing experiences that different players might have with the same game. However, a few of the students who had a great deal of experience playing video games, responded to the reflections of those who struggled with comments, such as "Oh, that was so easy!" or "I can't believe you thought that was hard." The strugglers tended to reply to these comments with the declaration, "I'm not a gamer." Although it was only a few of the experienced "gamers" who made these comments (others were more empathetic and understanding), an interesting conversation about "gamers" emerged over the two weeks of playtesting: who are "gamers"? do they only play video games? can those who play other kinds of games be called gamers? are athletes (i.e. those who play sports) gamers? do gamers fall into a certain demographic group or personality type? is the term "gamer" a stereotype? isn't everyone, to some extent, a "gamer" given that everyone *plays*?

The weekly humor offerings did seem to function as intended, supporting a spirit of playfulness in weekly discussions. In the first week of the course, a couple students didn't realize that the video, "Are Violent Video Games Adequately Preparing Children for the Apocalypse?", was a spoof on serious discussions of video games and violence. In order to avoid embarrassing these students in the discussion forum, I sent them a private email explaining that the video wasn't serious and invited them to edit their posts in light of this information. Both responded that they were fooled by how realistic *The Onion* made the panel discussion seem and came to appreciate the humor in it.

As anticipated, the humor offerings did indeed become an expectation—*beyond* the course instead of within it. This course was offered in the first subterm (first 7-weeks) of the fall semester. Before the second subterm began, students who were enrolled in courses that I was teaching in the second subterm began asking whether there would be "Just for fun" items each week in those courses. Students reported enjoying the comic relief that these offerings provided alongside the more serious readings and resources. They were particularly appreciative of the relevant connections between each selection and the concepts explored each week. Far from belittling or poking fun at each of these concepts, they enriched understanding in that they illuminated misconceptions associated with the concepts. Moreover, no student complained about the objectionable content. Apparently those that would have or did object realized that they had been cautioned to avoid them.

Game Design Project

Students created an array of designs: a role playing activity using Spanish vocabulary, an event planning simulation game involving budgeting and recipe ingredient calculations for math, and quiz game plug-in for the commercial game, Minecraft. Although designing, prototyping and playtesting a game in 7-weeks was a challenge, students seemed to manage the project relatively well and reported that the weekly design activities during weeks three through six helped scaffold their thinking and keep them on pace.

However, a weakness, or at least a missing piece, throughout the course was the lack of an externally valid rubric or evaluation model specific to educational games. Although the instructor created a rubric that adequately assessed the intellectual skills involved in the design project, a rubric describing the qualities of an effective learning game design developed from a shared understanding among various members of the learning game design field could be used as a much more powerful tool for learning than the mere assignment of project grades. I offer as an example the Galileo Educational Network's (2013) Rubric for Discipline-based and Inter-disciplinary Inquiry Studies. I used this rubric in some early evaluation activities in the other new course (Technology and Inquiry-based Instructional Methods) discussed previously in the "Initial Analysis" section of this paper. First, students applied the rubric to determine how Inquiry-based a lesson that they selected was. They also used the rubric to evaluate how "inquiry-based" three instructor selected designs were later in the term. These activities helped students deepen their understanding of the elements and criteria of inquiry-based learning design, prior to working on their own inquiry-based learning designs. Such a rubric describing the elements and criteria of an effective learning game design would have been extremely helpful to students in this course. They could have applied it in their evaluation of Gamestar Mechanic, as well as their playtesting and peer reviews of each other's game designs.

Indeed, research in the field over the last decade has generated a substantial knowledge base regarding evaluation of learning games. We have extensive lists of criteria for evaluation, such as Dondi and Moretti's (2007) criteria for selection and quality assessment, as well as Bedwell, Pavlas, Heyne, Lazzara, and Salas' (2012) taxonomy linking game attributes to learning. We also have various frameworks for evaluating learning game designs, such as de Freitas and Oliver's (2006) four-part framework; Hunicke, LeBlanc, and Zubek's (2004) Mechanics, Dynamics,

and Aesthetics (MDA) framework; Winn's (2009) Design, Play, and Experience (DPE) framework; Hartevelde's (2010) triadic game evaluation (TGE) comprised of reality, meaning, and play; and Tragazikis, Kirginas, Gouscos, and Meimaris' (2011) Open Methodological Framework (OMEGA). Although each of these works has provided unique insights to our understanding of the key elements and criteria requisite for a learning game to be judged "effective," it's unclear whether there is consensus among learning game designers and educators regarding the most critical elements and criteria. Moreover, these models don't define the varying degrees of effectiveness within these criteria, as the progressive performance descriptors in the VALUE rubrics do. Many of the existing evaluation models call only for analyzing the presence or absence of a key element/criteria: clear learning objectives, for example. If there is consensus that "clear learning objectives" are a critical element of effective learning games, we need to better describe the degrees of clarity from absent to unclear, to clearer, to clear. Such a tool could better scaffold students thinking about their own learning game designs, as well as provide a useful rubric for evaluating other learning games that they might use in their respective classrooms.

Final Course Reflection/Discussion

Despite this weakness, students did seem to attain a sense of the key elements of sound learning game design, as evidenced in their reflections in the final week of the course. The last reading discussion in week seven prompted students to reflect on their learning, choosing one of two topics or prompts for their initial post. One of these prompts made use of a thinking routine from Harvard's Project Zero, titled "I used to think… Now I think…" This routine asked learners to reflect on what they used to think about games and simulations for learning before the course began, and then reflect on how their thinking changed over the duration of the course. The other option for reflection pertained to the program eportfolio requirement. More specifically, students were reminded of the learning outcomes from the program (see program learning outcomes in "The Program" subsection of "The Context" section in this article) and asked to reflect on which outcomes their game design project supported best. This prompt was intended to support students in making connections between course level learning and the broader learning outcomes for the masters program. The following are excerpts from student responses to both prompts in this end-of-course discussion.

I Used to Think ... Now I think….

Student A: "*I used to think* that designing games was easy, and did not take so much effort. I thought game designers focused mainly on the story of the game and that was it. I also thought games were based around what sells, what kids like. I also thought most digital games that kids play now had no real meaning to them at all, and were often bad influence on kids. *Now I think* games can be a lot more if you open your mind and consider the possibilities. I think games can be used for meaningful play and education objectives can be intertwined into the game without the kids feeling like they are doing work. I also think now the best games do just that. They teach some aspect of learning to the player without feeling like they are doing work. That they are set up so well that kids get engulfed in the game and stay engaged for hours. I also have learned there is so much to game design that I would have never considered. … Watching the funny videos in class showed me that you have to open your mind and see things in a different way. All games are created with an objective in mind and designers go through many steps to make sure so many aspects of the game and what its goal is accomplished. I will really look at games differently from now on. I find myself trying to figure out what the designers objectives were for creating the game."

Student B: "*I used to think* that games were just for fun. They did not necessarily go hand in hand with learning. *Now I think* that one can learn so much through games. I had that misconception in part because that was the way I was educated. Usually school is not associated with fun or games. But I have learned that they can coexist. I did not realize that even a game like chess was helping me learn. I used to play chess because I wanted to check mate my older brother. But as I look back and more closely I was learning a lot! Games, depending on the design, can teach so many skills. *I used to think* that simulators were only used for pilots and astronauts. *Now I think* that our classroom is a simulator and that there are simulators inside the simulators! I am a strong advocate for engagement. I have learned this from going to countless meetings where I have to force myself to be engaged to the lecture. A person playing a game is usually 100% engaged! … It can be a board game or a video game, and as long as I actively participate, then I am engaged. Games deserve more credit than what they usually get."

Student C: "*I used to think* that simulations were helpful and not very fun games. I thought that games were entertaining and suspected that there was some analytic value for those involved in playing, but never really considered games as a truly feasible method for education. *I now think* that some simulations can actually be games. That some games are VERY

valuable to the education process and that some games are simply entertaining (*Candy Crush* anyone?). I also think that play is serious business. From flow, to motivation and meaningful play the concept and practice of playing runs deep. I recall my mother telling me that kids are at work when they are playing, and I better understand why they use play to develop. I also see how many activities and rules that adults create take on a form of simulation or game, which offers some benefit to the participants. The most thought provoking of the content is McGonigal's TED talk. The idea of leveraging an environment where gamers engage and exhibit the types of behavior to collaborate, take risks and solve problems seems like a approach that has merit. I think setting up an environment on any level can produce results that traditional education environments might not be able to accomplish."

ETEC Eportfolio Reflection

Student D: "The portfolio concept, to my understanding, is supposed to demonstrate overall mastery of particular knowledge and skills in some integrated fashion. That being the case, it is likely that a product of any particular course would, to some degree, reflect all of the listed program goals. The Game Design Document, defined as an educational technology application, also addresses the other ETEC learning outcomes. A philosophy [outcome 1], even if implicit, will guide the development and employment of any extant application. If my Ed-Tech Philosophy includes a requirement that technology be integrated seamlessly into a learning plan, as opposed to driving the plan, then a game/simulation would need to meet that demand. As the game design progressed, consistent interaction between game design and the educational understanding of the game's purpose guided the evolving outcome. Additionally, best practices [outcome 2] generally flow directly from a foundational philosophy. Regardless of epistemological leanings, the utilization of any sound application requires evaluation. Despite lack of universal operationalization for 'learning' or 'understanding,' most models of scientific knowledge suggest that theoretical propositions be tested in some manner. A great deal of time in this course was devoted to testing prototypes and bribing folks to participate. The cycle of testing and subsequent modifications clearly demonstrates a significant attempt at improving the learning experience through gameplay. As with an evolving Ed-Tech philosophy, each course in the Ed-Tech curriculum, presumably, would contribute to the development of the communication skills [outcome 3]. In one past course, the objective was to develop a web site; a great deal of the time was spent learning a program. As the course progressed, I achieved greater technological literacy (and Student C's number on speed dial). This course, I believe targeted information and communication skills. A successfully designed game or simulation would need to convey information and communicate rules; perhaps almost intuitively. Further, games with educational objectives would need to be designed so that those objectives flow naturally within the magic circle; hopefully even transferred to real-world scenarios [outcome 4]. Learning game theory, even if only scratching the surface, provided some insight into what a successful educational game might require."

Student E: "I think that the Game Design Project for this class has supported all of the program learning outcomes to an extent. Over the last couple of years, my educational technology philosophy has been that technology should be integrated to support and encourage learning, not be the only learning. No computer or technology device can replace a skilled teacher, and merely using technology in a classroom does not automatically mean that it is beneficial to learning. In fact, sometimes it can be a barrier if not understood, planned and implemented by a skilled teacher. The same notion applies to games. Before this course, I was not as receptive to using gaming in the classroom, but the right game employed as support or reinforcement for content could be beneficial, as games are by nature intended to be fun. We spent the first portion of this course learning about the concept of play, research regarding play, specifically meaningful play, the design process and elements required for effective gaming. We were asked to play games, then evaluate them, and reflect of what worked, and what didn't. We then developed, planned and tested our own game designs so we could experience part of the process for ourselves. I feel like if I were able to go searching for a game to purchase, I would have a better understanding of how to critically evaluate a game, and I also have a much better understanding of all the hours of work that went into creating each game. … To me, the goal of educational gameplay is to give students an opportunity to engage in meaningful play. That's to say that instead of just going through the motions, the child is growing and learning from the play. The game, whether technology based or not, should serve as the vehicle to support and enhance the learning, not be a teacher and lesson replacement. Furthermore, meaningful play does not have as great of a chance at success when used as a bribe or filler for early finishers. After this course, I have to say I am more open-minded to the idea of using gameplay in my classroom."

Instructor Summary

Although the above is only a sample (5 of 9 class participants) and it does not capture the full text of

these reflection, nor students' replies to each other in this discussion, it does represent the overarching themes from their learning:

- Game design is more complex than it might seem to the player, but can be accomplished with thorough analysis, prototyping, playtesting, and refinement.
- Creating the conditions for meaningful play is more important than labeling the product a game, simulation, role playing activity, etc.
- Games (or meaningful play) evoke many more emotions than "fun." Indeed, what makes games "fun" is often the "meaning" we find in play.
- Designing a meaningful play experience (game/instructional design document) supports all four of the program learning outcomes.

Moreover, the course supported development of new ways of thinking. As Student A indicated, "Watching the funny videos in class showed me that you have to open your mind and see things in a different way." Thus, the intended dispositions or affective learning outcome for the "spirit of playfulness" designed into the course seemed to succeed with at least one course participant.

CONCLUSION

The purpose of this design case was to share the design thinking that went into the course with others setting out to design courses on games and simulations as learning technologies, as well as those exploring student-centered designs. The instructor observations and student reflections from the initial implementation are not meant to be viewed as empirical research, but as evidence of the "groundedness" of the design. Although the methods, tools, and tactics leveraged in the design of this learning environment represent only one approach among many possible approaches, as Land, Hannafin, and Oliver (2012) argue, "What is important from a grounded design perspective is that the design decisions, features, and sequences of the learning environment align with theoretically-grounded perspectives on learning and associated pedagogy" (p. 7). The following are the primary perspectives on learning that drove the design:

- Learning results from a personal interpretation of experience.
- Learning is an active process occurring in realistic and relevant situations.
- Learning results from an exploration of multiple perspectives (Richey, Klein, & Tracey, 2011).

Playing Gamestar Mechanic in the first weeks of the course, as well as prototyping and playtesting their own game designs, allowed students to interpret their own experiences with games and game designs. Both activities involved active processes in realistic and relevant situations. Moreover, students had many opportunities to explore multiple perspectives: those of other students in their reading and design discussions, those who participated in the playtesting of their design prototypes, as well as those represented through various readings and resources—academic, cultural, humorous, popular.

Nevertheless, the course was not without flaws that could provide valuable lessons to others designing courses on games and simulations as learning technologies. First, some students didn't understand that the humor offerings were, in fact, humorous rather than serious, scholarly resources. Although these resources were introduced with the phrase, "Just for fun," a more detailed introduction was needed, at least in the first week or two of the course. Designers incorporating humor into the readings and resources for an online course should be aware that students could assume that all course materials are serious in nature, and identify ways to make sure that students understand what is and what's not.

Secondly, designers should be aware that games may be associated with or evoke a sense of competitiveness in some students. While competition can certainly be leveraged as a means to motivate academic performance, it can also stifle cooperation or lead to feelings of alienation and inadequacy. I intended the discussions regarding Gamestar Mechanic to be safe spaces for students to share their experiences, particularly if they experienced failure or frustration while playing the game. Comments of a competitive nature made these spaces less "safe." A couple of students felt belittled by these comments. Future iterations of the course will attempt to minimize the unintended competitiveness in these discussions.

Finally, developing and deploying a rubric that more specifically describes the attributes of an effective learning game is another opportunity for improvement of the course. Alternately, having students collaboratively construct a rubric or evaluation model might also be an effective approach. Although the rubric used in the course was adequate for assigning grades, it was a measure of the quality of thought put into the design project, rather than a measure of the quality of the learning game design.

Nevertheless, student reports in their end-of-course course reflections and in their design projects themselves provide evidence that the framework upon which this course design was grounded did result in the intended learning. Students gained an

understanding of the complexities of learning game design and an appreciation for the role of meaningful play in learning.

REFERENCES

AAC&U. (2008). VALUE: Valid assessment of learning in undergraduate education. Retrieved from http://www.aacu.org/value/.

Association for Educational Communications & Technology. (2008). Definition. In A. Januszewski and M. Molenda (Eds.), *Educational technology: A definition with commentary.* New York: Lawrence Erlbaum Associates.

Becker, K. & Parker, J. R. (2009). A simulation primer. In Gibson, D. & Baek, Y., eds. *Digital simulations for improving education: Learning through artificial teaching environments.* Hershey, PA: Information Science Reference.

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*(6), 729-760.

Csikzentmihalyi, M. (2004). *Flow: The secret to happiness*. [Video]. Retrieved from http://www.ted.com/talks/mihaly_csikszentmihalyi_on_flow

de Freitas, S., & Oliver, M. (2008. How can exploratory learning with games and simulations within the curriculum be most effectively evaluated?. *Computers & Education, 46*(3), 249-264.

Dondi, C., & Moretti, M. (2007). A methodological proposal for learning games selection and quality assessment. *British Journal Of Educational Technology, 38*(3), 502-512. doi:10.1111/j.1467-8535.2007.00713.x

Duffy, T. M., & Cunningham, D. J. (1996). Constructivism: Implications for the design and delivery of instruction. In D. H. Jonassen (Ed.), *Handbook of research for educational communications and technology*. NY: Macmillan.

Galileo Educational Network. (2013). Discipline-based inquiry rubric. Retrieved from http://www.galileo.org/research/publications/rubric.pdf

Garvey, C. (1977, 1990). *Play*. Cambridge, MA: Harvard University Press.

Gredler, M. E. (2003). Games and simulations and their relationships to learning. In D. Jonassen (Ed.), *Handbook of research for educational communications and technology* (2nd ed., pp. 571-581). Mahwah, NJ: Lawrence Erlbaum Associates.

Harteveld, C. (2010). Triadic game evaluation: A framework for assessing games with a serious purpose. In Raymaekers, C., Coninx, K., & Gonzalez-Calleros, J. M. (Eds.), Proceedings of the Design and Engineering of Game-like Virtual and Multimodal Environments Workshop, Berlin, Germany, June 20.

Huizinga, J. (1949, 1955). *Homo ludens; A study of the play-element in culture.* Boston, Beacon Press.

Hunicke, R., LeBlanc, M., & Zubek, R. (2004). MDA: A formal approach to game design and game research. In Proceedings of the Challenges in Game AI Workshop, Nineteenth National Conference on Artificial Intelligence.

Instructional Design Fusions (2011) Video and article round-up on games for learning. Retrieved from https://instructionaldesignfusions.wordpress.com/tag/ted-talks/

ISTE. (2008). *NETS for Teachers*. Retrieved from http://www.iste.org/standards/standards-for-teachers/nets-for-teachers-2008

Land, S. M., Hannafin, M. J., & Oliver, K. (2012). Student-centered learning environments: Foundations, assumptions, and design. in Jonassen, D. & Land, S. (Eds.), *Student-centered learning environments: Theoretical foundations of learning environments*. New York: Routledge.

McGonigal, J. (2010). *Gaming can make a better world*. [Video file]. Retrieved from http://www.ted.com/talks/jane_mcgonigal_gaming_can_make_a_better_world

National Institute for Play. (2013). *The science: Pattern of play*. Retrieved from http://www.nifplay.org/science/pattern-play/

Prince, M. J. & Felder, R. M. (2006). Inductive teaching and learning methods: Definitions, comparisons, and research bases. *Journal of Engineering Education, 95*(2), 123-138.

Richey, R. C., Klein, J. D., & Tracey, M. W. (2011). *The instructional design knowledge base: Theory, research, and practice.* New York: Routledge.

Salen, K. and Zimmerman, E. (2004). *Rules of play: Game design fundamentals.* Cambridge, Mass: MIT Press.

Savery, J. R., & Duffy, T. M. (1995). Problem based learning: An instructional model and its constructivist framework. Educational Technology, 35, 31-38.

Seels, B. & Richey, R. C. (1994). *Instructional technology: The definition and domains of the field.* Washington, D. C.: Association for Educational Communications and Technology.

Thiagarajan, S. (1993). Just-in-time instructional design. *The ASTD Handbook of Instructional Technology*. In G. Piskurich., ed. New York, McGraw-Hill.

Tragazikis, P., Kirginas, S., Gouscos, D., & Meimaris, M. (2011). Digital games evaluation and educational assessment: A review and proposal for an Open Methodological Framework (OMEGA). Proceedings of the European Conference On Games Based Learning, 604-612.

Vygotsky, L. (1978). The role of play in development. In *Mind in Society*. (Trans. M. Cole). Cambridge, MA: Harvard University Press.

Wasik, B., Avrich, J., Johnson, S., Koster, R., & De Zengotita, T. (2006, September). Grand theft education: Literacy in the age of video games. *Harper's*, 31-39.

Weininger, O. (1979). *Play and education: The basic tool for early childhood learning*. Springfield, IL: Charles C Thomas Publishing.

Winn, B. (2009). The design, play, and experience framework. In R.E. Ferdig (ed.), *Handbook of Research on Effective Electronic Gaming in Education* (Vol. III, pp. 1010-1024). Information Science Reference, Hershey PA.

APPENDICES

Appendix A: Evaluation Rubric for Reading and Design Discussions

Criteria	Level of Attainment			
	4	3	2	1
Purpose and Context of the Discussion *Includes considerations of purpose, audience, and the circumstances surrounding the task(s) or topic of discussion.*	Demonstrates a thorough understanding of context, audience, and purpose that is responsive to the assigned topic and focuses all posts in the discussion.	Demonstrates adequate consideration of context, audience, and purpose and a clear focus on the assigned topic (e.g., the posts align with audience, purpose, and context).	Demonstrates awareness of context, audience, purpose, and to the assigned topic (e.g., begins to show awareness of audience's perceptions and assumptions).	Demonstrates minimal attention to context, audience, purpose, and to the assigned topic (e.g., expectation of instructor or self as audience).
Individual Contributions to the Discussion *Includes completing posts in time for others to respond, as well as responding to others in way that advances thinking and understanding.*	Completes all assigned posts by deadline; posts are thorough, comprehensive, and advance the discussion. Proactively helps other team members advance their understanding of the topic.	Completes all assigned posts by deadline; posts are thorough, comprehensive, and advance the discussion.	Completes all assigned posts by deadline; posts advance the discussion.	Completes all assigned posts by deadline.
Facilitates the Contributions of Others *Includes engaging with others by building upon or synthesizing their contributions and inviting others to offer their perspective(s).*	Engages others in ways that facilitate their contributions by both constructively building upon or synthesizing the contributions of others as well as noticing when someone hasn't addressed part of the question fully and inviting them to clarify.	Engages others in ways that facilitate their contributions by constructively building upon or synthesizing the contributions of others.	Engages others in ways that facilitate their contributions by restating the views of others and/or asking questions for clarification.	Engages others by acknowledging their posts. (e.g.posts replies such as 'Good job' or 'Nice work')
Learning from Others *Includes providing evidence of an adjustment in one's own understanding, attitudes, or beliefs because of learning from others.*	Demonstrates evidence of adjustment in own understanding, attitudes, or beliefs because of working with and learning from others.	Reflects on how own understanding, attitudes and beliefs are different from those of others. Exhibits curiosity about what can be learned from others.	Has awareness that own understanding, attitudes and beliefs are different from those of others. Exhibits little curiosity about what can be learned from others.	Expresses understanding, attitudes and beliefs as an individual, from a one-sided view. Is indifferent or resistant to what can be learned from others.
Taking Risks *May include personal risk (fear of embarrassment or rejection) or risk of failure in successfully completing assignment, i.e. going beyond the assigned task, introducing new ideas, tackling controversy, advocating unpopular ideas or solutions.*	Incorporates alternative perspectives that may be unpopular or controversial approaches into the assigned topic in the discussion.	Incorporates new directions or approaches into the assigned topic in the discussion, or considers new directions or approaches, that go beyond the assigned topic.	Considers new directions or approaches without going beyond the assigned topic.	Stays strictly within the guidelines of the assigned topic.

Appendix B: Evaluation Rubric for Playtesting Reflections

Criteria	Level of Attainment			
	4	3	2	1
Curiosity	Explores the play experience in depth, yielding a rich awareness and/or indicating intense interest in the subject.	Explores the play experience in depth, yielding insight and/or indicating interest in the subject.	Explores the play experience with some evidence of depth, providing occasional insight and/or indicating mild interest in the subject.	Explores play experience at a surface level, providing little insight and/or indicating low interest in the subject.
Initiative	Completes required work, generates and pursues opportunities to expand knowledge, skills, and abilities.	Completes required work, identifies and pursues opportunities to expand knowledge, skills, and abilities.	Completes required work and identifies opportunities to expand knowledge, skills, and abilities.	Completes required work.
Transfer	Makes explicit references to previous learning/experiences and applies in an innovative (new and creative) way that knowledge and those skills to demonstrate comprehension and performance in novel situations.	Makes references to previous learning/experiences and shows evidence of applying that knowledge and those skills to demonstrate comprehension and performance in novel situations.	Makes references to previous learning/experiences and attempts to apply that knowledge and those skills to demonstrate comprehension and performance in novel situations.	Makes vague references to previous learning/experiences but does not apply knowledge and skills to demonstrate comprehension and performance in novel situations.
Reflection	Reviews prior learning (past experiences inside and outside of class) in depth to reveal significantly changed perspectives about educational and life experiences, which provide foundation for expanded knowledge, growth, and maturity over time.	Reviews prior learning (past experiences inside and outside of class) in depth, revealing fully clarified meanings or indicating broader perspectives about educational or life events.	Reviews prior learning (past experiences inside and outside of class) with some depth, revealing slightly clarified meanings or indicating a somewhat broader perspectives about educational or life events.	Reviews prior learning (past experiences inside and outside of class) at a surface level, without revealing clarified meaning or indicating a broader perspective about educational or life events.
Comprehension	Recognizes possible implications of the game for contexts, perspectives, or issues beyond the assigned task within the class or beyond the game's explicit message (e.g., might recognize broader issues at play, or might pose challenges to the game's design).	Uses the game, general background knowledge, and/or specific knowledge of the game's context to draw more complex inferences about the game's design.	Evaluates how game features contribute to the game's purpose/design; draws basic inferences about context and purpose of the game.	Draws basic inferences about context and purpose of the game.

Appendix C: Evaluation Rubric for Design Project

Criteria	Level of Attainment			
	4	**3**	**2**	**1**
Scope and Information *Examines the scope of the question(s) and determines the extent of information needed.*	Effectively defines the scope of the design question(s) posed. Effectively determines key concepts. Types of information (sources) selected directly relate to concepts or answer design question(s).	Defines the scope of design question(s) completely. Can determine key concepts. Types of information (sources) selected relate to concepts or answer design question(s).	Defines the scope of the design question(s) incompletely (parts are missing, remains too broad or too narrow, etc.). Can determine key concepts. Types of information (sources) selected partially relate to concepts or answer design question(s).	Has difficulty defining the scope of the design question(s). Has difficulty determining key concepts. Types of information (sources) selected do not relate to concepts answer design question(s).
Theoretical Perspectives *Applies theoretical perspectives/concepts to the design question or problem.*	Independently and accurately applies theoretical perspectives/concepts to a design question and considers full implications of the application.	Independently and accurately applies theoretical perspectives/concepts to a design question, but does not fully consider the specific implications of the application.	Applies theoretical perspectives/concepts to a design question, but the application is partially inaccurate and/or does not consider the specific implications of the application.	Applies theoretical perspectives/concepts to a design question but the application is inaccurate and/or does not consider the specific implications of the application.
Problem Solution *Devolops a logical solution to the design problem and justifies that design solution.*	Not only develops a logical, consistent plan to solve a design problem, but recognizes consequences of solution and can articulate reason for choosing solution.	Having selected from among alternatives, develops a logical, consistent plan to solve the design problem.	Considers and rejects less acceptable approaches to solving the design problem.	Only a single approach is considered and is used to solve the design problem.
Innovative & Transformative Thinking *Demonstrates novelty or uniqueness (of idea, claim, question, form, etc.) and connects, synthesizes, and/or transforms ideas.*	Extends a novel or unique idea, question, format, or product to transform ideas or solutions into entirely new forms.	Creates a novel or unique idea, question, format, or product and synthesizes ideas or solutions into a coherent whole.	Experiments with creating a novel or unique idea, question, format, or product and connects ideas or solutions in novel ways	Reformulates a collection of available ideas and recognizes existing connections among ideas or solutions.
Content Development *Provides content to illustrate (describe, explain, support) the design solution.*	Uses appropriate, relevant, and compelling content to illustrate the design solution, conveying the writer's understanding, and shaping the whole work.	Uses appropriate, relevant, and compelling content to explore the design ideas and shape the whole work.	Uses appropriate and relevant content to develop and explore the design ideas through most of the work.	Uses appropriate and relevant content to develop simple ideas in some parts of the work.