Leveraging transmedia game play and student design to target 21st Century skills:
Instructor experiences teaching computer literacy in *Broken Window*

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Abstract

There is evidence that video games can promote an inquiry-based and dynamic form of lifelong learning. For example, video games have been shown to support problem-solving processes, developing critical thinking skills, and foster the communication skills necessary for civic engagement. This study examined how scholarship is informed through problem based learning (PBL) and game play of an alternate reality game (AltRG). We examined instructor practices in an undergraduate course as a means of identifying those elements of the learning environment that inform the Scholarship of Teaching and Learning. Qualitative results are discussed in light of how large enrollment undergraduate courses can be designed to better promote cognitive engagement with academic literacy.

Background and objectives

As technology and media advance, becoming increasingly transparent in our daily lives, they also continue to change our ways of teaching and learning. Education in the 21st century is no longer defined by static guidelines but rather by growing, changing, and evolving sets of opportunities, projects, technology, and communities (Brown, Bryan & Brown, 2005; Hajhashemi, Anderson, Jackson, & Caltabiano, 2014). Emphasis is on learning through discourse, and the exchange of ideas, through critical thinking, problem solving and participatory forms of learning.

Traditional instruction is often content based, based on drill and response routines. It emphasizes the absorption of information rather than acting, engaging, exploring, practicing, and experimenting. Students may obtain high marks, but often lack meaningful insights and understanding required for using knowledge in productive or creative ways (Brown, et. al., 2005). By contrast, literacy in the 21st century requires students to investigate problems that require more than textbook formulas or simple rationales to solve. Instead, it requires the ability to explore, think laterally, retain, and transfer what is learned to new contexts. Unfortunately, many classroom pedagogies instead focus on simple acquisition and retention of reified knowledge and skills, because the outcomes of learning are assessed through multiple-choice, state-sanctioned tests.

For future employment, today's student requires a more dynamic form of learning, one of inquiry and lifelong learning that also involves a focus on computer literacy. Sullivan noted that "employers, in general, are looking for graduates with vital

soft skills, such as communication, action planning, and networking (p. 247).

How to foster these skills is another question. Bennett, et al. (2009) argued that to do so, students should to be actively involved in defining issues, producing and sharing information, and planning social action. Collaborative, expressive, project-based pedagogy provides an effective way to transfer learning outcomes to students' lived experience (Feldman, Pasek, Romer & Jamieson, 2007; Galston, 2003; Kahne & Westheimer, 2003; Niemi & Junn, 2005; Torney-Purta & Amadeo, 2003). As a result, post secondary institutions face increased pressure to re-examine curricula, improve instructional methods and use innovation to better engage and meet student needs. The idea is to improve undergraduate education by promoting the development of life long learning skills so they are better prepared for the world of work beyond their academic life. There is evidence that video games can address these goals by scaffolding problem-solving processes (Brush & Saye, 2009), developing critical thinking skills (e.g., Gee, 2007; Knijnik, 2012; Tobias & Fletcher, 2011), and fostering the communication skills necessary for civic engagement (Steinkuehler & Williams, 2006). Students can then transfer those skills to social action in their community.

Games and learning

Game-based learning offers a way to meet the needs of the information age and to better engage learners. What games are and how they should be studied have emerged from a cross between ludology (the study of games as formal rule systems) and narratology (the study of games as texts) (Steinkuehler, 2006, p. 97). While, many of the

earliest games supported training and learning objectives (Herz, 2001), educational games in the form of simulations, were mostly part of academic computer science departments such as *Spacewar* developed in 1960. The first computer game was developed by Steve Russell, a young graduate in 1961, on a PDP-11 computer at Massachusetts Institute of Technology. Arguably this first game exhibited learning capabilities as well as was collaborative in its application (Herz, 2001, p.169). Programming the physics simulations, allocating resources and representing scale and perspective – all were necessary to make the game better" (Herz, 2001, p.170).

One of the perceptions about games has been that they cause violent behavior and promote aggression, which partly explains why learning through games is only now becoming part of the toolset of the tutor. A comprehensive meta-analysis by Anderson and Bushma (2001) found that playing video games promotes aggressive behavior, particularly for children and young adults. Their analyses revealed that exposure to violent video games increased physiological arousal and aggression-related thoughts and feelings, while also decreasing prosocial behavior. By contrast, more recent research focusing on user motivations (Granic, Lobel, & Engels, 2014; Sherry, 2007) has found that the impact of video games on children has found no link between aggressive real world behavior and video game playing - even when studying children with clinically elevated depression or attention deficit disorder (Ferguson & Olsen, 2014). For the most, game-based learning has represented learning through video games (Gee, 2003, Steinkuehler, 2006). Many off-the-shelf commercial video games have extensive time lags before the learner is able to master the interface and lack sound pedagogy essential for learning (Gee, 2003; Taylor, Carboni, Fachantidis, Vlahavas, & Torrey, 2014).

Further, the game-based activity does not always show relevance to the learning objectives on hand.

Advances in computer technology and networked learning of interactive digital media provide new opportunities for learning; one of designed learning spaces that are immersive and representative of individual, and collective activity, and how this activity changes over time. The learner is immersed in the complex system and experiences what it is like to abide by the rules of the system. He develops identities in relation to the established community of practice and learns the intricacies of the system itself (Brown et. al., 2005; Hajhashemi et al, 2014). Such games help players invest in new identities or roles, which in turn are powerful motivators for new and deep learning in the classroom and the workplace (Brown et. al., 2005).

Games and engagement

In terms of graphics, as interaction and narrative online computer games have become more complex this has given rise to a variety of genres, some dominating the market more than others. This includes strategy-games, adventure-games, role-playing games, hybrid forms of game based learning, and augmented, mixed & alternate reality, among others (Minović, Milovanović, & Starcevic, 2013; Kirriemuir & McFarlane, 2006). Massively Multiplayer Online Role Playing Games (MMORPG) such as World of Warcraft™ involve a large number of players that interact with one another in virtual worlds (computer-based simulated environments), via text/audio, and three dimensional, avatars (Minović, et al, 2013; Kirriemuir & McFarlane, 2006). Conceptually, MMORPGs follow the rich tradition of alternative worlds that science fiction and fantasy literature provide (e.g., Tolkien's The Hobbit, 1938). Steinkuehler (2006) described them as:

Virtual worlds loosely structured by open ended narratives where players are usually free to do what they please slay ogres, siege castles, barter goods or shake the fruit out of trees. The virtual economies are significant each world having its own in-game currency, in-game goods, in-game trading and therefore in-game economy (p. 299).

These narrative based environments allow players to collaborate, strategize, plan, and interact with objects, resources, and other players within a multi- modal environment (Minović, et al, 2013; Dickey, 2006). They have shown themselves to be powerful forms of modern gaming as they allow the possibility of reliving situations and conflicts in different settings and conditions (Minović, et al, 2013; Salen & Zimmerman, 2004). It has been proposed that games make use of sound learning principles such as:

- They present information on demand, just on time in context of actual use
- They keep the content challenging and doable, pleasantly frustrating but motivating.
- They allow players to be producer's not just consumers: that is players are actively involved and their actions help procreate further activity.
- They help the player form generalizations as to what will work and what won't, thus they act as hidden tutorials for learning the material.
- They create a cycle of expertise presenting the same problem over and over again until mastery of the skill is achieved (Gee, 2003, pp. 15-23; Chang & Lin, 2014).

Game play has been indicated to support valuable skill development such as strategic thinking, organization, communication, negotiating skills, group decision-making and data handling (Minović et al, 2013; Kirriemuir & McFarlane, 2006). Such games can help

players to invest in new identities or roles, which in turn can be powerful motivators for new and deep learning in the classroom and the workplace (Gee, 2003).

Online games have been correlated with increasing engagement, motivating learners to perform at increased levels on both standardized achievement items (Barab, et al., 2009) as well as scored writing samples with an earlier game called *Anytown*, which was designed to support traditional literacies such as reading and writing (Warren, Dondlinger, & Barab, 2008; Warren, Dondlinger, Stein, & Barab, 2009). Further, as required by social constructivist theorists such as Savery and Duffy (1995) and designers, games may allow for the design of authentic learning experiences and participation in authentic learning practices.

Though the primary purpose of most games can be expected to be entertainment, many also leverage sound cognitive principles such as gaining and keeping attention and leveraging rewards to foster intrinsic motivation by making learning fun through "engagement." Engagement is "a sense of exhilaration and deep enjoyment" (Csikszentmihalyi, 1990, p. 3). It is relative to a particular task and though it promotes "concern of the self" to disappear during the task, it tends to make it grow stronger afterwards. The player, through strong feelings of attachment to the content of the game, becomes completely in touch with their self and abilities (Jones, 1998, p. 206). Described as a state in which awareness of everyday activity is lost and the sense of time is altered; it is the complete and total engagement in a task (Jones, 1998, p. 206) this is also referred by Csikszentmihalyi as "flow." Prensky (2001) likens enjoyment during game play to this concept of flow summarizing it this way:

In the flow state, the challenges presented, and your ability to solve them

are almost perfectly matched, and you often accomplish things that you didn't

think you could; along with a great deal of pleasure (p. 124).

Therefore, effective games instill an intense feeling of engagement; feelings so intense

that players forget the need to eat, and ignore the need to sleep just to be able to solve the

puzzle. It was suggested that understanding the deep structures of game play that

contribute to "flow" and "engagement" can help game developers build better

environments that help support the process of learning (Jones, 1998).

Research Question

This study examined how scholarship is informed through problem based learning

(PBL) and game play of an Alternate Reality Game (AltRG). These games are considered

a subset of transmedia experiences that draw players across the Internet to solve

problems, work together, and encourage both the acquisition and use of media literacy

skills through emergent play and critical thinking. We examine instructor practices in an

undergraduate course that leverages alternate reality games. This is done as a means of

identifying those elements of the learning environment that inform the Scholarship of

Teaching and Learning (SOTL; Prosser & Trigwell, 1999). Additionally, we discuss how

findings of this study has lessons for many large enrollment undergraduate courses to

promote engagement and academic success regardless of the content area being taught.

THEORETICAL FOUNDATION

The debate over the quality of teaching and learning in higher education settings

is not a new phenomenon and has persisted for sometime (Ramsden, 1992; Prosser &

Trigwell, 1999). Some scholars view teaching to be more of a research-oriented function,

while others place emphasis on its instructional component to enhance the status of teaching as practiced. Subsequently, the forms of instruction that promote effective and successful learning are often viewed with a wide lens and may be loosely defined within the arena of "best practices" (Gambrell, Mandel Morrow, & Pressley, 2007).

Habermas' Theory of Communicative Actions

In order to address the problem of this split of worldviews into objectivist, subjectivist, and relativist (Bernstein, 1983), the work of Jurgen Habermas' (1981a, 1981b), the German sociologist, pragmatist and critical theorist sheds considerable light on learner interactions and the social-construction of knowledge without falling prey to privileging one form of knowledge over others. Critical theory is the critique of ideology to enable individuals to become self aware of knowledge distortions (Habermas, 1971). Whereas empirical and interpretive social scientists describe the world as each perceives it, critical theorists seek to understand *why* the social world is the way it is and, more importantly, through a process of critique know how it *should be* (Habermas, 1971).

This self-awareness of knowledge distortion is enlightenment – a necessary pre-condition for individual freedom and self-determination. Underlying the process of critique is the concept that existing social structures and beliefs are socially constructed and therefore are changeable through social action. The individual takes freeing (emancipatory) action that changes the social system to permit the realization of his or her unique potential and therefore is emancipated (Habermas, 1984).

Within Habermas' Theory of Communicative Action, human speakers and their acts of communication are the means by which there is the creation of shared meaning among participants. Communicative actions are "acts oriented to achieving, sustaining and reviewing consensus " (p.17). The speech acts raise "validity claims" as they claim to be valid or acceptable representations of some facet of the world. Habermas (1984) argued that, with the participants' implicit response of "yes" or "no," the speaker accepts a speech-act offer and grounds an agreement (p. 296).

Learning and Teaching as Communicative Actions

While originally outlined by Warren and Stein (2008), over the last five years Warren & Wakefield have extended Habermas' work into education-focused theory of Learning and Teaching as Communicative Actions. It is expanded to contextualize learning and teaching as activities that have inherent claims to truth and knowledge that emerge from the designed instructional activities and the discourse that accompanies them as presented in Table 1.

Table 1: Examples of educational communicative actions in learning settings

Communication Type	*Function*	Example
Strategic (Teleological) actions are geared towards effectively getting what the student or teacher wants from the objective world and what one wants to communicate as true or valid knowledge.	Communication is geared towards effectively getting what the student or teacher wants from the objective world and wants to communicate as true or valid knowledge.	Students are told by a teacher to read a section of a textbook containing objective knowledge regarding Roosevelt's New Deal. The knowledge contained has previously been socially agreed upon as valid by a state school board or local district. Students may then evaluate what information is truthful and either accept or reject what has been communicated by the text and, by extension, the instructor. However, in this form of communication, no negotiation regarding this truth claim emerges and ends with acceptance or rejection.
Constative are geared towards allowing students to interactively and inter-subjectively make and challenge claims to the validity of objective and even subjective knowledge. In this case, a truth claim is challenged or accepted through communicative negotiation such as argumentation regarding the entirety of a claim or particular supporting evidence or critique of sub-claims	Communication focuses on allowing students to interactively and intersubjectively make and challenge claims to the validity of objective and even subjective knowledge. A truth claim is challenged or accepted through communicative negotiation such as argumentation regarding the entirety of a claim or particular supporting evidence or critique of sub-claims (Habermas, 1984; Warren et. al., 2008).	An instructor may make a claim to spur discourse amongst students in their class. As they challenge the truth of the claim and develop counter-claims. Such as imposing severe punishments on students for failing to return home before curfew. This may spur discourse between and among students as to the fairness of curfew laws during historic wartimes that learners can use to draw parallels with the world today. This may spur discourse between and among students as to the fairness of curfew laws during historic wartimes that learners can use to draw parallels with the world today.
Normative relate to the validity of claims about group, institution, and societal rules. Such actions are constructed through consensus with other faculty, administrators and the students of a class.	Communicative actions relate to the validity of claims about group, institution, and societal rules and norms. Such actions are constructed through consensus with other faculty, administrators and the students of a class.	The teacher communicates the norms of appropriate behavior including rules for grading, required assignments, attendance and class expectations. Students may choose to follow or not follow those they feel are valid. Rule transgression is an implicit rejection of that truth claim. These may also be further negotiated within the classroom group.
Dramaturgical actions allow for individual expressions of truth and personal identity such as when a teacher teaches with an inner passion for the subject matter with the goal of inspiring similar passion in students. It is taking action to achieve a purpose related to one's identity or personal truth; however, it is open to interpretation by learning participants.	Such communications are those that allow for individual expressions of truth and personal identity such as when a teacher teaches with an inner passion for the subject matter with the goal of inspiring similar passion in students. These are about taking action to achieve a purpose related to one's identity or personal truth; however, it is open to learner's interpretation.	Dramaturgical action would be to ask students to develop some artistic work (i.e. dance, poem, painting, drawing, story, etc.) that is an expression of their personal identity. These expressions would be open to critique for improvement by peers in order to improve the level to which the artwork communicates the meanings intended by the artist.

Technology and LTCA

      Virtual worlds and modern, digital communication offer learners a medium through which "social presence" can be created, and where such communication and learning can be achieved as indicated by Warren, Dondlinger, et al (2011). In these spaces, autonomy centers on the learners themselves to select, combine, and coordinate motivational and cognitive strategies, in elective ways to control their own learning. However, Martin Heidegger (1966) warned that technology may distort the human communication that we claim is at the heart of learning and teaching. He suggested that it is possible that it is changing our identities, and how we interact with the world. Further, how we present ourselves to others in online instructional settings is often limited by our personal abilities to manipulate and use the tools to communicate, which may present a distorted view of the individual.

      Heidegger stated, "We can affirm the unavoidable use of technical devices, and also deny them the right to dominate us, and so to warp, confuse, and lay waste our nature (p. 54)." Based on this, it follows that we have an ethical responsibility to leverage technology while minimizing this distortion by thinking deeply about how it influences us. Further, we should consider whether it should be used and whether it serves the interests of teaching and learning (Warren & Lin, 2012). This is in contrast to how, in the history of instructional technology, it has been used where technology has guided or limited instruction to what it allows rather than what is needed to be allowed for effective educational communication (Heidegger, 1966).

LTCA Theory Instructional Principles

In order to learn, LTCA claims that student experiences should mirror four main characteristics. Each followed by a suggestion for designing instruction based on the LTCA instructional principles is in Table 2.

Table 2. LTCA normative and strategic instructional design principles

Communicative Action	Principle	Design Direction
Normative	Allow students an opportunity to negotiate norms and classroom rules that support their learning experiences. Students and instructor should construct norms that will guide effective communication in which all members of the classroom may fairly and respectfully critique claims to truth and knowledge.	When preparing learning experiences, include and model initial rules for behavior and discourse, but allow for whole class negotiation and modification of these norms early and regularly in response to expressed need. The instructor may start with the rule that no one may speak without raising their hand and being recognized by the teacher. However, through negotiation, learners may instead establish conditions under which they may speak without the instructor's permission.
Strategic	Provide knowledge of or access to shared, socially validated facts that can be communicated by an instructor or technological tool including textbooks, web sites, and other repositories of reified knowledge.	When designing instruction, include activities that communicate basic, socially validated knowledge to give learners a framework for understanding, discourse, social and relative knowledge construction, and other future learning experiences. That knowledge which comes to schools from the state has been subjected to numerous challenges to claims to truth prior to being instituted in state standards. While some may be faulty, they provide a starting point for shared understanding and a place to begin critique of validity.

Table 3. LTCA constative and dramaturgical instructional design principles

Constative	Give opportunities for learners to engage in critical discourse centered on understanding claims to truth and knowledge put forth by peers, instructor, textbooks, and others capable of doing so and to have their own claims to truth and knowledge critiqued and challenged towards a larger goal of constructing or acquiring validated knowledge to be used towards making future change.	Include specific opportunities for learners to critique challenge existing claims to knowledge and truth from texts, instructor, peers, and other sources of reified knowledge. Allow students to construct their own claims to truth and knowledge and allow them to be tested for validity by peers, instructor, and, if applicable, experts. As put forth in social constructivist views, communication among and between learners is an effective means of constructing knowledge. However, any knowledge emerging from this discursive process must be open to the crucible of critique in order to test its validity.
Dramaturgical	Make available chances to safely express their personal identities, passions, and other internal, relative or subjective truths and knowledge, which are open to respectful critique through discourse with peers, instructor, and others.	Design instruction that allows learners opportunities for safe personal expressions of identity, while still allowing for minor critique. While a poem a student writes may be an expression of their personal identity and truth, it is still subject to critique as to its validity through discourse in a social setting no differently than when a Broadway musical is subjected to newspaper critics.

When designing a learning environment according to these principles, it is also suggested that it include supporting scaffolds for modeling and tools for making communication efficient and respectful, as critique is at the heart of learning in this theoretical model. Further, learning activities should include instructor cognitive challenges to learner truth claims based on established research in cognitive, social, behavioral, and communication theory research. This allows a balance between the instructor and student power in the learning relationship rather than centering all power with the student, which may devalue any truth claims brought by the instructor in the eyes of learners, leading to misconceptions and miscommunications.

Problem-based Learning

While also including strategic, state-mandated learning objectives, the design of instruction also follows the social constructivist instructional design principles for knowledge construction put forth by Duffy and Cunningham (1996) to support constative and normative knowledge construction. Problem based learning (PBL) is a learner-centered approach that helps learners to acquire and develop the knowledge and skills needed to solve problems effectively (Boud & Feletti, 1991). Introduced initially by Barrows (1996) to prepare medical students for the realities of clinical practice in Canada, PBL extends across many disciplines. According to Jonassen (1997; 1999), ill-structured problems enable the learner to engage in different cognitive processes and often require different problem solving skills. They prepare students to solve issues encountered in real life. They are complex and have multiple solutions.

The principles of PBL — contextuality, collaboration and experientialism (Boud & Feletti, 1991) — are utilized game-based learning. Specifically, learners engage in story-

driven tasks embedded in realistic contexts, interact amongst each other and the

instructor, face artificial conflicts and develop defensible solutions to a problem or

conflict. Learning goes beyond the acquisition of surface level skills and memorization.

The allure with games for learning is that they have the propensity to situate learning in

contexts that represent reality such that knowledge gained in the digital environment is

cognitively transferable to real situations (Denzin & Lincoln, 2003). Thus they support

the development of life long learning skills. Figure 1 presents an overview of the

commonalities between problem-based learning and game elements, and how together
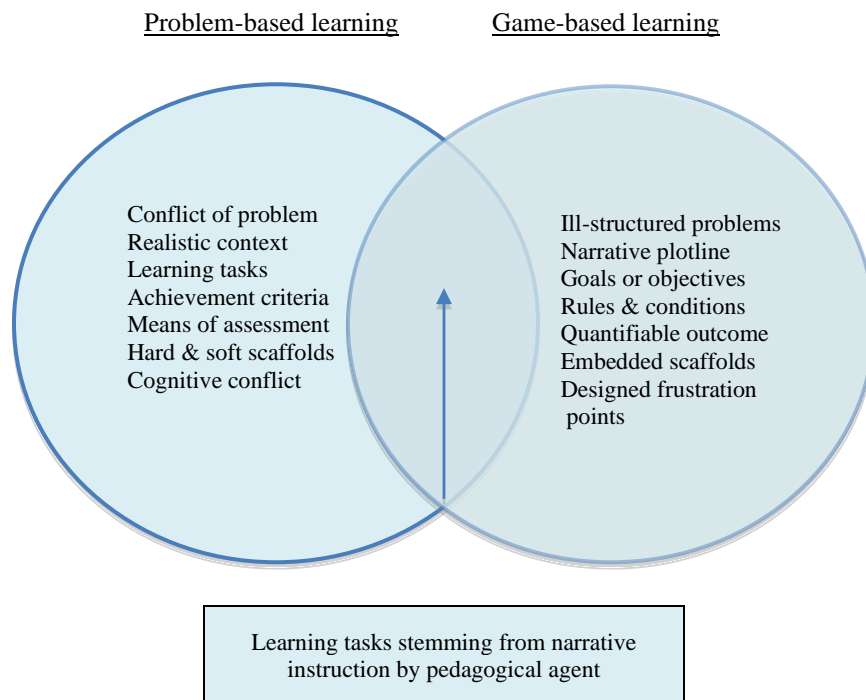
they inform teaching and learning.

Problem-based learning   Game-based learning

Conflict of problem
Realistic context
Learning tasks
Achievement criteria
Means of assessment
Hard & soft scaffolds
Cognitive conflict

Ill-structured problems
Narrative plotline
Goals or objectives
Rules & conditions
Quantifiable outcome
Embedded scaffolds
Designed frustration
 points

Learning tasks stemming from narrative
instruction by pedagogical agent

Figure 1. Similarities between games and PBL principles fromWarren & Dondlinger, 2009

Educational transmedia: Alternate reality games

Alternate reality games (AltRG) are a game genre that supports such learning. It can be viewed as the first narrative art form, native to the Internet, because its storytelling relies on the two main activities conducted there: searching and sharing of information (ARGNet, 2008). It uses, any and every application available on the Internet as small parts of the wider game and the real world as a platform (Dickey, 2006). The contents of the narratives constantly intersect with reality. The *Rabbit Hole* is the point of entry; the first puzzle piece or event signaling the beginning of the game. The teacher controls the characters in their role as the Puppet Master. They use the narrative to follow the *Trail* to uncover clues and solve puzzles during the transmedia game (ARGNet, 2005). Feedback is embedded within the system to help students overcome difficulties with learning tasks (Bryan, Dena, et al, 2006).

Educational AltRGs that make "knowledge" their product can be found on viral platforms in the form of Second Life learning games (Wakefield, Warren, Rankin, Mills, & Gratch, 2012; Warren & Wakefield, 2011). Several alternate reality games, often led by activists and educational organizations, have included as *World Without Oil* (McGonigal, 2011), *The 2015 Project* (Warren, Lee, & Najmi, 2013; Warren & Wakefield, 2014) and were used to encourage students solve real world problems. Yet, others like the *Hexagon Challenge* and *Never Rest Game* targeted decision-making skills and performance adaptation (ARGNet, 2008). Serious AltRGs such as *World Without Oil* (McGonigal, 2011) used the power of "collective intelligence" to come up with a solution to manage a real world crisis; namely, a dramatic decrease in availability of oil. As a result of their play and associated learning about the consequences of this loss, some players changed their real world behavior by planting trees or converting their cars to run

on bio-diesel (Strickland, 2007). The simulated problem often prompted players to yield practical solutions and use real world applications of the knowledge constructed in the simulated play space.

When combined with PBL methods and an AltRG, we hypothesized that the narrative of the game-based learning environment would provide cognitive scaffolding. It is through this experience that knowledge and skills should be more easily transferable, a view supported by Kiili (2007, p. 3). The use of artificial conflict that is common in digital games can be used to create interesting interactive content that can be used to drive student motivation and problem solving in immersive ways that engage students Csikszentmihalyi (1991) idea of *flow*.

Scholarship in Teaching and Learning (SoTL)

Along with the assertion to facilitate student learning comes the importance of support for faculty learning, as "teaching and learning have an element of reciprocity where faculty can learn from students as students are learning from faculty" (Boyer Commission, 1995, p. 15; Vanderbilt Amigo, 2002). Hutchings and Shulman (1999) argued that "it is the ongoing and cumulative intellectual inquiry, through systematic observations and ongoing investigations by faculty, into the nature of learning and the impact of teaching on it (p. 6)."

The Study

The course redesign was part of a campus wide initiative aimed to improve student retention, satisfaction, and academic achievement in a large enrollment, undergraduate course (Warren, et. al., 2010). The goal was to increase student

engagement and improve learning outcomes. The original course was designed on a

traditional lecture-project-test approach using an Adobe Flash™-based online computer

assisted instruction (CAI) system (Thomson Course Technology, 2007). Most learning

objectives focused on a narrow set of skills such as how to open, save, or close a file.

Further, students were not introduced to online productivity or collaboration tools (i.e.

weblogs, wikis, social networking sites) that could be invaluable in their academic and

professional careers (Warren, et. al., 2010).

Both PBL and AltRG concepts were used to redesign the Introduction to Computer

Applications course. Based on a two-tiered narrative *The Door* AltRG framed the

activities and provided the context for problem solving (Warren, Dondlinger, McLeod, &

Bigenho, 2011). Students were "hired" by fictional clients to work in small groups to

solve ill-structured problems to create specific products. The second tier of the narrative

engaged students in the game structure and involved mysterious happenings, artificial

conflict, and "win" conditions that rewarded players with additional information and

resources for completing first tier, PBL tasks (Warren et. al., 2008, p.11). As students

moved through the story at both levels, clues and minor puzzles are revealed. The

instructor functioned as the Puppet Master to help students navigate the unsolved

mysteries of each task, and facilitate them through the learning process (Warren,

Dondlinger, et. al., 2010).

A variety of online resources were used to provide objective information about the

ill-structured learning tasks and to spur communications among students, instructors, and

game characters. Additionally, a number of different communication tools both

synchronous and asynchronous (i.e. chat, instant messaging), podcasts, video clips, wikis,

and weblogs were incorporated into the course. These allowed for socially constructing shared knowledge, including meetings within Linden Labs' *Second Life™* (SL). Students could use these tools to challenge information offered by the instructor, peers, and even some of the pedagogical agents, which were encountered as digital avatars or e-mail contacts. The two-tiered narrative was designed to challenge students to rethink their surface-level understandings of what was presented to them by the game characters, peers, and even the instructor.

Further, job aids were available to instructors to guide them in implementing the instructional content and the game-play. Graduate students were assigned as graders to assist with grading each task. Feedback was given via rubrics for each of the ill-structured tasks along with peer evaluations, which were taken into consideration before assigning a grade. The course was offered in three different formats, online, hybrid and face-to-face.

RESEARCH METHODS

Over 100 undergraduate students completed the course in the semester the study was carried out. Of those 30% were freshman and 27% seniors; the rest were roughly an even mix of juniors and sophomores. Data collected from the initial iterations of the course indicate an 8.55% difference in the percent of students who dropped, failed or withdrew between the comparison course and treatment, which while not significant shows some improvement in raw numbers (Warren, Dondlinger, Jones & Whitworth, 2010).

However, satisfaction, as gauged by the four question student satisfaction evaluation, the main measure used by the university to measure this construct, found that students reported higher levels of engagement than their counterparts who took the

traditional version of the course. In addition, the researchers found students perceived their problem solving skills as superior compared to students who completed the traditional one (Warren, et. al., 2010).

To examine the level at which scholarship was implemented, a qualitative method for the study was selected because it provided a richer understanding in a non-traditional way. Semi-structured interviews were conducted with instructors at the end of the semester. This was viewed as the best way to gather data, as the instructors would feel more comfortable expressing their views privately rather than in a focus group setting. Participation was voluntary; instructors were not offered any incentive for assisting with the study.

Participants

With the interview questions, we sought to spur instructor reflections both on their specific experiences with students participating in educational alternate reality game, as well as on their own role as instructors in transmedia teaching. Five instructors were approached for the study, only four instructors accepted, as the fifth was not available during that time. Jason, Kevin, Rob, and Tim taught *The Door* version of the course. With the exception of Jason, the other three instructors have taught *The Door* since its development in the spring of 2007.

Methods of analysis

In this study, constant-comparative coding was used to contextualize findings and develop a richer understanding of student experiences (Glaser, 1992). Two researchers conducted and transcribed the interviews. Audio clips were stored in the authors' computers; the institutional review board consent forms were placed in a secure filing

cabinet. After interviews were transcribed, they were coded individually before the

authors met as a team. Data analysis was conducted supported by organizing of codes,

categories, and themes using Microsoft Excel^{TM}. After repeated readings of the

transcripts, several common threads were identified with student experiences, instructor-

student interactions, peer-to-peer interaction and the problem-based context of learning.

The authors met several times to refine categories and themes.

FINDINGS

Overall, five successful benchmarks that inform scholarship in teaching and

learning were identified which link to the principles of the Scholarship of Teaching and

Learning. Instructors were able to incorporate the main principles of PBL; namely, these

were contextuality, collaboration and experientialism (Boud & Feletti, 1991). This was

enacted by utilizing game-based learning to engage learners, and provide learning

methods that better correspond with students' requirements and habits (Prensky, 2001).

Encourages contact between students and faculty

The narrative and character role-play of the game supported the instructors' role

of the facilitator and established several different ways of interaction between student and

instructor. Kevin described this as, "teaching through a narrative essentially; (it) forces

you to take more the guide on the side role." The approach engaged the instructors to the

extent that Jason described the experience of teaching the course through an Alternative

Reality Game to be "very unique" and he found himself "personally very engaged in the

class." Tim said that: "In a sense it broadens my ability to reach students, to engage

students in new and meaningful ways. I think in some ways that can be fun, learning

should be fun."

Kevin found he "had to work with students to (have them) buy into the storyline"

and was often trying "to get students to ask the questions that they weren't asking

themselves." On the other hand, Rob found "students who have experience using

computers appreciated the narrative and the game play more,"

Furthermore, the narrative and character role-play offered instructors a screen

through which to facilitate student learning. Jason referred to it as, "a metaphorical

screen; it actually made it kind of fun and interesting, and could actually get into the

character." He went on to elaborate that when role-playing characters such as Leto and

the Arbiter:

> I found that I would push back by telling students they need to contact these
>
> characters and I didn't know what they were talking about, then they would email
>
> the character I would respond as the character. If they asked me a direct question
>
> they got nothing. What they'd get is I have no idea what you're talking about,
>
> where did you hear about this? So, I was just this instructor guy who was also
>
> pulled into this world, we all needed to talk to Leto or the Arbiter.

Hence, the smaller, causally linked problems of an AltRG were perceived by the

instructors to be good tools for understanding cause and consequence chains (Kiili,

2005b).

However, the approach was not without limitations, lack of results on

standardized tests due to focus on practice rather than rote memorization, and the

extensive amount of time that teaching through this perspective takes are some of the

criticism leveraged against this method. All four instructors commented on the increased workload associated with the course. The instructors acknowledged the challenge of keeping up with the characters of the narrative and the different student teams. Rob stated that:

> It was busy trying to keep groups in three different places going moving forward knowing where they were. There (were) really three different dialogues going on at any given time.

Moreover, students were progressing through the course at different paces, and multiple grading systems meant that the instructors had to track individual and team progress at various points of the projects. Tim felt overwhelmed by the amount of tracking and grading required of him stating that, "the grading process was phenomenal. The hardest part was the sheer amount of time it takes even with the grader, it's a very chunky process." Rob described this in more moderate terms,

> Unfortunately, if anytime there is an online aspect email, asynchronous communication it just slows things down. It increases your time. There were again those students that, even though it was written there, they wouldn't read it and (instead) fired off an email. 'Well, did you read the feedback? No.' So, e-mail got the job done…I hated it, but it did its job.

Develops reciprocity and cooperation among students; encourages active learning

Next, all four instructors believed that their roles as facilitators rather than teachers helped empower students. They were expected to take the lead in teaching and learning. Kevin noted that " the students who wanted to put forth the effort and try to figure things out and problem solve, were the those who got involved in group work and

they seemed to do fine." In terms of group work, Rob stated "the groups that worked well, could bounce ideas off each other and would relieve some of the load off (of) me."

In the hybrid version, face-to-face communication occurred during class meeting times where students could meet with the instructors for help on their problem solutions. Much of this involved informal learning as instructors left it up to the students who needed help and allowed them to initiate meetings. Tim found that

> (b)ecause they would sit and…think about the problem…they would debate it (and) discuss…they would say 'I think this means this and I think this means this.' So, I do believe they were actually constructing their own knowledge, and truly getting involved.

However, not all students shared in this attitude. Jason noted that many students "wanted to be told what they needed to do." Kevin called it, "resistance: they don't want to mess with the game aspect while it could add to there experience and help them." He compared it to "you can lead a horse to water but you can't make it drink." Some students were not comfortable learning in this manner and wanted to be given information and regurgitate it on a test. Rob put it this way: "they've been ingrained in this you know; there is only one right answer and you either regurgitate it to me (correctly) or…it's wrong." This indicated that the absence of structured instruction made some students uncomfortable. They were not used to charting their own path to learning as is required by PBL and were not prepared for the level of communication required by LTCA theory. The instructors indicated that additional scaffolding was needed to guide students who were not comfortable with autonomous learning.

Gives prompt feedback and emphasizes time on task

The fourth and fifth benchmarks focused on how feedback and time on task enhanced student learning. The rubric, peer evaluations, an assigned grader for each instructor, and the narrative each provided feedback structures. Jason noted that students had three different ways to communicate and seek assistance with the content of the class: 1.) through the characters of the story; 2.) from each other and; 3.) the instructor. Kevin made the comment, "the overall feedback in most cases was much more substantial than other classes where an assignment would be turned in and they would get a grade back."

Rob said that during the process "there was a lot of communication between the grader and I, and in some cases, we actually discussed the project that was up on the screen before we wrote out the feedback." Jason described the process as,

> All the feedback was broken into generally four domains reviewed by three fictional characters. One person would play character number one, the second person would play character number two and the third person would play character number three…of course students were receiving this feedback from three different perspectives.

Jason described the roles of the characters and instructors this way:

> One who was almost entirely focused on the content…did it meet their specific needs…another on the structure and formatting, is it professional looking? Would it work outside of a class environment or outside of the fictional context, in say the student's professional career regardless of what it maybe. Finally, one (examined the work) from an overview (perspective): did it meet all these, both of

those, and where else can it go pushing, It (was) sort of like the facilitator or somebody who was just looking at the (work from a) comprehensive view of that project itself.

The feedback could be revised and re-submitted if the solution was far from expectations. Therefore, everybody moved through the narrative and learning process, but started and finished at different levels. Each task followed a pre-determined due date by which the student team was to have submitted the solution. Tim made the comment that "students don't respond without due dates." Due dates for each task were clearly indicated in the syllabus, though were not often followed by learners who often asked for extensions.

Communicates high expectations, and respects diverse talents and ways of learning

Analysis of the interviews revealed that problem-based learning provided the students with opportunities to acquire and develop the knowledge, skills and capabilities needed to solve problems, effectively (Engel, 1997). The two-tiered narrative, coupled with open-ended tasks, provided students multiple pathways to learning. Rob described the high expectations set for all students as,

Each group could put their own stamp on each project, yes, and they could either reach that plateau, or exceed it. Or, they would fall under it. If they fell under it, they still had the opportunity to revise and go on but anything that was really low went back to them immediately.

However, all four instructors acknowledged that students struggled with problem-based learning. Tim noted that some of his students had a predetermined idea of what the course would be like even before they came to class and that it would be taught from an information processing or acquisition model as described by Sfard (1998). As a result,

many students resisted the idea of solving ill-structured problems in order to learn the class content. Kevin described how some students got angry early in the semester. Specifically, one student voiced her frustrations saying, "'I don't know what to do; you are not telling us what to do. We are totally lost. I can't learn like this.' (However,) by the end of the semester she had (the problem solving) down."

Rob also described the first four weeks of his course as 'growing pains' where the students struggled with self-directed learning. Each instructor made extensive use of the narrative, the game characters, gradual release of the clues to the storyline in order to increase intrigue and motivate students. As a result, Jason realized early on that,

> I had to let go of the idea we have to keep marching forward, if somebody needs to circle around awhile in order to get it, that had to be okay. The open-enededness of this method allowed each team in each student group to kind of follow their own path and learn what was important for them.

Kevin acknowledged that "many students had difficulty with learning in this manner and it wasn't until the very end, they said 'Oh!'"

The basic idea was to anchor the learning of knowledge and skills into meaningful problem-solving situations encountered in everyday life. The authenticity of learning situations and tasks is an important factor in facilitating higher order learning (Brown, Collins & Duguid, 1989). Such an approach supports the transfer of learned knowledge and skills into practice (Savery & Duffy, 1995). However, it was also necessary to overcome existing student world views regarding what knowledge and learning are before they could be successful in the course, which was challenging for all instructors.

DISCUSSION

Through interviews with instructors, we captured data regarding the experiences of instructors in a redesigned, innovative, undergraduate course. A qualitative analysis of the data was employed in order to gain a richer more contextualized understanding of instructor practices, and how they chose to leverage scholarship, through problem based learning and game play of a transmedia alternate reality game.

Chickering and Gamson's (1987) seven principles that inform scholarship in undergraduate education were evident at all levels. The problem solving and game elements of the learning environment (i.e. narrative, ill-structured problems and game characters) engaged both students and instructors. These elements provided structure and scaffolding for the learning tasks. Instructors reported leveraging multiple methods to better engage and motivate students through the game characters and technology (i.e., email, chat, text-messages, blogs, wiki's, social networks etc.). Further, students and instructors through strategic, constative, normative, and dramaturgical acts of communication could use any method to come to an agreement on what the course required from them and what they must do.

Students were allowed to respond to ill-structured problems in the way they thought most appropriate. While the tasks were open-ended and the solution was based on the group consensus, it provided many opportunities for learners to communicate and challenge claims to truth made by each member of their group while discursively constructing norms and rules for behaving in class. Students were able to revise and resubmit any poorly constructed solutions using feedback communicated by instructors. Students moved through the course at different paced as they often started the semester at different skill and knowledge levels. The curriculum and instructors along with multiple

options to demonstrate the skills they learned set high expectations for all students. Both summative and formative feedback were part of the course assessment including student reflections using blogs, solutions to ill-structured problems, pretest, midterm and final exam. Additionally, instructors had the support of a job aid, graders, rubric, and peer evaluations to facilitate student learning and ensure prompt feedback was given.

However, the study is not without limitations; instructors reported that frustration was high as many students resisted this way of learning. Learners often struggled with their epistemic view of what learning should be, which was largely informed by their experiences in elementary and secondary public schools. They wanted things to be listed out for them and to be told what to do at every step. Many disliked working in groups and struggled to communicate with one another without instructor intervention.

The instructors also reported that many students lacked self-regulated learning skills necessary for successful learning such as organization, time management, self-monitoring, information seeking skills, and planning. As a result instructors were inundated with email from students resistant to taking responsibility for their own learning. Despite this, many students came around by the end of the semester and recognized the necessity of interpersonal communications skills for their future success in their careers beyond school. Instructors also, noted there were several students who did enjoy learning independently from the start. Some, key points that have emerged about learner attitudes and preferences for learning in such ill-structured, problem-based learning environments are presented in Table 3 below.

Table 3: Learner attitudes and preferences (Warren et. al., 2009)

Students learn the best when they are engaged & motivated and can actively participate in learning
They choose methods to learn by that match past experiences
They prefer prescriptive teaching methods
They often neglect to read directions and instructions compelling the need to implement additional measures to communicate class content & material
They prefer to have choices as well as multiple means of access to information
Some learners don't want to learn what is taught in a game while some don't want to play a game at all
They perceive education to be a product or service and see themselves as consumers purchasing it
Many lack self regulated learning skills

These learner attitudes and preferences indicate possible revisions to be considered for future iterations of the course that could help to improve student learning and instructor practices, and are,

- Yearly revision of course requirements

- Larger learning projects and problem solving not disembodied tasks plus rubric based assessments

- Leverage game elements to improve student engagement

- Instructors central role in teaching and learning

- Increase number of required class meetings to enable support for student communication through direct modeling and face-to-face contact

- Embed into course content routines to support self regulated learning skills

LTCA-supported transmedia in practice

Both, the problem-based learning and the AltRG narrative driven, game based design of the course provided numerous ways to communicate and negotiate knowledge. All four means of discourse for communicative action were noted. *Strategic*

communication of information for students and instructors was presented through the game characters, email, chat, discussion forums, blogs, wiki-guides, audio/video links, podcasts, social networks, and Second Life. In each instance both students and instructors could negotiate and choose the communication tools and activities that they thought were most relevant and useful for their needs.

The need to work in groups to come up with a solution for the ill-structured problems caused students to be engaged in *constative* negotiation in order to reach agreement on the best resources to use given the problem on hand as well as to engage in time management, planning, organization, and information seeking activities that were necessary for successfully completing the course. Students had the choice to accept or reject one another's claims and resources, leading to discourse intended to reach consensus as to how to approach the problem and proposed solutions. Some groups engaged in more constative discourse than others; this was also evident with their communication with the instructor as they negotiated their own understanding of the task and the requirements that were acceptable to them. Kevin described the negotiation as, they wanted some sort of document that said 'for Task One you are to provide *a, b, c, d* they didn't want to have read it in paragraph form, and you know carefully critique or evaluate what they were reading, to try to determine what was being asked of them, they wanted it listed.

Normative claims, specific to university policies, were communicated through the syllabus and verbal review by the instructors of the class, such as rules related to cheating and plagiarism. Others were more specific to the course itself, such as grading policies, deadlines for the tasks and final exam dates; however, they could negotiate some of these

with their instructors. Moreover, students had to follow further guidelines provided through the rubric for each task and peer evaluations. Students were also expected to establish normative guidelines for participation among their own teams, which emerged organically. Noticeably, this was an area that challenged students and instructors reported to be problematic. Kevin described it as,

> A lot of those students just didn't want to have anything do with a partner (and) the cases where it didn't work was with students that didn't want to put forth the effort; (however, for)…students working in collaborative groups, it provided them the opportunity to bounce ideas off of each other to go in different directions and to express their creativity.

Dramaturgical actions were evident as students engaged with the fictional characters of the narrative and learned how to deal with the different personae of each rather than the single instructor. Also, when student teams used a variety of media to express their solutions to a problem, it was clearly evident as Rob said:

> Then yes…it's not this one random teacher that I'm trying to please they're these other people out there that are seeing what I am doing. The narrative context of these (students role playing) professionals working for clients really helped push them.

CONCLUSION

The course was redesigned to enable students to transfer their skills across disciplines and develop critical thinking skills. Technology proficiency is an important component of the Texas K-16 curriculum. Rather than repeat previously taught skills and materials, students were taught to apply their knowledge of computer applications through authentic, real world tasks such as working in groups, solving problems, and

creating authentic products. The narrative of the AltRG game engaged both students and instructors, providing structure through multiple means of class communication.

Furthermore, the problem-based format and game-based design of the course offered multiple ways through which instructors were able to practice and exercise scholarship at varying levels in order to facilitate student learning, confirming previous research on how video games can help to support problem-solving processes (Brush & Saye, 2009) and develop critical thinking skills (e.g., Gee, 2007; Knijnik, 2012; Tobias & Fletcher, 2011). As designers, we have already leveraged these findings into new transmedia gaming experiences for literacy. The first was *Broken Window*, which immersed students in an alternate reality transmedia experience that asked players to play an alternate reality game created *for* them (S. J. Warren & Najmi, 2013). This was followed by a requirement to use their newly acquired computer literacy skills to build their own AltRG to teach others about such global topics as environmental sustainability and maternal health, a *designed by* approach to student immersive learning. This was followed by The 2015 Project, which leveraged these same global topics, as identified as the United Nations Millennium Development Goals, but took collaborative approach to seeking solutions to problems explored within the United States rather than in settings that were less familiar to students. Since then, we have also employed transmedia gaming to support gaming literacies with middle school students in *Villainous* and place-based literacy through informal transmedia experience called *Now and Then*, which was created to teach conference attendees about local history.

As the use of educational transmedia expands, new technologies have emerged that are easier to use such as Conducttr (Pratten, 2014). These include centralized tools for

both design and implementation. This should help provide designers and educators with

the means to expand the use of educational transmedia, allowing innovations in multiple

forms of literacy and we look forward to innovations that we cannot imagine today,

including fostering the communication skills necessary for civic engagement

(Steinkuehler & Williams, 2006 and social action in their community, being actively

involved in defining issues, producing and sharing information, and planning social

action (Bennett, et al., 2009).

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