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USING GAME-BASED LEARNING TO FOSTER
CRITICAL THINKING IN STUDENT DISCOURSE

by

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A Dissertation submitted to

The Graduate School of Education

Rutgers, The State University of New Jersey

in partial fulfillment for the requirements

for the degree of

Doctor of Education

Graduate Program in the Design of Learning Environments

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October 2013

USING GBL TO FOSTER CRITICAL THINKING

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Abstract

In spite of a global shift that emphasizes the importance of critical thinking skills, America's schools are not yet equipped with a sufficient repertoire of pedagogical strategies necessary to foster these skills. The purpose of this dissertation is to explore the effectiveness of game-based learning (GBL) as a strategy for fostering higher-level critical-thinking skills so that it may potentially be appropriated for popular use in traditional school environments. I examined student discourse throughout a GBL intervention designed to promote content knowledge and critical thinking in an eighth grade social studies classroom. A total of three 8th grade social studies classes engaged in the intervention. Post-tests and delayed post-tests were conducted for the entire 8th grade (ten social studies classes across two instructors). Five groups of students that engaged in the GBL intervention were videotaped and analyzed. Data analysis showed that features of the GBL intervention and particular cycles of gameplay were effective in promoting higher levels of critical thinking, including the development of independent beliefs prior to engaging in collaborative discourse and providing opportunities for guided reflection. The portfolio that follows seeks to make the findings of my research on GBL practical via three major components: (1) an article written for publication in a scholarly journal; (2) curriculum for a fifteen-hour professional development course designed to share my

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learnings with fellow practitioners; and (3) a presentation to be delivered to school administrators with the purpose of sharing my findings, fostering discussion, and exploring potential avenues for effecting change in schools.

Acknowledgements

This dissertation could not even have been imagined without the support of so many wonderful people. I wish to thank my fellow students in the 2010 cohort who embarked upon this journey alongside me years ago and who provided measureless moral support. Thank you, Dr. Cindy Hmelo-Silver, for chairing my dissertation committee, and for teaching me so much through coursework, research, and revision. Thank you, Dr. Steven Barnett and Dr. Rebecca Reynolds, for sitting on my dissertation committee, for contributing your time, and for sharing your insights with me along the way.

I would be remiss if I did not acknowledge the many formidable educators upon whose shoulders I am fortunate enough to stand. Thank you, to the great many teachers who opened my eyes to what an *exceptional* classroom looks and feels like— and thank you, to all of my students, who strolled beside me as I strove to walk in my teachers' shoes.

Thank you, Ashley, for enduring skyscraper stacks of research on any viable surface, for your boundless patience, and for your endless support. You are *tremendous*, and writing this dissertation would not have been possible without you.

Grazie mamma, papà, sorellina, e le nonne, per tutto l'aiuto, il supporto, e l'ispirazione che ha reso questo possibile. Sarebbe impossibile per ringraziarvi adeguatamente senza scrivere un libro intero dedicato a quelle cose. Siete i migliori insegnanti che abbia mai conosciuto. Questa tesi è dedicato a voi.

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Introduction

In spite of a global shift that emphasizes the importance of critical thinking skills, America's schools are not yet equipped with a sufficient repertoire of pedagogical strategies necessary to foster these skills. The purpose of this dissertation is to explore the effectiveness of game-based learning (GBL) as a strategy for fostering higher-level critical-thinking skills so that it may potentially be appropriated for popular use in traditional school environments. The portfolio that follows seeks to make the findings of my research on GBL practical and readily communicable via three major components: (1) an article conveying the details of my study, written for publication in a scholarly journal; (2) curriculum for a fifteen-hour professional development course designed to share my findings, learnings, and experiences pertinent to the design, implementation, and evaluation of a GBL environment with fellow practitioners; and (3) a presentation to be delivered to New Jersey school administrators with the purpose of sharing my findings, fostering discussion, and exploring potential avenues for effecting change in NJ's schools.

GBL can be defined as a set of learning principles derived from various games and gaming environments that have ultimately proven to be effective "teachers." For the purpose of this study, a number of game-based learning frameworks and principles were taken into consideration, including those put forth by Gee (2003), Squire (2008b), Prensky (2001), and Malone (1981). Six principles were derived from the research, selected because of the effects they should have on learning, such as fostering student engagement and providing opportunities for knowledge-making.

The six principles selected for this study require that the GBL intervention: (1) be provocative of critical thinking; (2) be appropriately challenging (—similar to Vygotsky’s zone of proximal development—); (3) provide opportunities for players to discover and/or create their own knowledge; (4) provide a fictional world or fantasy-driven metaphor; (5) be “social” (i.e. encouraging collaborative interactions between players); and (6) be winnable (so as to provide goals, as well as some sense of competition).

This study draws heavily from a growing body of research pertinent to video games and learning, because video games are often highly engaging (i.e. players “play” for hours on end, and almost always at their own inclination), and can be considered highly effective “teachers” — i.e. games teach players how to become “experts” in the activities and/or roles with which they engage (Gee 2003). In designing a classroom experience that embodies these principles, I expected that students would utilize higher order thinking skills in a manner that was frequent and compelling. Beyond promoting higher levels of engagement, I also anticipated that students would gain a deeper and longer-lasting understanding of the content covered.

I investigated a GBL intervention as implemented in three 8th grade social studies classes that were studying the French and Indian War. The French and Indian War unit was chosen as the focus of this intervention primarily because the participating social studies teacher indicated several concerns with the quality of student learning in “traditional” classroom conditions that are increasingly common, and that have been the focal point of previous research. These issues include a difficulty in creating opportunities for students’ to think critically about the French and Indian War, concerns

regarding students' content knowledge acquisition and retention, and an emerging sense of ennui on the students' behalf. Stevens, Wineburg, Herrenkohl, and Bell (2005) identify this problem as inherent to the landscape of domain specificity. The issue that they raise, and that this study seeks to address, is traditional schools' lack of emphasis on helping students' to make good use of their prior knowledge, as well as their interdisciplinary understandings. The GBL intervention reflects an attempt to facilitate learning with understanding so that students may develop a deep body of factual knowledge, understand facts and ideas in the appropriate context and on a theoretical level, and organize knowledge in flexible ways that can be applied to novel contexts (Bransford, Brown, & Cocking).

The sections that follow provide a brief review of relevant research, an explanation of the GBL intervention design, and a description and rationale of my portfolio.

Review of Research

While most game genres have something to offer in the way of understanding GBL as it is embodied in this study, the task of detailing every genre and each corresponding contribution would be beyond the scope of this literature review. However, the genre that is most congruent with the GBL intervention being studied must be considered: *open-ended games* (Squire, 2008a). An open-ended game is a game without a singular, objective purpose in which the game designer and game player both make meaning through "play." As such, the trajectory of gameplay is ever changing, and given the degree of control that players have in determining that trajectory, these games

should be considered in constructivist terms. Although open-ended games often put the player in a role, such as “pilot,” or “platoon leader,” these games are not necessarily about assuming a specific identity as much as they are about experiencing a new reality, from a new perspective. The person “playing” is then able to consider this world in whatever fashion he/she chooses. Learning in these games deemphasizes the importance of recreating particular ways of thinking, but rather, focuses on the creation of spaces for knowledge construction, meaningful experience, and discovery (Squire, 2008a). Squire argues that in order to truly understand the meaning of game play, it is essential to look beyond the rules of the game itself, to focus on players’ performances, and to gain insight into *their* understandings.

Such games often consist of “microworlds,” or “open-ended universes,” where a player is able to interact with, and construct knowledge from, various artifacts (Egenfeldt-Nielsen, 2006). This parallels Squire’s (2008b) explanation that games and simulations are not perfect representations of reality, but rather, simplifications (much like books and films) that require user participation in order to foster the construction of meaning. In this way, game-based learning lends itself to sharing a common constructivist perspective with problem-based learning (PBL) in that the latter expects learners to work through a problem as self-directed constructors of their own knowledge, intrinsically motivated by their puzzlement, scaffolded by a more knowledgeable other, and to engage in a social negotiation of knowledge (Savery & Duffy, 1995; Barrows, 1996; Hmelo-Silver & Barrows, 2006). Likewise, a socio-constructivist interpretation of GBL expects learners to play through games in a similarly self-directed fashion, to be intrinsically motivated, to be scaffolded by an instructor and/or the game-world itself, and

to participate in the process of socially negotiating knowledge. Gresalfi et al. (2009) speak to this in their work on consequential engagement, whereupon students' feelings of "consequentiality" are fostered by their immersion in and significant control over the learning environment.

Video games are frequently heralded as the most engaging pastime in human history, which Prensky (2001) attributes to twelve elements that generate engagement.

These elements are at the core of GBL as it is implemented in the present study:

- (1) Fun, in that games provide enjoyment and pleasure.
- (2) Play, which Prensky defines as something one *chooses* to do, something intensely and utterly absorbing, and something that promotes the formation of social grouping.
- (3) Rules, which provides players with necessary structure.
- (4) Goals, which provide motivation.
- (5) Interactivity, which continually provides players with "doing."
- (6) Adaptive qualities, which create "flow" (Csíkszentmihályi, 1990).
- (7) Outcomes and feedback, which provides an effective system for learning.
- (8) Win states, which provide "ego gratification."
- (9) Conflict/competition/challenge/opposition, which provides "adrenaline."
- (10) Problem solving, which provokes players' creativity.
- (11) Interaction, which allows for the formation and development of social groups.
- (12) Representation and story, which incites emotional responses.

Prensky argues that the latter elements are essential to effective game design, which, he suggests, is both an art and a science. Although Prensky focuses primarily on digital video games (because, unlike toys and other, older generations of games, they offer a whole slew of advantages, i.e. they are faster, more responsive, provide whole worlds, offer huge numbers of options, scenarios, different levels of challenges, etc.), the principles of game design he provides can be considered across the realm of all game genres, and is particularly insightful for the design of game-based learning environments.

Like books and street signs, video games qualify as semiotic domains – that is, that they consist of a set of modalities (i.e. images, words, sounds, gestures, etc.) which users use to convey meaning to one another (Gee, 2003). Subsequently, games encourage players to take on new identities, to learn in various contexts, and to create situated meaning. Gee explains that games require interaction, what he calls “telling and doing,” while encouraging transfer between domains and enhancing students’ cultural models – i.e. ways of understanding the complexities of the world that surrounds them. In his seminal work, Gee (2003) describes a set of 36 principles that make video games highly effective learning environments, several of which were highly influential in the design of this study’s GBL intervention. These principles include the psychosocial moratorium principle (“learners can take risks in a space where real-world consequences are lowered”), the regime of competence principle (“the learner gets ample opportunity to operate within, but at the outer edge of, his or her resources, so that at those points things are felt as challenging but not ‘undoable’”), and the discovery principle (“overt telling is kept to a well-thought-out minimum, allowing ample opportunity for the learner to experiment and make discoveries”).

The preceding section seeks to highlight only the work that is most pertinent to the GBL framework and intervention design implemented in this study. Many other game genres (i.e. computer simulations, massively multiplayer online role play games, etc.) do lend themselves to consideration through the constructivist lens, but are beyond the scope of this review. The section that follows will focus on studies done with regard to GBL in schools, highlighting significant findings as well as gaps in the research.

Game-based learning in schools.

Much of the work done on GBL (even in a constructivist light) focuses on the integration of commercial *video* games into educational contexts. For instance, Squire has done research on students' learning experiences while playing *Civilization III* (Squire, DeVane, & Durga, 2008; Squire, 2008a; Durga & Squire, 2011; Squire, Giovanetto, Devane, & Durga, 2005). Squire argues that by playing *Civilization*, students are given the opportunity to play through weeks of ancient history curriculum, while simultaneously developing communities – whether online via message forum, or in real-life via middle-school sleepovers – and engaging in sophisticated mentoring models, where both adults and experienced players mentor novices. Squire, DeVane, and Durga's (2008) study sought to create a community of expert players of *Civilization III*. Twelve participants, largely low SES African American 5th and 6th graders, were immersed in gameplay with the intentions of investigating how players might gain access to more sophisticated academic practices. These included historical content, vocabulary, “deeper” conceptual understandings, and problem solving skills. Participants demonstrated a strong grasp of historical content knowledge associated with the gameplay through researcher-administered pop-quizzes. Moreover, the actions that

players took during gameplay indicated growth in systemic expertise with regard to the workings of the game itself.

Similarly, Shaffer (2005) argues that games offer players' the opportunity to develop epistemic frames (defined as a way of "seeing, valuing, and being" in the world, i.e. thinking like a lawyer) in the context of a community of practice so that he/she might bring more expansive and profound insights into other areas of his/her life. Shaffer explains that epistemic games provide opportunities for educators to evolve beyond the increasingly obsolete forces that shaped the structure associated with traditional schooling. Instead, games provide opportunities for authentic, reflective, and critical thinking practices that are not only pertinent, but *essential* for success in the 21st century. Shaffer investigated these theories by implementing a game that asked 11 high school seniors to take on the roles of urban planners over the course of a two day weekend workshop. Students were asked to develop plans, make important decisions, and ultimately present their finished products to a representative from the city planning office. Through qualitative analysis and interviews, Shaffer found that students not only enjoyed the gameplay, but developed ways of thinking and doing congruent with the characteristics of urban planners.

DeVane and Squire's (2008) study of how kids "actually play" the video game *Grand Theft Auto: San Andreas* suggested that rather than passively absorbing game content, players situated content in the context of their own experiences. Interviews with participants indicated that different players interpret the same content and game-play experiences in different ways, essentially allowing each individual to construct his/her own localized understandings in a fashion that requires higher-order thinking skills.

The effects of such game-environments on engagement during history instruction is documented in several studies (Devlin-Scherer & Sardone, 2010; Watson, Mong, & Harris, 2011). One of the few empirical studies of history learning and video games was conducted by Moshirnia and Israel (2010), examining 74 undergraduate students' learning across three conditions – a pretest-posttest control group that received PowerPoint instruction, a pretest-posttest group that played *Civilization IV*, and a posttest-only group that also played the game. The study found no significant difference in knowledge gained between the PowerPoint and the game group, although they did note two interesting observations. The first was a retention effect evidenced in the game-play group, and the second was with regard to the trajectory of game players' attention – *toward* gameplay, *away* from historical facts in game text and cut scenes.

A recent meta-analysis (Young et al., 2012) of 300+ articles on video games and academic achievement across content areas “found some evidence for the effects of video games on language learning, history, and physical education (specifically exergames), but little support for the academic value of video games in science and math” (p. 61). Further, Young et al. (2012) call for more contributions in the way of empirical research to deepen our understanding of games' impact on learning. The present study seeks to contribute to the research and to our understandings in this fashion, particularly in the way of GBL's potential for impacting learning and critical thinking through discourse. The proceeding section provides a brief overview of discourse, critical thinking, and active engagement as they relate to game-based learning, immediately followed by the methods I implemented in order to study these features in a GBL intervention.

GBL through discourse, critical thinking, and active engagement.

A considerable amount of research has been done on the role of classroom discourse in fostering comprehension and learning using socio-cognitive and socio-cultural frameworks. Steinkuehler (2006) applies Gee's (1999) discourse theory (with particular attention to massively multiplayer online games) and argues that, given the richness of discourse, learning, and social interaction taking place in these virtual worlds, these games must be taken seriously. When these interactions are harnessed in a classroom, and students interact with group-members in deep and meaningful ways, the group's learning is essentially "greater than the sum of its parts" (Wertsch, Del Rio, & Alvarez, 1995). This is generally attributed to the social perspectives and cultural values that each group member brings to the discussion, as well as the inherent nature of these interactions for fostering critical thinking skills. Because talk is central to social constructivist pedagogy, verbal interactions are strong indicators of student learning; in turn, the quality of student talk is immediately linked to the quality of student problem solving, understanding, and learning (Nystrand, Gamoran, Kachur, & Prendergast, 1997; Dunlap, 1999). Additionally, Murphy et al. (2009) argue that there is "sufficient reliability in language use to enable us to make valid inferences about the productiveness of talk for student learning" (p. 741) – in the meta-analysis in which they examine the effects of utilizing group discussions as a means for promoting high-level comprehension of text (i.e. "critical, reflective thinking about text"). By the same token, this study utilizes student discourse as a means for measuring critical thinking as participants experience the GBL intervention.

Although term “critical thinking” has often used loosely with regard to a smorgasbord of complex thinking skills, the present study has adopted Moon’s (2008) definition of critical thinking as a “capacity to work with complex ideas whereby a person can make effective provision of evidence to justify a reasonable judgment. The evidence, and therefore the judgment, will pay appropriate attention to context” (p. 7). Additionally, this study considers (1) the importance of developing these skills so that individuals might ultimately deal with complex problems in authentic/real-life contexts (Bransford, Brown, & Cocking, 2000; National Research Council, 1996), and (2) the necessity of students to engage in active critical thinking processes. These include purposeful and reasoned thinking, analysis of appropriate data, construction of evidence-based arguments, inference-making, and evaluation of relevant information (Halpern, 1999; Paul, 1995; Perkins, 1998).

The GBL intervention investigated in this study was designed with the aforementioned literature in mind. Ultimately, this intervention sought to embody the six principles of GBL (indicated on page 2) so that the impact of game-based learning on student learning, achievement, and critical thinking could be explored.

GBL Intervention Design

In the two years preceding this study, the participating teacher enacted similar iterations of this game. In order to ensure that the six principles of GBL were embodied in the iteration of the game being studied, the participating teacher and I worked together to identify necessary rules and mechanisms of play (i.e. grouping, turn taking, etc.), and to make necessary revisions to the intervention.

At the onset of the game, students who were permitted to participate in the study were randomly assigned to small groups (two to five students per group), and each group was randomly assigned to a particular territory (i.e. British, French, Huron, etc.). Each territory was visually represented on a map in the front of the classroom, and different territories were allotted varying numbers of land-spaces (i.e. the French began the game with six land-spaces, whereas the Miami began with three). Further, each territory received a predetermined number of dice (i.e. the French received six dice, the Miami received two dice, etc.). Every territory was also assigned an overarching game objective – most of which required “waging war” against other territories (i.e. competitively rolling dice) in an effort to win their land-spaces. For example, the French objective was: “Finish the game with 16 spaces under your control, including at least six of your original British spaces, at least one original Ottawa space, at least one original Miami space, and at least one original Huron space.”

Here, the uneven distribution of land-spaces and dice was intended to mirror the historical advantages and disadvantages of specific forces (i.e. the British and French began with more “firepower”/mathematical advantage of victory by sheer number of dice to roll than any single Native American tribe). Objectives were designed to reflect the historical motives of the territories to which students were assigned (i.e. the French would have to take control of a great deal of North American land in order to win, whereas the Miami people would simply have to hold on to their own land), and constituted potential “win states” for players. The territories, their respective objectives, and the number of dice distributed at setup, are detailed in Table 1; the rules of gameplay, including an explanation of how dice are used to “wage war,” are indicated in Table 2.

Table 1

French and Indian War Game Objectives

Territory	Objective	Dice
British	Finish the game with 16 spaces under your control, including at least six of your original British spaces, at least one original Ottawa space, at least one original Miami space, and at least one original Huron space.	6
French	Finish the game with 16 spaces under your control, including at least six of your original French spaces, at least one original Ottawa space, at least one original Miami space, and at least one original Shawnee space.	6
Huron	Finish the game with at least two of your original spaces, plus two additional spaces. You are not allowed to form an alliance with the Erie people.	3
Erie	Finish the game with at least three of your original spaces, OR two of your original spaces <i>plus</i> two additional spaces. You are not allowed to form an alliance with the Miami people.	2
Shawnee	Finish the game with at least three of your original spaces, <i>plus</i> two additional spaces. You are not allowed to form an alliance with the Ottawa people.	3
Miami	Finish the game with all three of your original spaces.	2
Ottawa	Finish the game with at least 2 of your original spaces, plus at least one additional space.	2

Table 2

French and Indian War Game Rules

Rule #1	When attacking and/or being attacked, both territories must roll all of their dice. The territory with the highest single roll is the winner. (For example, if France rolls six dice: 1, 1, 1, 2, 2, 5 – their highest roll is a 5. If the Huron then roll a 1 and a 6, the Huron's 6 trumps the French 5, and the Huron win the battle.)
Rule #2	Territories can only attack other territories that are connected to their own spaces, or their ally's spaces.
Rule #3	Alliances can be broken by either ally.
Rule #4	If the aggressor wins a battle, he/she gains the space that was attacked.

Rule #5 If a battle is lost, the territory loses a die. (No territory can have less than one die.)

Rule #6 If a territory is attacked, it may forfeit its space to the attacker. (This allows for the conservation of dice.)

Rule #7 Allies may choose to combine their dice when attacking an enemy. If they lose the battle, every member of the alliance loses one die.

Once students are assigned territories, the teacher provides an introductory mini-lecture on the French and Indian War (historical context, between five and ten minutes). This is framed for students as an opportunity to learn from the past, and to actively engage in the process of “replaying history.” Given that students are already assigned specific territories, it is anticipated that students will find the historical content to be more meaningful. This content is also intended to provide opportunities for students to consider how their territories historically participated in the French and Indian War, how they fared, and whether or not these techniques merited replication in the GBL intervention.

At the start of the game, students are given time (approximately one minute) to discuss strategy with their own groups, followed by an opportunity (approximately one more minute) to form alliances with their fellow players in *other* groups. Then, in a rotating fashion, each territory is given an opportunity to make a move (i.e. to declare war). After each territory has the chance to attack, the process is repeated, beginning with another opportunity to discuss strategy within their groups. As the game is played, students are permitted to make and break alliances at any time.

Students are continually provided with opportunities to engage in active discussion regarding the strategies that they seek to employ (i.e. the turn cycle: one minute to discuss strategy with their own groups, followed by one minute to negotiate

alliances with other groups). While the rules and objectives provide the necessary structure for play and embody the six core principles of GBL, the game itself is open-ended in that there is uncertainty regarding the time it will take to complete, the avenues that students will take in an effort to achieve their objectives, the strategies students will employ, and the kinds of discussions students will be having throughout.

Portfolio Description

The portfolio that follows is comprised of three products that seek to embody the makings of a literature review, a methods section, and an analysis of findings in a fashion that is both practical and professional. Each product seeks to advocate for the consideration of game-based learning by targeting a different set of stakeholders (researchers, teachers, administrators), and by delivering a different “slice” of my findings (critical thinking in student discourse, teacher practices and intervention design, student knowledge and retention).

Scholarly article.

The first component of my portfolio is a research article written with intent to publish in a peer-reviewed journal. In this piece, I articulated the context of my study, the problem of practice that stirred its conception, a review of relevant literature, a methods section detailing data sources, results, and a discussion of implications. Given the similarities between problem-based learning and the game-based learning intervention I have been investigating, this article was written with submission to the *Interdisciplinary Journal of Problem-Based Learning* in mind.

The findings I draw upon in this article focus on the depth (in terms of critical thinking) of student discourse when participating in game-based learning (indicated by mixed-methods analysis of video data). It is through this piece of my portfolio that I hope to contribute to the research community as an authentic “voice from the field.”

Game-based learning professional development curriculum.

The district in which I am currently employed offers all staff the opportunity to participate in professional development courses offered by their willing and knowledgeable colleagues. The second feature of my portfolio is a GBL professional development curriculum, designed for implementation in this program.

As detailed in the curriculum, this course will span 15-hours and is designed with the practitioner in mind. In order to ensure that the course curriculum is appropriately rigorous, participants will read and discuss pertinent research articles (my intention here is to make my own literature review a living and practical resource for practitioners). I will utilize the methods and results of my own investigation as a springboard for participants to (1) design their own game-based learning environments, (2) consider the avenues by which they may evaluate the quality of such environments, and (3) contribute practically to the field. Here, my findings will serve as examples for participants – in thinking about the effects of GBL from a research perspective, and in thinking about how their own interventions might be evaluated. This product will provide an opportunity to draw upon and share a different facet of my study’s results: teacher practice and intervention design.

Presentation to New Jersey principals and supervisors.

The final component of my portfolio is a presentation (projected at 90-minutes) targeting New Jersey's principals and supervisors. As of the submission of this dissertation, a proposal for has been submitted to share my presentation at the 2013 FEA/NJPSA/NJASCD Fall Conference. As the NJPSA recently announced that the 2013 Fall Conference would be themed "*Inspire*," my intention is to *inspire* principals and supervisors to integrate soundly crafted game-based learning environments into their schools and/or curricula. This presentation utilizes select literature to ground participants' understandings of game-based learning, details my own methods for developing a game-based learning environment in the context of a traditional school curriculum, shares the avenues by which such interventions can/should be evaluated, and utilizes my findings as a springboard for discussing the potential implications of game-based learning on traditional school environments.

In keeping my audience in mind, the discussion of implications will seek to span beyond those detailed in the first two components of my portfolio. The presentation allots time for a live forum in which administrators will be prompted to discuss the implications of my findings in the context of new teacher evaluation models and standardized tests. I expect that these conversations will be practical for participants, and that they will add additional dimensions to the findings detailed in my article.

It is my aspiration to share my research with as many pertinent stakeholders as possible, and to empower fellow practitioners. The portfolio that follows speaks to these aspirations, and provides a robust backbone for inquiry-driven advocacy for change in education.

Journal Article

Abstract

Previous research indicates the importance of student discourse in the construction of knowledge and the fostering of critical thinking skills, especially in the field of problem-based learning (PBL). Further, a growing body of research on game-based learning (GBL) draws parallels between playing certain types of games and the solving of ill-structured problems, citing similar conditions for learning (student centered, small student groups, teachers as facilitators, problems as vehicles for development) and similar learning outcomes (communication, problem-solving, critical thinking, collaboration) as PBL. However, there is a gap in understanding how GBL affects critical thinking as embodied by student discourse when implemented in traditional classroom environments. In this study, I examined student discourse throughout a GBL intervention designed to promote content knowledge and critical thinking in an eighth grade social studies classroom. A total of three 8th grade social studies classes engaged in the intervention. Post-tests and delayed post-tests were conducted for the entire 8th grade (ten social studies classes across two instructors). Five groups of students that engaged in the GBL intervention were videotaped and analyzed. Data analysis showed that features of the GBL intervention and particular cycles of gameplay were effective in promoting higher levels of critical thinking, including the development of independent beliefs prior to engaging in collaborative discourse and providing opportunities for guided reflection. This study has implications for the developers of GBL frameworks, researchers interested in exploring GBL, and teachers seeking to integrate GBL into their classrooms.

Keywords: game-based learning, GBL, critical thinking

Game-Based Learning (GBL) is inherently driven by a sociocultural view of learning (Young et al., 2012). Much like Problem-Based Learning (PBL), players are presented with ill-structured problems, often work in groups, and must construct knowledge through the activation of prior understandings, as well as by engaging in collaborative discourse (Gresalfi et al., 2009; Hmelo-Silver, 2004). In addition to these features, GBL places an emphasis on the integration of game-elements, often in an effort to heighten engagement and/or to induce a state of flow (Csíkszentmihályi, 1990). Where the implications of PBL on critical thinking and collaborative discourse are well documented (i.e. Hmelo-Silver & Barrows, 2006), research on GBL in this context is still limited. This is not to say that compelling “educational” video games do not exist, but that there is not yet substantial evidence describing their impact on student achievement, nor detailing their successful implementation in K-12 academia (Young et al., 2012).

Much of the research on GBL has been theoretical in nature (i.e. Malone, 1980; 1981; Prensky, 2001; Schaffer, 2005), and while a growing body of work exists regarding the educational power of “games” – that is, video games (i.e. Gee, 2003; Squire 2003; 2006), experiential educational games (Nicholson, 2012), etc. – limited work has been done in the way of GBL interventions and critical thinking in traditional classroom contexts.

One of the largest obstacles in gaining a more complete understanding of GBL is the lack of “common language” across research. The term GBL is itself quite vague; does it refer to the nascent power of hyper-immersive online video games, or the timeworn brawn of backgammon? Should we concern ourselves with the platform (Is it digital? Are there varying degrees of digital? If so, how digital is it?), the genre (Is it a

game or is it a *simulation*?), the context (Is it played in school? At home? In a museum? In an underwater dungeon?) or simply the mechanics (which, as it turns out, are not quite so simple)? Myriad efforts have been made to make concrete the terms associated with games and learning, the most recent and most sensible of which offer suggestions for propelling the field in a cohesive fashion. The National Research Council (2011) details the differences of scope and purpose between simulations and games, as well as between formal and informal learning contexts. Further, Young et al. (2012) offer suggestions for furthering the collective understanding and evaluation of games. Suggestions include constructing working definitions, creating an educational video game repository with metatagged curricular objectives, researching educational video games that are already in use, and conducting longitudinal studies in order to examine the impact of educational games.

For the purposes of this study, I sought to investigate the effects of a game-based learning environment designed for implementation in a traditional/formal (non-digital) school context with hopes of enhancing our understanding of how GBL might inform traditional K-12 education. A number of game-based learning frameworks and principles were taken into consideration, including those detailed by the National Research Council (2011) and those put forth by Gee (2003), Squire (2008b), Prensky (2001), and Malone (1981). A working definition of GBL was derived from the research in the form of six principles, indicated in Table 1. These principles were selected because of the effects they should have on learning, such as fostering student engagement and providing opportunities for knowledge-making.

The six principles selected for this study require that the GBL intervention: (1) be provocative of critical thinking via one or more ill-structured problems; (2) be appropriately challenging (—similar to Vygotsky’s zone of proximal development—); (3) provide opportunities for players to discover and/or create their own knowledge; (4) provide a fictional world or fantasy-driven metaphor; (5) be “social” (i.e. encouraging collaborative interactions between players); and (6) be winnable (so as to provide goals, as well as some sense of competition). While it does not constitute an additional principle, it is also important to consider that effective GBL environments are designed with learning outcomes in mind (Squire, 2006).

Table 1

Six Principles of Game-Based Learning

GBL Principles	Purpose / Outcomes
The intervention must inspire critical thinking.	<ul style="list-style-type: none"> • All aspects of learning environment set up to encourage active and critical, learning. • Encourage students to utilize and practice skills we are seeking to develop.
The intervention provides “just enough” challenge for players.	<ul style="list-style-type: none"> • Ample opportunity for learner to operate at the outer edge of his/her resources • Create a surmountable challenge. • Environment provides necessary scaffolds for overcoming challenge and/or learning task.
The intervention provides opportunities for players to discover/ construct their own knowledge/ understandings	<ul style="list-style-type: none"> • Learners have opportunities to engage in guided discovery • Congruent with constructivist learning theories.
The intervention provides a fictional-world.	<ul style="list-style-type: none"> • “Metaphor” or “fantasy”-driven context for gameplay. • Learner has choices in developing a virtual identity in this fictional world. • Learners can take risks where real-world consequences are lowered.
The intervention is “social.”	<ul style="list-style-type: none"> • Players must interact with one another to make

The intervention must be winnable – and by various avenues.

- progress in the game.
- Learners constitute a group that is bonded through shared endeavors, goals, and practices.
- Community of practice.
- Win-states provide challenge and competition via multiple routers
- Intervention maintains its allure as a “game.”
- Learners may make choices, rely on their strengths and learning preferences, and engage in problem solving.

In designing a classroom experience that embodied each of these principles, I expected that students would utilize higher order thinking skills in a manner that was frequent and compelling. Beyond promoting higher levels of engagement, I also anticipated that students would gain a deeper and longer-lasting understanding of the content that was covered (see logic model, Figure 1).

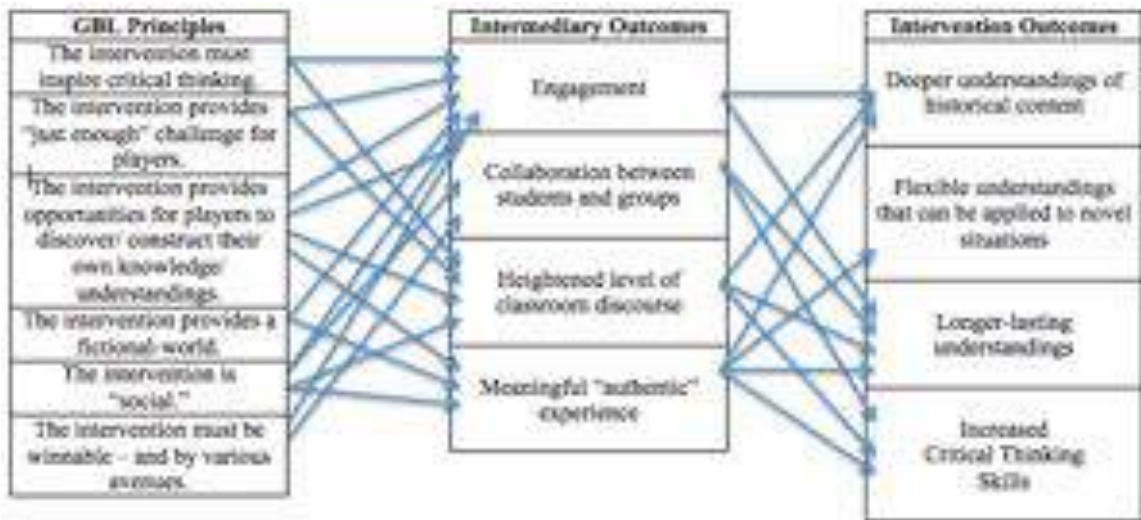


Figure 1. Logic model linking six principles of game-based learning to intermediary outcomes and intervention outcomes.

The logic model in Figure 1 demonstrates how the six selected principles of GBL should produce four intermediary outcomes: (1) engagement, (2) collaboration between students, and between groups of students, (3) heightened levels of classroom discourse, and (4) meaningful and/or “authentic” experiences. These intermediary outcomes will

ultimately guide participants to the following intervention outcomes: (1) Deeper understandings of content knowledge (in the case of this intervention, *historical* content knowledge), (2) Flexible understandings that can be applied to novel situations, (3) Longer-lasting understandings, and (4) Increased critical thinking skills.

The similarities shared between GBL and PBL in the way of collaborative discourse, student-centeredness, and knowledge “construction” suggest that well designed “games” may provide comparable learning benefits in the way of developing flexible knowledge, effective problem solving skills, and intrinsic motivation (Hmelo-Silver, 2004). Consequently, a deeper understanding of GBL – how it affects student learning, engagement, and critical thinking in discourse – holds significant implications for educators. The section that follows will provide a brief review of research on GBL frameworks before proceeding to studies concerning the impact of GBL on student learning, followed by a context for examining critical thinking and discourse in constructivist learning environments.

Theories of Game-Based Learning

While most game genres have something to offer in the way of understanding GBL as it is embodied in this study, the task of detailing every genre and each corresponding contribution would be beyond the scope of this article. However, the genre that is most congruent with the GBL intervention being studied must be considered: *open-ended games* (Squire, 2008a). An open-ended game is a game without a singular, objective purpose in which the game designer and game player both make meaning through “play.” As such, the trajectory of gameplay is ever changing, and given

the degree of control that players have in determining that trajectory, these games should be considered in constructivist terms. Although open-ended games often put the player in a role, such as “pilot,” or “platoon leader,” these games are not necessarily about assuming a specific identity as much as they are about experiencing a new reality, from a new perspective. The person “playing” is then able to consider this world in whatever fashion he/she chooses. Learning in these games deemphasizes the importance of recreating particular ways of thinking, but rather, focuses on the creation of spaces for knowledge construction, meaningful experience, and discovery (Squire, 2008a). Squire argues that in order to truly understand the meaning of game play, it is essential to look beyond the rules of the game itself, to focus on players’ performances, and to gain insight into *their* understandings.

Such games often consist of “microworlds,” or “open-ended universes,” where a player is able to interact with, and construct knowledge from, various artifacts (Egenfeldt-Nielsen, 2006). This parallels Squire’s (2008b) explanation that games and simulations are not perfect representations of reality, but rather, simplifications (much like books and films) that require user participation in order to foster the construction of meaning. In this way, game-based learning lends itself to sharing a common constructivist perspective with problem-based learning (PBL) in that the latter expects learners to work through a problem as self-directed constructors of their own knowledge, intrinsically motivated by their puzzlement, scaffolded by a more knowledgeable other, and to engage in a social negotiation of knowledge (Savery & Duffy, 1995; Barrows, 1996; Hmelo-Silver & Barrows, 2006). Likewise, a social-constructivist interpretation of GBL expects learners to play through games in a similarly self-directed fashion, to be

intrinsically motivated, to be scaffolded by an instructor and/or the game-world itself, and to participate in the process of socially negotiating knowledge. Gresalfi et al. (2009) speak to this in their work on consequential engagement, whereupon students' feelings of "consequentiality" are fostered by their immersion in and significant control over the learning environment.

Video games are frequently heralded as the most engaging pastime in human history, which Prensky (2001) attributes to twelve elements that generate engagement. These elements are at the core of GBL as it is implemented in the present study:

- (1) Fun, in that games provide enjoyment and pleasure.
- (2) Play, which Prensky defines as something one *chooses* to do, something intensely and utterly absorbing, and something that promotes the formation of social grouping.
- (3) Rules, which provides players with necessary structure.
- (4) Goals, which provide motivation.
- (5) Interactivity, which continually provides players with "doing."
- (6) Adaptive qualities, which create "flow" (Csíkszentmihályi, 1990).
- (7) Outcomes and feedback, which provides an effective system for learning.
- (8) Win states, which provide "ego gratification."
- (9) Conflict/competition/challenge/opposition, which provides "adrenaline."
- (10) Problem solving, which provokes players' creativity.
- (11) Interaction, which allows for the formation and development of social groups.
- (12) Representation and story, which incites emotional responses.

Prensky argues that the latter elements are essential to effective game design, which, he suggests, is both an art and a science. Although Prensky focuses primarily on digital video games (because, unlike toys and other, older generations of games, they offer a whole slew of advantages, i.e. they are faster, more responsive, provide whole worlds, offer huge numbers of options, scenarios, different levels of challenges, etc.), the principles of game design he provides can be considered across the realm of all game genres, and is particularly insightful for the design of game-based learning environments.

Like books and street signs, video games qualify as semiotic domains – that is, that they consist of a set of modalities (i.e. images, words, sounds, gestures, etc.) which users use to convey meaning to one another (Gee, 2003). Subsequently, games encourage players to take on new identities, to learn in various contexts, and to create situated meaning. Gee explains that games require interaction, what he calls “telling and doing,” while encouraging transfer between domains and enhancing students’ cultural models – i.e. ways of understanding the complexities of the world that surrounds them. In his seminal work, Gee (2003) describes a set of 36 principles that make video games highly effective learning environments, several of which were highly influential in the design of this study’s GBL intervention. These principles include the psychosocial moratorium principle (“learners can take risks in a space where real-world consequences are lowered”), the regime of competence principle (“the learner gets ample opportunity to operate within, but at the outer edge of, his or her resources, so that at those points things are felt as challenging but not ‘undoable’”), and the discovery principle (“overt telling is kept to a well-thought-out minimum, allowing ample opportunity for the learner to experiment and make discoveries”).

The preceding section seeks to highlight only the work that is most pertinent to the GBL framework and intervention design implemented in this study. Many other game genres (i.e. computer simulations, massively multiplayer online role play games, etc.) do lend themselves to consideration through the constructivist lens, but are beyond the scope of this review. The section that follows will focus on studies done with regard to GBL in schools, highlighting significant findings as well as gaps in the research.

Game-Based Learning in Schools

Much of the work done on GBL (even in a constructivist light) focuses on the integration of commercial *video* games into educational contexts. For instance, Squire has done research on students' learning experiences while playing *Civilization III* (Squire, DeVane, & Durga, 2008; Squire, 2008a; Durga & Squire, 2011; Squire, Giovanetto, Devane, & Durga, 2005). Squire argues that by playing *Civilization*, students are given the opportunity to play through weeks of ancient history curriculum, while simultaneously developing communities – whether online via message forum, or in real-life via middle-school sleepovers – and engaging in sophisticated mentoring models, where both adults and experienced players mentor novices. Squire, DeVane, and Durga's (2008) study sought to create a community of expert players of *Civilization III*. Twelve participants, largely low SES African American 5th and 6th graders, were immersed in gameplay with the intentions of investigating how players might gain access to more sophisticated academic practices. These included historical content, vocabulary, “deeper” conceptual understandings, and problem solving skills. Participants demonstrated a strong grasp of historical content knowledge associated with the

gameplay through researcher-administered pop-quizzes. Moreover, the actions that players took during gameplay indicated growth in systemic expertise with regard to the workings of the game itself.

Similarly, Shaffer (2005) argues that games offer players' the opportunity to develop epistemic frames (defined as a way of "seeing, valuing, and being" in the world, i.e. thinking like a lawyer) in the context of a community of practice so that he/she might bring more expansive and profound insights into other areas of his/her life. Shaffer explains that epistemic games provide opportunities for educators to evolve beyond the increasingly obsolete forces that shaped the structure associated with traditional schooling. Instead, games provide opportunities for authentic, reflective, and critical thinking practices that are not only pertinent, but *essential* for success in the 21st century. Shaffer investigated these theories by implementing a game that asked 11 high school seniors to take on the roles of urban planners over the course of a two day weekend workshop. Students were asked to develop plans, make important decisions, and ultimately present their finished products to a representative from the city planning office. Through qualitative analysis of observations and interviews, Shaffer found that students not only enjoyed the gameplay, but developed ways of thinking and doing congruent with the characteristics of urban planners.

DeVane and Squire's (2008) study of how kids "actually play" the video game *Grand Theft Auto: San Andreas* suggested that rather than passively absorbing game content, players situated content in the context of their own experiences. Interviews with participants indicated that different players interpret the same content and game-play

experiences in different ways, essentially allowing each individual to construct his/her own localized understandings in a fashion that requires higher-order thinking skills.

The effects of such game-environments on engagement during history instruction is documented in several studies (Devlin-Scherer & Sardone, 2010; Watson, Mong, & Harris, 2011). One of the few empirical studies of history learning and video games was conducted by Moshirnia and Israel (2010), examining 74 undergraduate students' learning across three conditions – a pretest-posttest control group that received PowerPoint instruction, a pretest-posttest group that played *Civilization IV*, and a posttest-only group that also played the game. The study found no significant difference in knowledge gained between the PowerPoint and the game group, although they did note two interesting observations. The first was a retention effect evidenced in the game-play group (i.e. players were able to recall facts learned for one week longer than their PowerPoint counterparts), and the second was with regard to the trajectory of game players' attention – *toward* gameplay, *away* from historical facts in game text and cut scenes.

A recent meta-analysis (Young et al., 2012) of 300+ articles on video games and academic achievement across content areas “found some evidence for the effects of video games on language learning, history, and physical education (specifically exergames), but little support for the academic value of video games in science and math” (p. 61). Further, Young et al. (2012) call for more contributions in the way of empirical research to deepen our understanding of games' impact on learning. The present study seeks to contribute to the research and to our understandings in this fashion, particularly in the

way of GBL's potential for impacting learning and critical thinking through discourse, as I describe in the next section.

GBL Through Discourse, Critical Thinking, and Active Engagement

A considerable amount of research has been done on the role of classroom discourse in fostering comprehension and learning using socio-cognitive and socio-cultural frameworks. Steinkuehler (2006) applies Gee's (1999) discourse theory (with particular attention to massively multiplayer online games) and argues that, given the richness of discourse, learning, and social interaction taking place in these virtual worlds, these games must be taken seriously. When these interactions are harnessed in a classroom, and students interact with group-members in deep and meaningful ways, the group's learning is essentially "greater than the sum of its parts" (Wertsch, Del Rio, & Alvarez, 1995). This is generally attributed to the social perspectives and cultural values that each group member brings to the discussion, as well as the inherent nature of these interactions for fostering critical thinking skills. Because talk is central to social constructivist pedagogy, verbal interactions are strong indicators of student learning; in turn, the quality of student talk is immediately linked to the quality of student problem solving, understanding, and learning (Nystrand, Gamoran, Kachur, & Prendergast, 1997; Dunlap, 1999). Additionally, Murphy et al. (2009) argue that there is "sufficient reliability in language use to enable us to make valid inferences about the productiveness of talk for student learning" (p. 741) – in the meta-analysis in which they examine the effects of utilizing group discussions as a means for promoting high-level comprehension of text (i.e. "critical, reflective thinking about text"). By the same token, this study

utilizes student discourse as a means for measuring critical thinking as participants experience the GBL intervention.

Although the term “critical thinking” has often been used loosely with regard to a smorgasbord of complex thinking skills, the present study has adopted Moon’s (2008) definition of critical thinking as a “capacity to work with complex ideas whereby a person can make effective provision of evidence to justify a reasonable judgment. The evidence, and therefore the judgment, will pay appropriate attention to context” (p. 7). Additionally, this study considers (1) the importance of developing these skills so that individuals might ultimately deal with complex problems in authentic/real-life contexts (Bransford, Brown, & Cocking, 2000; National Research Council, 1996), and (2) the necessity of students to engage in active critical thinking processes. These include purposeful and reasoned thinking, analysis of appropriate data, construction of evidence-based arguments, inference-making, and evaluation of relevant information (Halpern, 1999; Paul, 1995; Perkins, 1998). Moon’s (2008) definition of critical thinking, as well as the oft-emphasized features such as evaluation, synthesis, and reflection, is embodied by Xin’s (2002) framework of intellectual acts of progressive stages of engaged collaborative discourse. Xin originally utilized this scheme in order to explore individuals’ levels of understanding during online seminars. This framework was adapted for the purposes of coding and analyzing discourse in the context of a GBL intervention (Table 4).

This study seeks to contribute to the growing field of game-based learning by embodying the principal features of GBL frameworks in an intervention, and by examining the effects of this intervention as implemented in a traditional school setting.

The primary research question posed by this study is: *How does game-based learning affect student learning and critical thinking?* The context for this study is a roleplay game in 8th grade social studies classes. Ideally, the answer to this question will better inform our understanding of how GBL can be utilized in traditional schools. This study also examined gender as a factor impacting the effects of GBL in order to investigate how the features of game-based learning might affect males or females differently. Much work has been done in the way of exploring the popularity of playing video games (and effects thereof) among males and females (Wright, et al., 2001). Results of a large-scale survey (n = 534) indicated that female respondents play less frequently, feel less motivated to play in social situations, and feel less attracted to competitive game genres as male counterparts (Lucas & Sherry, 2004). Because of concerns that effects of GBL might be mediated by gender, I explored this variable as well.

The effectiveness of the GBL intervention was explored using a quasi-experimental, mixed methods design, the qualitative portion of which examined students' utterances and interactions as captured on video during gameplay. Additionally, post-tests were used to compare student learning across treatment, and delayed post-tests were used to measure retention.

Methods

Participants

The GBL intervention was implemented in a middle school located in suburban New Jersey that served approximately 600 students in grades 6 through 8. The township served had an approximate median household income of \$130,000, and a median family

income of \$150,000. Approximately .8% of families and 1.4% of the population were below the poverty line at the time of the study. In 2010, the racial makeup of the township was as follows: 85.64% White, 1.49% African American, 10.43% Asian, and 5.12% Hispanic (*Census*).

This particular middle school was selected as the research site for several reasons:

- 1) The 8th grade social studies classes in this school were not tracked. That is, social studies classes were not randomly assigned but academic ability was not used as criteria for grouping students.
- 2) The teacher who volunteered to facilitate the GBL intervention in his 8th grade social studies classroom had previously implemented game-based activities. He had also taught the French and Indian War in a “traditional” fashion (i.e. via lecture, textbook, worksheets, and small-group work), and was willing to implement both the “traditional” and the “GBL” across multiple sections of 8th grade social studies. The participating teacher was in his fourth year of teaching 8th grade social studies at the time of the investigation.

The GBL intervention was implemented in a total of three 8th grade social studies classes. These classes were selected at random from the five sections that the participating teacher was responsible for teaching. The seven remaining 8th grade social studies classes (two of which were taught by the participating teacher, five of which were taught by another instructor) received traditional business-as-usual instruction. Lesson plans indicated that business-as-usual instruction entailed mini-lectures, guided note taking, and screening educational film clips. A total of 62 students were in the intervention condition and 115 in the comparison condition.

GBL Intervention

In the two years preceding this study, the participating teacher enacted similar iterations of this game during the French and Indian War unit of his 8th grade social studies course. In order to ensure that the six principles of GBL (see Table 1) were embodied in the iteration of the game being studied, the participating teacher and I worked together to identify necessary rules and mechanisms of play (i.e. grouping, turn taking, etc.), and to make necessary revisions to the intervention. The overarching learning goals we identified at the outset of the design process were: (1) to instill a deep and long-lasting understanding of content pertinent to the French and Indian War, and (2) to engage students in critical thinking so as to bolster their understanding of historical content, and so as to foster these skills for use in other contexts. (See Appendix A for learning outcomes detailed in the GBL curriculum map.)

At the onset of the game, students who were permitted to participate in the study were randomly assigned to small groups (two to five students per group), and each group was randomly assigned to a particular territory (i.e. British, French, Huron, etc.). Each territory was visually represented on a map in the front of the classroom, and different territories were allotted varying numbers of land-spaces (i.e. the French began the game with six land-spaces, whereas the Miami began with three). Further, each territory received a predetermined number of dice (i.e. the French received six dice, the Miami received two dice, etc.). Every territory was also assigned an overarching game objective – most of which required “waging war” against other territories (i.e. competitively rolling dice) in an effort to win their land-spaces. For example, the French objective was: “Finish the game with 16 spaces under your control, including at least six of your original

British spaces, at least one original Ottawa space, at least one original Miami space, and at least one original Huron space.”

Here, the uneven distribution of land-spaces and dice was intended to mirror the historical advantages and disadvantages of specific forces (i.e. the British and French began with more “firepower”/mathematical advantage of victory by sheer number of dice to roll than any single Native American tribe). Objectives were designed to reflect the historical motives of the territories to which students were assigned (i.e. the French would have to take control of a great deal of North American land in order to win, whereas the Miami people would simply have to hold on to their own land), and constituted potential “win states” for players. The territories, their respective objectives, and the number of dice distributed at setup, are detailed in Table 2; the rules of gameplay, including an explanation of how dice are used to “wage war,” are indicated in Table 3.

Table 2

French and Indian War Game Objectives

Territory	Objective	Dice
British	Finish the game with 16 spaces under your control, including at least six of your original British spaces, at least one original Ottawa space, at least one original Miami space, and at least one original Huron space.	6
French	Finish the game with 16 spaces under your control, including at least six of your original French spaces, at least one original Ottawa space, at least one original Miami space, and at least one original Shawnee space.	6
Huron	Finish the game with at least two of your original spaces, plus two additional spaces. You are not allowed to form an alliance with the Erie people.	3
Erie	Finish the game with at least three of your original spaces, OR two of your original spaces <i>plus</i> two additional spaces. You are not allowed to form an alliance with the Miami people.	2

Shawnee	Finish the game with at least three of your original spaces, <i>plus</i> two additional spaces. You are not allowed to form an alliance with the Ottawa people.	3
Miami	Finish the game with all three of your original spaces.	2
Ottawa	Finish the game with at least 2 of your original spaces, plus at least one additional space.	2

Table 3

French and Indian War Game Rules

- Rule #1 When attacking and/or being attacked, both territories must roll all of their dice. The territory with the highest single roll is the winner. (For example, if France rolls six dice: 1, 1, 1, 2, 2, 5 – their highest roll is a 5. If the Huron then roll a 1 and a 6, the Huron’s 6 trumps the French 5, and the Huron win the battle.)
- Rule #2 Territories can only attack other territories that are connected to their own spaces, or their ally’s spaces.
- Rule #3 Alliances can be broken by either ally.
- Rule #4 If the aggressor wins a battle, he/she gains the space that was attacked.
- Rule #5 If a battle is lost, the territory loses a die. (No territory can have less than one die.)
- Rule #6 If a territory is attacked, it may forfeit its space to the attacker. (This allows for the conservation of dice.)
- Rule #7 Allies may choose to combine their dice when attacking an enemy. If they lose the battle, every member of the alliance loses one die.
-

Once students were assigned territories, the teacher provided an introductory mini-lecture on the French and Indian War (historical context, between five and ten minutes). This was framed for students as an opportunity to learn from the past, and to actively engage in the process of “replaying history.” Given that students had already been assigned specific territories, it was expected that students would find the historical content to be more meaningful. This content was also intended to provide opportunities

for students to consider how their territories historically participated in the French and Indian War, how they fared, and whether or not these techniques merited replication in the GBL intervention.

As the gameplay began, students were given time (approximately one minute) to discuss strategy with their own groups, followed by an opportunity (approximately one more minute) to form alliances with their fellow players in *other* groups. Then, in a rotating fashion, each territory was given an opportunity to make a move (i.e. to declare war). After each territory had the chance to attack, the process was repeated, beginning with another opportunity to discuss strategy within their groups. As the game was played, students were permitted to make and break alliances at any time.

Students were continually provided with opportunities to engage in active discussion regarding the strategies that they sought to employ (i.e. the turn cycle: one minute to discuss strategy with their own groups, followed by one minute to negotiate alliances with other groups). While the rules and objectives provided the necessary structure for play and embodied the six core principles of GBL, the game itself was open-ended in that there was uncertainty regarding the time it would take to complete, the avenues that students would take in an effort to achieve their objectives, the strategies students would employ, and the kinds of discussions students would be having throughout.

Data Sources

Video data collection began on the first day that the French and Indian War GBL intervention was introduced to the class, and continued for the entire course of the game.

The gameplay was videotaped using six recording devices set up at various points in the classroom, as well as four external microphones in an effort to ensure satisfactory audio recording. A total of eight GBL groups (across three classes participating in the GBL intervention) were filmed across four days, playing approximately thirty-five minutes per day, resulting in about 19 hours of video data.

Within one month of the GBL intervention, students were given a test in order to assess their knowledge regarding the French and Indian War. This test (Appendix B) contained five short-response/fill-in-the-blank style items pertinent to the traditional French and Indian War curriculum content knowledge, i.e. “What is guerilla warfare?” This measure is valid in that it was designed collaboratively by both 8th grade teachers to assess students’ content knowledge regarding the French and Indian war. These items were used in previous years as part of a larger unit test, and have been part of both teachers’ implemented social studies curriculum. These assessments were issued to *all* 8th grade classes. Although students belonging to the control and treatment groups may have discussed their divergent learning experiences, this was presumed to have not affected students’ responses given that time between the intervention and the post-test was limited. Six months after the initial post-test, the same assessment was given again; students were not made aware of this assessment prior to its being given.

Data Analysis

Approximately 12 hours of video data was uploaded into *Dedoose* – a web-based qualitative data analysis package. The uploaded data was pertinent to five of the eight

GBL groups filmed, purposefully selected because they were verbal, and because technical quality of audio and video was adequate for analysis.

Video footage was divided into five-minute segments, and each segment was coded as the highest level of critical thinking expressed. An adaptation of Xin's (2002) "Intellectual Acts of Progressive Stages of Engaged Collaborative Discourse" was used to code segments, shown in Table 4. Xin's coding scheme lends itself to an examination of students' critical thinking in that it provides a categorical structure for identifying various levels of depth in thinking as demonstrated through discourse. These codes were treated as ordered variables. In order to ensure the reliability of this study's findings, a second scorer coded 20% of the video data and attained 86.2% agreement.

Table 4

Adaptation of Intellectual Acts of Progressive Stages of Engaged Collaborative Discourse (Xin, 2002)

Code (Critical Thinking)	Intellectual Acts	Description of the Intellectual Act	Example
0. Off-Task	Off-task	Student is evidently disengaged, engaging in an inappropriate act, and/or visibly off-task.	<i>"Where did you buy those shoes?"</i>
1. Initiation Zone (Lower Order)	Posing	Introducing new concepts, ideas, or topics of discussion often describing their origin, background, or context, or definition of problem boundaries, ends and means.	<i>"We should declare war with the English."</i>
	Clarifying	Making clear by removing misunderstanding or ambiguity of a specific point, a problem situation, or related context, often	<i>"If we declare war on the English, we'll be able to take our sixth territory and get closer to winning."</i>

		associated with restating an issue or concept, or asking and answering a specific question.	
2.	Confirming	Expressing agreement or providing supporting arguments by giving examples, relating to personal or other people's experiences, and/or providing evidence from various sources.	<i>"She's right. The English attacked Miami last turn and now they're in the lead. We should go ahead with her plan."</i>
Negotiation Zone (Middle Order)			
	Disagreeing	Expressing disagreement or providing counter argument(s) by giving counter examples or counter evidence, and/or presenting alternative approaches or perspectives.	<i>"No. The English lost that battle and now they're behind. If we fight against them, we'll lose allies. We should form a truce."</i>
3.	Elaborating	Articulating at greater length or in detail based on previous contributions, often associated with hypothesizing, reasoning, and or analyzing.	<i>"By forming an alliance with three different tribes, we can probably fight more wars and have a big advantage."</i>
Co-Construction Zone (High Order)			
	Evaluating	Testing ideas or hypotheses, comparing and analyzing different perspectives, proposals, or solutions, and/or making substantiated judgments.	<i>"Joe thinks we should battle. Jane thinks we should form a truce. The battle is riskier but we can win sooner if it works. The truce might work, but the Miami people already betrayed the French twice. We can't trust them."</i>

4. Integration Zone (Higher Order)	Extending	Branching into new ideas or concepts, generalizing to other contexts, drawing out implications and predictions, or indicating new applications.	<i>“This reminds me of Jamestown. We’re outnumbered. If we don’t make peace, we’re goners.”</i>
	Synthesizing	Identifying emerging themes and unifying concept(s), agreements, and disagreements, organizing and integrating multiple perspectives, and/or drawing conclusions or making resolutions based on synthesis.	<i>“Everyone is driven by their own motives. Jane has a good point, but John’s idea is a risk we have to take. We can’t trust anyone.”</i>

An Analysis of Variance (ANOVA) was used to look for effects of treatment condition on post-tests and to see whether this interacted with gender. This allowed for testing the hypothesis regarding the effects of the intervention on improving learning, and for the identification of unintended consequences, i.e. differences between male and female students. This process was repeated for the delayed-post test (given approximately six months later) to examine long-term retention.

Results

All five intellectual acts were identified across the five GBL groups. As indicated in Table 5 and by Figure 2, “initiation” was the most prevalent intellectual act, followed by negotiation, co-construction, integration, and off-task behavior.

Table 5

The frequencies and percentages of intellectual acts coded in five GBL groups

Act	Group 1		Group 2		Group 3		Group 4		Group 5	
	N	%	N	%	N	%	N	%	N	%
Off Task	0	0.0	0	0.0	0	0.0	4	13.8	0	0.0
Initiation	22	75.9	10	37.0	12	42.9	17	58.6	11	37.9
Negotiation	4	13.8	7	25.9	10	35.7	4	13.8	7	24.1
Coconstruction	2	6.9	8	29.6	6	21.4	2	6.9	10	34.5
Integration	1	3.4	2	7.4	0	0.0	2	6.9	1	3.4

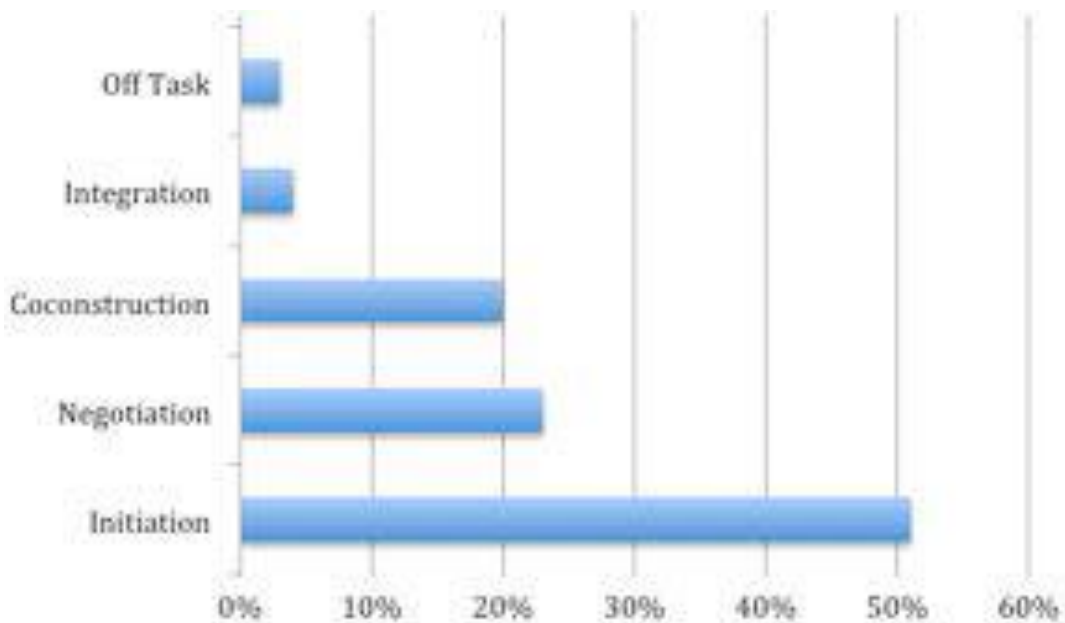


Figure 2. Average percentage of intellectual acts in five GBL groups

Additionally, not every group expressed every intellectual act. For instance, “off task behavior” was only coded for group 4, while group 3 was never coded with “integration.” Table 5 shows the frequency (in terms of the number of times coded) and the percentage of units spent engaged with each intellectual act per individual group. Figure 2 shows the average percentage of units coded across all five groups. The presence of lower acts (such as “initiation” acts) were often embedded in the units coded as higher acts given that units of analysis consisted of five minute “chunks,” and that units were coded for the highest intellectual act expressed.

Figure 3 shows the trajectory of each group’s intellectual acts as coded across four days of GBL activity. Video data consisted of approximately 35 minutes of footage per class day, providing an average of 29 units per group.

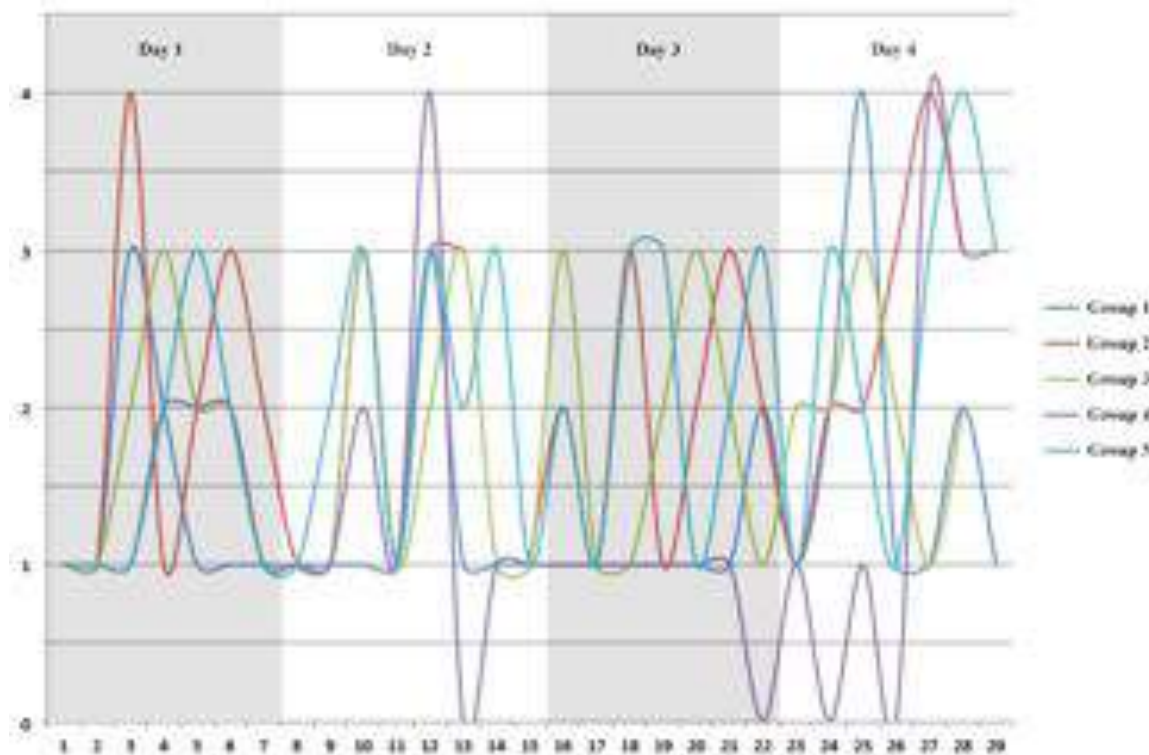


Figure 3. Intellectual acts as coded for individual groups across four days

As shown in Figure 3, each group’s dialogue indicated a different trajectory of critical thinking expressed through discourse. “Peaks” (groups achieving 4:Integration) and “valleys” (the group coded as “off-task”) are immediately identifiable here. This figure also makes visible some semblance of oscillation between intellectual acts (i.e. between 3:Co-construction and 1:Initiation). Higher-level acts are generally not maintained across consecutive units of analysis. This is significant, given that the GBL intervention purposed to foster higher levels of critical thinking. In turn, these moments were examined with particular deliberation so as to better understand their contexts and causes.

The daily happenings of the GBL group consisted of movement through the game’s turn-cycle (discussion within the group, discussion with other groups, “battle,” repeat). The instructor began each class with a mini-lecture (approximately five minutes) in which he (1) delivered content to the class (to be written by students in their notebooks), and (2) quickly reviewed the prior day’s in-game events (i.e. recent battles and exchanges of land-spaces). Classes who did not receive the GBL intervention spent these days engaged in “traditional” learning activities as indicated by instructors’ notes and lesson plans. Traditional instruction on these days consisted of mini-lectures, writing skeleton notes, completing content-based worksheets, watching short films, and completing small-group learning projects (i.e. designing a news report about some aspect of the French and Indian War). See table 6 for detailed daily happenings.

Table 6

Daily happenings in intervention and “business-as-usual” groups

	Intervention	“Business-as-usual”
Day One	<ul style="list-style-type: none"> • Minutes 1 – 4: Initial distribution of game materials (maps, objectives) • Minutes 5 – 16: Teacher explanation of all materials, game rules, and win-states • Minutes 17 to 30: Students “play” (intra-group discussion, inter-group discussion, battle) 	<ul style="list-style-type: none"> • Students drew and labeled maps of 1750 America • Students discussed maps with class • Students viewed a scene from <i>The War That Made America</i> film • Students were asked to explain the components of the war (how it was fought and why it happened) in their own words
Day Two	<ul style="list-style-type: none"> • Minutes 1 to 6: Teacher led a mini-lecture, elaborating on the key players in the French and Indian War, as well as their motives. Students were asked to take notes. • Minutes 7 to 36: Students “play” (intra-group discussion, inter-group discussion, battle) 	<ul style="list-style-type: none"> • Students discussed the nature of alliances as per popular reality television shows • Students discussed the goal of alliances in the French and Indian War in small groups, followed by teacher explanation • Students were asked to make predictions about the colonies’

	<ul style="list-style-type: none"> • Minutes 37 to 40: Teacher explained historical content pertinent to war (i.e. nature of artillery, traditional vs. guerilla warfare). Students took notes. 	<p>reaction to the Albany Plan of Union</p>
Day Three	<ul style="list-style-type: none"> • Minutes 1 to 5: Teacher distributes game materials while reviewing gameplay (i.e. the class's previous battles and land exchanges) • Minutes 6 to 40: Students "play" (intra-group discussion, inter-group discussion, battle) 	<ul style="list-style-type: none"> • Students watched additional scenes from <i>The War That Made America</i> film • Students were asked to put index cards detailing events from the war in chronological order • Students were asked to complete a "facts sheet" handout
Day Four	<ul style="list-style-type: none"> • Minutes 1 to 6: Teacher distributes materials and while reviewing gameplay • Minutes 7 to 20: Teachers "play" (intra-group discussion, inter group discussion, battle) • Minutes 20 to 35: Game "ended" and students discussed their objectives, their strategies, and the thinking behind their tactical decisions. 	<ul style="list-style-type: none"> • Students created and shared news reports on the Treaty of Paris, Pontiac's Rebellion, and the Proclamation of 1763 • Teacher reviewed "fact sheets" with the class

In the sections that follow, each type of intellectual act will be explained in the context of the video data, and representative excerpts will be provided. Additionally, patterns that have been discerned from the data, such as oscillations and "peaks and valleys" will be identified and unpacked. Pseudonyms are used for all participants.

Oscillation

A frequently exhibited pattern in groups' discourse was an oscillatory trajectory, most often wavering to and from Initiation and Co-construction. The high rate of occurrence of "Initiation" units was anticipated, and can be attributed to the necessity of

posing/clarifying points prior to moving toward higher levels of critical thinking and discourse. In this fashion, segments coded as Initiation can be considered springboards for critical thinking as they were often identified during the instructor's explanations of gameplay/content, and consistently proceeded by Negotiation and Co-construction.

The following excerpt is taken from group 1's discourse in their first unit of play:

- Teacher: So throughout the game, you are going to take turns deciding if you want to attack other spaces because everybody has the objective of controlling more territory. The amount of territory you have to control by the end of the game though is different from group to group.
- Erin: (Looking to group member and pointing to map) These are the spaces?
- Jason: (Nods in the affirmative.)
- Erin: There's thirty-nine.
- Jason: (Nods in the affirmative.)
- Teacher: There are, I think, thirty spaces.
- Erin: Thirty? I thought it was...
- Jason: Thirty-nine.
- Erin: But I counted the big ones too.
- Teacher: Thirty-one spaces.

Discourse of this nature (i.e. teacher explanations followed by students' clarifying questions) continued for the first two units of group 1's play, until the teacher asked all students to discuss strategy with the members of their own groups. The following excerpt is taken from group 1's third unit of play, and is significant in that it exemplifies how both tactics and understandings can be co-constructed once an appropriate knowledge base has been established.

- Erin: So let's make an alliance with the Shawnee. That way it blocks -- (pointing to map) -- then they can't get through here, they can't get through here, or down here.
- Ashley: We're British. Almost every person here (pointing to map), they can attack us.
- Erin: It doesn't matter though, cause we get six die and everyone else only gets three. Except for the French. The French can't attack us though.
- Ashley: Why?
- Erin: Read the map. So, Louisiana territory. What is the Louisiana territory?
- Ashley: (Indicates the Louisiana Territory on the map)

Erin: This. So we can't -- we have to block them getting anywhere down here.
 Jason: We'll make an alliance here to here (pointing at map).

This discourse is compelling for several reasons. First, the group is clearly immersed in the game-play. This is evidenced in the fluency of their discussion regarding alliances and game tactics. Second, students are contending for the best tactic using evidence that is grounded in knowledge learned during Initiation segments. This is indicative of the critical thinking “springboard” effect. Further, once immersed in the game-space and engaged in small-group discussion, students seem to organically negotiate and co-construct knowledge. For instance, Erin’s proposal to form a strategic alliance with the Shawnee so as to blockade the other tribes was made possibly by the knowledge that she attained during the preceding Initiation segments (historical content, game mechanics). Ashley, who was also present for the preceding Initiation segments, internalized potential avenues for winning in a different way. Ashley’s intuitional demand for Erin to substantiate her proposal before moving forward inherently prompted the group to think more critically about their circumstances.

Shortly thereafter, Initiation was revisited in the context of the group clarifying their strategic plans and imminent decisions. While these moments have proven fertile ground for generating higher-level discourse (i.e. making an evidence-based argument for or against a clarified point), group discourse occasionally remained static. In the excerpt that follows, Ashley and Erin wait their turn to roll the dice. Their exchange simply clarifies the tactics they resolved to pursue in the previous Co-constructural segment.

Ashley: (During attack phase, to her group) Guys. Were we going to go up and attack them too?
 Erin: (Nods in the affirmative.)
 Ashley: Can I go up?
 Erin: Yeah. Go. (Hands her dice.)

Ashley: (Regarding dice) Wait, all of them?
Erin: Yeah!

As such, Initiation units may often represent unrealized opportunities for critical thinking (i.e. passive agreement, disagreement without support). While Initiation discourse does not qualify as higher-level thinking, the presence of this kind of talk is significant in the context of facilitating learning with understanding. If this type of GBL intervention is to be used as a means of facilitating learning with understanding so that students may develop a deep body of factual knowledge, understand facts and ideas in the appropriate context and on a theoretical level, and organize knowledge in flexible ways that can be applied to novel contexts (Bransford, Brown, & Cocking, 2000), the process of posing and clarifying ideas is paramount.

Peaks and Valleys

On occasion, the seemingly predictable oscillations discussed in the preceding section were disrupted by “peaks” (leaps to the highest level of critical thinking) and “valleys” (plunges into off-task behavior). Understanding the causes and contexts of these moments is significant in considering how this particular GBL intervention (and learning environments at large) might be refined to create conditions that better foster critical thinking and that shirk off-task behavior. Group 4 best lends itself to the discussion of peaks and valleys in that it was the only group to exhibit both the highest levels of critical thinking, as well as off-task segments.

In the case of group 4, units coded as “off task” consisted largely of passive watching, stretches of silence, irrelevant behaviors (i.e. drawing pictures), and irrelevant discourse.

Joseph: (Makes hand gesture toward camera.)
 Cassandra: Seriously?
 Joseph: What do you have against the Vulcan hand signal?
 Cassandra: You just do it a lot.
 Steven: (Drawing a picture on a piece of paper, looking frustrated.) I suck!
 Joseph: Okay. Spock didn't do it for nothing.
 Cassandra: I'm not sure. Where is he now?
 Joseph: Well I actually saw the person who played Spock at my cousin's graduation.

However, the above example of off-task discourse is far less remarkable than its context.

Group 4 was not coded as “off-task” until their 14th five-minute unit of analysis. In their 13th unit, two significant events took place: (1) group 4 lost all of their territory, ultimately “losing” the game (at which point they were assigned the task of writing to track other groups’ progress), and (2) group 4 was coded at their highest intellectual act.

The imminent loss seemed to inspire a final effort to “survive,” characterized by reflective analysis and a plea to the teacher to alter the game rules to better reflect “real wars.”

Steven: The funny thing is the French, after they get from everyone else and beat everybody else, then the French is going to attack their friends.
 Cassandra: Yeah, what everyone doesn't realize is that once we're gone, the common hatred—
 Steven: Yeah. The French is going to attack them.
 Cassandra: Everyone is going to go running.
 Steven: (To neighboring group) You groups that are helping them, they are going to attack you after they are done with us.
 Joseph: (To teacher) I say we should have a raffle to win back die right now. Come on, that would add more suspense.
 Cassandra: Yeah! I agree with Joseph on that one.
 Teacher: Yeah but then it will all be chance.
 Steven: This game is about chance.
 Cassandra: Yeah.
 Teacher: Part of it is about chance.
 Joseph: Well yeah but in a real war, it depends on how hard and determined someone is. Now it's just, if I roll my lucky numbers, I win the war. If that's how regular war was fought, then there would be a lot less war in the world.

In sum, group 4 was not coded as “off task” prior to losing all of their territory (thus being ejected from the GBL intervention) and “peaking” (i.e. extending their gameplay experience to their understanding of “real wars”) in the preceding unit of analysis. While off task segments appear to be the byproduct of experiencing a “game over” condition, the watersheds that occurred in the dire moments preceding loss are of tremendous importance. These peaks may be interpreted as indicators of forced synthesis and reflection, prompted by the imminence of a condition that ultimately detaches players from the game-environment. Through this lens, it is not surprising to see that the highest moments of critical thinking were often followed by steep drop-offs, and that the majority of these moments occurred during the final stages of gameplay.

Critical Thinking: Aha!

As per the coding scheme used in this study, “Integration” is intended to indicate the highest levels of critical thinking, demonstrative of extension and synthesis. The qualities of Integration discourse include branching into new ideas, making implications and predictions, indicating new applications, and identifying overarching themes/concepts. Unlike other intellectual acts discussed, Integration does not seem to emerge as fluidly and in association with “precursor” acts. Rather, “Integration” was only coded six times across all video data, and only in four of the five GBL groups. In the first two instances, “integration” happened earlier in the game, somewhat unexpectedly (i.e. just prior to Group 4 losing the game, discussed in the “*Peaks and Valleys*” section above). In the remaining four instances, these “peaks” came on the last day of the

intervention as teams began to seek closure and make overarching, reflective statements about the gameplay.

Shawnee Student 1: Okay. We'll go for the – blue
 French Student 1: What are you talking about? No!
 Shawnee Student 2: No! Go with the Erie.
 Shawnee Student 1: Listen to them (referring to her group members), not me.
 French Student 1: Go with the British!
 Shawnee Student 3: What?!
 French Student 2: What?! The British Just supported us!
 Shawnee Student 1: Decide. Decide.
 Shawnee Student 3: Erie.
 French Student 2: (Sigh of relief.) Oh my god. That was like a nuclear war.

These instances of Integration (synthesis and/or extension) are critical in that they represent the kind of thinking and discourse that this intervention seeks to foster and, ultimately, to maximize. The features of play that promote Integration appear to happen organically as a part of gameplay – often in dire circumstances and/or as late/post-game reflections. The question of how these kinds of reflective processes might be prompted is significant in considering how future iterations of this intervention (and GBL environments in general) might be refined to better promote critical thinking.

Inter-group Dialogue

While the majority of discourse took place between group members (within single groups), instances of *inter*-group dialogue are particularly interesting in that they seem to prompt a different and deeper kind of thinking. For instance, Negotiation was prevalent in moments that promoted *intra*-group dialogue (often prompted by the teacher) as students brought their ideas to the table for the first time, questioned the strategies put forth by their peers, and supported their own with evidence. The following excerpt from group 2 exemplifies typical intra-group Negotiation:

David: No, no, no. Screw the French. The French are going to hell.
 Matthew: They're going to think that they're our allies.
 David: I already told them.
 Matthew: You already told them that? What is your problem?
 David: No, no. They're going down. We're taking all the Indian tribes and we're going against them. Because then, once we — Ottawa said they would stay with us so once we get rid of the French, we take Ottawa, and we try to take Erie.

However, groups were also allotted time to form alliances, to which *inter*-group dialogue is essential. In these instances, students engaged in higher order processes, evidenced by their elaborately detailed and often evaluative discourse. The following excerpt exhibits a typical *inter*-group exchange between Matthew and David of group 2, and Lori of group 3:

Matthew: Erie, do you want to be in our alliance?
 David: Come over here!
 (Lori walks over.)
 Matthew: You backstabbed us! You backstabbed us in the middle of the game!
 Lori: You did that to us too!
 Matthew: Attack the British and we're gonna support you.
 Peter: They have one die. You have one die. I have one die. And he has one die. That's three on two, which means they can't beat us.
 Matthew: They call it the French and Indian war for a reason.
 Lori: (Silent and pensive for a moment.) Okay. Fine. But we're going to make it look like we don't have an alliance. I'm going to take this space (pointing to map), and you take this space.

This kind of evaluative discourse may be attributed to the circumstances of gameplay; as one group approaches another with the intention of forming an alliance, players inherently evaluate the perspectives of their peers and of their prospective alliances. Further, the discussions and in-game actions that have already taken place (i.e. betrayals) often fueled a more meticulous consideration and elaboration of surmised intentions.

Post-tests and Delayed Post-tests

A five-question content-based post-test was given to 177 participants, 62 of whom received the GBL treatment condition, 115 of whom received traditional “business as usual” instruction (see table 7 for descriptive statistics). An analysis of variance (see table 8) did not show any reliable effect of condition ($F(1, 173) = 2.66, p > .05$), and there was no condition by gender interaction ($F(1, 173) = .42, p > .05$). There was an overall effect of gender ($F(1, 173) = 5.96, p = .02$), whereby females ($M = 3.88$) outperformed males ($M = 3.39$) on the post-test, however this effect does not interact with treatment.

Table 7

Descriptive Statistics for Post-Tests and Delayed Post-Tests

	Total <i>N</i>	Game-Based Learning			Traditional		
		<i>N</i>	<i>M</i>	<i>sd</i>	<i>N</i>	<i>M</i>	<i>sd</i>
Post-Tests	177	62	3.66	1.07	115	3.88	.98
Males	91	28	3.39	1.20	63	3.75	.98
Females	86	34	3.88	.92	52	4.04	.96
Delayed Post-Tests	167	60	2.11	.75	107	2.28	1.02
Males	84	27	2.20	.89	57	2.28	1.01
Females	83	33	2.03	.62	50	2.27	1.04

Table 8

Tests of Between-Subjects Effects

	Post-Test		Delayed Post-Test	
	<i>F</i>	<i>p</i>	<i>F</i>	<i>p</i>
Condition	2.66	.11	1.09	.30
Gender	5.96	.02	.37	.55
Condition by Gender	.42	.52	.29	.59

Six months later, the same post-test was taken by 167 of the same participants, 60 of whom belonged to the GBL condition, 107 of whom received traditional instruction. An analysis of variance did not show any reliable effect of condition ($F(1, 163) = 1.09$,

$p > .05$), of gender ($F(1, 163) = .37, p > .05$), and there was no condition by gender interaction ($F(1, 163) = .29, p > .05$).

Discussion

In this study, GBL seems to have proven itself a viable means for promoting critical thinking and learning. Given (1) the lack of significant difference across test and control groups as indicated by post-tests and delayed-post tests, and (2) the quality of student discourse, the results suggest that GBL has the potential to flourish in otherwise traditional school settings.

The Absence of Difference

The lack of significant difference in effect across the condition and control group is a compelling finding in that it speaks to the viability of GBL in traditional classrooms. Given that GBL, as implemented for this study, is able to yield statistically comparable results on a content test as traditional practices, it seems appropriate to ask “*Why not?*” when considering the implementation of such instructional strategies in schools. As the principles of GBL-design are refined, it will be interesting to see how such interventions (i.e. future iterations of this study’s intervention) continue to compare with “traditional” means for delivering instruction.

The statistically significant finding indicating greater achievement for females than males on the content post-test in the GBL condition is also fascinating, but raises more questions than it answers: Are female students more apt to learn in GBL environments than males? In light of the fact that the highest scoring group was the

female population in the control condition ($M = 4.04$), is it that 8th grade female students are simply more adept at mastering content? What kept the male GBL students' post-test scores from achieving the same heights as their female peers? Did these male students, who scored significantly lower than their female counterparts on the post-test but equivalently on the same test given six months later, "learn" any less? While the answers to these questions are beyond the scope of this study, they are important pieces in the GBL "puzzle," and should be examined in future research.

Quality of Student Discourse

The implemented GBL intervention essentially asked students to play a game in which they took on the collective identities of various tribes and nations during the French and Indian war, and to compete (using the game's system of rules) against other small groups in order to complete predetermined objectives. In doing so, students engaged in varied levels of discourse, ranging from posing ideas and clarifying questions to making substantiated judgments based on the synthesis of evidence. Interestingly, lower-level discourse occurred most frequently during teacher-driven explanations and dice-rolling "war" phases, whereas higher-level discourse was most often grounded in intra- and inter- group discussion. The juxtaposition of these findings with those of studies examining the effects of PBL (Hmelo-Silver, 2004; Hmelo-Silver & Barrows, 2006) yield similar results regarding the pertinence of student-centeredness, of small-group discourse, of teacher-as-facilitator, and of authentically driven ("problem-based") learning scenarios when seeking to foster critical thinking.

These findings have implications for traditional schools in that the tenets of GBL mentioned above are congruent with the highest levels of teaching as described by the most widely adopted teacher-evaluation models. For instance, Danielson's (2007) Framework for Teaching heralds student engagement, student choice, and student-driven learning as critical to the high quality teaching. These findings corroborate the salient features of such evaluation models, and suggest that constructivist-style learning environments (such as the GBL intervention examined in this study) are harmonious with great teaching.

The results of this study are important for the sake of better understanding and refining the implemented GBL intervention, as well as for the design of future GBL environments. The first of these results, clearly evidenced in Figure 3, is the oscillation rather than sustainment of intellectual acts across units of time. After careful analysis of the video data, the wavering of student discourse between the first, second, and third codes appears attributable to the logistical structure of the game – that is, the system of turn-taking, of teacher-interjections, and of forty-minute class periods. It might also be argued that the codes associated with lower-levels of critical thinking (“posing” and “clarifying”) were essential for building a deep knowledge base, therefore empowering students to achieve deeper understandings and higher-levels of critical thinking (“elaborating” and “evaluating”) (Bransford, Brown, & Cocking, 2000). The questions that arise: Is student discourse inherently oscillatory in constructivist/game-based learning environments? Is higher level critical thinking sustainable across extended periods of time in such environments? If so, how might sustained levels of thinking and discourse be cultivated?

Moreover, the highest level for critical thinking (Integration) was only coded in 4.2% of all measurable units. Integration was most prevalent for group 2 (coded in 7.4% of their units), and was wholly absent for group 3 (coded in 0% of their units). The pressing questions here are fairly obvious: What is it about these groups that supports higher levels of critical thinking, and how might that support be utilized to the advantage of all groups? As mentioned in the results, the majority of Integration codes are embedded in reflective contexts; that is, as students were faced with dire circumstances (i.e. imminent loss, major strategic shifts, etc.), they often responded by sharing sweeping insights into the game, by making connections to major pieces of the social studies curriculum (often using them as evidence to substantiate their claims), and/or by extending their in-game experiences to their own lives. Here, it seems that a critical seventh principle should be appended to the six principles of game-based learning detailed in figure 1: *The intervention must create deliberate spaces for reflection and synthesis*. The importance of reflection has been documented with regard to experiential learning (Kolb, 1984), problem-based learning (Hmelo-Silver, 2004), and even game-based learning (Nicholson, 2012) (although often referred to as “debriefing” in the context of GBL). These reflective spaces might be embedded into GBL environments as explicit opportunities to express feelings, to explore the learning that has recently occurred, and to relate prior knowledge and/or experiences. With regard to the GBL intervention considered in this study, a relatively straightforward revision may have achieved these ends (i.e. following each “inter-group discussion” or “battle” phase with a “reflective talk” phase; embedding a reflective/dialectical journal exercise; holding a full-class “debriefing” at the game’s end), and will be pursued in iterative implementations.

The limitations of this study are primarily drawn from the real-world constraints often associated with design-based research. The students who received the GBL intervention were not randomly selected, although the fact that the participating middle school did not track students in terms of ability helped to promote variation across participants.

Further, the three sections receiving the GBL intervention were compared with seven sections receiving “traditional” business-as-usual instruction. The same teacher who implemented the GBL intervention also taught two of the seven business-as-usual classes, and as a result, his potential bias for game-based learning should be taken into consideration. Five additional sections of 8th grade social studies were taught by a different instructor altogether. In order to determine that the methods being utilized in these classes were not consistent with those of the GBL intervention, teachers were asked to share their lesson plans for this particular unit.

Future research should explore the possibility of heightened and/or sustained levels of critical thinking. This can be done by implementing multiple iterations of a GBL intervention using this study’s findings as a springboard for design, and/or by implementing reiterations of the intervention discussed in this article. Researchers and educators alike are encouraged to continue exploring GBL for purposes of engaging students, fostering critical thinking skills, and teaching content in a manner that is student-centered, congruent with the grammar of traditional schooling, and at least equally as effective as conventional teaching practices.

R O X B U R Y S C H O O L D I S T R I C T

Preparing the children of today for tomorrow...

GAME-BASED LEARNING

SUMMER PD COURSE OFFERING

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Supervisor of Humanities

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Foreword

This game-based learning PD curriculum represents an effort to bridge the “practicality gap” that is all-too-often associated with dissertation research. I am thrilled at the prospect of discussing many seminal and fascinating pieces of GBL research with a group of educators who are seeking to expand upon their teaching practices, and who (hopefully) have some interest in game-based learning. It is my aspiration to share all that I’ve learned in the process of designing and evaluating a game-based learning intervention with the participants of this course. These experiences have undoubtedly bolstered my understanding of GBL, of “design,” and of learning at large. I can only hope that this curriculum will serve as a vehicle for fostering similar insights in all course participants.

The pages that follow catalog the course’s intended learning outcomes, each of which embodies some major element of my dissertational process. Outcomes include (1) defining GBL, (2) designing a GBL environment, (3) evaluating GBL environments, and (4) understanding and harnessing the power of constructivism. Scholarly articles are woven throughout the course in order to ground our understandings in research and in order to generate discussion. Additionally, pieces my own research (i.e. intervention design, transcripts, analytical processes, findings) will be utilized as springboards for discussion, and as an authentic “fabric” from which participants may weave their own deeper understandings.

I would like to acknowledge and thank both the Rutgers Graduate School of Education curriculum committee and my dissertation committee for providing me the opportunity to share the findings and experiences of my doctoral research in a manner that is somewhat untraditional, but immensely valuable in its practicality. I would also like to thank the Roxbury Board of Education for the opportunity to implement the first iteration of this course as a part of Roxbury’s awesome in-house professional development program.

Game on!

Syllabus

Our Purpose

Throughout this course, participants will review a growing body of academic research on games in education and will explore various frameworks for integrating Game-Based Learning (GBL) into their own classrooms. Participants will consider how a variety of game genres (i.e. roleplay, boardgames, alternate reality games, video games) might be adopted for instructional purposes, and will consider research/case studies that have made account of such endeavors. Participants will examine the close relationship between game-based learning and problem-based learning, and will explore the role of games in promoting critical thinking.

Participants will have opportunities to work collaboratively, to fashion game-based learning environments as best fit for their own classroom purposes, and to develop procedures for evaluating/refining those environments.

Our Structure

This course will meet five times, for three hours each time. Following our first class, a series of recommended readings will be provided to contextualize the work we will be doing. Class will generally take the following structure:

20 MINUTES	40 MINUTES	30 MINUTES
Discussion of Introductory Piece (short article, film clip)	Research Seminar (discussion of readings)	GBL Experience (play & evaluate a game)
40 MINUTES	20 MINUTES	30 MINUTES
GBL Design (design a GBL environment)	GBL Workshop (share and evaluate our designs)	“Sandbox” (participants’ contributions)
<i>BETWEEN CLASSES: RECOMMENDED READINGS / ONLINE FORUM / SANDBOX</i>		

An *introductory piece* will be used as a springboard for discussion at the start of each class. Pieces will range from TED talks to Educational Leadership articles to online mini-games. This segment will be followed by a *research seminar* in which participants will discuss (1) the essential questions of the day, and (2) the recommended readings. Readings will draw from scholarly journals, will include seminal works pertinent to games and learning (Gee, Squire, Prensky, etc.), and will touch upon a growing body of current GBL research. The *research seminar* is followed by a *GBL experience* in which all members of the class will be “immersed” in an authentic GBL environment -- that is, we’ll be playing a game. As we play, we will reflect upon and deconstruct the kind of learning that is taking place. (GBL experiences will vary based on each class’s focus, spanning video games, boardgames, and simulations across intended user age-ranges and content areas/disciplines.)

After playing and evaluating a GBL environment, participants will have the opportunity to design (independently or collaboratively) an environment of their own. This design should be grounded in the research, experiences, and discussions pertinent to the current class. Designs will then be shared with colleagues and evaluated with intentions to refine and enhance.

The final thirty minutes of class will be slated for “sandbox” time. On the first day of class, participants will sign up for particular days, and on those days, will be responsible for bringing in articles, games, and points of discussion. These individuals will be responsible for “fueling” the final thirty minutes of each class. Sandbox materials should be emailed to the instructor the day prior so that additional resources/supports may be provided.

Curriculum Map

DAY 1	INTENDED LEARNING OUTCOMES	CORE READINGS
	<p style="text-align: center;"><u>CORE FOCUS: INTRODUCTION TO GBL</u></p> <p>By the end of <i>day 1</i>, participants will be able to:</p> <ul style="list-style-type: none"> • Understand the significance of GBL • Identify principles of GBL in select video games • Apply these principles to their own learning environments • Evaluate environments for effective learning principles • Reflect on the process of designing a GBL environment 	<p style="text-align: center;">Gee (2003): <i>What Video Games Have to Teach Us About Learning and Literacy</i></p> <p style="text-align: center;">Malone (1980): <i>Toward a theory of instructionally motivating instruction</i></p> <p style="text-align: center;">Prensky (2001): <i>Digital Game-based Learning</i></p>
DAY 2	INTENDED LEARNING OUTCOMES	CORE READINGS
	<p style="text-align: center;"><u>CORE FOCUS: DESIGNING A GBL ENVIRONMENT</u></p> <p>By the end of <i>day 2</i>, participants will be able to:</p> <ul style="list-style-type: none"> • Consider the affordances & constraints of game genres • Understand the fundamentals of <i>Design Based Research</i> • Apply overview of research on GBL to their own practices 	<p style="text-align: center;">Brown (1992): <i>Design experiments...</i></p> <p style="text-align: center;">Csikszentmihalyi (1990): <i>Flow: The psychology of optimal experience</i></p> <p style="text-align: center;">Norman (1988): <i>The Design of Everyday Things</i></p> <p style="text-align: center;">Squire, DeVane & Durga (2005): <i>From users to designers...</i></p>
DAY 3	INTENDED LEARNING OUTCOMES	CORE READINGS
	<p style="text-align: center;"><u>CORE FOCUS: EVALUATING A GBL ENVIRONMENT</u></p> <p>By the end of <i>day 3</i>, participants will be able to:</p> <ul style="list-style-type: none"> • Analyze/design simulations, board games, roleplay games • Engage in the process of designing and evaluating GBL environments in a methodologically sound fashion 	<p style="text-align: center;">National Research Council (2011): <i>Learning science through computer games...</i></p> <p style="text-align: center;">Nicholson (2012): <i>Completing the experience: Debriefing in experiential education games</i></p> <p style="text-align: center;">Shaffer (2006): <i>Epistemic frames for epistemic games</i></p> <p style="text-align: center;">Squire & Barab (2004): <i>Replaying history...</i></p>
DAY 4	INTENDED LEARNING OUTCOMES	CORE READINGS
	<p style="text-align: center;"><u>CORE FOCUS: CONSTRUCTIVIST ENVIRONMENTS</u></p> <p>By the end of <i>day 4</i>, participants will be able to:</p> <ul style="list-style-type: none"> • Understand the tenets of problem-based learning • Design/evaluate alternate-reality games, open-ended games, and similar constructivist learning frameworks 	<p style="text-align: center;">Cicchino (2013): <i>Using game-based learning to foster critical thinking in student discourse</i></p> <p style="text-align: center;">Hmelo-Silver (2004): <i>Problem-based learning: What and how do students learn?</i></p>
DAY 5	INTENDED LEARNING OUTCOMES	CORE READINGS
	<p style="text-align: center;"><u>CORE FOCUS: SYNTHESIS & DEBRIEFING</u></p> <p>By the end of <i>day 5</i>, participants will be able to:</p> <ul style="list-style-type: none"> • Synthesize the material covered in this course • Direct their own learning in order to fill any gaps, address individual needs, and/or pursue personal interests 	<p style="text-align: center;">TBD based on students' needs and/or preferences.</p>

Day 1: What is Game-Based Learning?

Essential Questions

- What makes a game “a game”?
- What qualifies “game-based learning” (GBL)?
- What does a GBL environment look like?
- How are GBL environments designed?

A) Introductory Piece(s)

- *Extra Credits: Gamifying Education* (video)
<http://www.youtube.com/watch?v=MuDlw1zIc94>
- *James Paul Gee on Learning with Video Games* (video)
<http://www.youtube.com/watch?v=JnEN2Sm4IIQ>

B) Research Seminar

Selected excerpts from:

- Gee, J.P. (2003). *What Video Games Have to Teach Us About Learning and Literacy*. New York: Palgrave Macmillan.
- Malone, T.W. (1980). Toward a theory of instructionally motivating instruction. *Cognitive Science*, (4), 333-369.
- Prensky, M. (2001). *Digital Game-based Learning*. New York: McGraw Hill.

C) GBL Experience

Play the following games. Then, (1) identify any of Gee’s principles of GBL, (2) additional features of GBL that contribute to the effectiveness of the learning environment, and (3) reflect on your experience. (What did you learn? How did you learn it?)

- *Super Mario Bros.*
- *PacMan*
- *Math Blaster*
- *Angry Birds*
- *Dumb Ways To Die*

D) GBL Design

Consider today’s readings (Prensky’s call for teaching the new “digital” generation of students differently, Gee’s list of game-based learning principles).

With a partner, begin the process of designing a game. You’ll be drafting on paper, but you have artistic license here -- be creative, be crafty, be compelling.

Requirements:

- Your game should have intended learning outcomes!
- Your game should have an overarching theme!
- Your game should have a system of rules!
- Your game should have a title!

E) GBL Workshop

You will be asked to share your game(s) with the class. As games are shared, your peers will evaluate your GBL environment using a grid of research-based principles (Appendix A). Opportunities will be provided for Q&A, and for making suggestions moving forward.

F) “Sandbox”

- Participants will sign up for future sandbox days
- Today’s sandbox will be led by the instructor.

Recommended Readings

- Egenfeldt-Nielsen, S. (2006). Overview of research on the educational use of video games. *Digital Kompetanse*, 1(3).
- Young, M.F., Slota, S., Cutter, A.B., Jalette, G., Mullin, G., Lai, B. Simeoni, Z., Tran, M., & Yukhymenko, M. (2012). Our princess is in another castle: A review of trends in serious gaming for education. *Review of Educational research*, 82(1), 61-89.

Day 2: Designing Game-Based Learning Environments

Essential Questions

- What are the affordances and constraints associated with various GBL platforms?
- What are the appropriate steps for building an effective GBL environment? For any learning environment?

A) Introductory Piece(s)

- Interviews pertinent to design-based research
<http://dbr.coe.uga.edu/expertinterview.htm>
- Play one of the following games:
Snake, Tetris, Dots, Bubble Struggle, Mario Bros.

B) Research Seminar

- Brown, A.L. (1992). Design experiments: Theoretical and methodological challenges in creating complex interventions in classroom settings. *The Journal of the Learning Sciences*, 2(2), 141-178.
- Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York: Harper Perennial.
- Norman, D. (1988). *The Design of Everyday Things*. London: The MIT Press.
- Squire, K.D., L. DeVane, B., & Durga, S. (2005). From users to designers: Building a self-organizing game-based learning environment. *Tech Trends*, 49(5), 34-42.

C) GBL Experience

Play *Oregon Trail*: <http://oregontrailgame.org>

After playing, evaluate and discuss the features of this game that may (or may not) lend themselves to Csikszentmihalyi's theory of flow.

Groups will create a list of (1) affordances and constraints pertinent to the game, (2) intended and unintended learning outcomes, and (3) social and motivational outcomes/processes.

D) GBL Design

Option 1: Continue / refine the GBL environment that you began working on on Day 1.

Option 2: Design a new GBL environment

Regardless of which option you choose, be certain to consider (1) how "flow" might be achieved for your participants, and (2) how this game might be studied through the lens of DBR.

E) GBL Workshop

Be prepared to share and discuss your new / refined game designs -- including your game's (1) affordances and constraints, (2) consideration for flow, and (3) aptness for a DBR study (potential alternative to action research).

F) "Sandbox"

Class participants will lead today's sandbox.

Recommended Readings

- Design-based Research Collective (2003). Design-based research: An emerging paradigm for educational inquiry. *Educational Researcher*, 32(1), 5-8.
- Sandoval, W.A. & Bell, P. (2004). Design-based research methods for studying learning in context: Introduction. *Educational Psychologist*, 39(4), 199-201.
- Williams, P. & Sheridan, S. (2010). Conditions for collaborative learning and constructive competition in school. *Educational Research*, 52(4), 335-350.

Day 3: Evaluating Game-Based Learning Environments

Essential Questions

- How do various game genres (board games, simulations, roleplay games) foster learning? How can these game-types be optimized for intended learning outcomes?
- Now that I've designed a game-based learning environment, how can I effectively evaluate it?

A) Introductory Piece(s)

- *Full Spectrum Warrior* (gameplay footage)
http://www.youtube.com/watch?v=CUN8MzrW_0A
- *Peacemaker* (gameplay footage)
<http://www.youtube.com/watch?v=4f8DKQqI-YE>
<http://www.youtube.com/watch?v=7iPvWefuPwo>

B) Research Seminar

- National Research Council (2011). *Learning science through computer games and simulations* (Committee on Science Learning: Computer Games, Simulations, and Education, A. A. Honey, & M. L. Hilton, Eds.). Washington, DC: National Academies Press.
- Nicholson, S. (2012). Proceedings of the 3rd international conference on society and information technologies: *Completing the experience: Debriefing in experiential education games*. Winter Garden, Florida.
- Shaffer, D.W. (2006). Epistemic frames for epistemic games. *Computers & Education*, (46), 223-234.
- Squire, K. & Barab, S. (2004). Proceedings of the 6th international conference on learning sciences: *Replaying history: Engaging urban underserved students in learning world history through computer simulation games*. Santa Monica, CA.

C) GBL Experience

Play one of the boardgames situated in the different areas of our classroom (Risk, Life, Scrabble). After playing, as per Nicholson's suggestion, "debrief." (Time will be allotted for an independent reflection, for a small-group discussion, and for full-class debriefing.)

In small-groups, evaluate the game itself. Is this a strong vehicle for instruction? What are its strengths? How can we test our presumed learning outcomes?

D) GBL Design

Part 1: Develop a board game. This should be a rough mockup, sketched on paper. Be sure to include intended learning outcomes and any pertinent game mechanics.

Part 2: Develop a plan for "debriefing" your participants.

Part 3: Develop a framework for evaluating your board game. How might your intended learning outcomes be assessed? How might this game be refined?

E) GBL Workshop

Board game designs, plans for "debriefing," and methods for evaluation will be shared/discussed.

F) "Sandbox"

Class participants will lead today's sandbox.

Recommended Readings

- Barrows, H.S. (1996). Problem-based learning in medicine and beyond: A brief overview. In L. Wilkerson & W. Gijsselaers (Eds.), *Bringing problem-based learning to higher education: Theory and practice*. New Directions For Teaching and Learning Series, No. 68 (pp. 3-11). San Francisco: Jossey-Bass.
- Bransford, J., Brown, A., & Cocking, R. (Eds.). (2000). *How People Learn: Brain, Mind, Experience, and School - Expanded Edition*. Washington, DC: The National Academies Press.

Day 4: Constructivist Learning Environments

Essential Questions

- What does a constructivist learning environment look like? What kind of gameplay supports constructivism?
- What are alternate reality games?
- What is problem-based learning, and how is it pertinent to GBL?

A) Introductory Piece(s)

- John Hunter's "World Peace Game" (film)
http://www.ted.com/talks/john_hunter_on_the_world_peace_game.html
- Classroom example of problem-based learning (film)
<http://www.youtube.com/watch?v=UllIBoDGqYvI>

B) Research Seminar

- Cicchino, M. (2013). *Using game-based learning to foster critical thinking in student discourse*. Unpublished manuscript, Rutgers University, New Brunswick, NJ.
- Hmelo-Silver, C.E. (2004). Problem-based learning: What and how do students learn? *Educational Psychology Review*, 16(3), 235-266.

C) GBL Experience

Today's GBL experience will happen vicariously -- via transcripts from the intervention described in *Using game-based learning to foster critical thinking in student discourse*.

Participants will read transcripts, analyze data via the same coding scheme detailed in the article using colored pencils (see Appendix B), and discuss their findings.

D) GBL Design

Unfortunately, alternate reality games are generally "too big" to play in the span of several hours. Instead of playing a full-length alternate reality game, we will engage in a PBL style activity:

You are a game designer, and you've been hired by the Board of Ed to construct an alternate reality game to support summertime learning for students. Use the computers/ technologies in the classroom to your advantage. Research alternate reality games, create a brief mock-up of your game, and prepare to present your proposal to the "Board of Ed."

E) GBL Workshop

All groups will present their alternate reality games to the class. Participants in the audience will be asked to take on the role of the Board of Ed, thereby evaluating these game proposals in an authentic context, posing pertinent questions, etc. (see evaluation, Appendix C).

F) "Sandbox"

Class participants will lead today's sandbox.

Recommended Readings

- Gresalfi, M., Barab, S., Siyahhan, S., & Christensen, T. (2009). Virtual worlds, conceptual understanding, and me: Designing for consequential engagement. *On the Horizon*, 17(1), 21-34.
- Steinkuehler, C. (2006). Massively multiplayer online video gaming as participation in discourse. *Mind, Culture, and Activity*, 13(1), 38-52.

Day 5: Synthesis & Debriefing

Essential Questions

- What have I learned in this course?
- How will what I have learned impact my teaching practices?
- How might this course be improved?

A) GBL Experience

Given its time-consuming nature, class will begin by immediately introducing/playing a board game that was designed to simulate the trials and tribulations associated with change leadership in education.

Participants will play in small groups, ultimately taking on the role of educational consultants striving to enhance an imaginary school district.

Students will play this game for approximately 2.5 hours, taking time to debrief after each school year, and again with the completion of the game.

B) Discussion & Synthesis

Following the GBL experience, we will discuss/debrief:

- What we've learned as a result of today's gameplay
- The intended (and unintended) learning outcomes
- The affordances and constraints of this game
- The power of debriefing
- The effects of flow
- How this game might be assessed
- The GBL course curriculum as a whole

C) Evaluation

Participants will be asked to evaluate the course.

See the "Facilitator's Guide to Evaluation" (p. 7) for details.

Facilitator's Guide for Evaluation

All too often, PD courses do not make use of the very educational principles they hope to instill in their participants. This page reflects a concerted effort to integrate *assessment* into the present GBL curriculum so as to (1) check for participants' understanding and engagement, (2) continually refine the content and pedagogy of this PD course, and (3) assess the success of this course.

Formative Assessments

As is the case with good teaching in any context, formative assessment is key to gauging participants' learning and levels of understanding. It is recommended that the facilitator informally evaluate the discourse practices of his/her students throughout the GBL course -- during class discussion and GBL experiences, in small-groups, online (via class discussion forum), and during "sandbox" time.

Questions to consider when evaluating discourse: Are students on task? Are they making the best use of their time? Are they engaged in features of engagement and flow? Are they thinking critically about the material? What kinds of questions are they asking about the assigned articles/materials?

Two additional practices to consider implementing in the way of assessment:

- Informal evaluation of the products (GBL environments) that participants design and share;
- Daily reflective assessments / feedback to be written and submitted by participants for instructor review.

Not only do these practices promise to be congruent with the tenets of constructivism and active learning, but they offer legitimate insights into participants' experiences. The facilitator is strongly encouraged to "evolve" the course material so as to best meet students' needs and interests. (To this end, selected readings and GBL experiences may be substituted accordingly.)

Measuring Success

With the completion of this curriculum, participants will be asked to respond to a survey (Appendix D) detailing their experiences. Participants will evaluate the course content and the instructor's pedagogical practices. Further, participants will be asked to provide feedback so that the course can be refined for future implementations.

Additionally, participants will receive a second survey (Appendix E) approximately three months after taking the course. Here, participants will be asked if and how the GBL course influenced their teaching practices. Opportunities for feedback (i.e. spaces for reflection, prompts for curricular suggestions, etc.) will be provided.

Appendix A: Principles of GBL Evaluation Grid

PRINCIPLE DESCRIPTION	EVIDENCE OF PRINCIPLE	NOTES
GBL environment is provocative of critical thinking via one or more ill-structured problems		
GBL environment is appropriately challenging		
GBL environment provides opportunities for players to discover/construct their own knowledge		
GBL environment provides a fictional world or fantasy-driven metaphor		
GBL environment is “social” (promotes collaboration and competition)		
GBL environment is winnable (clear goals and objectives)		
GBL environment provides a deliberate space and/or opportunity for reflection/debriefing		

Appendix B: Coding Scheme

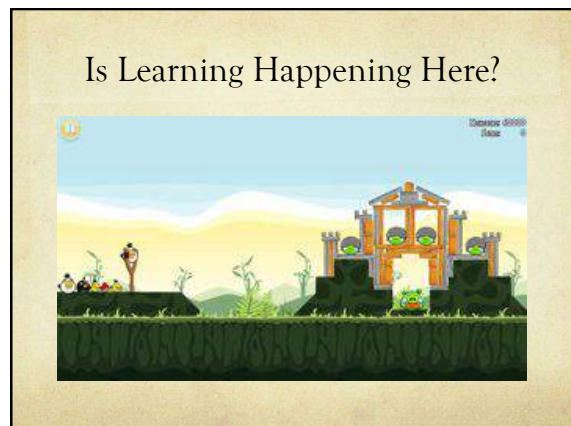
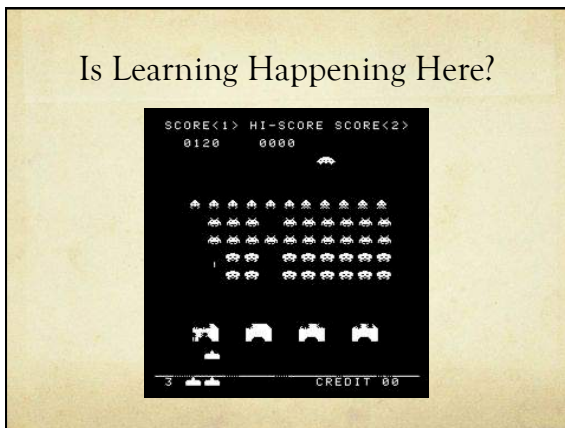
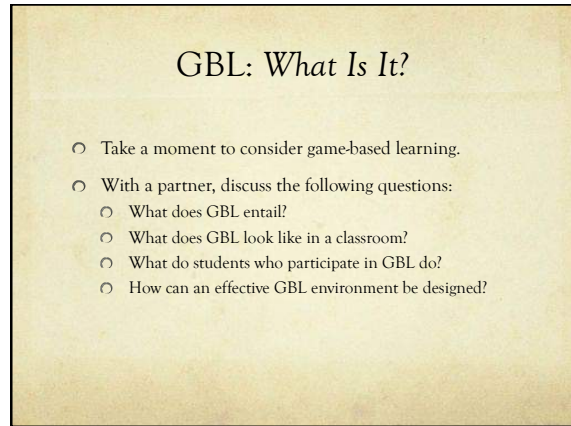
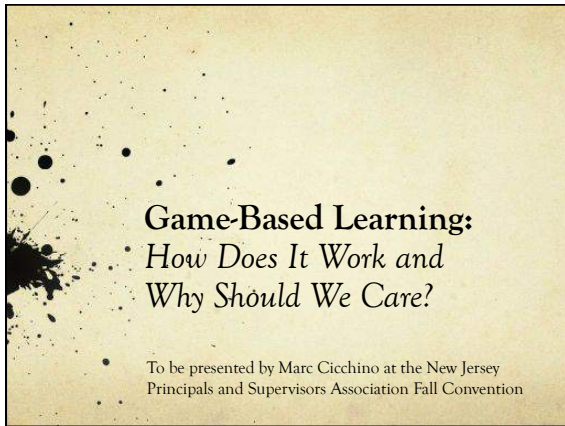
(Adapted from Xin's (2002) Intellectual Acts)

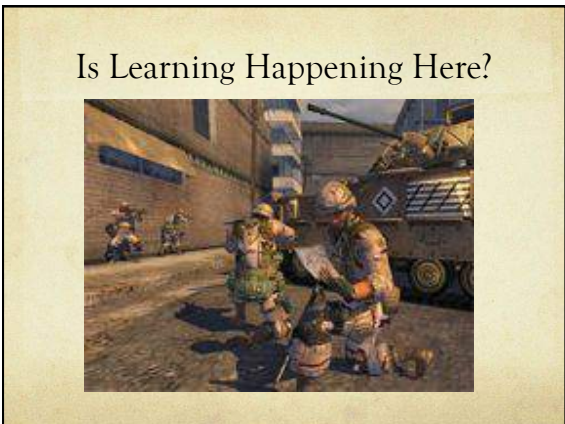
Code (Critical Thinking)	Intellectual Acts	Description of the Intellectual Act	Example
0. Off-Task	Off-task	Student is evidently disengaged, engaging in an inappropriate act, and/or visibly off-task.	<i>"Where did you buy those shoes?"</i>
1. Initiation Zone (Lower Order)	Posing	Introducing new concepts, ideas, or topics of discussion often describing their origin, background, or context, or definition of problem boundaries, ends and means.	<i>"We should declare war with the English."</i>
	Clarifying	Making clear by removing misunderstanding or ambiguity of a specific point, a problem situation, or related context, often associated with restating an issue or concept, or asking and answering a specific question.	<i>"If we declare war on the English, we'll be able to take our sixth territory and get closer to winning."</i>
2. Negotiation Zone (Middle Order)	Confirming	Expressing agreement or providing supporting arguments by giving examples, relating to personal or other people's experiences, and/or providing evidence from various sources.	<i>"She's right. The English attacked Miami last turn and now they're in the lead. We should go ahead with her plan."</i>
	Disagreeing	Expressing disagreement or providing counter argument(s) by giving counter examples or counter evidence, and/or presenting alternative approaches or perspectives.	<i>"No. The English lost that battle and now they're behind. If we fight against them, we'll lose allies. We should form a truce."</i>

3. Co-Construction Zone (High Order)	Elaborating	Articulating at greater length or in detail based on previous contributions, often associated with hypothesizing, reasoning, and or analyzing.	<i>“By forming an alliance with three different tribes, we can probably fight more wars and have a big advantage.”</i>
	Evaluating	Testing ideas or hypotheses, comparing and analyzing different perspectives, proposals, or solutions, and/or making substantiated judgments.	<i>“Joe thinks we should battle. Jane thinks we should form a truce. The battle is riskier but we can win sooner if it works. The truce might work, but the Miami people already betrayed the French twice. We can’t trust them.”</i>
4. Integration Zone (Higher Order)	Extending	Branching into new ideas or concepts, generalizing to other contexts, drawing out implications and predictions, or indicating new applications.	<i>“This reminds me of Jamestown. We’re outnumbered. If we don’t make peace, we’re goners.”</i>
	Synthesizing	Identifying emerging themes and unifying concept(s), agreements, and disagreements, organizing and integrating multiple perspectives, and/or drawing conclusions or making resolutions based on synthesis.	<i>“Everyone is driven by their own motives. Jane has a good point, but John’s idea is a risk we have to take. We can’t trust anyone.”</i>

Appendix C: Board of Education Evaluation Grid

STAKEHOLDER CONCERN	PERTINENT EVIDENCE	NOTES
How much money is this going to cost our district?		
How will we manage to implement this? Do we have the man-power? What kind of training necessary?		
How will this benefit all students?		
How will this impact students with special needs?		
I don't want my kid playing games in school.		
Is there any research to support the implementation of this program?		
How will we be able to assess the effectiveness of this program?		





Getting Complicated?

- Board Games?
- Role-play Games?
- Simulation Games?
- Video Games?
- Massively Multiplayer Online Games?
- Alternate Reality Games?
- "Edutainment" Games?

Theorists

- Toward a Theory of Intrinsically Motivating Instruction (Malone, 1981)
- Challenge + Curiosity + Control + Fantasy

Theorists

- Video Game-Based Learning: An Emerging Paradigm for Instruction (Squire, 2008)
 - Emotionally compelling contexts for learning
 - Situate learners in complex information management and decision making situations where facts and knowledge are drawn upon for the purpose of doing
 - Construct challenges that lead to productive future understandings
 - Anticipate users' experiences
 - Invite the learner to participate in constructing solutions and understandings
 - Embrace the ideologically-driven nature of education and training

Theorists

- What Video Games Have To Teach Us About Learning and Literacy (Gee, 2003)
 - "Psychosocial Moratorium" Principle
 - Identity Principle
 - Amplification of Input Principle
 - Practice Principle
 - "Regime of Competence" Principle
 - Multiple Routes Principle
 - Discovery Principle

A Working Definition

- A game-based learning environment must:
 - Be provocative of critical thinking via one or more ill-structured problems
 - Be appropriately challenging
 - Provide opportunities for players to discover/construct their own knowledge
 - Provide a fictional world or fantasy-driven metaphor
 - Be "social" (encouraging collaboration and competition)
 - Be winnable (clear goals and objectives)
 - Provide a deliberate space for reflection/debriefing

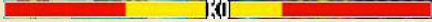
Not Gamification

Consider Problem-Based Learning

- Problem-Based Learning in Medicine and Beyond: A Brief Overview (Barrows, 1996)
 - Student-centered
 - Small groups
 - Teacher as facilitator
 - Driven by ill-structured problems
 - Knowledge is constructed by learners

Affordances & Constraints

Affordances & Constraints




- High levels of Engagement
- Student Centered
- Support Collaboration
- Support Critical Thinking
- Environment Limitations (Digital? Non-Digital?)
- Time Limitations
- Curricular Limitations
- "The Grammar of Schooling"

My Study

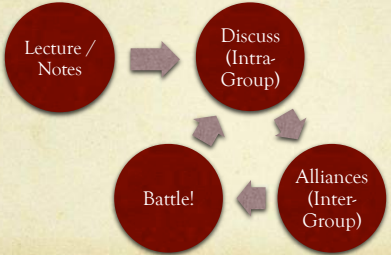
- **Research Question**
 - *How does game-based learning, as embodied by a roleplay-style intervention in 8th grade Social Studies classes, affect learning?*
- **Population/Context**
 - Suburban middle school
 - Median household income of \$130,000
 - Teacher experienced with GBL

The French & Indian War

- **Game Mechanics**
 - Small groups are assigned to territories (i.e. France)
 - Each territory has X dice and controls Y spaces
 - Each territory has specified objectives (i.e. control 16 spaces to win)
 - Territories may attack each other for land (using dice)
 - Territories may make/break alliances at any time.



Game Play



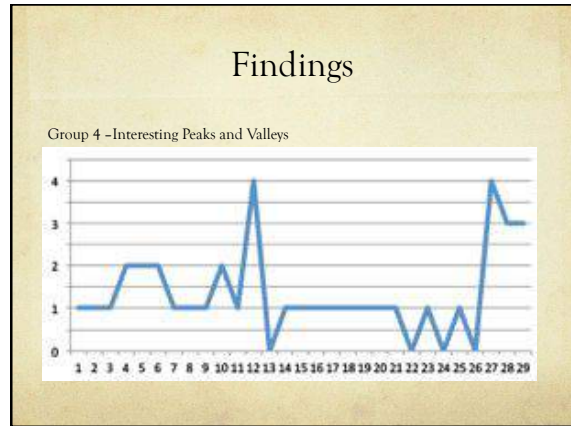
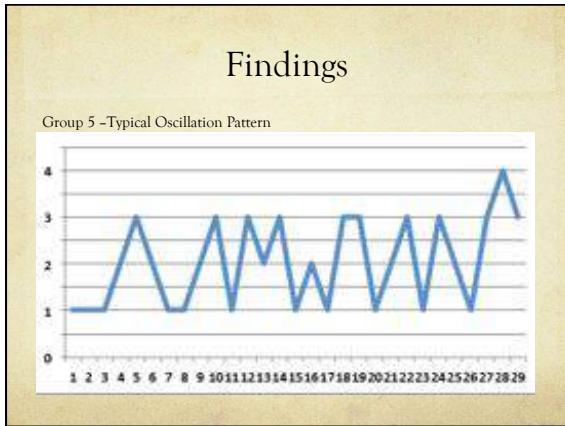
A Working Definition

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Data Collection & Analysis

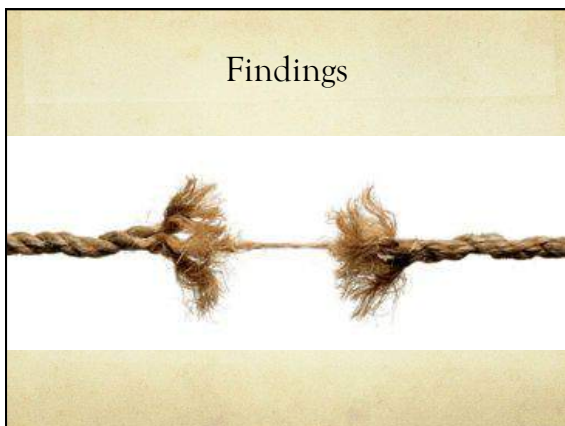
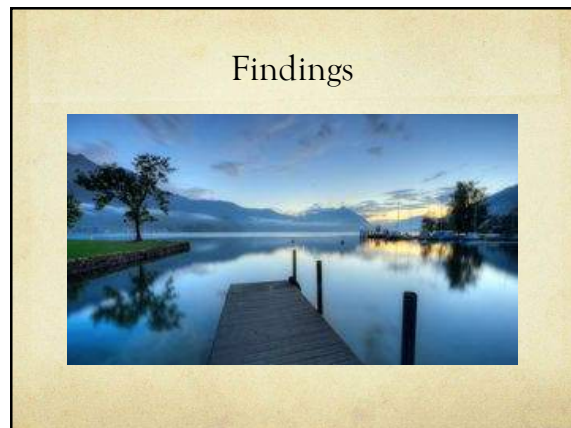
- Six video cameras & four strategically placed mic's
- Video data coded in five minute chunks using an adaptation of Xin's (2002) Intellectual Acts framework:

Code	Description
0. Off-Task	Off-task behavior.
1. Initiation Zone	Posing/Clarifying ideas.
2. Negotiation Zone	Confirming/Disagreeing with evidence.
3. Co-Construction Zone	Elaborating/Evaluating with evidence.
4. Integration Zone	Extending to other contexts/Synthesizing.




Findings

- Steven: This game is about chance.
- Cassandra: Yeah.
- Teacher: Part of it is about chance.
- Joseph: Well yeah but in a real war, it depends on how hard and determined someone is. Now it's just, if I roll my lucky numbers, I win the war. If that's how regular war was fought, then there would be a lot less war in the world.




Findings

- Post-test given to GBL group (62 students) and to "traditional" group (115 students).
 - No Significant Difference.
- Six months later, delayed post-test to same groups.
 - No Significant Difference.
- GBL appears to be at least as effective as traditional instruction




Implications

- Implications for curriculum




Implications

- Real world curricular application. (Can GBL fix summer reading?)



Implications

- Implementation in the context of evaluation



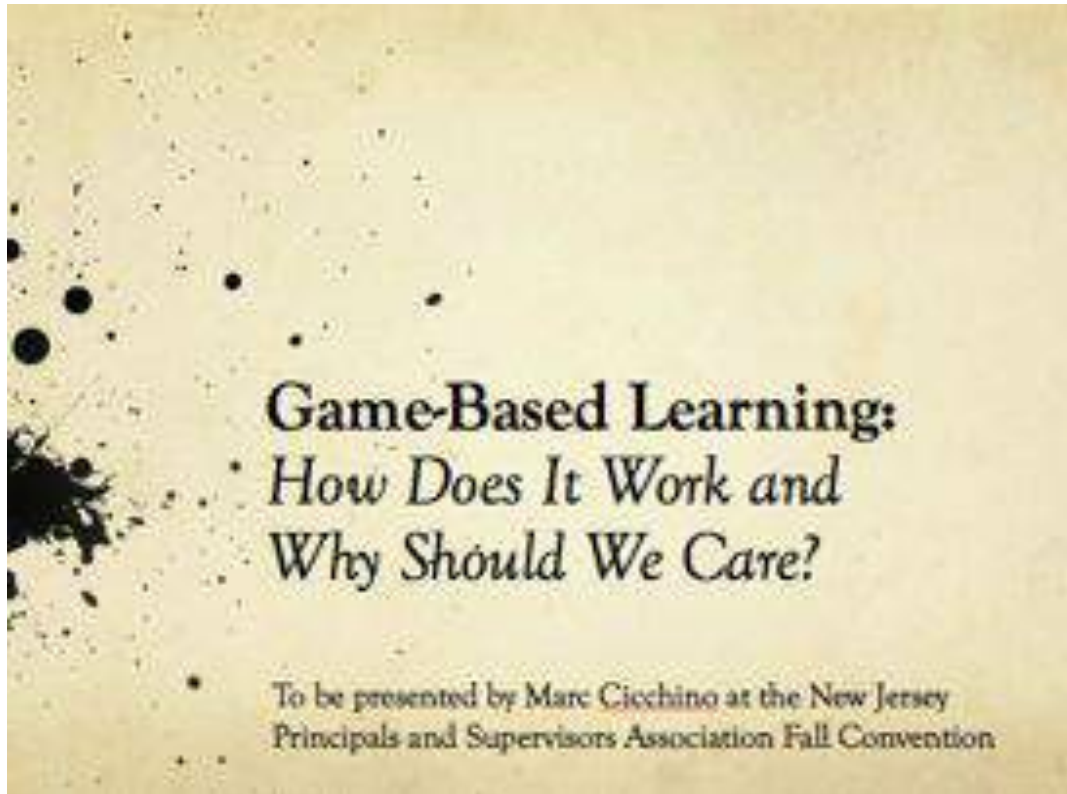
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G A M E - B A S E D L E A R N I N G

How does it work and why should we care?

PRESENTER NOTES

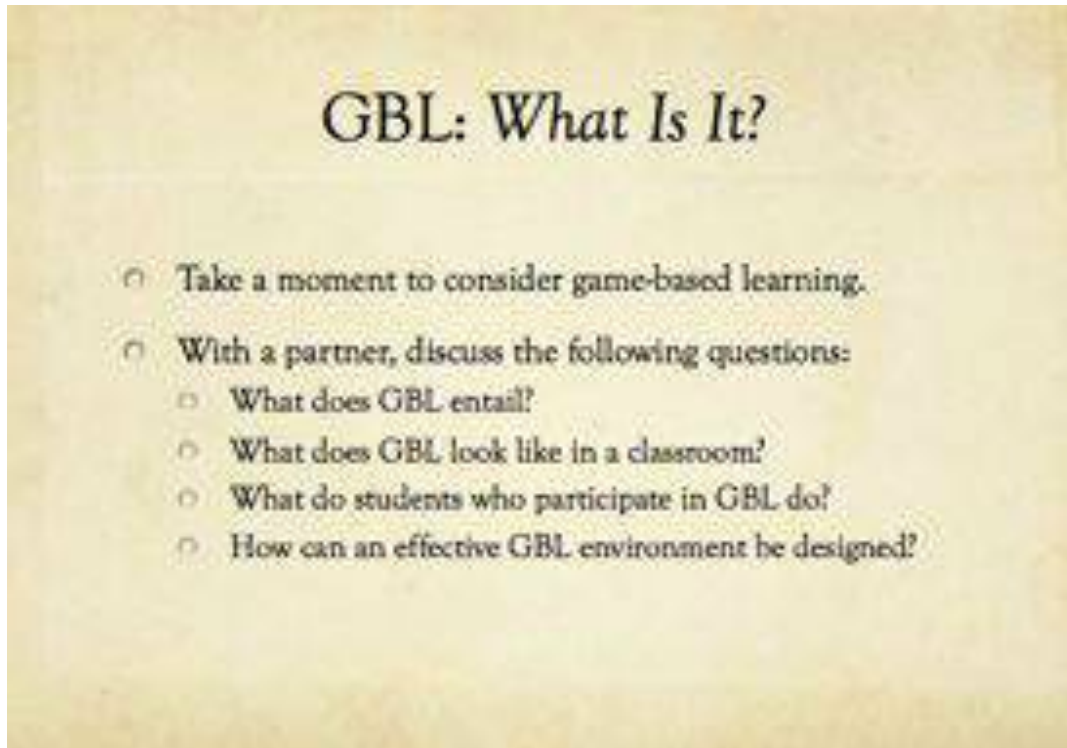


MARC CICCHINO

RUTGERS GRADUATE SCHOOL OF EDUCATION

AUGUST 2013

SLIDE # 2



The presentation will begin with a partnered discussion.

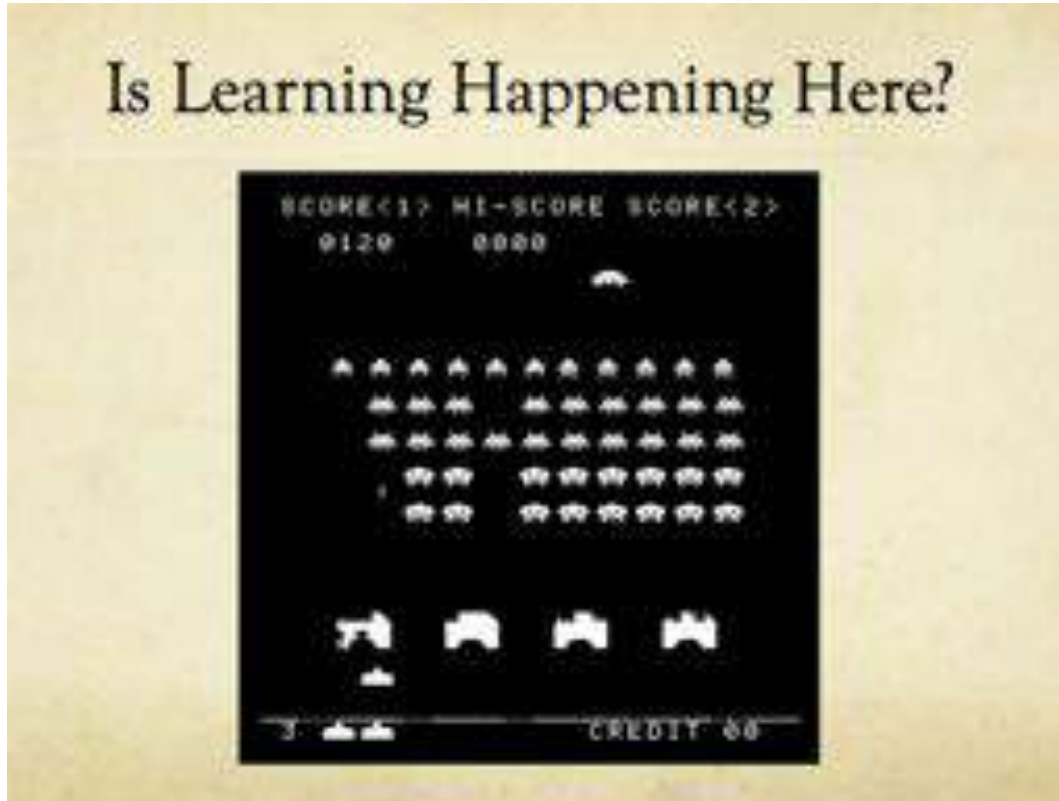
Members of the audience will be asked to think about each of the questions above independently for two minutes.

Then, participants will be asked to discuss their thoughts with a partner for three to five additional minutes.

Once discussion has subsided, volunteers will be asked to share their understandings of "GBL."

How does it work and why should we care?

SLIDES #3 - 10



After having discussed participants' own conceptions of game-based learning (i.e. what it looks like, how it might be implemented in schools, how GBL environments might be designed, etc.), a series of images will be shown.

Images range from "Space Invaders" (shown above, slide #3) to Math Blaster, Scrabble, Angry Birds, Flight Simulator.

The question posed for each game: *Is Learning Happening Here?*

Participants will discuss their thoughts with a partner before sharing with the group.

The purpose of this activity is to prompt creative and critical thinking regarding the diverse and expansive of GBL.

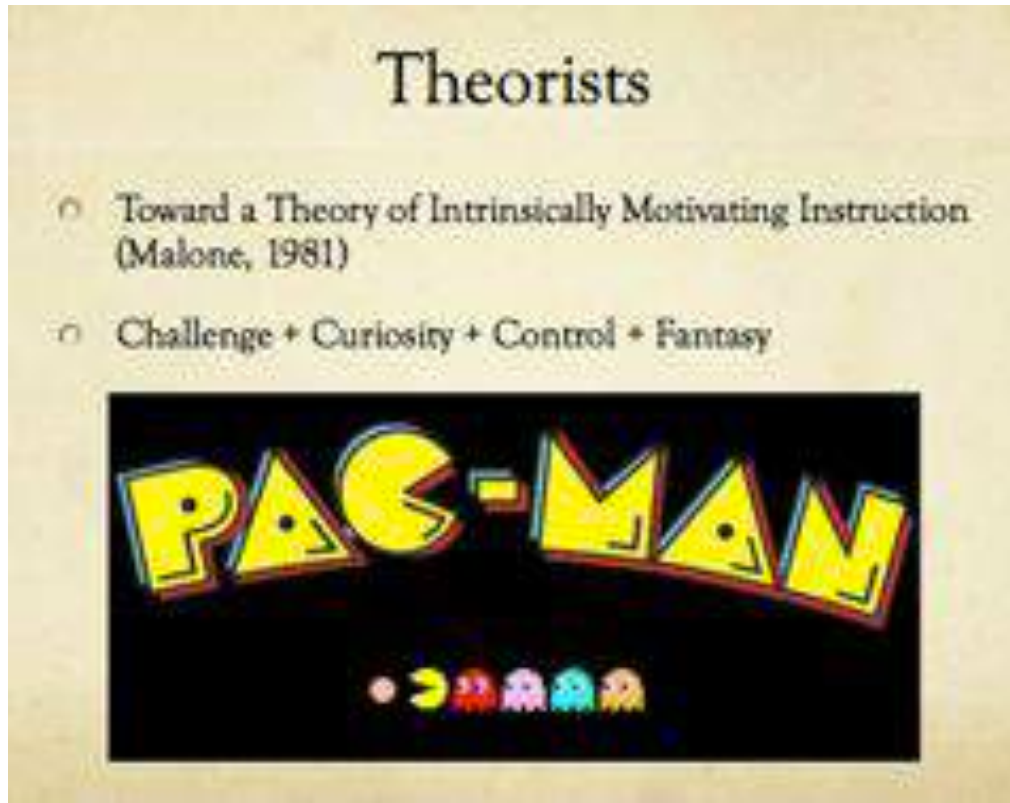
SLIDE #11



Slide #11 will essentially prompt participants to reflect on the group's discussion ("Is Learning Happening Here" - slides #3 - 10). The presenter will provide a brief explanation of various game genres, and pose the question:

How can the power of these games/genres be harnessed by educators?

SLIDES # 12 - 14



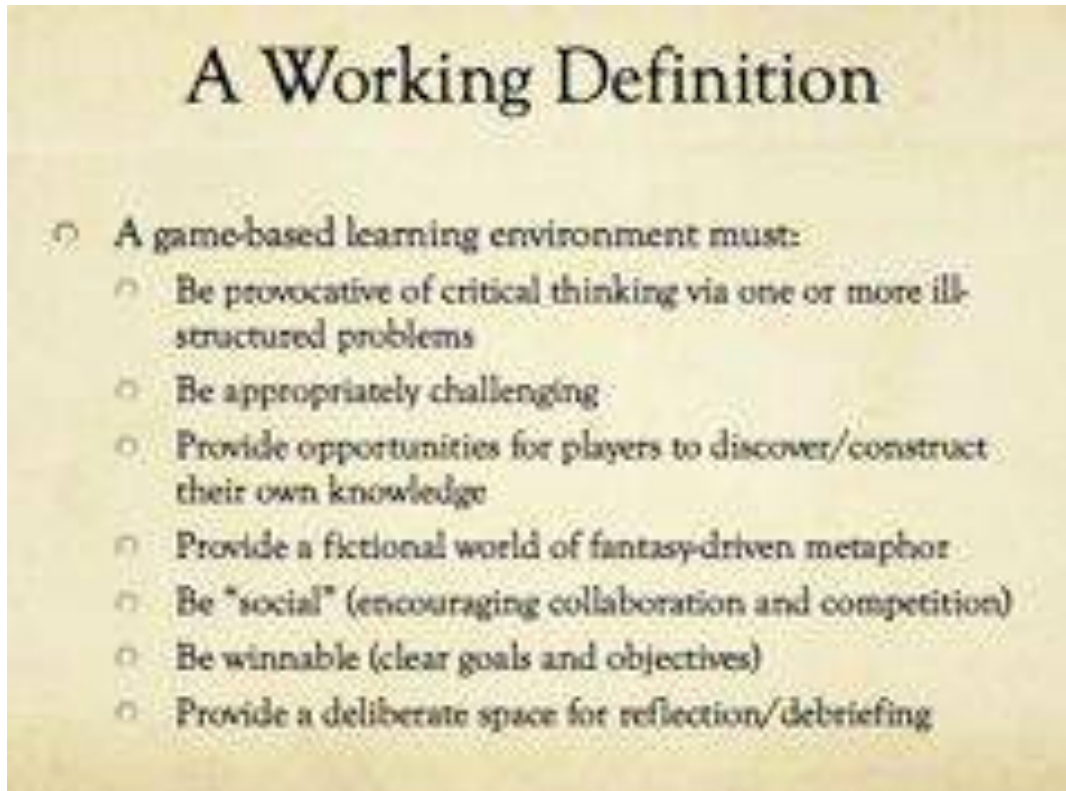
Slides #12 - 14 will introduce the audience to three seminal GBL theorists: Malone, Squire, & Gee.

The presenter will begin by explaining Malone's work (inspired by Pac-Man) and his suggestion that intrinsically motivating environments are grounded in (1) challenge, (2) curiosity, (3) control, and (4) fantasy.

Slide #13 contains a more detailed framework for understanding/designing GBL environments, proposed by Squire. The presenter will briefly review this framework in the context of Squire's work (as well as the complex video games that were considered in its creation -- i.e. *Civilization*).

Slide #14 will introduce participants to several of Gee's "learning principles." Presenter will elaborate on several principles, such as the "psychosocial moratorium principle," which states that players feel comfortable taking greater risks given a low-stakes environment -- i.e. in video games, dying isn't nearly as consequential as it is in real life.

SLIDE #15



Slide #15 displays the core principles of GBL that were chosen/condensed from various frameworks.

The first six principles were used to design the GBL intervention in the presenter's study.

The seventh principle was added post hoc as a result of findings.

Principles will be elaborated upon, and avenues for implementation will be discussed.

How does it work and why should we care?

SLIDES # 16 & 17



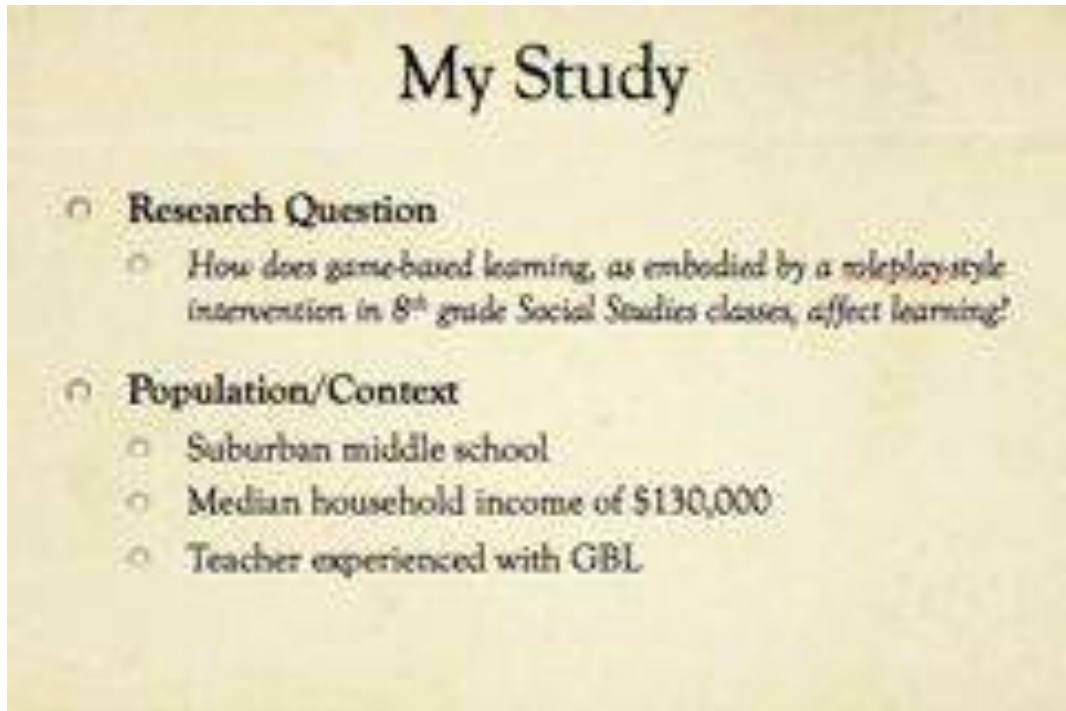
The purpose of slides #16 & 17 is to draw a distinction between “gamification” (i.e. using game-elements to make rote tasks seem more appealing) and game-based learning (i.e. a framework for learning that has a good deal in common with problem-based learning in that both strategies are student centered, utilize small groups, situate the instructor as a facilitator, are driven by ill-structured problems, and expect that knowledge is created by learners).

SLIDES # 18 & 19



Slides #18 and 19 will prompt a discussion of the affordances and constraints associated with GBL.

The presenter will begin by explaining the notion of affordances and constraints in the context of design, using the two remote controls pictured on slide #18 as a touchstone (i.e. the affordances of a simpler design, and corresponding limitations). Then, participants will discuss the affordances and constraints associated with GBL before proceeding to slide #19 (displaying several examples of each). The affordances associated with specific kinds of content (i.e. social studies, communication, critical thinking) will also be covered during these slides.

SLIDES # 20 - 24

Slides #20 - 24 will introduce my GBL study. Slide #20 will begin by stating the research question (*How does game-based learning, as embodied by a roleplay-style intervention in 8th grade Social Studies classes, affect learning?*) and target population. Slides #21 and 22 explain the mechanics of gameplay designed for implementation, slide #23 revisits the principles of GBL that were utilized in designing the said intervention, and slide #24 details the coding scheme used to analyze GBL video data for critical thinking.

How does it work and why should we care?

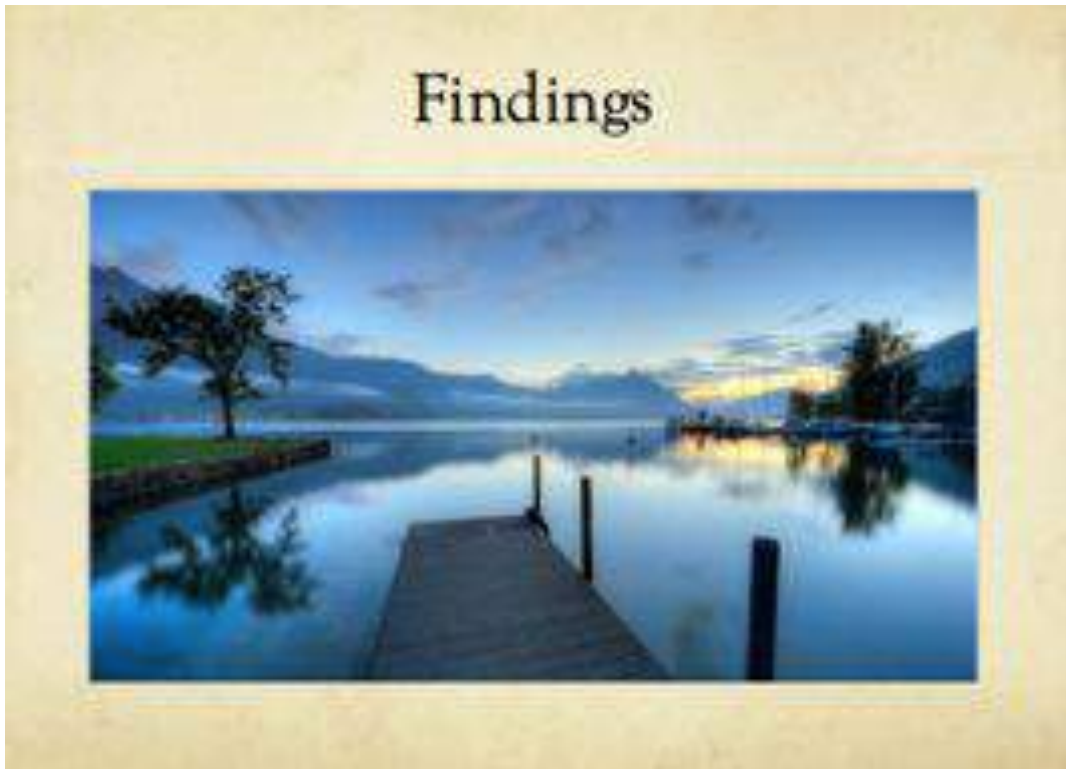
SLIDES # 25 - 27



Slides #25 and 26 contain line graphs indicating the trajectory of critical thinking for groups #4 & 5 across four days of gameplay. Audience will be given time to consider and discuss the implications of this data. Questions to prompt discussion include: *What does this graph tell us? What questions does this graph raise? What conclusions might be draw? What do you find most interesting about this piece of data?*

Slide #27 includes a brief excerpt taken from group #4's transcript. Participants will be asked to consider the said dialogue in the context of the line graphs. Questions to prompt discussion include: *What does this exchange of dialogue suggest? Is learning happening? Is this critical thinking? How can this kind of thinking be fostered? Is this sustainable?*

SLIDES # 28 - 31

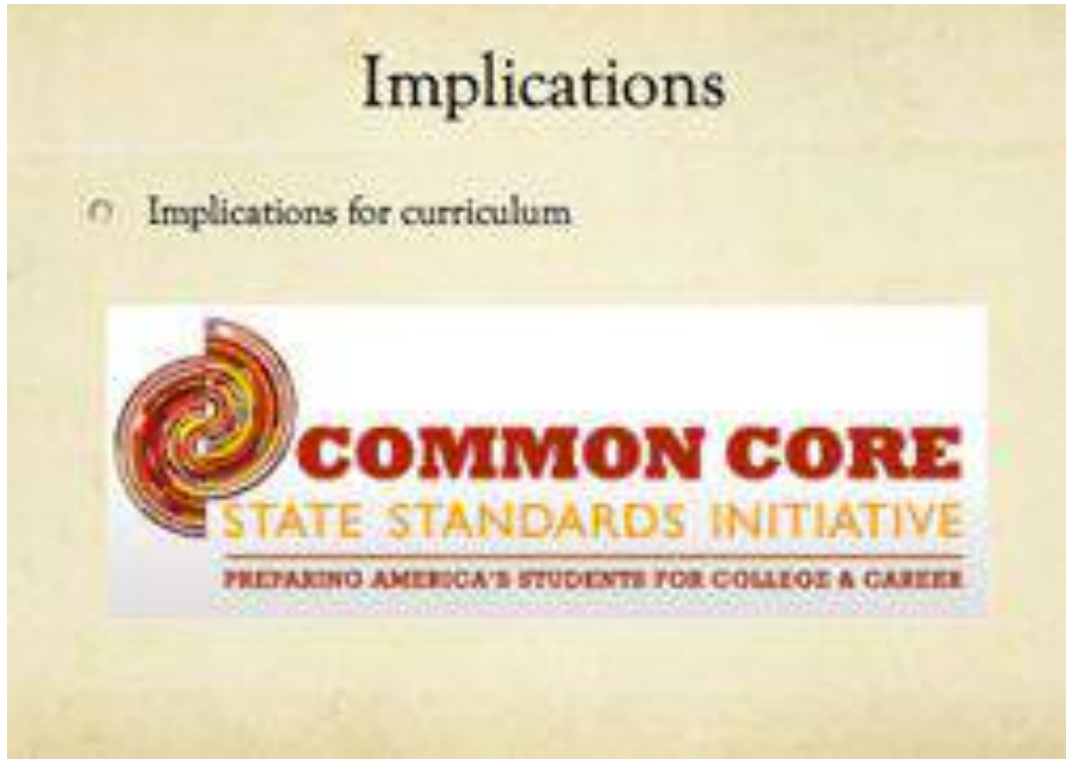


During slides #28 - 30, the presenter will share several overarching findings: (1) the importance of reflection/debriefing; (2) the role that dire moments (i.e. approaching “game-over”) might play in prompting critical thinking; (3) the presence and potential necessity of oscillating levels of critical thinking.

Slide #31 shares the findings of the content post-test across GBL and “traditional” groups. (No significant difference.)

GBL appears to be at least as effective as traditional instruction.

SLIDES # 32 - 34



Slides #32 - 34 will be used to prompt discussion amongst participants. This is the final portion of the presentation. Here, the presenter will seek to facilitate a conversation between participants that is immediately pertinent to their own practices. The topics being discussed were selected with principals & supervisors in mind.

Discussion topics include implications: (1) for curriculum in light of the Common Core State Standards, (2) for real world implementation (i.e. how might GBL be utilized to “fix” the issues associated with “summer reading” programs? and (3) in the context of new teacher evaluation models (i.e. Danielson).

[Implications for Curriculum & Implementation]

The Common Core State Standards place a emphasis on critical thinking and skills-based curriculum. It seems that GBL provides an opportunity to address these kinds of skills in a fashion that is congruent with CCSS. Discussion might cover the development of GBL lessons, units, or even entire courses. The presenter will pose the question, “How might game-based learning be used to support students’ literacy development in conjunction with, or in lieu of, a traditionally summer reading program?”

[Implications for Evaluation]

Discussion of implications for evaluation will draw largely from the audience’s experiences observing teachers. New evaluation models place tremendous emphasis on student-centeredness, which is a core component of GBL. The presenter will ask participants to consider how GBL training might impact teacher practice / performance.

SLIDE #35



Slides #35 will signal the end of the presentation.

Participants will be asked to fill out a survey in order to (1) provide feedback about the helpfulness and practicality of the presentation, and (2) provide an opportunity for reflect on/debrief their learning!

GAME-BASED LEARNING



What Is Game-Based Learning?

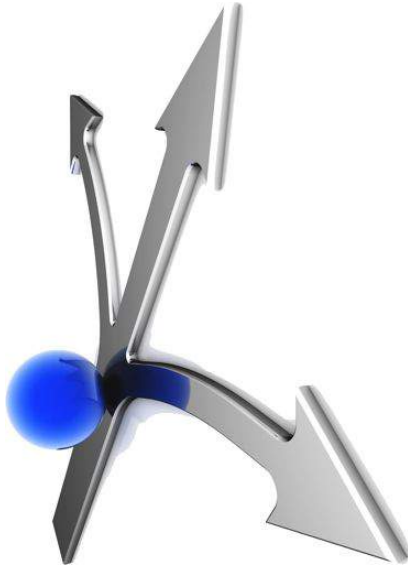
Game-based learning (GBL) is a student-centered instructional strategy in which students are presented with ill-structured problems, often work in groups, and must construct knowledge through the activation of prior understandings, as well as by engaging in collaborative discourse. In addition to these elements (which parallel the features of Problem-Based Learning), GBL places an emphasis on the integration of game-elements, often in an effort to heighten engagement and/or to induce a state of flow.

While a number of expansive GBL frameworks exist, seven core principles have been gleaned from the research (indicated below).

These principles are applicable across game-genres and learning environments, and are intended for flexible consideration when designing/analyzing GBL environments.

A Game-Based Learning Environment Must:

- Be provocative of critical thinking via one or more ill-structured problems
- Be appropriately challenging
- Provide opportunities for players to discover/construct their own knowledge
- Provide a fictional world or fantasy-driven metaphor
- Be “social” (encouraging collaboration and competition)
- Be winnable (clear goals and objectives)
- Provide a deliberate space and/or opportunity for reflection/debriefing



Implications

The results of this study suggest that game-based learning has the potential to flourish in otherwise traditional school settings.

- Content-based post-tests indicated no significant differences between GBL and traditional classes. This suggests that game-based learning is at least as effective as traditional models of instruction in terms of content-learning.
 - Qualitative video analysis indicated high levels of critical thinking in student discourse for students participating in the GBL intervention. This suggests that GBL can be a strong vehicle for fostering these skills.
 - The highest levels of critical thinking were captured in reflective contexts. This reinforces the importance of reflection and debriefing, and suggests that effective learning environments provide deliberate spaces for these practices.
 - The GBL classroom is congruent with the student-centered philosophy that drives the most popular teacher-evaluation frameworks.
- Avenues for future research:**
- Explore the possibility of heightened and/or sustained levels of critical thinking through GBL.
 - Explore the effects of GBL environments on teacher effectiveness as per new evaluative models (i.e. Danielson), as well as on student achievement, engagement, and critical thinking.

HOW DOES IT WORK AND WHY SHOULD WE CARE?

Methods

In order to best explore the research question (How does game-based learning, as embodied by a roleplay-style intervention in 8th grade Social Studies classes, affect learning?), six video cameras and four microphones were strategically placed throughout the classroom in order to capture qualitative gameplay data.

A coding scheme (detailed below) was utilized for the purposes of measuring critical thinking in student discourse. Approximately twelve hours of video data were coded in five minute segments

Post-tests were given in order to compare content-learning across GBL and traditional classrooms, and delayed post-tests were given six months after the intervention in order to measure retention across the same groups. No significant difference was found in either instance.

Xin's (2002) Intellectual Acts (Adaptation)

Coding Scheme for Critical Thinking	
0. Off-Task	Student is evidently disengaged, engaging in an inappropriate act, and/or visibly off-task.
1. Initiation	Posing new concepts, ideas, or topics of discussion / Clarifying concepts or problems.
2. Negotiation	Expressing agreement or disagreement, providing evidence-based supporting arguments.
3. Co-Construction	Elaborating on points based on previous contributions / Analyzing and Evaluating hypotheses and/or perspectives.
4. Integration	Extension into new ideas, drawing out implications / Synthesis via identification of emerging themes and unifying concepts.

The GBL Intervention

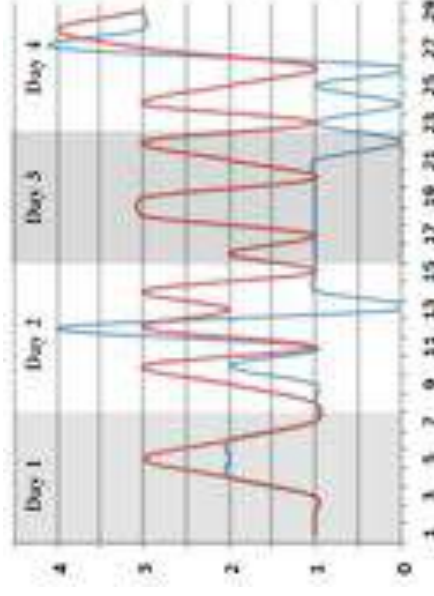
A game-based learning intervention was designed utilizing the principles of GBL detailed on the opposite side of this brochure. This game was designed to support instruction in an 8th grade Social Studies class, and was implemented in a 40 minute period for four consecutive days. Students were assigned to small groups and asked to take on the roles of various territories during the French and Indian War.

Each territory was allotted a particular number of land (spaces on a game-board) and dice (mechanisms for "waging war" against other territories). As a part of gameplay, students were assigned objectives ("win-states") that could only be completed by waging war and obtaining more land.

The "turn cycle" rotated through three phases: (1) intra-group discussion (opportunity to discuss strategy within group), (2) inter-group discussion (opportunity to strategize / make alliances with other groups), and (3) battle (opportunity to wage war against neighboring territories in order to gain land). Occasionally, the teacher interjected with mini-lectures in order to ground gameplay in historical content.

Research Findings

Once coded, intellectual acts were graphed chronologically (shown below). The red line represents the most common trajectory of critical thinking discourse -- an oscillatory pattern that wavers between Initiation and Integration. The blue line represents the trajectory of a group that proved to be far less predictable, and arguably, far more interesting.



Questions raised by oscillations (red):

- Are lower levels of critical thinking in discourse (i.e. Initiation: posing/clarifying) necessary for fostering higher levels (i.e. CoConstruction: elaborating/evaluating)?
- Why are the highest levels of critical thinking (Integration: extension/synthesis) so scarce, and how might they be fostered in future iterations of this intervention?
- Are higher levels of critical thinking in discourse sustainable for longer periods of time?

Observations reinforced by "peaks and valleys" (blue):

- "Peaks" (Integration) seem to be most prevalent in moments of crisis (i.e. as a group approaches "game over" and in reflective dialogue).
- "Valleys" (Off-Task) were only coded for groups who had already lost the game.



Learnings, Reflections, and Implications

In creating a portfolio dissertation, I have been able to explore a problem of practice that is immediately pertinent to my daily practices in a fashion that is (1) highly practical, and (2) already positively affecting the practices of fellow educators. This problem of practice can be plainly described as a gap between our understanding of *what* should be taught in schools (critical thinking skills) and our “traditional” means for teaching. I explored Game-Based Learning as an avenue for addressing students’ needs in the way of fostering critical thinking skills by studying an intervention in an 8th grade social studies classroom. An analysis of student discourse, as well as of student achievement as embodied by content post-tests compared between control and GBL groups, yielded insightful results that would interest educational researchers and practitioners alike. Therefore, each piece of this portfolio serves a different purpose in terms of target audience and intended outcomes, and each piece seeks to deliver a different “slice” of my research in a practicable manner.

General Implications

My research findings yielded two major implications: first, that game-based learning is a viable teaching strategy, and second, that reflection and debriefing is crucial when seeking to foster higher-level critical thinking skills.

In short, my findings suggest that game-based learning is at least as effective as “traditional” classroom instruction in that there was no statistically significant difference on students’ content-based post-test scores. Additionally, a qualitative analysis indicated frequent instances of higher-order critical thinking in students’ discourse during the GBL intervention. Given that this intervention was played in an otherwise “traditional”

classroom, these implications hold exciting possibilities for the future of mainstream classroom strategies in our schools. Although additional research is necessary to further explore these findings (i.e. to corroborate the effectiveness of GBL, to unpack the makings of engagement and critical thinking, to refine the GBL intervention so as to better foster critical thinking skills), game-based learning is ripe for classroom implementation.

In closely examining the context and features of critical thinking in student discourse during the GBL intervention, it became apparent that the highest levels of critical thinking (associated with extension and synthesis) occurred primarily in the reflective circumstances. For instance, on the brink of disaster and/or as the game was winding to its close, students generally made sweeping claims about their strategies, reflected upon the up's and down's of their gameplay, and made connections to significant historical content. The major implication here is fairly straightforward, and extends beyond the field of GBL into general "best practices" for education and learning: reflection should be a deliberate part of any learning experience that seeks to foster critical thinking. In the GBL intervention, this kind of reflective space might manifest itself as an additional turn-phase (i.e. a time to reflect after the battle-phase), or as an instructor-scaffolded post-game discussion of what was learned. In a more traditional classroom context, reflection might occur in the form of journal writing or as an "exit-slip." Either way, the importance of reflection and debriefing is clear, and educators should utilize such practices accordingly.

Reflection on Portfolio

The research article component of my portfolio serves many of the same purposes as a traditional dissertation in that it communicates my research in scholarly fashion. Additionally, conveying my findings in such a way offers a streamlined opportunity for publication in a scholarly journal – ultimately affording me the opportunity to share my results with a broad and interested audience. I am currently in the process of paring down the manuscript of my article so as to meet the submission guidelines for the *Interdisciplinary Journal of Problem-Based Learning*, and am looking forward to contributing to the research community as a “voice from the field.” Upon publication, it is my hope that this study will better inform researchers and educators alike, will help pave the way for refining our understanding of GBL, and will encourage interested practitioners to design and evaluate their own game-based learning environments. Although my findings do speak to the promise of GBL as a viable instructional strategy in otherwise traditional school settings, it seems that more questions were raised than answered:

- How might the implemented GBL intervention be refined for future iterations?
- How might levels of critical thinking in student discourse be heightened?
- How might high levels of critical thinking in student discourse be sustained?
- In what way(s) does GBL affect females differently than it affects males?
- How else might GBL be appropriated for effective mainstream implementation?

Future research in the field should explore the aforementioned questions as a means for gaining a deeper understanding of how game-based learning affects student learning, and for better harnessing the power of GBL for classroom use.

Beyond its contribution to the academic research community, I can report that my research has already empowered a small group of teachers in my present school district. The first iteration of my GBL professional development curriculum was implemented in July of 2013 with a class of 10 teachers who voluntarily enrolled. As described in my curricular materials, we met for five three-hour classes to read and discuss GBL literature, to unpack the findings of my own research, to design game-based learning environments (and plans for evaluating these environments), and to discuss the implications for education at large. Initial surveys indicated overall satisfaction with the class, as well as expectations to implement features of GBL into classroom practice. Follow-up surveys will be emailed to class participants in several months in order to gauge whether or not GBL principles were actually integrated into classroom practices. Designing this GBL curriculum (and ultimately, facilitating this course) provided me the tremendous opportunity to share my learnings with educators who are actively teaching in a New Jersey public school district, across grade levels and content areas. I am already able to see my research “coming to life” in that it is inspiring teachers to approach GBL-design in an informed fashion, to engage in the research process in their own classrooms, and to evaluate/refine their designs accordingly. I am looking forward to offering a second iteration of this GBL course in December 2013.

As far as administrative influence is concerned, I submitted a proposal to the Foundation of Educational Administration with hopes of presenting my research on October 17th and 18th, 2013 at the New Jersey Principals and Supervisors Association Fall Conference. As an administrator myself, I find myself in a position to enact school- and district-wide change with a greater ease than in my days as a teacher. That being said, I

am still limited by the scope of my influence – most immediately, the teachers in my departments, the participants in my professional development classes, and, of course, anyone else who is willing to listen. In sharing my findings with principals and supervisors at the NJPSA Fall Conference, I intend to encourage the integration of game-based learning into professional development opportunities, curricular documents, and ultimately, classrooms across counties, districts, and classrooms in the state of New Jersey. By sharing my research, as well as the practical embodiments of this research as implemented in my own district, I believe that participants will be more informed, comfortable, and willing to employ game-based learning as a means for resolving a widespread problem of practice: fostering critical thinking skills.

Overall, the development of this portfolio reflects a deliberate effort on my behalf to enact positive educational change through research. The various vehicles by which this research is communicated (a scholarly article, a professional development course, a conference presentation) seek to inform a trifecta of stakeholders: researchers, teachers, and administrators. While effecting change is no easy task, I am hopeful that this portfolio will yield positive results for the field of game-based learning, and for student learning at large.

On a personal note, this study has illuminated for me the many intricacies of *design*. Contrary to popular belief, designing an effective learning environment is no easy task. The process must be careful, comprehensive, and (for purposes of evaluation and intelligent revision) cyclical. Since my study was conducted, I have had numerous conversations with the teacher who facilitated gameplay with regard to how the GBL intervention might be refined for its next implementation. We have been working to

revise the game in light of the results and implications of my study, including the integration of reflective turn-phases and the substitution of teacher-centered mini-lectures with alternative means for delivering content. We are also toying with the notion of how “game over” states might be refashioned to prompt reflective critical thought processes without detaching students from further participation. In the fall of 2013, *he* intends to implement the next iteration of this GBL environment, and *I* intend to study it.

Although these revisions are most immediately relevant to the intervention examined in my study, these findings offer important insights to the grander scheme of GBL. My study affirms (1) the power and importance of reflection and debriefing in facilitating higher levels of critical thinking, (2) the effectiveness of GBL with regard to the fostering of critical thinking as embodied by student discourse, and (3) the potential for mainstream use of GBL in traditional schools. My research also raises questions about the sustainability of critical thinking across extended periods of time for 8th grade students and the oscillatory nature of critical thinking in discourse (i.e. must students spend time engaged in lower level thinking processes in order to ultimately achieve higher levels of thinking at later points?). Statistical analyses did not indicate any significant differences of effect between GBL and traditional classes, but the question of why female students in the GBL condition outperformed males is compelling, and should be explored in future research.

Likewise, I hope to see a number of GBL endeavors, actionable in light of this research, explored in my own departments. As Supervisor of Humanities, I find myself continually wondering how the principles of GBL can be applied to English and Social Studies classes for the purpose of teaching critical thinking, problem-solving, and literacy

skills. For instance, we might consider the development of an interdisciplinary game-week in which students “play” by honing essential skills in authentic contexts. Even the intervention examined in this study might be reimagined to include literacy and math skills (i.e. the integration of letter writing to create formal alliances and/or of policy-making to establish norms and strategies within groups, the application of mathematics to better understand statistical power differentials based on territories, alliances, etc.). As the intervention grows in complexity, there will be more to be studied – and arguably, more to be gained.

I believe that game-based learning has potential to transform the way learning happens in schools by shifting focus away from rote tasks (i.e. extended lectures, forced reading sans situated context) and toward meaningful, authentic, and exciting “play” (i.e. taking on authentic roles and working collaboratively to solve complex problems). Such soundly designed interventions, built upon the principles of GBL, hold a great deal of promise in the way of fostering essential problem-solving and critical thinking skills, and for the future of education in America.

Appendix A

French & Indian War GBL Intervention Curriculum Map

<p>Essential Questions</p> <ul style="list-style-type: none"> • How does the formation (and termination) of alliances impact international relations? Wartime strategies and tactics? • What guided relations between the French, British, and various Native American tribes during the French and Indian War? 	<p>Enduring Understandings</p> <ul style="list-style-type: none"> • International (and interpersonal) relationships are critical to gaining leverage in political/military contexts. • The formation and sustenance of relationships/alliances can often be driven by mutual positive benefits, trust, and power/fear.
<p>Knowledge</p> <ul style="list-style-type: none"> • Major wartime events (Pontiac’s Rebellion, The French and Indian War). • Pertinent geographical content (British colonies, French territories, ceded land). 	<p>Skills (Students will be able to...)</p> <ul style="list-style-type: none"> • Think critically about historical content and apply their understandings to novel situations in gameplay. • Analyze and deeply understand French and Indian War content.
<p>Learning Activities</p> <ul style="list-style-type: none"> • Students will play the French and Indian War game for approximately four class periods across four consecutive school days. • As a part of gameplay, students will be assigned to small groups (2 to 5 students per group). Each group will be assigned to a territory (Britain, France, and Native American tribes such as the Erie and the Shawnee). • Territories will be represented on a map that is projected in the front of the classroom. Each territory will begin the game with a number of land spaces on the game board. Britain will begin with six land spaces, whereas smaller/less powerful territories will begin with a fewer number of land spaces. (The number of land spaces each territory possesses will change as the game is played as a result of “battles” for land.) • Each territory will also be given a number of dice to be used as a mechanism for waging war. Larger territories, such as France and Britain, will receive six dice, whereas smaller territories, such as the Erie and the Shawnee, will receive fewer dice. • Each territory will also be given an objective to accomplish in order to “win.” These objectives are based on the accumulation of land spaces. For instance, France and Britain will be given the objective of possessing at least 16 land spaces by the game’s end. Smaller tribes will be required to possess smaller amounts of land and/or simply to maintain the amount they began the game with. • Classes will begin with a brief mini-lecture from the teacher in which content about the French and Indian War is delivered to students. Then, students will rotate through the three phases of gameplay: (1) intra-group discussion, (2) inter-group discussion (i.e. time to form alliances), and (3) “battle.” During the battle phase, each territory will have the opportunity to declare war on a land space adjacent to one of their own. Then, each territory will roll all of their dice. The territory that has the highest rolling dice (i.e. a six is the highest possible roll – not to be confused with the highest sum of all dice) is the winner. If the attacking territory wins, they now possess the land space. If not, possession does not change. In either circumstance, the losing territory also loses one of his/her dice. • Gameplay will continue for four days, at which point all objectives and winners will be revealed. 	

Appendix B

French and Indian War Content Post-Test

Name _____

Date _____

Social Studies/Period _____

Teacher _____

1) What are two reasons why the French and Indian War occurred?

2) The British fought using more conventional tactics that succeeded in Europe. What style of fighting did the Indians use?

3) What land did England gain as a result of the Treaty of Paris?

4) What was the English response to Pontiac’s Rebellion?

5) Aside from land, what were two positive outcomes of the French and Indian War for the colonists?

References

- Barrows, H. S. (1996). Problem-based learning in medicine and beyond: A brief overview. In L. Wilkerson & W. Gijsselaers (Eds.), *Bringing problem-based learning to higher education: Theory and practice*. New Directions For Teaching and Learning Series, No. 68 (pp. 3-11). San Francisco: Jossey-Bass.
- Bransford, J., Brown, A., & Cocking, R. (Eds.). (2000). *How People Learn: Brain, Mind, Experience, and School - Expanded Edition*. Washington, DC: The National Academies Press.
- Common core state standards* [English language arts standards]. (n.d.). Retrieved December, 2011, from <http://corestandards.org>
- Csikszentmihályi, M. (1990). *Flow: The psychology of optimal experience*. New York: Harper Perennial.
- Danielson, C. (2007). *Enhancing professional practice: A framework for teaching*. Alexandria, VA: Association for Supervision and Curriculum Development.
- DeVane, B. & Squire, K.D. (2008). The meaning of race and violence in Grand Theft Auto. *Games and Culture*, 3(3-4), 264-285.
- Devlin-Scherer, R., & Sardone, N.B. (2010). Digital simulation games for social studies classrooms. *Clearing House*, 83, 138-144.
- Dunlap, K. L. (1999). *Listening in on classroom discourse: Three 9th grade classes discuss literature* (Unpublished doctoral dissertation). Stanford University, Stanford, CA.
- Durga, S., & Squire, K. D. (2011). Productive gaming and the case for historiographic game-play. In *Gaming and Simulations: Concepts, Methodologies, Tools and*

- Applications* (pp. 1124-1141). USA: In Management Association.
- Egenfeldt-Nielsen, S. (2006). Overview of research on the educational use of video games. *Digital Kompetanse*, 1(3).
- Gee, J. P. (1999). *An Introduction to Discourse Analysis: Theory and Method*. London and New York: Routledge.
- Gresalfi, M., Barab, S., Siyahhan, S., & Christensen, T. (2009). Virtual worlds, conceptual understands, and me: Designing for consequential engagement. *On the Horizon*, 17(1), 21 – 34.
- Halpern, D. F. (1999). Teaching for critical thinking: Helping college students develop the skills and dispositions of a critical thinker. *New Directions for Teaching & Learning*, 80, 69-74.
- Hmelo-Silver, C.E. (2004). Problem-based learning: What and How Do Students Learn?. *Educational Psychology Review*, 16(3).
- Hmelo-Silver, C. E. & Barrows, H. S. (2006). Goals and strategies of a problem-based learning facilitator. *Interdisciplinary Journal of Problem-based Learning*, 1, 21-39.
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs, NJ: Prentice-Hall, Inc.
- Lucas, K. & Sherry, J. L. (2004). Sex differences in video game play: A communication-based explanation. *Communication Research*, 31(5), 499 – 523.
- Malone, T.W. (1980). What makes things fun to learn? A study of intrinsically motivating computer games. (Report CIS-7). Palo Alto, CA: Xerox Palo Alto Research Center.

- Malone, T.W. (1981). Toward a theory of intrinsically motivating instruction. *Cognitive Science*, (4), 333-369.
- Moon, J. (2008). *Critical thinking: An exploration of theory and practice*. London: Routledge.
- Moshirnia, A. & Israel, M. (2010). The educational efficacy of distinct information delivery systems in modified video games. *Journal of Interactive Learning Research*, 21, 383 – 405.
- Murphy, P. K., Wilkinson, I. A.G., Soter, A. O., Hennessey, M. N., & Alexander, J. F. (2009). Examining the effects of classroom discussion on students' comprehension of text: A meta-analysis. *American Psychological Association*, 101(2), 740-764.
- National Research Council (1996). *From analysis to action: Undergraduate education in science, mathematics, engineering, and technology*. Washington, DC: National Academy Press.
- National Research Council (2011). *Learning science through computer games and simulations* (Committee on Science Learning: Computer Games, Simulations, and Education, A. A. Honey, & M. L. Hilton, Eds.). Washington, DC: National Academies Press, Board on Science Education, Division of Behavioral and Social Sciences and Education.
- Nicholson, S. (2012). Proceedings of the 3rd international conference on society and information technologies: *Completing the experience: Debriefing in experiential education games*. Winter Garden, Florida.
- Nystrand, M., Gamoran, A., Kachur, R., & Prendergast, C. (1997). *Opening dialogue:*

Understanding the dynamics of language and learning in the English classroom.

New York: Teachers College Press.

Paul, R. (1995). *Critical thinking: How to prepare students for a rapidly changing world.* Santa Rosa, CA: Foundation for Critical Thinking.

Perkins, D. (1998). *What is Understanding?* In M.S. Wiske (Ed), *Teaching for Understanding: Linking research with practice* (pp. 39 – 57). San Francisco, CA: Jossey- Bass.

Prensky, M. (2001). *Digital game-based learning.* New York: McGraw Hill.

Savery, J.R., & Duffy, T.M. (1995). Problem-based learning: An instructional model and its constructivist framework. In B. Wilson (Ed.), *Constructivist learning environments: Case studies in instructional design* (pp. 135-148). Englewood Cliffs, NJ: Educational Technology Publications.

Shaffer, D. W. (2005). Epistemic games. *Journal of Online Education.*

Squire, K. D. (2008a). Open-ended video games: A model for developing learning for the interactive age. *The Ecology of Games: Connecting Youth, Games, and Learning*, 167-198.

Squire, K. D. (2006). From content to context: Videogames as designed experience. *Educational Researcher*, 35(8), 19-29.

Squire, K. D. (2008b). Video game-based learning: An emerging paradigm for instruction. *Performance Improvement Quarterly*, 21, 7-36.

Squire, K. D., DeVane, B., & Durga, S. (2008). Designing centers of expertise for academic learning through video games. *Theory Into Practice*, 47, 240-251.

- Squire, K. D., Giovanetto, L., Devane, B., & Durga, S. (2005). From users to designers: Building a self-organizing game-based learning environment. *Tech Trends*, 49(5), 34-42.
- Steinkuehler, C. (2006). Massively multiplayer online video gaming as participation in a discourse. *Mind, Culture, and Activity*, 13(1), 38-52.
- Watson, W. R., Mong, C. J., & Harris, C. A. (2011). A case study of in-class use of a video game for teaching high school history. *Computers & Education*, 56, 466-474.
- Wertsch, J., Del Rio, P., & Alvarez, A. (Eds). (1995). *Sociocultural studies of mind*. Cambridge, UK: Cambridge University Press.
- Wright, J. C., Houston, A. C., Vadewater, E. A., Bickham, D. S., Scantlin, R. M., Kotler, J. A. (2001). American children's use of electronic media in 1997: A national survey. *Applied Developmental Psychology*, 22, 31-47.
- Xin, M. (2002). *Validity centered design for the domain of being engaged: Collaborative discourse in computer conferencing*, Brigham Young University. Unpublished doctoral dissertation.
- Young, M. F., Slota, S., Cutter, A. B., Jalette, G., Mullin, G., Lai, B., Simeoni, Z., Tran, M., & Yukhymenko, M. (2012). Our princess is in another castle: A review of trends in serious gaming for education. *Review of Educational Research*, 82(1), 61-89.