ABSTRACT

PROBERT, JEFFREY ALLAN. Impact of Computer Gameplay on Student Learning Utilizing *Civilization IV: Colonization* with High School Students in a United States History Class. (Under the direction of committee chair John K. Lee).

This action research study investigated the effectiveness and impact of instructional uses of computer gaming on student comprehension of major themes and concepts in United States history. A concurrent embedded experimental mixed method design (Creswell, 2009; Creswell & Plano Clark, 2007; Greene & Caracelli, 1997) was used to determine what impact gameplay has upon student learning as well as student perceptions of the gaming experience upon their learning using Sid Meier's *Civilization IV: Colonization* in an eleventh grade high school United States History class. This study addressed key issues concerning computer gameplay in an educational setting, asking what impact does computer gameplay have on student understanding and academic performance, and what impact does social interaction surrounding computer gameplay have upon student understanding of content. The quantitative phase of this study focused on the relationship between computer games and academic performance. The qualitative phase of the study focused on student understanding and comprehension of historical content, perceptions of computer gameplay and the social interaction surrounding gameplay.

Students were randomly assigned to one of two classes: one class engaged in gameplay utilizing *Civilization IV: Colonization* and served as the experimental group, the other class engaged in traditional research and served as the control group. Quantitative data was collected from a pretest administered at the beginning of the semester as well as a posttest administered at the end of the semester. Additional quantitative data was collected from term project presentation grades from both groups at the end of the semester. Scores

from the pretest/posttest and student presentations were analyzed to determine if there was a significant difference in learning between the two groups.

Qualitative data was collected at multiple points throughout the study from the experimental group utilizing observation, teacher-researcher reflections, individual interviews, focus group interview, and student data sheets to explore student understanding of the exploration and colonization of North America as well as perceptions of the gaming experience. The qualitative data was analyzed to inform and better understand the impact of computer gaming on student learning.

The findings of this study indicated students who engaged in gameplay with *Civilization IV: Colonization* scored significantly higher on the postest and presentation scores as well as developed a deeper understanding of major themes, concepts and content in United States History than students who conducted traditional research. The findings of this studyalso supported and built upon previous research concerning computer game-based learning, specifically within social studies education, as well as addressed a specific void in the research – what impact does computer game-based learning have upon student academic performance?

Impact of Computer Gameplay on Student Learning Utilizing *Civilization IV: Colonization* with High School Students in a United States History Class

by
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DEDICATION

This study is dedicated to my father Robert Kyle Probert who died from cancer in August 2011. I did it dad!

BIOGRAPHY

Jeffrey Allan Probert received his Bachelor of Science in Secondary Education Social Studies from Miami University, Oxford Ohio in 1985 and his Masters in Secondary Education from Miami University in 1993. After resigning his commission in the United States Marine Corps in 1993, he began his career as a high school Social Studies teacher.

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A special thank you for my family for their support. My wife, Sharon, for the hours I was locked away in my office reading, studying and writing. My children, Hunter and Cameron, for having to do without their father on more than one occasion. My mother, Barbara Probert, for helping take care of the children, transporting them to practices and horseback riding, and cooking more meals than I can remember. Lastly, my father, Robert Probert, for his encouragement and support.

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Chapter 1: Introduction

Background of Study

Because of the prevalence and popularity of computer games in today's culture and society, researchers, government officials and educators see games as useful or even necessary in today's learning environment. The youth of today are digital natives, raised in and surrounded by the digital world – they use technology everyday and expect technology to be part of their learning environment (Blount, 2006). Henry Kelly, former President of the Federation of American Scientists, argues "education in the United States is facing a critical problem in preparing students to face the challenges of [21st Century] America…electronic games can help"(Foster, 2009, p. 1).

The Partnership for 21st Century Skills identifies History and Government and Civics as two of its nine core subjects with an emphasis upon understanding at higher levels rather than basic competencies, "Mastery of core subjects and 21st century themes is essential for students in the 21st century… In addition to these subjects, we believe schools must move beyond a focus on basic competency in core subjects to promoting understanding of academic content at much higher levels"(Partnership, n.d.). This emphasis upon higher levels of understanding includes critical thinking, problem-solving, collaboration and communication skills, creativity, and media literacy (Partnership, 2002).

The impact of computer games on student learning remains the focus of debate among social, psychological and educational researchers. Proponents of computer gaming in educational settings such as Arnseth (2006), Gee (2007, 2005), Owston (2009), Pelletier and Oliver (2006), Schaffer (2006), and Squire, Giovanetto, Devine, and Durga (2005)

emphasized the benefits of gaming. Arnseth (2006) stated “children learn many important skills through gameplay” (p. 3). Opponents of computer gaming stated “games have little social value and may even be harmful” (Squire et al., 2005, p. 34) and believed that “computer games will shift people’s focus away from more worthy activities such as reading and writing, doing math and science or playing outdoors” (Arnseth, 2006, p. 3).

Numerous computer game studies focus on learning, memory, motivation and the cognitive processes associated with computer gameplay. Computer games as a learning tool offer multiple benefits for learners. In fact, these games are seeing increased use in education. Gaming can be a rewarding and motivating experience for students (Annetta, 2008; Gee, 2005, 2007; Owston, 2009; Papert, 1998; Prensky, 2007, 2010). Computer game-based learning is active learning, promotes collaboration and sharing of strategies, and provides immediate feedback to individuals engaged in gameplay (Annetta, Murray, Laird, Bohr, and Park, 2006; Gee, 2005, 2007; Owston, 2009; Schaffer, 2006; Squire et al., 2005; Steinkuehler, 2007). Squire et al. (2005) stated game-based learning is “complex, cognitively challenging and emotionally engaging” (p. 34). Goldstein (2003) noted the learning potential of computer games to develop strategic thinking skills and the ability to transfer knowledge from one setting to another. Wong (1996) agreed that gaming allows learners to engage in the learning process without the fear of failure. In other words, computer games allow players to learn as they progress through a game’s levels, correcting mistakes as they proceed or by replaying the game, adopting and implementing strategies developed from previous failure or success.

Proponents of computer gaming in formal educational settings, such as Gee (2007), Schaffer (2006), Prensky (2007) and Papert (1998) focus on the ability and potential of computer games to engage learners rather than the entertainment aspect of gaming. "[K]ids prefer things that are hard, as long as they are also interesting.…[and] children who are heavily involved with computer games often show an exceptional degree of sophistication in their ways of thinking and talking about learning" (Papert, 1988, p. 2). Papert (1988) stated the best learning occurs when students are deeply engaged in hard and challenging activities. Many of today's computer games do just this. Game players are required to learn as they progress through the game's increasingly difficult scenarios, noting which strategies are successful and which are not. As game players progress through various stages of the game, they build upon previous successes and failures.

Gee (2005) argued that the educational profession can learn from computer games' ability to engage learners:

> Young people today are often exposed to more creative and challenging learning experiences in popular culture than they are in school. The principles on which computer-game design is based are foundational to the kind of learning that enables children to become innovators and lifelong learners. (p. 3)

Squire et al. (2005) summed up the dilemma facing educators today. How do we "respond to a generation of students who, raised on interactive games, expect the same kinds of interactive experiences from their education…?" (p. 34). The question was not whether to incorporate computer games into the classroom but rather how to utilize effectively computer games to improve student learning?

Statement of the Problem

In spite of the general consensus among researchers that some type of learning does occur through computer gameplay, Foster (2009) asserted questions still exist in regard to computer games and learning, including the following: What is game-based learning (how is it conceptualized)?; How does game-based learning occur (what is the process)?; And, is game-based learning beneficial (can students learn content and skills)? Foster elaborates further on the status of computer game research:

> The research findings in the area of learning from games are mixed. Large scale analyses of studies done on games for learning did not show significant effects on learning outcomes. In addition, there has not been much research on the claims about games and learning school content. (2009, p. 2)

Squire (2003) called for more naturalistic studies of gameplay which focus on how players experience gameplay, how it relates to other activities in their lives and the practices in which players engage when playing a game. Squire et al (2005) stated further study is needed to investigate the impact of game-based learning on academic performance. Arnseth (2006) agreed that there is a need for "interactionist and practice-oriented approach to the study of computer games, learning and literacy" (p. 3).

Research Questions

This action research study addresses key issues concerning computer gameplay in an educational setting, asking what impact does computer gameplay have on student understanding and academic performance, and what impact does social interaction

surrounding computer gameplay have upon student understanding of content. In total, this research is framed by six research questions. The first two research questions focus on the relationship between computer games and academic performance. The remaining questions focus on student understanding and comprehension of historical content, perceptions of computer gameplay and the social interaction surrounding gameplay.

1. What is the relationship between computer gaming as an instructional tool and student test scores among eleventh grade United States history students?
2. Is there a significant difference in the academic performance between students who engage in gameplay and students who do not?
3. What is the level of understanding of historical content among students who engage in gameplay and students who do not?
4. What are the student perceptions of computer gaming on their learning?
5. How does peer interaction during gameplay impact student learning?
6. How does student-teacher interaction surrounding gameplay impact student learning?

Purpose Statement

The purpose of this action research is to explore the effectiveness and impact of instructional uses of computer gaming on student comprehension of major themes and concepts in United States history. A concurrent embedded experimental mixed method design (Creswell, 2009; Creswell & Plano Clark, 2007; Greene & Caracelli, 1997) was used to determine what impact gameplay has upon student learning as well as student perceptions

of the gaming experience upon their learning using Sid Meier's *Civilization IV: Colonization* in an eleventh grade high school United States History class. The objectives of the research are to, first, add to the existing knowledge base concerning the use of computer games as a learning tool, specifically *Civilization IV: Colonization,* in a classroom setting (Squire 2004; Squire, Giovanetta, Devine, & Durga 2005); second, investigate teaching practices in formal learning environments to include collaborative learning and strategic thinking skills as identified by The Partnership for 21st Century Skills, with an emphasis upon the socio-cultural aspects of gaming (Arnseth 2006; Gee 2007; Squire 2002); and third, examine the effects of integrating computer games, such as *Civilization IV: Colonization,* in the classroom to improve student learning.

In this research quantitative data was collected from a pretest administered at the beginning of the semester as well as a posttest administered at the end of the semester (see Appendix B). The pretest and posttest, created by the researcher, was an abridged version of the New York State United States History and Government Regents Examinations (Regents Exam) and the National Assessment of Educational Progress (NEAP) assessment for United States History (released versions of the exams are available online). Items selected for inclusion on the abridged version of the tests focused on exploration, colonization, the colonial era and The American Revolution. The pretest and posttest were identical tests (test-retest). The tests were taken by all students enrolled in United States History during the Fall Semester of 2012.

Students were randomly assigned to one of two classes: one class engaged in gameplay utilizing *Civilization IV: Colonization* and served as the experimental group, the

other class engaged in traditional research and served as the control group. Scores from the pretest/posttest were analyzed to determine if there was a significant difference in scores between the two groups. Additional quantitative data was collected from term project presentation grades from both groups at the end of the semester. Qualitative data was collected at multiple points throughout the study from the experimental group utilizing observation, teacher-researcher reflections, individual interviews, focus group interview, and student data sheets to explore student understanding of the exploration and colonization of North America as well as perceptions of the gaming experience. The qualitative data was analyzed to inform and better understand the impact of computer gaming on student learning.

Rationale for the Study

There is limited applied empirical research on game-based learning environments in the social studies as well as technology integration in general. Numerous scholars, educators and computer game proponents agree computer games are effective at enhancing motivation and interest among students, but what is unclear is how "this translates into more effective learning" (Annetta, 2008). What is needed is empirical data. Bolick (2009) stated there is a void in the literature about how technology integration impacts teaching and learning. Lee and Freidman (2009) referred to Slavin (2002) and the United States Department of Education in the call for evidenced based research. Lee and Freidman (2009) noted what research exists suggests technology integration into social studies classrooms "has been unsophisticated" while the literature in general "suggests that technology is being used, but that use is not particularly advanced, sophisticated, or effective"(p. 4-5).

Existing research on the relationship between computer games and student learning include Foster's (2009) mixed method study utilizing *Rollercoaster Tycoon 3* with students in fourth through sixth grades; Moline's (2009) qualitative study on computer games with twelve to eighteen year olds; Blount's (2006) quantitative study utilizing *Virtual U* with college students; Tisa's (2005) position paper on adolescent gaming experiences; Charsky's (2004) mixed method study utilizing *Civilization III* with ninth grade World History students; and Squire's (2004) qualitative study utilizing *Civilization III* with ninth grade World History students. This study built upon previous research concerning computer game-based learning, specifically within social studies education, as well as addressed a specific void in the research – what impact does computer game-based learning have upon student academic performance?

The study utilized the simulation computer game *Civilization IV: Colonization* to evaluate the impact of gameplay upon student understanding of major concepts and themes in United States history. *Civilization IV: Colonization* is a single/multiple player turn-based game based on historical concepts such as expansion, exploration, colonization, conflict, economics, and revolution. The setting for the game is the exploration and colonization of North America and South America. Game players decide which European nation to play for: Spain, France, the Netherlands, or England, and make decisions regarding the growth and development of their colonies. They must decide where to settle, what improvements to make, which colonists to recruit, whether to engage in warfare, pursue trade, establish diplomatic relationships, and develop agriculture and industry. The decisions they make determine whether their colony thrives or dies, with the ultimate goal of declaring

independence. The scenarios presented in the game relate to concepts and themes inherent in United States history such as the importance of geography in the establishment of cities, expansionism, warfare, and economic development.

Theoretical and Conceptual Frameworks

This research utilized an action research framework grounded in cognitive and social constructivist pedagogies. This section includes a review of constructivist learning theory and a consideration of the theoretical constructs for action research.

Constructivist learning theory. Splitter (2009) stated there are "two distinct constructivist theses, only one of which deserves serious attention" (p. 135). He identified the two theses as constructivism and social constructionism. Splitter (2009) explaind the difference:

> Constructivism is, primarily, an epistemological and psychological thesis about how we learn, viz. by actively and self-consciously bringing our past experiences and understandings…to bear, in a collaborative exercise with other learners,…It is, fundamentally, concerned with making sense of our experience…By contrast, social constructionism,…maintains that not only knowledge, but truth, reality, facts, texts, even ourselves, are social constructs, and that learning…does not depend upon any kind of fixed correspondence with the "real world". (p. 139)

The conceptual framework that informed this research was constructivism. Constructivism, simplified, is the construction of knowledge. Constructivists believe individuals interpret and construct meaning based on experience and beliefs (Hannafin et al.,

1997). Regardless of the various forms of constructivism – critical, cognitive, individual, psychological, radical, or social; or theorists – Berkley, Dewey, Friere, Hegel, Kant, Kuhn, Piaget, Vygotsky, von Glasefeld, or any other, (Gordon, 2009; Phillips, 1995) "a core assumption of constructivist theory is that learners actively construct knowledge through activity" (Hernández-Ramos & De La Paz, 2009, p. 152). Phillips (1995) stated the common element among constructivist perspectives is "active participation by the learner" (p. 11). Constructivist classrooms include learning environments which support communities of inquiry – students, peers and teachers interacting collaboratively. A classroom operating within a constructivist framework has a balance between teacher-directed and student-directed learning, with the teacher acting as a guide throughout the learning process (Gordon, 2009). Students in constructivist classrooms "learn in a variety of ways, which include trying to solve problems on their own, sharing their ideas with their peers, and asking the teacher to explain issues and concepts that are unclear" (Gordon, 2009, p. 48). Constructivism's emphasis upon inquiry, communication, collaboration, and problem-solving is, in part, what the Partnership for 21st Century Skills, the U.S. Department of Education, as well as, state boards of education and business leaders are demanding of public schools today. Computer games, such as *Civilization IV: Colonization*, provide a constructivist approach to learning.

Pragmatic constructivism. The constructivist perspective most closely connected with this research is pragmatic constructivism which holds that there is an objective reality. Pragmatic constructivism focuses on inquiry and discussion in support of identified objectives, which according to Splitter (2009),

> act as safe-guards, both against crude forms of subjectivity and relativism, and against the epistemological and psychological gridlock that passes for understanding when students must learn all of those predetermined and prepackaged bits and pieces that so often constitute the "objective" curriculum. (p. 149)

Pragmatic constructivism is based upon the theories of Dewey (pragmatism), Freire (critical inquiry and problem-based learning), Piaget (individual), and Vygotsky (social collaboration), with the common denominator being interaction and discourse (Gordon, 2009). It provides a foundation in which to engage students in active learning experiences designed by the teacher "to promote a deep understanding rather than superficial (and short-lived) memorization (Hernández-Ramos & De La Paz, 2009, p. 152). The teacher is a key component in constructivist classrooms. Gordon (2009) states "knowledge in [pragmatic] constructivist classrooms still resides heavily on the teachers' own knowledge and experience" (p. 48).

Pragmatic constructivist discourse involves a shift from theoretical to practical. It is descriptive, explanatory and prescriptive. Gordon (2009) states pragmatic constructivism is "good constructivist teaching and learning" (p.54) in conjunction with constructivist theories, and takes into account the lessons that can be learned "from the experience of excellent constructivist teachers" (p. 55). Pragmatic constructivism, according to Windschitl (2002), provides teachers with a working framework for understanding constructivist concepts because without one "'teachers cannot be expected to link constructivist objectives for learning with appropriate types of instruction and assessment or to adopt constructivist principles to their particular classroom contexts" (Gordon, 2009, p. 43).

Teacher's role in a constructivist classroom. Confrey (1990) stated "When one applies constructivism to the issue of teaching, one must reject the assumption that one can simply pass on information to a set of learners and expect that understanding will result…the teacher must…assist the student in the restructuring process" (p. 109). It is the responsibility of the teacher to guide the learner through the learning process. Key to this process is individual inquiry and dialogue among student, peers and teacher. Gordon noted teachers "should promote experiences that require students to become active, scholarly participators in the learning process" (2009, p. 39-40). Newmann et al., (1996) stated "'student construction of knowledge must be based on a foundation of prior knowledge'" (Splitter, 2009, p. 140). Splitter (2009), linking constructivism to objectivism, stated teachers "need to ensure that the fruits of students' constructs are linked appropriately to that which qualifies as genuine knowledge from the perspectives of experts within the 'real-world' disciplines" (p. 140).

Pragmatic constructivism is not an abandonment of objectives, nor is it student-centered learning as defined by radical constructivists. It is theory based upon practical applications of constructivist practices pulled from the experiences of successful constructivist teachers. The base pedagogy associated with this approach focuses on developing, encouraging and cultivating reflective thought in the classroom.

Action research. The research methodology informing this research is action research (Anderson, Herr & Nihlen, 2007; Cochran-Smith & Lytle, 1993; Kincheloe, 2003; Herr & Anderson, 2005). The researcher and author of this study was also the teacher of the students involved in the study, thus playing the role of an insider. Herr and Anderson (2005) described insider positionality as a researcher who studies their own self or practice in order

to contribute to existing knowledge base and/or improve educational practice. Herr and Anderson (2005) stated although action research is similar to qualitative and even quantitative research, "action research is inquiry that is done *by* or *with* insiders to an organization or community, but never *to* or *on* them…Action research is oriented to some action or cycle of actions that organizations or community members have taken, are taking, or wish to take to address a particular problematic situation" (pp. 3-4). Megowan-Romanowicz (2010) defined action research as "an approach to conducting research that links theory building with activity that will induce a change or solve a problem in a social setting" (p. 994). Smith (2010) referred to Corey's (1953) explanation of action research as "research that is undertaken by educational practitioners because they believe that by doing so they can make better decisions and engage in better actions" (p. 5). Hammersley (2004) stated the core feature of action research is the "intimate relationship between research and some form of practical activity – such that the focus arises out of, and its results feed back into, the activity concerned" (p. 165).

Limitations

There are several limitations to this study. The first of which is the teacher as researcher/insider. Active participation on the part of the researcher was necessitated given that the researcher was also the students' teacher. This research concentrated on the use of computer games as an instructional tool to improve learning. The effectiveness of an instructional tool was dependent upon how a teacher utilized a particular tool. A key component of the study was the role of discourse in the learning process. This includes the

discourse between teacher and student as well as among students. Existing literature indicated that the discourse surrounding gameplay is as important as the gameplay itself. As the students' teacher, the researcher engaged the students in discussions in order to relate gameplay to themes and concepts of United States history. A secondary reason for active participation on the part of the researcher was the complexity of *Civilization IV: Colonization.* I provided instructions and guidance throughout the six sessions of gameplay. Squire (2004) noted participation as a facilitator of the gameplay sessions was necessary in his study of *Civilization III* in a ninth grade World History class.

The second limitation is generalizability. The findings were only a reflection of the outcome for this particular group of students, teacher-researcher and school. An additional limitation to generalizability was the sample size. Forty-two students participated in the study. The experimental group consisted of twenty-four students. The control group consisted of eighteen students (students in the control group have the opportunity to play *Civilization IV: Colonization* during the Spring Semester 2013).

The third limitation was technology. Technology access was not a problem for the school featured in this research. The student computer ratio was 1:1. There were over 140 laptop computers. Freshmen and sophomores were issued netbook computers for personal use. Additionally, many of the school's students bring laptops to school. Many schools do not have the computer availability per student that this school possesses.

Significance and Overview of Study

This mixed methods study filled the void in empirical research concerning technology integration in social studies education. Lee and Freidman (2009) noted there was a lack of research in the use of technology in the social studies despite the growth of technology as a central tool to teaching and learning over the past two decades. They referred to VanFossen and Shively's (2003) study of technology presentations at the National Council for the Social Studies as evidence. Lee and Freidman stated that less than 5% of the technology presentations were research oriented (2009, p.5). They agreed with Harris (2005) in the need for research but extended his argument suggesting,

> That a more reasoned and well-informed consideration of technology use in education can emerge from research and scholarship focused on discovering the educational technology applications that have deep and consistent academic pedagogical potential. (Lee and Freidman, 2009, p. 4)

Squire et al. (2005) argued we know very little about the effects of gameplay on cognition because there were few studies of "expert" game practice. Pelletier and Oliver (2006) stated despite the growing interest in computer gaming as an instructional tool to teach curriculum content, there were few studies of this being done in a classroom environment.

This study focused on the effectiveness of computer gameplay on student comprehension of major themes and concepts in U.S. history, the change in students' original understandings of U.S. history as a result of playing *Civilization IV: Colonization*, and the intervention of the researcher as teacher and facilitator of the learning process.

Chapter 2: Review of Literature

This chapter provides a review of literature on the appeal of computer gaming, play as part of the learning process, challenges to the integration of computer games into the classroom, game-based learning verse text-based learning, justification for game-based learning environments, and game learning theories focusing on cognitive and social constructivism. The chapter concludes with a discussion of Activity Theory and gameplay as socio-cultural activity.

Computer Generation

William Draves, an adult education specialist, states "we are living in an age of sensory stimulation" (Staley, 2003, p. 38). Computer gaming along with television, camera phones and Internet sites such as Youtube and Facebook have contributed to the development of a generation dependent upon visual images. Computer games have infiltrated main stream culture. Computer gaming has become a major industry. Oblinger (2006) states "digital games are part of modern culture…Digital gaming is a multi-billion dollar industry" (p. 5). In 2008, in the United States, 99% of boys and 94% of girls indicated they "played digital games on consoles, computers, or handhelds" (Moline, 2009, p. 3). Annetta (2008) notes the majority of the game playing population lies within the fourteen to nineteen year old age group. The Net Generation has grown up in a society in which technology is the norm, "the K-12 arena in particular [is facing] an uphill battle to engage these students (Annetta et al. 2006, p. 16). Classroom instruction needs to change to meet the learning needs of the Net Generation.

Computer games exist in a variety of formats: single-player, multiple-player, online, consoles (such as Sony's Playstation, Nintendo's Gamecube, and Microsoft's Xbox), portable game players and cell phones. Why the attraction of digital computer games? Computer games are not just for entertainment. Individuals engage in gameplay for the challenge and sense of accomplishment one realizes when overcoming various situational problems in order to advance to the next level. Papert (1988) states it is the challenge of "being the first on the block to master the game" that draws players to computer games (p. 2). Goldstein (2003) notes computer games are able to capture the attention of players by offering "clear and simple goals with uncertain outcomes and new challenges" (p. 38). Staley (2003) adds that young people are drawn to the action and noisy "environment of the [computer] screen" (p. 5).

Playing to Learn

Oblinger (2006) notes that play is an important part of the learning process. Annetta (2008) states play "systematically confronts the child with a learning situation that could only be located within his or her area of close development. That is, it would involve a task located slightly above the acquired skills (of the child)" (p. 232). Proponents of computer gaming in formal educational settings, such as Papert and Gee, have moved beyond the entertainment aspect of gaming to the ability and potential of computer games to engage learners. "[K]ids prefer things that are hard, as long as they are also interesting.…[and] children who are heavily involved with computer games often show an exceptional degree of sophistication in their ways of thinking and talking about learning" (Papert, 1988, p. 2).

Papert (1988) adds the best learning occurs when students are deeply engaged in hard and challenging activities. Many of today's computer games do just this. Game players are required to learn as they progress through a computer game's increasingly difficult scenarios, noting which strategies are successful and which are not. As game players progress through various stages of the game, they build upon previous successes and failures. Annetta (2008) refers to Clegg (1991) in that the "instructional context that envelops gaming is a more important predictor of learning than the game itself" (p. 232).

Challenges

The impact of computer games upon children has been the focus of political debate as well as social, psychological and educational research. Proponents of computer gaming in educational settings such as Arnseth (2006), Pelletier & Oliver (2006), Squire et al. (2005) and Gee (2005, 2003) emphasize the benefits of gaming. Arnseth (2006), in fact, states "children learn many important skills through gameplay" (p. 3). However, critics of computer gaming, such as Anderson and Dill (2000) and Walsh, Gentile, Gleske, Walsh and Chasko (2004) argue that "computer games might have negative effects on people's attitudes and behavior" (Arnseth, 2006, p. 3). Opponents of computer gaming, as noted by gaming researchers Kurt Squire and Hans Christian Arnseth, believe that computer games may be harmful, offer little social value and believe gaming will shift people's attention from more worthy activities such as reading or playing outdoors (Arnseth, 2006; Squire et al.; 2005). Squire (2002), in response to criticism of computer gaming, notes studies linking computer gameplay to acts of violence or other anti-social behavior are problematic:

> These studies generally lack any real-world evidence linking game-playing to acts of violence; they ignore broad trends that show inverse correlations between game-playing and violent behavior; finally, they make wild logical leaps in linking very constrained behaviors in laboratories to violent acts where people really get hurt. (p. 2)

An additional challenge to the use of computer games in educational settings is the perception of teachers towards computer games. Staley (2003) believes teachers are a main obstacle to effective integration of visual resources, such as computer games, in formal learning environments. This is because they view visual resources - television, computer games, and movies - as enrichment experiences, not as cognitive experiences. Staley does recognize teachers use visual secondary sources on a regular basis, but if "a visual secondary source [is] to be useful it must convey some wisdom or insight" and the user must be able to create a meaningful pattern (Staley, 2003, p. 60). In other words, the game itself should not be the focus of the activity, but rather it should be treated as a resource embedded in the activity of learning (Arnseth, 2006).

As educators, we need to re-evaluate our view of learning. How we value and determine what learning occurs during gameplay depends on how computer gaming is utilized in formal learning environments in relation to curriculum and assessment (Pelletier & Oliver, 2006).

Game-based Learning vs. Text-based Learning

Gameplay is something in which an individual engages in. It does not involve just reading or watching. Computer games situate thinking and problem solving in a meaningful context. Evidence exists that students do better when learning tasks are embedded in a context of gameplay (Arnseth, 2006). In computer games "players encounter various signs and tasks in a multimodal environment where words, images, actions and sounds are intertwined with one another" (Arnseth, 2006, p. 9).

The one-dimensional, sequential aspect of text-based learning is contrary to the multidimensional world in which we live. Although words are multidimensional, complex, and nonlinear, syntax is not (Staley, 2003). The writing process puts nonlinear, complex, abstract objects (words) in a linear order; whereas, visualizations, such as computer games, are multidimensional and can represent the multivariate realities of human life (Staley, 2003). Visualizations, such as computer games, can convey information and complex relationships that written text cannot due to a text's one-dimensional sequential structure.

Limitations of Computer Game-based Learning

Evidence that computer games have been successfully integrated into formal learning environments, despite the potential positive effects of gameplay, is sparse according to Arnseth (2006). Ceci and Roazzi (1994), found "students did significantly better when a task was presented in the context of a game…[However] children's reasoning was tightly bound to the specific context in question. Thus, children had problems transferring the knowledge gained in a computer game context back into a laboratory context" (Arnseth, 2006, p. 6).

The potential of games to facilitate learning is dependent on how games are incorporated into the classroom (Arnseth, 2006). The key to effective use of computer games in formal learning environments is discourse (Arnseth, 2006; Squire et al., 2005). Proponents of gaming emphasize the focus of gaming activities should be in the discourse among students and with their teachers, not in the computer games themselves. Arnseth agrees with Linderoth (2004) that "the activity of gaming needs to be contextualized in a way that enables children to make sense of educationally relevant content…children do not necessarily treat a game as a representation of something beyond the immediate activity of playing the game" (Arnseth, 2006, p. 8). He adds "gaming cannot or should not be conceived as something which in and by itself will make learning more meaningful, fun or pleasurable" (p. 10).

Advocates for the integration of computer games in educational settings, such as Arnseth (2006), and Gee (2005), differentiate between good games and simplistic educational games. They believe good computer games promote problem solving and development of critical thinking skills. The problem with many educational games is the emphasis on repetition and basic skill development. Arnseth (2006) is highly critical of edutainment games – games designed specifically for learning - because these games are too simplistic, repetitive, focus on specific skills or content and offer no active exploration.

Justification for Game-based Learning Environments

Researchers have touted the benefits of computer games as a learning tool. Numerous computer game studies have focused on learning, memory, motivation and the cognitive

processes associated with computer gameplay. Squire et al. (2005) state game-based learning is “complex, cognitively challenging and emotionally engaging” (p. 34). Goldstein (2003) notes the learning potential of computer games to develop strategic thinking skills and the ability to transfer knowledge from one setting to another. Gaming allows learners to engage in the learning process without the fear of failure (Wong, 1996). Computer games allow players to learn as they progress through a game, correcting mistakes as they proceed or by replaying the game, adopting and implementing strategies developed from previous failure or success.

Adaptability of computer games. An attractive feature of computer games as an instructional tool in formal learning environments is the inherent versatility of computer games. Games can be adapted to the experience level of the player. Games differentiate between learners by allowing players to select a level of difficulty and challenge with which they are comfortable (Arnseth, 2006; Gee, 2005). A key benefit of complex simulation games such as *Rise of Nations, Age of Mythology, [Civilization]* and *The Elder Scrolls III: Morrowind* is they permit players to fit the game to their learning and playing styles (Gee, 2005).

Active learning and ownership. First and foremost, gameplay is something an individual does; it is not just something read or watched. Simulation computer games offer an activity approach to learning with multiple solutions to problems (Arnseth, 2006). A key component of active learning is exploration. Computer games promote exploration, risk taking, and willingness to try something new (Gee, 2005). The consequences associated with

failure are minimal; players can start a new game or revert to a saved game (Gee, 2005). Gee explains the active learning inherent in game play:

> Computer games operate on the principle of performance before competence. That is, players can learn as they play, rather than having to master an entire body of knowledge before being able to put it to use…students learn best when they learn in context – that is when they can relate words, concepts, skills or strategies to prior experience. (2005, p. 2)

Ownership of learning is an integral component of active learning. Games are designed to allow players to make choices, to take charge of the learning process. It is this aspect of game- based learning which makes it different from school learning (Papert, 1988). Papert (1988) states "The most important learning skills that I see children getting from games are those that support the empowering sense of taking charge of their own learning" (p. 4).

Thinking skills, problem solving and feedback. Complex simulation computer games "commonly require the use of logic, memory, problem solving, critical thinking skills, visualization and discovery" (Annetta, 2008, p. 232). Proponents of integrating computer games into formal learning environments agree gaming allows players to evaluate information and hypothesize solutions to problems. Feedback is central to learning, problem solving and gaming success. Goldstein (2003) notes "feedback on the user's success is immediate, allowing users to evaluate their progress quickly" (p. 38). The immediate feedback provided by gameplay allows players to seek solutions to problems while learning

from mistakes. Gee (2005) states computer games "teach children not only how to play but how to learn, and to keep on learning" (p. 1).

A key characteristic of computer games is problem solving which is presented in a meaningful context. Squire et al. (2005) note computer games' ability to develop problem solving skills: "Games teach concepts…modeling expert problem solving, calling attention to key features of the problem through cues and structuring problems so that the player builds on previous under- standings, all of which are features of our most powerful learning environments" (p. 34). Gee (2005) refers to computer games' ability to promote creative thinking among players to solve problems:

> Research has shown that when learners are left completely free to solve a complex problem, they may hit upon creative solutions…In good computer games problems are well ordered so that early ones lead the player to formulate hypotheses that work well for solving later, harder problems. (p. 2)

Goldstein (2003) concurs with Squire et al. (2005) and Gee's (2005) assessment of the ability of computer games to promote strategic thinking and problem solving skills. He states the increasing complexity of each level requires players to build upon previous knowledge or game competence to succeed at the next higher level (Goldstein, 2003).

Social activity, collaboration and cooperative learning. Gameplay does not occur in a vacuum; rather it is a social activity which promotes collaborative and cooperative learning among players. Zemsky and Massey (2004) identify three reasons why technology as a learning tool - specifically computers and software - appeals to learners: first is the social

interaction that occurs among users; second is the entertainment aspect whether it is music, computer games or movies; and third is the display of work or accomplishments.

Game players form social networks to discuss strategies and offer support to other players. Annetta (2008) states "Games are not just played; they are talked about, read about, fantasized about, cheated at, altered, and become models for everyday life" (p. 230). Steinkuehler (2004) addresses the social-communicative aspect of gaming in her study of online computer games. She notes computer games promote communication and social interaction among game players (Steinkuehler, 2004). Papert (1988) addresses the benefits of collaborative learning in which he states "learners who know what they are doing will learn far better than children who go mindlessly through the motion of learning" (p. 2). Oblinger (2006) argues computer games promote reflective and active learning through collaboration and social networks. Goldstein (2003) emphasizes the social aspect of gaming and refers to Holm, Sorenson and Jessen (2000):

> 'The social aspect of playing computer games is another essential reason for the children's interest [in gaming]. Computer games generate friendship and social events, and computer games can be cultivated as a common interest – an interest that often goes beyond the playing itself.' (p. 34)

Kurt Squire (Squire, 2008; Squire et al., 2005; Squire, 2004; Squire, 2003; Squire, 2002) has conducted research into the social activity of gaming and has published several articles that focus on the social discourse associated with gaming. In Squire et al. (2005), he reports the gameplay he observed of *Civilization III* in a ninth grade World History class was "fundamentally a social experience and every participant showed a desire to share his/her

game play with other people" (p. 38). Squire emphasized that entire gaming process was a cooperative/collaborative experience among the students, even when they played single player games (Squire et al., 2005; Squire, 2004). Squire also noted students who played in pairs experienced greater engagement in gameplay because they had someone with whom to discuss strategies, leading to greater reflection, as well as someone with whom to share in their struggles while they engaged in gameplay (Squire et al, 2005; Squire, 2004). Squire's observations of student gameplay of *Civilization III* reinforce Papert's (1988), Goldstein's (2003) and Steinkuehler's (2004) statements concerning the benefits of communication, cooperative learning, and social networking among game players. Students who support each other experience greater success and develop a deeper understanding of the content and context of their gameplay (Squire et al., 2005; Squire, 2004).

New literacies. Thinking and problem solving skills are one of three learning skills specifically identified by the Partnership for 21st Century Skills. Gaming promotes and develops the skills workers need for the 21st Century: creativity, communication skills, collaboration and problem solving (Annetta, 2008). The integration of computer games in formal learning environments enables educators to meet these requirements. Students who engage in gameplay utilize critical thinking skills and engage in context specific problem solving. Other skills identified by the Partnership for 21st Century Skills are self-direction and communication skills. Computer games allow players to monitor their learning and transfer knowledge from one phase of a game to another as well as promote communication between players.

Squire et al. (2005) state simulation games, such as *Civilization III*, support the learning skills identified by the Partnership for the 21st Century Skills because gameplay "initiates students into practice, literacies, and cultures central to the information age" (p.34). They do acknowledge that computer game-based learning "may not produce traditional literacies as efficiently and effectively as traditional approaches", but game-based learning is better suited for developing literacies required for a digital age (Squire et al., 2005, p. 41).

Theories for Game-based Learning

Constructivism. Constructivist classrooms create learning environments that support communities of inquiry – students, peers and teachers interacting collaboratively. A classroom operating within a constructivist framework has a balance between teacher-directed and student-directed learning, with the teacher acting as a guide throughout the learning process (Gordon, 2009). Students in constructivist classrooms create their own knowledge; they "learn in a variety of ways, which include trying to solve problems on their own, sharing their ideas with their peers, and asking the teacher to explain issues and concepts that are unclear" (Gordon, 2009, p. 48).

So, what is knowledge, how is it constructed and what is the role of the learner in this process? Knowledge does not simply exist in the world, waiting to be discovered, but is created or rather constructed by individuals through interaction with the world (Gordon, 2009). Constructivists, regardless of their different views on constructivism, are in agreement that knowledge construction is an active process on the part of the learner. Phillips (1995) explains the different views, "some hold that knowledge production comes about solely from

intellectual or cognitive processes internal to each individual knower, whereas for others the processes are regarded as sociopolitical…and not simply or solely… mental or intellectual in nature" (p. 8). Hernandez-Ramos, et al., (2009) state "knowledge is socially constructed through structured interaction and collaboration around meaningful tasks" (p. 152). Piaget, father of cognitive constructivism, states "knowledge does not result from a mere recording of observations without a structuring activity on the part of the subject" which includes assimilation and accommodation (Phillips, 1995, p. 6). Gordon (2009) adds "knowledge construction involves an integration of individual cognitive processes and social processes" (p. 48). Longino (1993) states knowledge "'is constructed…by individuals in interaction with one another in ways that modify their observations, theories and hypotheses, and patterns of reasoning'" (Phillips, 1995, p. 11).

Knowledge creation or learning is an active process on the part of the learner. Dewey (1960) states "'the true object of knowledge resides in the consequences of the directed action'" (Phillips, 1995, p. 6). He opposes teacher-directed knowledge by transmission, in which students are expected to absorb information provided the teacher. This passive approach to learning, or as Dewey calls it "spectator theory of knowledge", is counter to his belief that knowledge comes "by integrating thinking and doing, by getting the mind to reflect on the act" (Gordon, 2009, p. 49). For Dewey, learners learn through participation and social activity. Dewey emphasizes the use of active methods because he views the learner as an actor not a spectator in the learning process (Phillips, 1995). Freire (1970, 1994) reiterates Dewey's position by stating "learning requires the learner to be active, and knowledge arises out of a shared process of inquiry, interpretation, and creation" (Gordon, 2009, p. 47).

Gordon (2009) states “genuine learning requires students to be active, not passive, and to construct their own interpretations of subject matter” (p. 47).

Cognitive and social constructivism. Of the various perspectives previously mentioned, cognitive constructivism and social constructivism are best suited for the classroom. Cognitive constructivism is linked to Piaget’s theory of cognitive development. His theory states “humans cannot be given information, which they immediately understand and use, instead, humans must construct their own knowledge… through the process of assimilation and accommodation” (Powell & Kalina, 2009, p. 242). Piaget’s theory focuses on the “reasoning ability of individuals and how individuals interpret knowledge…[as well as how] information is processed based on what already exists, as well as, through inquiry” (Powell & Kalina, 2009, p. 246). Piaget does not believe knowledge is something to be absorbed like a sponge absorbs water. The learner needs to mold, modify, alter and adjust new information to previous concepts or beliefs in order for learning to occur.

A constructivist education, based upon Piaget’s theory, views learning “as a process of concept construction through active interpretation and reorganization of conceptual schemas by the learner” (Vianna & Stetsenko, 2006, p. 90). Vianna and Stetsenko (2006) state teaching methods, according to Piaget’s theory, should focus on “meaningful problems designed to encourage and facilitate the constructive process. By engaging in meaningful problem-solving situations, including discussions with others…[students] develop conceptual connections that will engender new understandings” (p. 90). Powell and Kalina (2009) state Piaget does acknowledge that "social interaction does occur and may be part of the learning

process but it is the individual who constructs knowledge based on his or her personal experience" (p. 246).

Social constructivism, unlike cognitive constructivism, does not focus on the individual, but on interaction with others. The common element for the two perspectives is knowledge is constructed from personal experience. Social constructivism is rooted in Vygotsky's cultural-historical theory. Vygotsky believes "human learning, mental development, and knowledge are all embedded in a particular social and cultural context" (Gordon, 2009, p. 52). Vygotsky also believes social interaction and cooperative learning are vital to the learning process, that the "internalization [of knowledge] occurs more effectively when there is social interaction" (Powell & Kalina, 2009, p. 244). Powell and Kalina (2009) add "cooperative learning is an integral part of creating a deeper understanding" and is a necessary component of a social constructivist classroom (p. 244).

Vygotsky and social constructivists believe learning is inherently social and occurs in a cultural setting, through community interaction and collaborative activities. Vygotskian theory holds that education should focus on the zone of proximal development, meaning-making, collaborative discourse and scaffolding (Vianna & Stetsenko, 2006). Powell and Kalina (2009) define the ZPD as "a zone where learning occurs when a child is helped in learning a concept in the classroom…students act first on what they can do on their own and then with assistance from the teacher [or peers], they learn the new concept" (p. 244). It is through social interaction with peers, as well as guidance from teachers (or other adults), that learning occurs (Gordon, 2009).

Common ground. Powell and Kalina (2009) state cognitive constructivism and social constructivism have similarities and differences, "as well as, situational advantages when using one method over the other; however they both have their place in the classroom and occur interactively in an eclectic learning atmosphere" (p. 249). The underlying commonality between the two perspectives is action. Piaget and Vygotsky view action as the source of knowledge creation (Vianna & Stetsenko, 2006). Both believe knowledge creation is "a contextually embedded process of interactions" and children learn through interaction with their environment (Vianna &Stetsenko, 2006, p. 85). Both perspectives value inquiry, cooperation, collaborative problem-solving, and communication. Powell and Kalina (2009) add both approaches support guided teaching and view the teacher as a facilitator in the learning process. It is the role of the teacher as facilitator of learning, not care-giver of knowledge, which is key to constructivist practices. The emphasis upon inquiry, communication, collaboration, and problem-solving is exactly what the Partnership for 21st Century Skills, the U.S. Department of Education as well as state boards of education and business leaders are demanding of public schools today.

Activity theory. Within the realm of gaming experience, Arnseth (2006) identifies two approaches to gameplay research - research from a cognitive perspective and research from a socio-cultural perspective. This study (e.g. Gee, 2003; Squire, 2004) focuses on utilizing computer games as a means to organize effectively learning activities as well as the integration of computer games (e.g. Egenfeldt-Nielsen, 2005; Kirriemuir & McFarlane, 2004) into the school curriculum (Arnseth, 2006).

Despite the increasing amount of research on gaming, we still know very little about the effects of gaming on cognition because there have been very few studies of "expert" game practice (Squire et al, 2005). We do know computer simulation games have been used successfully in the areas of decision making, military training, navigation and health (Arnseth, 2006). Additionally, the social and behavioral sciences recognize game play as important for the "development and formation of thinking, identities, values and norms" (Arnseth, 2006, p. 2). What is not in question is the value of computer gameplay; however, what is in question is how to evaluate the learning that occurs as a result of gameplay:

> Although there is substantial interest in using games to teach curriculum content, there are few examples of this being done successfully, precisely because it remains unclear how to evaluate the process of learning in games. (Pelletier & Oliver, 2006, p. 341)

According to Pelletier and Oliver (2006), what is needed in gameplay research "is a method that looks at the process and outcomes of play, explaining how this relates to the design of the game as well as the social and cultural aspect of play" (p. 131). Pelletier and Oliver (2006) and Squire (2004, 2002) suggest Activity Theory as a theoretical framework for researching learning and gaming. Pelletier and Oliver (2006) refer to Squire's use of Activity Theory as a theoretical framework for a naturalistic study of gameplay experiences. Squire (2002) defines and describes Activity Theory as a methodological approach to evaluate game-based learning. In fact, Squire (2004) utilizes Activity Theory in his research of *Civilization III* in a ninth grade world history class.

Activity Theory is based upon Vygotsky's psychological research into learning which focuses on the role of artifacts in cognition (Pelletier & Oliver, 2006). The basic premise of Activity Theory is human action (in this case learning), is mediated by a tool, either conceptual or symbolic (Pelletier & Oliver 2006). The basic framework for Activity Theory (see Figure 1.) is triangular in shape with three points representing the Subject (person), the Tool (mediating item) and Object (intent), but it has been expanded upon to create a system of learning which includes Community (where learning takes place), Rules (within the Community) and Division of Labor (how work is organized) (Pelletier & Oliver 2006).

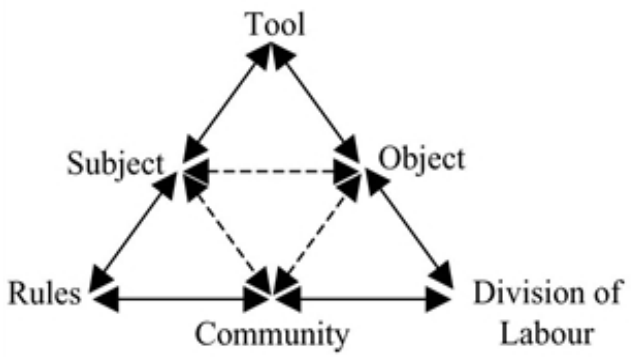

Figure 1. An activity system

Pelletier and Oliver (2006) explain Activity Theory as a method of analysis which does not focus on the subject or the tool but rather a "system" that examines how a subject utilizes a tool within a specific cultural context. They are concerned with "how individuals learn to progress in a game…[and view] learning as a property of the system" (Pelletier & Oliver, 2006, p. 332). Central to this approach for understanding learning during gameplay is

how learners use contradictions as learning points during gameplay. Pelletier and Oliver (2006) describe the process as follows:

> The method involves close analysis of computer recordings of play, using a table to record the players' actions. While some level of description may be useful for the entire recorded session, particular attention (and corresponding detail) is given to contradictions (failures, mistakes, etc.). Evidence is then sought to see whether these contradictions are resolved – for example, by re-trying the problem with a different strategy and succeeding. (p. 334)

Symbolic interaction and semiotics. Symbolic interaction and semiotics, the belief that individuals construct meaning through interaction with their surroundings, are directly connected to Activity Theory and gameplay. This paradigm focuses on individuals as interpreters – individuals act on and give meaning to their experiences (Bogden & Bilken (2007). It is this interaction and interpretation that makes gameplay an appropriate instructional tool for formal learning environments. "People in a given situation (for example, students in a particular class) often develop common definitions… since they regularly interact and share experiences…" (Bogden & Bilken, 2007, p. 27-28). Steinkuehler (2004) argues individuals learn through interpretation of symbols and interaction with the social and material resources around them. "An individual does more than merely acquire and reorganize symbolic knowledge", he is transformed by it while participating in a community (Steinkuehler, 2004, p. 523). Gee (2003) states learning occurs as an individual masters a semiotic domain. Arnseth (2006, p. 8) adds, "to learn is to gradually master various forms of tools and signs through the activity of using them for

various purposes" and defines semiotic domain as a way "of acting, talking and using signs and tools within a particular social practice.

Gee (2003) addresses the problems inherent in traditional classroom instruction in relation to semiotics. He believes the difficulties students experience in grasping semiotic signs in schools is because they lack "concrete realizations in practical meaningful activities" because the activities and resources used in schools are dissimilar to students' previous experiences (Arnseth, 2006, p. 9). The semiotic signs involved in gameplay provide students with the practical, meaningful activities that Gee indicates are necessary for the development of critical thinking skills. Gameplay requires players to build upon previous experiences in order to find solutions to new problems.

Gameplay as a socio-cultural activity. In order to understand how computer games are used and are internalized by game players, it is important to analyze the learning process as a component of social interaction (Arnseth, 2006). Steinkuehler (2004) states "through participation in a community of practice, an individual comes to understand the world from the perspective of that community" (p.523). Game players form gaming communities among other game players in order to provide suggestions and help for gameplay strategies. This support exists through online communication and personal interaction with one another (Steinkuehler, 2004). Squire (2003) explains it is the collaborative activities and discourse surrounding gameplay that is important to the learning process, not the game itself (Arnseth, 2006).

Gee (2003) contends learning is a social activity; it occurs as part of "a network of people, tools, technologies and companies all interconnected together" (Arnseth, 2006, p. 8).

Arnseth (2006) provides further elaboration on the social aspect of gameplay, “the pleasures and rewards of gaming are very much mediated by social relationships in and around games…within specific gaming communities and cultures” (p. 1). According to Gee (2003), game-based research needs to focus on the socio-cultural aspect of gaming, particularly “how people in and through their participation in gaming activities construct social identities, relationships, competencies and languages” (Arnseth, 2006, p. 8).

Chapter 3: Methodology

This chapter reviews the mixed-methods approaches used in this action research study. Specifically, the chapter includes a review of action research as a theoretical research construct, a discussion of the role of the teacher as a researcher, an examination of the debate over practical knowledge verse formal knowledge, a justification for teacher research, and an explanation of the mixed method research design used in this research.

Action Research

The origins of action research can be traced to social psychologist Kurt Lewin during the 1940s. Lewin believed knowledge should be developed from the study of problems in real life situations (Hammersley, 2004; Herr & Anderson, 2005). In a review of Lewin's work, Hammersley (2004) claim that Lewin envisioned action research as "a spiral process in which a hypothetical solution to a problem is formulated and tried out, its level of success monitored, the proposed solution reformulated in light of this, the new strategy implemented and assessed, and so on…" (p. 165). Lewin viewed action research as a type of applied science that served the "pursuit of practical improvement…combined with the search for theoretical understanding" (Hammersley, 2004, p. 166). In another review of Lewin's work, Herr and Anderson (2005) assert that Lewin called "for theory grounded in local problem solving" (p. 12).

Action research became popular in the United States for educational research applications in the 1950s in order to help teachers solve practical classroom problems using the scientific method, but fell out of favor by the end of that decade (Hammersley, 2004). It

reappeared in Great Britain during the 1960s and 1970s with teachers and university professors who sought to improve the practice of teaching through research conducted by teacher-practitioners. Herr and Anderson (2005) describe these early British forms of action research as “as a teacher-led curriculum reform movement that grew out of concern by teachers over the forced implementation of behavioral objectives in curriculum and Britain’s tracked education system” (p. 20). Wong (1995a) further describes the early efforts of action researchers as attempts to apply generalities of theory to specific sites and practices, because more abstract scientific research findings needing fine-tuning by the teachers and administrators who applied them. The resulting forms of action research, according to Hammersley (2004), were a response to “the failure of large scale curriculum projects” to change classroom practice (p. 166). Hammersley supports this perspective by referring to Stenhouse (1995) who contends that "effective curricular improvement" can only occur through the efforts of teachers who develop and test it in their classrooms. Wong (1995a) goes on to even suggest that action research, specifically practitioner-based action research, is critical to the development of instructional theory (Wong, 199a).

Reflecting on four decades of action research, Cochran-Smith and Lytle (1998) contend that scholars, educators and policy makers are taking teacher research seriously as evidenced through intellectual discourse, publications and funding for teacher research from foundations, national, regional and local organizations. According to Megowan-Romanowicz (2010), action research has grown in popularity and has a home in education as evidenced by the writings of Barksdale-Ladd (2000), Kang (2007), Rust (2009), Smith (1991), and Stringer (2008). Herr and Anderson (2005) state that action research “has gained its greatest

acceptance in applied fields such as organizational development, *education* [emphasis added], social work, criminology, nursing, public health, international development and agriculture" (p. 25). Megowan-Romanowicz (2010) expands on the effectiveness of action research in education suggesting that:

> Action Research straddles the divide between theory and experiment. It requires classroom practitioners – experimentalists – to adopt the 'theorist's' approach, conducting research on their students' learning as it emerges or examining their own teaching practice as it unfolds in classroom activity…Teachers become legitimate peripheral participants in the research community of practice as they plan, conduct, and participate in a classroom teaching experiment. (p. 995)

Cochran-Smith and Lytle state that teacher action research has been conceptualized "as a new way of thinking about knowledge for teaching…and a part of the larger agenda for school and social change" (1998, p. 22). However, the field does not enjoy universal acceptance. In spite of the growing acceptance of teacher action research, Manfra (2010), in her review of recent trends in action research, claims that "there seems to be little interest in exploring the outcomes of teacher research for practicing teachers…There are only a few examples of 'self-study' conducted by social studies educators in K-12 classrooms" (p. 299).

Teacher as researcher. Before exploring the concept of teacher as researcher, the term researcher needs to be defined. Laster (1997) defines researcher as "'one who asks questions and systematically purses answers'" (p. 1). Wilson (1995) extends this simple definition suggesting that action researchers produce knowledge and ask, what do researchers do? Wilson (1995) explains that researchers sit and watch; ask questions and listen; examine

artifacts and documents; participate in an event or just observe; develop hypotheses, examine evidence; and view multiple interpretations. Wilson (1995) adds "the researcher also has a deep sense of self and the ways in which the self colors both what is seen and written…For some researchers, the self is part and parcel of research…subjectivity is inevitable but it can be harnessed, or at least understood" (1995, p.19). Smith (2010) expands on Wilson's description of action research, emphasizing that the concept of teacher as researcher has been around for decades.

> Although action research is currently receiving a lot of attention among educators, it is far from a new or short-lived approach to professional practice. In fact, the concept of teacher-as-researcher was discussed in the 1920s. Further, the use of action research within the classroom has been in evidence since the early 1950s (p.6).

Considering the status of action research relevant to other educational research methods, Laster (1997) poses the following questions: "Why are classroom teachers who conduct research not considered educational researchers? Is the difference between teacher and institutional or formal research based solely upon methodology?" (p. 4). Laster (1997) has expressed confidence that in fact teacher action researchers should be considered as educational researchers. As she put it, there are many methodologies that can be used in classroom research" (1997, p. 4). In fact, the action research movement has "made efforts to eliminate the distinction between the researcher and the teacher…teachers assume primary responsibility to identifying the research issues, collecting data, and analyzing and interpreting data" (Wong, 1995a, p. 25). Smith (2010) goes so far as to say that all teachers who engage in formal inquiry about their practice are researchers. "Anyone who tries to get

better evidence of the success or failure of his/her teaching…and what he/she does in the light of this evidence is conducting a type of action research" (p. 5).

According to Smith (2010), teachers have always conducted research while teaching in order to modify strategies, improve learning and evaluate their effectiveness. Furthermore, Smith (2010) explains that although these are essential components of good teaching and being a good teacher, the difference between a teacher and a teacher researcher is the "systemic reflection of one's activities…the teacher-as-researcher systematically investigates his/her teaching and learning so as to improve their own and their students' learning" (p. 6). Smith went on to support her concept of teacher research as "'any systemic inquiry conducted by teacher researchers…to gather information about how their particular schools operate, how they teach, and how well their students learn'" (2010, p.6).

Many models have been put forward to describing the process of teacher action research. Smith (2010) describes teacher research as a five step process. Anderson, Herr, and Nihlen (2007) describe the teacher research process as spiraling and ongoing rather than linear, and identify four steps. Henning, Stone, and Kelly (2009) and Manfra (2010) identify teacher research as a four step process. Table 1 presents these four models in a comparative format.

Table 1

Action Research Process

Steps	Smith (2010)	Anderson et al. (2007)	Henning et al. (2009)	Manfra (2009)
Step 1	Planning	Planning	Plan	Pose a Question
Step 2	Collecting Data	Acting	Collect Data	Collect and Analyze Data
Step 3	Analyzing the Data	Observing	Analyze	Form a Hypothesis
Step 4	Data Reflection	Reflecting	Reflect	Make Plans for Change
Step 5	Action			

Although the terminology used by the authors differs, the overall methodology is essentially the same. The first phase is to identify a problem, develop a plan and decide what data to collect. The second phase focuses on the collection of data through a variety of means from student observations and interviews to surveys, tests and other artifacts. The third phase involves analysis of the data. The fourth phase consists of reflecting upon observations and interpretations as well as determining what to revise or revisit. It is generally at this point in the process where spiraling occurs (Anderson et al., 2007; Brown, 2002). The final phase of the process is to take action. This involves the development of a plan and its implementation to address the original problem. Smith (2010) wants teacher-researchers to take an additional step - publish their findings.

The methods of action research call on the researcher to maintain a close connection with the context of the research. In explaining this relationship, Wilson (1995) says that

teaching requires a close examination of what is transpiring in the classroom, which is a basic component of being a researcher as well as a teacher. Laster (1997) agrees with Wilson that the roles of teacher and researcher should be complimentary. Wilson (1995) also thinks that the discussions surrounding teachers as researchers have centered on knowledge and its production, specifically who can and should produce knowledge, as well as, "what kinds of knowledge are most useful in teaching?"(p. 19). Cochran-Smith and Lytle (1998) expand on this notion of knowledge legitimacy.

> Teacher research can help to question and reinvent the whole idea of a knowledge base, disrupting the existing relationships of power among knowers and known…The point is not to determine whether teacher research 'counts' but what it counts for, not whether it is 'interesting', but whose interests it serves. (p. 33)

When considering the overall purpose of teacher action research, Cochran-Smith and Lytle (1998) contend its purpose is to examine and change schooling. Manfra (2009) goes further emphasizing the potential for teacher research to revolutionize classroom instruction through critical inquiry. Manfra (2009) categorizes action research into two research areas – practical teacher research and critical teacher research. Practical teacher research focuses on "day- to-day" concerns of teachers and is intended to assist teachers in improving "their 'professional knowledge landscapes'" (Manfra, 2009, p. 300). Critical teacher research focuses on issues that "go beyond practical concerns to examine social justice issues and the socio-historical contexts of schools" (Manfra, 2009, p. 300). Hammersley (2004) also explains the role of action research in education: "the goal of critical action research is to restructure profession practice and thereby to transform the education system…, not simply

to produce knowledge that is relevant to educational issues" (p. 175). Whether the research orientation is practical or critical inquiry, it is the insider perspective of teacher research that offers promise for educational improvement. The unique lenses through which a teacher observes and senses classroom interaction over time can bring to light new aspects of learning, teaching and schooling (Cochran-Smith & Lytle, 1998).

Practical knowledge v. formal knowledge. The debate surrounding practical knowledge and formal knowledge is centered on epistemology. In their consideration of action research, Cochran-Smith and Lytle (1998) define the distinctions between practical and formal knowledge:.

> [Practical knowledge] is developed from participating in and reflecting on action and experience. It is bounded by the situation or context in which it arises…[it] is generally related to how to do things, the right place and time to do them, or how to see and interpret events related to one's actions…[formal] knowledge is gained from studies that use conventional scientific methods, quantitative and qualitative; these methods and their accompanying designs are intended to yield a commonly accepted degree of significance, validity, generalizability, and intersubjectivity. (p. 23)

Laster (1997) situates these distinctions in the traditional research paradigm by arguing that traditional researchers view "research as carefully planned, not evolving. It strives for objectivity" in its effort to produce knowledge (p. 5). Furthermore, Richardson (1994) believes that because practical knowledge developed from 'practical inquiry' focuses solely on improving practice it relegates it to secondary status in relation to formal

knowledge/formal research (Herr & Anderson, 2005). Cochran-Smith and Lytle (1998) also argue that critics of teacher research, such as Fenstermacher, rely on:

> dominant epistemological and methodological paradigms [which] use established terms, conventions, standards and definitions to evaluate, and essentially dismiss alternate ones…[they] fail to entertain the possibility that the relationship of teacher research and professional knowledge and practice may truly be new territory. (p. 27)

When considering other distinctions, Cochran-Smith and Lytle (1998) have compared teacher researchers to feminists and other postmodern/poststructuralists theorists who challenge the epistemology and methodology of traditionalists. "Teacher researchers (like feminists) actually use familiar research methods in new ways as they struggle to construct research that is designed to be *for* teachers and learners and not simply *about* them" Cochran-Smith & Lytle, 1998, p. 29). According to Herr and Anderson (2005) what is at the center of the debate is the source of knowledge – whether it is practice driven or theory driven, "Clearly the formal/practical debate is about more than research epistemology and methodology; it is about the very nature of professional practice itself and what types of knowledge can best inform it (p. 53).

Proponents of action research/teacher research (Cochran-Smith & Lytle, 1998; Greene, 1992; Herr & Anderson, 2005; Laster, 1997; Wilson, 1995) reject the dualism of formal knowledge and practical knowledge. Cochran-Smith and Lytle (1998) explain that teacher research does not fall into the dualism of practical knowledge/formal knowledge because:

> Teacher research is about how students and their teachers construct the curriculum, co-mingling their experiences, their culture and linguistic resources, and their interpretive frameworks. It is about how teachers' actions are infused with complex and multi-layered understandings of learners, culture, class, gender, literacy, social issues, institution, communities, materials, texts and curricula…There is no way in which research that takes on these projects can be regarded *simply as research that generates knowledge about how or when to do things* [emphasis added]. (p. 24)

Cochran-Smith and Lytle (1998) further view the dualism of formal/practical knowledge as a hindrance to teaching and teacher research (Herr & Anderson, 2005). Herr and Anderson also emphasize this point:

> …outsider knowledge is often experienced by practitioners as a 'rhetoric of conclusions,' which enters the practitioners' professional landscape through informational conduits that funnel propositional and theoretical knowledge to them with little understanding that their landscape is personal, contextual, subjective, temporal, historical, and relational among people. (2005, p. 53)

Teacher research as interpretive inquiry. Greene (1992), Hammersley (2004), Laster (1997) and Wilson (1995) among others reject the notion that research must be driven by objectivity and conducted by outsiders to the classroom setting. Hammersley (2004) states that "inquiry is a form of human activity" hence it is inherently subjective (p. 169). Greene (1992) concurs, arguing that subjectivity cannot be removed from inquiry; "there are always multiple and different constructions possible in social activity, none inherently more legitimate than others. Hence all knowledge is…mind dependent and culturally contextual,

personalized and intertwined with the *self* of the inquirer" (p. 39). Wilson (1995) does not view subjectivity as a problem, but rather as a benefit to research and refers to Erickson (1984) and Peshkin (1988) to provide support for her view, stating "some researchers try to exploit their subjectivity to provide additional insights" (1995, p. 19). Laster (1997) adds to the anti-objectivist argument by referring to Lincoln's (1996) view that researchers must be passionate about their research, that "a deep sense of caring, trust, and mutuality rather than a stance of 'objectivity' is what is important about research" (p. 6). Laster contends the research process utilized by teacher researchers should be an ongoing and evolving process, something Lincoln (1996) calls "'interpretive research'" (1997, p. 6).

Greene (1992) supports interpretivist inquiry advocated by Lincoln (1996) and Smith (1989), stating that "for the practitioner, adopting the interpretivist logic of justification for inquiry means foregoing aspirations *to get it right* and embracing instead ideals of *making it meaningful*" (p. 39). Greene (1992) agrees with Smith's (1989) description of interpretivism as a form of inquiry in which the central premise, whether the framework is constructivist, qualitative, naturalistic or ethnographic, which is based upon the conviction that "in the world of human experience, there is only interpretation" (p. 39). Greene explains that the key to this epistemology is the idea that knowledge is actively constructed, pluralistic and relative. "Epistemologically and practically, interpretivist knowledge is, in its very essence, an understanding of the meaning we create from the dynamic transaction between ourselves and our worlds" (Greene, 1992, p. 40). Greene reminds us that an increasing number of well-respected researchers, including Guba (1992), Eisner (1992), and Barone (1992) all advocate for an interpretivist inquiry approach to teacher research which moves away from the

traditional focus on methods (1992). Guba (1992) qualifies support for interpretivist inquiry by arguing against any mandate for the use of qualitative methods in interpretivist inquiry; instead the only requirement should be the methods used fit the paradigm driving the inquiry (Greene, 1992). Eisner (1992) encourages the use of a variety of methods for interpretivist inquiry because different methods provide multiple perspectives. Barone (1992) believes that researchers who adhere to the methodology of the objectivists restrict and divert their inquiry from what is truly important, the inquiry itself.

Justification for teacher research. Justifications for teacher action research typically draw on the practicality and directness of interpretivist inquiry. Hammersley (2004) refers to Sanford's (1970) indictment of traditional social science research to advocate for action research paradigms.

> Like other industries, social science had been polluting its environment. Not only has it been spoiling its research subjects by treating them as means rather than ends; not only has it been disseminating a rather monstrous image of researchable man; it has been creating an enormous amount of useless information. (Hammersley, 2004, p. 177)

In contrast, action research is solution-oriented and connected directly to the sources of an educational problem through the practitioner researcher who is both embedded in the problem context and seeking a solution through research. Hammersley does explain this position has its critics. Action research "is often very closely associated with the instrumentalist view that to be of value research must serve practical and/or political goals directly" (Hammersley, 2004, p. 165). However, advocates for action research argue that "the

epistemology, goals and methods of traditional scientific research are in principle unsuited to understand…practical activities such as teaching" (Wong, 1995a, p. 24). Wong (1995a) provides further elaboration for this perspective.

> Specifically, the practice of teaching cannot be usefully described by the abstract principles derived from the social sciences because the activity of teaching is imbued with human intention and inextricably embedded in the specifics of each situation…that teaching cannot be understood fully from the perspective of an outsider. (pp. 24-25)

Megowan-Romanowicz (2010) provides additional justification for teacher action research by stating carefully controlled experimental educational studies cannot be carried out in a classroom because a classroom is not a laboratory, rather it is a complex social system. Cochran-Smith and Lytle (1998) explain that teachers,

> are uniquely situated to know about teaching…teacher researchers are both users and generators of knowledge…the knowledge they generate is not only local – deeply embedded in an immediate context – but at the same time often public – relevant and useful to the wider educational community. (p. 22-23)

Further illustrating the growing support for teacher action research Megowan-Romanowicz (2010), describes the growing prevalence of action research courses in teacher education programs. She explains the importance of teacher researcher in understanding student learning and student-teacher interaction.

> In order to optimize the impact of their teaching practice, teachers must successfully turn their gaze from their own work…to their students' work…The teacher watches

> and listens mindfully and reflects upon students' acts, utterances, and reasoning, and is then able to make better sense of that student-teacher interaction called learning, and adjust teaching practices going forward based on new understandings. (Megowan-Romanowicz , 2010, p. 996)

Teacher researchers are uniquely positioned to bring about change in educational practice, including the development of alternative assessments, teaching practices, and empowerment of the teaching profession. Cochran-Smith and Lytle (1998) remind us that "the concept of teacher research carries with it an enlarged view of the teacher's role – as decision maker, consultant, curriculum developer, analyst, activist, school leader – as well as enhanced understandings of the contexts of educational change" (p. 20). Smith (2010) effectively sums up the significance of and need for action research in education,

> [The] systemic reflection of one's professional practices, in order to increase teaching effectiveness, is the core of action research in an educational setting. Action research is an ideal approach for facilitating educational changes within a classroom, a school, across districts, if not nationally. (Smith, pp. 5-6)

The potential of teacher research to reform educational practices and policy at all levels is not in question. Instead more teacher research is needed (Cochran-Smith & Lytle, 1998; Hammersly, 2004; Manfra, 2009; Megowan-Romanowicz, 2010; Smith, 2010). This study helps fill that void.

Research Design

This research is grounded in action research (Anderson, Herr & Nihlen, 2007; Cochran-Smith & Lytle, 1993; Herr & Anderson, 2005; Kincheloe, 2003) and follows an intrinsic case study (Stake, 1995) approach to conducting research. Stake (1995) defines a case as something of interest; something we want to know more about. A research case may focus on a student, a classroom, or an innovate program (Stake, 2005). An intrinsic case study is a case "we are interested in…because we need to learn about that particular case. We have an intrinsic interest in the case" (Stake, 2005, p. 3).

The specific design of this research is based on a concurrent embedded experimental mixed method design (Creswell, 2009; Creswell & Plano, 2007; Greene & Caracelli, 1997). Mixed methods designs use both qualitative and quantitative methods and procedures (Creswell, 2007). Creswell (2009) defines concurrent mixed methods as "procedures…in which the researcher converges or merges quantitative and qualitative data in order to provide a comprehensive analysis of the research" question (p. 14). Creswell and Plano (2007) state the data collection process in a concurrent design occurs "at roughly the same time" or "during the same timeframe" (pp. 116-117). An embedded design, as explained by Creswell and Plano (2007) is a design in which one form of data (quantitative) is given more weight than the other form of data (qualitative):

> In the Embedded Designs, it is assumed that the embedded data will play a secondary role and be supplemental to the primary dataset. Also, the embedded data typically answer a different question…than the primary data. (p. 119)

Creswell and Plano (2007) explain that the sample sizes for the two types of data will not be equal. The quantitative data sample size will be larger than the qualitative data sample size.

The advantage of a mixed method research design is that it provides the hard data/statistical analysis, through quantitative methods, which is demanded by administrators, school boards and government officials in order to determine if an educational program, initiative or project is effective. On the other hand, qualitative methods provide indications or evidence of understanding or change that is not measurable by test scores and/or statistical analysis.

Research Questions

This mixed methods research is framed by six research questions. The first two research questions focus on the relationship between computer games and academic performance. The remaining questions focus on student understanding and comprehension of historical content, perceptions of computer gameplay and the social interaction surrounding gameplay.

1. What is the relationship between computer gaming as an instructional tool and student test scores among eleventh grade United States history students?
2. Is there a significant difference in the academic performance between students who engage in gameplay and students who do not?
3. What is the level of understanding of historical content among students who engage in gameplay and students who do not?

4. What are the student perceptions of computer gaming on their learning?
5. How does peer interaction during gameplay impact student learning?
6. How does student-teacher interaction surrounding gameplay impact student learning?

Data Sources

Quantitative data consisted of test scores from a pretest/posttest of participants' knowledge about four eras in American history: exploration, colonization, the colonial period and the American Revolution (see Appendix B). An additional source of quantitative data was derived from scores on projects students completed at the conclusion of the research (see Appendices C, D and E). A rubric was used to score the student projects (see Appendix F). Qualitative data consisted of observation, field notes, video recordings of students' game play, audio recordings of class discussions, gameplay session student log sheets (see Appendix G), teacher-researcher reflections, individual interviews, and a focus group interview that consisted of semi-structured and open-ended questions (Johnson & Turner, 2003; Yin, 2009) (see Appendices H and I). The qualitative data was used to supplement and provide further understanding of the quantitative data.

Data Collection and Instruments

The data collection process for this research utilized a concurrent quantitative and qualitative method (Creswell, 2009; Creswell & Plano Clark, 2007; Morse, 2003). Qualitative data was collected throughout the study as well as at the conclusion of the study (see Appendix A). Students took the pretest during the first week of the fall semester. The

pretest was used to establish a base line for the posttest. The posttest was administered at the end of the data collection period and as review for the semester exam. The data collected was used to determine the relationship between computer gaming as an instructional tool and student test scores. The scores on the pretest and posttest were not included in the students' grades for the course.

Quantitative Procedures

The pretest and posttest administered to both groups were identical (test-retest). All of the students enrolled in the target United States history classes during the fall semester 2012 at the school where this research place took the tests. The test consisted of forty-four multiple choice questions, and was an abridged version of the New York State United States History and Government Regents Examinations (Regents Exam) and the National Assessment of Educational Progress (NEAP) assessment for United States History (released versions of the exams are available online). Items selected for inclusion on the test focused on exploration, colonization, the colonial period and The American Revolution.

A third source of quantitative data was derived from the students' term project scores (see Appendices C, D and E). The same rubric was used to score the presentations for students from in both classes (see Appendix F).

Preliminary Data Analysis

Initial analysis of the quantitative data was conducted to verify assumptions of a normal distribution for the pretest, posttest and presentation scores. An examination of histograms and boxplots for the pretest and posttest indicated that the distributions for the

pretest and posttest were slightly skewed (See Figure 2). No outliers were present for the pretest or the posttest. The pretest was slightly skewed to the right indicating a positive skew. The posttest test was slightly skewed to the left indicating a negative skew. Both skewness and kurtosis were within the value of ±1.0. This suggested that both pre-test and posttest distributions were normal. Normality of the distributions was further analyzed using the Shapiro-Wilk test and Kolomogorov-Smirnov tests for normality (See Table 2). The tests produced a value of $p>0.05$ for the pretest and a value of $p\leq0.05$ for the posttest. The Shapiro-Wilk and Kolomogorov-Smirnov tests for normality confirm that the distribution for the pretest was positively skewed and the distribution for the posttest was normal.

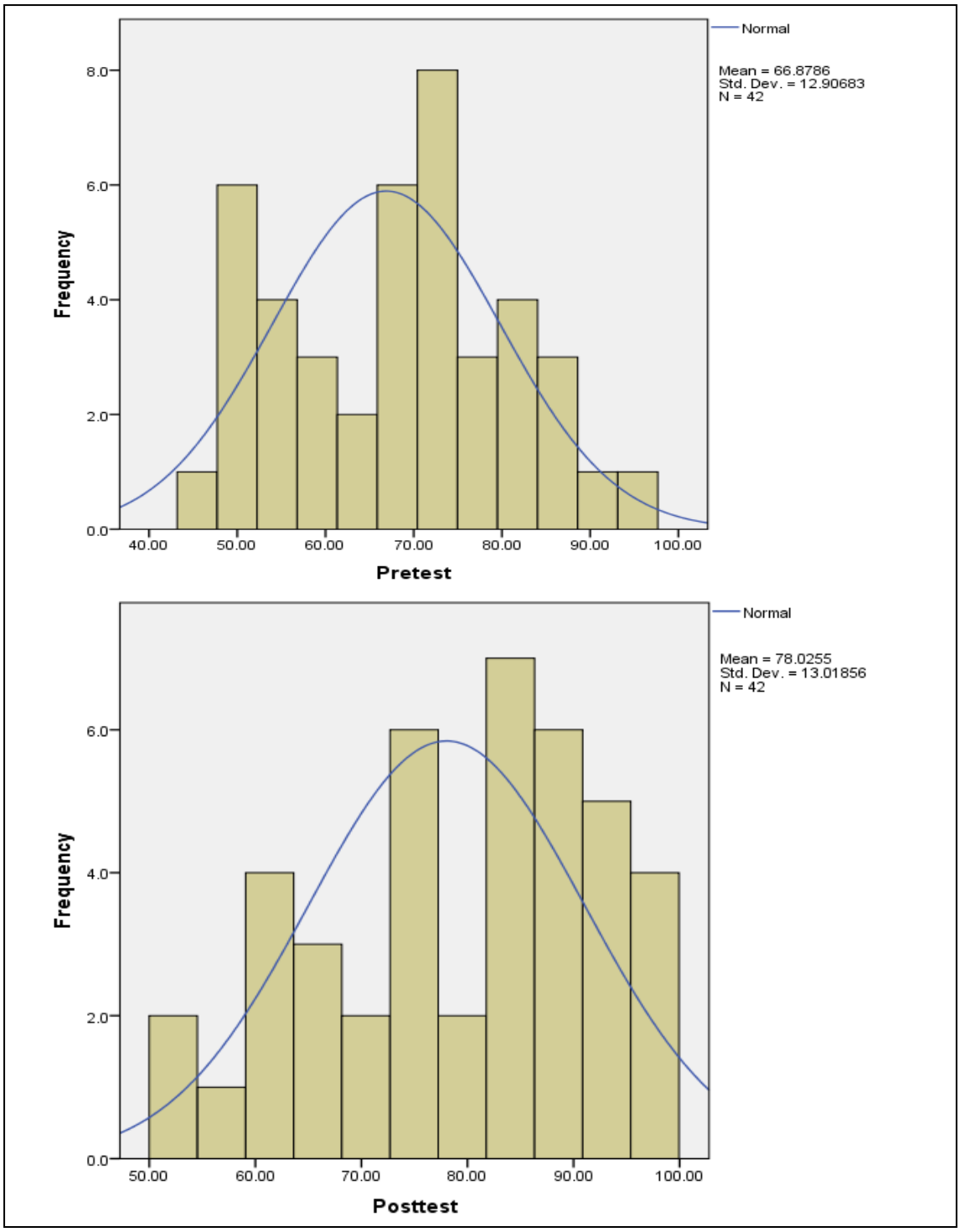

Figure 2. Histograms for Pretest and Posttest

Table 2

Preliminary Analysis for Pretest, Posttest, and Presentation (N=42)

Evaluation	M	SD	Min	Max	Skew	Kurtosis	S-W	K-S
Pretest	66.88	12.91	45.45	93.18	0.05	-0.92	0.16	0.15
Posttest	78.03	13.02	52.27	97.72	-0.37	-0.96	0.05	0.04
Presentation	88.64	8.13	67.00	100.00	-0.81	0.30	0.03	0.05

Note: Figures for Shapiro-Wilk (S-W) and Kolmogorov-Smirnov (K-S) are p-values utilizing an alpha of <0.05 for normality.

The initial examination of the histogram for presentation scores indicated three outliers were present (Figure 3). The presentation results were skewed to the left indicating a negative skew. Both skewness and kurtosis are within the value of ±1.0. This suggested the distributions were normal. Normality of the distribution was further analyzed using the Shapiro-Wilk test and the Kolomogorov-Smirnov test for normality (See Table 2). The tests produced a $p \leq 0.05$ for the presentation. The Shapiro-Wilk and Kolomogorov-Smirnov tests for normality confirm the distribution for the presentation scores was negatively skewed.

Additional analysis was conducted after the data was converted to z scores in order to determine if the perceived outliers were true outliers. The z scores for the presentation were within the ±3 minimum and maximum scores. The perceived outliers were not true outliers. The parameters for pretest, posttest and presentation were within ±3 for minimum and

maximum scores (Table 3). All scores were within three standard deviations of the mean for each distribution. The distributions for pretest, posttest and presentation were assumed to be normal.

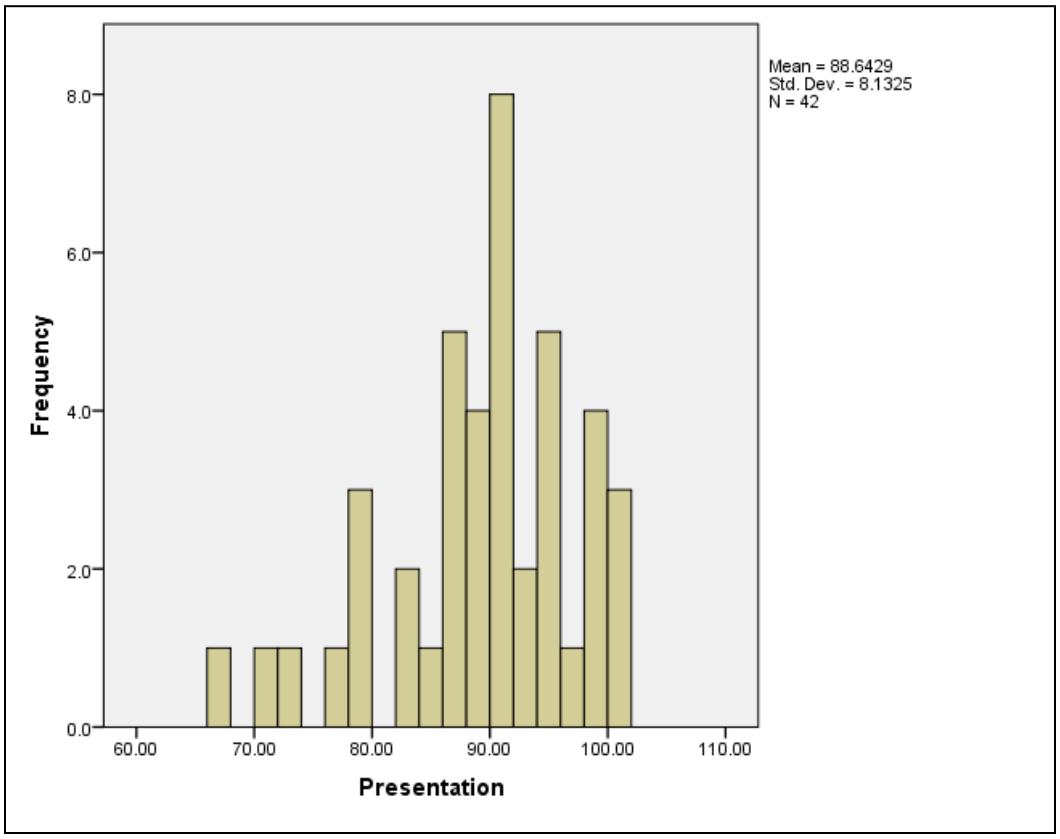

Figure 3. Histogram for Presentation

Table 3

Z scores for Pretest, Posttest, and Presentation

Evaluation	N	M	SD	Min	Max
Pretest	42	0.00	1.00	-1.66	2.04
Posttest	42	0.00	1.00	-1.98	1.51
Presentation	42	0.00	1.00	-2.66	1.40

Note: Mean for Pretest = 6.39699E -16; Mean for Posttest = -1.56753E -15; and Mean for Presentation = 5.551115E -16.

Validity and reliability. Validity and reliability for test items on the NAEP's test for United States history has been verified by the National Center for Education Statistics (NCES). The NAEP's National Center for Education Statistics (NCES):

> has established various panels of technical experts to study NAEP, and panels are formed periodically by NCES or external organizations, such as the National Academy of Sciences, to conduct evaluations. The Buros Center for Testing, in collaboration with the University of Massachusetts/Center for Educational Assessment and the University of Georgia, recently conducted an external evaluation of NAEP. (NAEP, 2012).

The NCES has established standards and guidelines for verifying the validity and reliability of NAEP tests (see Appendix N). The national standard error of measurement for

the 2010 and 2006 Eighth Grade U.S History Tests is 0.8 (NCES). The national standard error of measurement for the 2010 and 2006 Twelfth Grade U.S History Tests are 0.8 and 0.7 (NCES). I examined each question for content validity before including the items on the pretest/posttest to ensure the questions aligned with the concepts and themes associated with *Civilization IV: Colonization* and the state standards for United States history.

I used a test-retest process for the administration of pretest/posttest. The test consisted of forty-four multiple questions. The time interval between the tests was eighty days. The pretest was administered during the first week of the semester. The posttest was administered the week prior to final exams. A Pearson Product Moment correlation (Pearson r) was used to determine the correlation coefficient for test-retest reliability. The acceptable reliability coefficient for group and individually administered tests, such as achievement tests, is .80 or greater. A reliability coefficient of at least .70 is expected for teacher created tests. The reliability coefficient for the pretest/posttest used in this study is .86 (r_{xy}=0.859).

Reliability for the presentation rubric scores was determined by calculating the inter-rater agreement between the researchers scores and the ratings from external evaluators. The external evaluators were the school principal (a former secondary social studies teacher) and a pre-service teacher enrolled in a local teacher education program. She was in the first semester of her clinical experience and was observing my classes one day a week.

Analysis of inter-rater agreement was limited to eleven of the forty-two presentations because of the limited availability of the additional evaluators. The inter-rater agreement for the total rubric score was 90.9% modified to within two points (maximum score of 24). The

inter-rater agreement for each category on the presentation rubric was modified to within one point (Table 4).

Table 4

Inter-rater Agreement: Presentation Rubric

Category	exact score	within 1 point
# Slides	90.9%	90.9%
Content	45.45%	90.9%
Comprehension	100%	100%
Grammar/Spelling	63.63%	90.9%
Volume	90.9%	100%
Creativity	72.72%	90.9%

Note: The lower percentages for Content, Grammar/Spelling, and Creativity can be attributed to the pre-service teacher who rated these categories higher than either myself or my principal

Data analysis. A one-way analysis of variance (ANOVA) was calculated to determine if there was a significant difference in the pretest and posttest scores of the experimental and control groups. A second ANOVA was calculated to determine if there was a difference in term project presentation scores between the experimental and control groups. An alpha level of 0.05 was used to determine the level of significance for both ANOVA tests.

Qualitative Procedures

Data collection and instruments. Data for the qualitative questions was collected throughout the study utilizing a variety of methods. Students recorded gameplay activities on the student gameplay log sheets at the conclusion of each gameplay session (see Appendix G). Additional gameplay data was obtained through digital video recordings of gameplay interaction, observation field notes, teacher-researcher reflections, audio recordings of class discussions following gameplay sessions, individual interviews, and a focus group interview.

Purposeful random sampling was used to select students for individual interviews. Three students were selected from the class that did not play the game and three were selected from the class that did play the game. Student selection for the focus group was dependent upon student availability during my planning period. Five students comprised the focus group. The individual and focus group interviews were guided by semi-structured and open-ended questions (Johnson, & Turner, 2003; Yin, 2009) (see Appendices H and I). All interviews were digitally recorded and transcribed for analysis.

Data analysis. The initial data analysis focused on the six individual student interviews. Five of the six students were randomly selected – two from the experimental group and three from the control group. The sixth student selected was from the experimental group. This student was included in the interview process because he was identified as OHI (Other Health Impaired). Inductive analysis, constant comparison and keywords in context methods drove the coding process (Glaser and Strauss, 1967; Glesne, 1999; Merriam, 1998). Five categories defining levels of understanding were created as a result of the coding process (see Appendix O).

Level I: No Response or Little to No Understanding

Level II: Limited Understanding – student response is finite or narrow.

Level III: Partial Understanding – student response is incomplete; fragmentary response; missing key components.

Level IV: Satisfactory Understanding – student response is adequate; acceptable response; missing a key component or did not elaborate.

Level IV: Complete Understanding – student response is comprehensive; broad, full response; elaborates, provides explanations and/or examples.

The second phase of the coding process focused on exclusively on the students in the class that played the game. This deep-dive analysis examined observation notes, digital recordings of gameplay sessions, researcher reflections, audio recordings of class debriefs/discussions, student gameplay log sheets and the focus group interview. The items were coded for concepts, themes, evidence of learning, complexity of understanding, and social interaction. A concept evidence chart was developed to assist in the coding of student gameplay log sheets (see Appendix P). Categories were created and themes expanded upon as the coding process evolved. Inductive analysis, constant comparison, and keywords in context methods were used again in the coding process (Glaser and Strauss, 1967; Glesne, 1999; Merriam, 1998).

Validity and reliability. Validity and reliability for the qualitative analysis was established through a variety of measures. Triangulation was conducted utilizing the individual and focus group interviews, student gameplay log sheets, observation notes, researcher-teacher reflections, audio records of gameplay discussions/debriefs and digital

video recordings of gameplay sessions. An additional observer was utilized to collect data on student interactions and discussions during gameplay. An additional check on validity involved the use of a critical friend to review the coding process and data codes. (Anderson et al., 2007; Herr & Anderson, 2005). Herr and Anderson define critical friend as someone "who is familiar with the setting and can serve as devil's advocate for alternative explanations of research data" (2005, p. 57). My former principal served as my critical friend. He reviewed all data sources and codes except for the digital video recordings of the gameplay sessions.

Herr and Anderson (2005) have developed and recommend five validity criteria for action research based upon the goals of the research (Table 5).

Table 5

Herr and Anderson's Goals of Action Research and Validity Criteria

Goals of Action Research	Quality/Validity Criteria
1) The generation of new knowledge	Dialogic and process validity
2) The achievement of action oriented outcomes	Outcome validity
3) The education of both researcher and participants	Catalytic validity
4) Results that are relevant to the local setting	Democratic validity
5) A sound and appropriate research methodology	Process validity

(Herr & Anderson, 2005, p. 55)

Dialogic validity refers to the 'goodness' of the research as verified or monitored through peer review (Herr & Anderson, 2005, p. 57). Outcome validity refers to the "'successful' outcome of the research project" (Herr & Anderson, 2005, p. 55). Catalytic validity refers to "the degree to which the research process reorients, focuses, and energizes participants toward knowing" (Herr & Anderson, 2005, p. 56). Democratic validity refers "to the extent in which research is done in collaboration with all parties who have a stake in the problem under investigation" (Herr & Anderson, 2005, p. 56). Process validity refers to "what extent problems are framed and solved in a manner that permits ongoing learning" (Herr & Anderson, 2005, p. 56). All five goals and the corresponding quality/validity criteria established by Herr and Anderson (2005) were met.

Participants

Participants were enrolled in a small pre-college high school located in the southeastern United States. The high school had an enrollment of 194 students, of which 42 were juniors. White students comprised 63% of the student population, Black students 21%, Hispanic students 13%, Multi-national students 2%, and Asian students 1%. Female students comprised 40% of the school's population. The percentage of students who qualified for free and reduced lunch was 71%. Two classes being instructed by the researcher participated in this study. The demographics of these classes were similar to the school demographics (see Table 6).

Table 6

Demographics: Percentages

Group	Males	Females	White	Black	Hispanic	Multi	Asian
High School	40%	60%	63%	21%	13%	2%	1%
Combined classes	40.5%	59.5%	64.3%	19%	16.7%		
Gameplay class	41.7%	58.3%	58.3%	16.7%	25%		
Traditional class	38.9%	61.1%	72.2%	22.2%	5.6%		

Note: The combined classes consisted of all the high school's juniors (42 students)

The participants for the study were enrolled in the researcher's high school United States history classes. The study was conducted during the fall semester 2012 and concluded with individual student and focus group interviews during the first two weeks of the spring semester 2013. Forty-two students (N=42) participated in the study.

Procedures

Students were randomly assigned to experimental (gameplay) or the control (traditional instruction)classes. There was one exception to selection process. A student who was identified as Other Health Impaired (OHI) was purposely included in the experimental group. The experimental group consisted of twenty-four students (n=24). More students were assigned to the experimental class as a precaution against students choosing to withdraw from the experimental class. One student withdrew from the experimental class after the first

gameplay session. Another student was randomly selected from the control group to replace the student who withdrew from the experimental group. The control class consisted of eighteen students (n=18). Participation in the study involved students from both classes reporting to an assigned classroom during the school's study hall/remediation period. The study/hall remediation period was held one day a week, for one hour, during the regular school day. All students in this high school were required to attend the study hall/remediation period regardless of academic performance.

The experimental class engaged in gameplay utilizing *Civilization IV: Colonization* for approximately 45 minutes one day a week over a six week period. The control class conducted individual research on exploration, colonization, the colonial period, or the American Revolution. Students in the control group had the same amount of time to conduct research as the students in the experimental group had to engage in gameplay. Students in the control group met in a separate classroom, supervised by a faculty member, while the experimental group met in a classroom monitored by the researcher (Table 7).

Table 7

Meetings Dates and Times

Group	10/31/12	11/07/12	11/14/12	11/20/12	11/28/12	12/05/12
Experimental	2:00-2:50	2:00-2:50	2:00-2:50	9:00-10:20 1:40-3:00	2:00-2:50	2:00-2:50
Control	2:00-2:50	2:00-2:50	2:00-2:50	9:00-10:20 1:40-3:00	2:00-2:50	2:00-2:50

Note: The study hall/remediation for 11/21/12 was cancelled because of Early Release for the Thanksgiving Holiday. I devoted an entire class period to gameplay and research project time. The first time period for 11/20/12 indicates 1st Period class. The second time period for 12/20/12 indicates 4th Period class. Students in the experimental group reported to one classroom and were supervised by myself. Students in the control group reported to a different classroom and were supervised by a faculty member.

Written approval was obtained from the school administrator with appropriate paperwork submitted to the Institutional Review Board prior to the beginning of the study. Verbal as well as written permission was received from the principal to conduct the study. Informed consent forms were sent home to parents/guardians of my students along with a letter that explained the purpose of the study.

Research Materials

The focus of this research was the computer game Sid Meier's *Civilization IV: Colonization.* The game had an ESRB Content rating of E10+ because of its references to

alcohol, tobacco, mild suggestive themes, and violence. The game was loaded onto twelve laptop computers prior to the start of the study. Other materials used during the study were student gameplay log sheets, pre-post knowledge test, two Flip digital video recorders, and a digital voice recorder.

Game description. *Civilization IV: Colonization* is a turn-based computer simulation strategy game. The setting for the game is the fifteenth through eighteen centuries when European nations were actively exploring and colonizing North America. As the game progresses, players explore unknown territories, establish settlements, develop their settlements, engage with other nations and colonies as well as native peoples, and acquire territory. Players decide what improvements to make to their settlements, the type of colonist to recruit, which specialists or occupations are needed, and whether or not to form alliances. *Civilization IV: Colonization* gameplay entails an increasingly complex set of decisions on the part of players. These decisions move the game forward. For example, as the colony grows, players must decide whether or not to continue to obey their king and or whether to pay the ever increasing taxes (Figure 4).

Figure 4. King Increases Taxes

The game uses conflict as a central construct for developing action in the unfolding of events. At some point in the game, players must decide also whether or not to go to war with their native country or other nations and native peoples (Figure 5). If the decision is war, the consequences might be productive – additional territory and wealth or even independence - or negative - loss of territory, destruction of shipping and settlements or losing the game.

Figure 5. Offer of Friendship with a Warning

Players begin the game by choosing one European nation (England, France, the Netherlands, or Spain) and a corresponding colonial leader. Colonial leaders are based upon historical figures, each one having specific traits and qualities. The English leaders are George Washington and John Adams. The French leaders are Samuel de Champlain and Louis de Frontenac. The colonial leaders for the Netherlands are Peter Stuyvesant and Adriaen van der Donck. The Spanish leaders are Simon Boliver and Jose de San Martin (Figure 6).

Figure 6. Nation and Colonial Leader Selection

Players continue setting up their game by selecting where they want to explore, either the New World or the Caribbean (Figure 7). Once the game map has been selected, players chose game difficulty, speed, and world size. For this research, the settings we used the easy game play mode, with normal speed, and standard world size.

Figure 7. Map Selection

Once the set-up is complete, an information screen appears providing basic information for the player including the year, goals, starting units, instructions from the king and objectives for achieving independence and winning the game (Figure 8).

Figure 8. Information Screen

Game play consists primarily of moving units and making decisions about how to allocate resources, and is carried out on a map-based main game-play screen (Figure 9). This screen includes numerous controls that enable unit movements, exploration, the construction of settlements, trade, negotiations, establishing alliances, improving settlements, expanding territory, and engaging in warfare. Controls along the top of the screen allow the player to engage in diplomacy, monitor progress in an event log, open the main menu, access the game's civilopedia, sail to Europe to buy and sell goods or pick-up colonists, obtain an

overview of various settlements, and check the status of military strength, sentiment for independence, and foreign relations (see Appendices J, K, L, and M).

Figure 9. Game Interface Screen

The bottom left corner of the screen contains a mini-map which shows players where they are in relation to other colonies, settlements and unexplored territory. An icon made up of gold coins allows players to monitor their wealth. The controls to the right of the mini-map enable players to automate trade, build a settlement, move all units or selected units, or

send a ship to Europe. Icons in the lower right portion of the screen indicate which units are currently active. In Figure 9, the ship icon is highlighted indicating the game player may move this unit. The two icons to right represent a soldier and a pioneer. When the game begins, players receive specific units from their king (as determined when players chose their nation and colonial leader).

The game requires players to trade in order to prosper. Players may trade with other settlements in their colony, with other colonies, native peoples, or with their mother country. During the early stages of the game, trade is conduct primarily with the game player's mother country (see Figure 10). Players may sell their goods, purchase items for their colonies or pick-up colonists. The row of icons at the bottom of the screen displays various items available for trade along with the selling and purchase price. All transactions are summarized in the lower right portion of the screen. Figure 10 illustrates a game scenario where one hundred horses were purchased for 300 coins, one hundred furs were sold for 500 coins, and an addition 56 furs were sold for 280 coins. The screen shows that the ship still has cargo space available. Players may add colonists or purchase other items. The lower left corner indicates the amount of money remaining in the game players' treasury.

Figure 10. Europe Screen

When the players have completed their transactions, they send the ship back to the New World. They can than trade the cargo with another colony, native peoples or bring it to one of their colony's settlements. At any time during gameplay, players may make changes to suit the needs of their individual settlements (see Figure 11).

Figure 11. Change Occupation Screen

Student gameplay log sheets. The student gameplay log sheets used in this study were modified versions of the log sheets developed by Squire (2004) for his study of *Civilization III* with ninth grade World History students and Lee and Probert (2010) for their study of *Civilization III* with eleventh grade United States History students. The log sheets were modified to correspond with the content and gameplay of *Civilization IV: Colonization* (see Appendix G). Students were provided copies of the log sheets at the beginning of each gameplay session. They recorded their gaming activities on the sheets while playing the

game and at the end of each session. The log sheets where collected and later analyzed during the coding process.

Chapter 4: Results

This chapter reports the results from this mixed methods study. The opening two sections of this chapter present general findings from analysis of the quantitative and qualitative data. Two additional sections present findings from analysis of student learning during *Civilization IV: Colonization* gameplay sessions and student perceptions of their gameplay experiences. In each of these sections, results are presented in direct response to research questions.

Research Questions

This research is framed by six research questions. The first two research questions focus on the relationship between computer games and academic performance. The remaining four questions focus on student understanding and comprehension of historical content, perceptions of computer gameplay and the social interaction surrounding gameplay.

1. What is the relationship between computer gaming as an instructional tool and student test scores among eleventh grade United States history students?
2. Is there a significant difference in the academic performance between students who engage in gameplay and students who do not?
3. What is the level of understanding of historical content among students who engage in gameplay and students who do not?
4. What are the student perceptions of computer gaming on their learning?
5. How does peer interaction during gameplay impact student learning?

6. How does student-teacher interaction surrounding gameplay impact student learning?

Research questions one and two utilized quantitative data and analysis methods. Research question one examined if there was a relationship between computer gaming as an instructional tool and student test scores among eleventh grade United States history students. Student scores on a pretest/posttest of United States history were analyzed to determine if there was a significant difference in scores between the experimental group and the control group. Research question two examined if there was a significant difference in the academic performance between students who engaged in gameplay and students who did not. Student achievement scores from a rubric used to evaluate student classroom presentations were analyzed to determine if there was a significant difference in scores between the experimental group and the control group.

Research question three utilized qualitative data and analysis methods to examine the level of understanding of historical content among students who engaged in gameplay and students who did not. Student responses to eight questions from a semi-structured interview protocol were analyzed assigned to one of five levels of understanding for each of the eight interview questions (see Appendix O).

Research questions four, five and six focused on the experiences of the students who engaged in gameplay and utilized qualitative data and analysis. Research question four examined student perceptions of computer gaming on their learning. Student comments recorded during the focus group interview and written comments on gameplay log sheets were analyzed to determine if students perceived playing *Civilization IV: Colonization* had an impact upon their learning. Research question five examined peer interaction during

gameplay to determine if student interaction had an impact upon student learning. Student comments from the focus group interview, observations and digital recordings were analyzed to determine if student discussions had an effect upon student learning. Research question six examined student-teacher interaction during gameplay sessions and gameplay debriefs to determine if the interaction had an effect upon student learning and understanding. Digital audio recordings and observation notes were analyzed to determine if the discussions between students and teacher had an effect upon student learning and understanding.

A discussion of the quantitative results is presented first, followed by the qualitative results. Pseudonyms were used for students throughout the discussion and in all tables. Qualitative results are followed by findings from the gameplay session by session analysis. The chapter concludes with a summary of the findings.

Quantitative Results

This section presents an analysis of quantitative data from the pretest, posttest, and evaluations of student classroom presentations at the end of the semester between the experimental and control groups. This analysis followed the two quantitative research questions.

Differences in student learning on pre-test and posttest. The first research question asked, What was the relationship between computer gaming as an instructional tool and student test scores among eleventh grade United States history students? Analysis of data generated in response to this quantitatively focused research question utilized an analysis of variance (ANOVA) statistical procedure to investigate if students who played *Civilization*

IV: Colonization scored higher on a test of knowledge of United States history than did students who participated in a traditional class. The following hypotheses were tested:

$H_{o:}$ There is no difference in test scores between students in the experimental group and the control group (H_o: $\mu_1 = \mu_2$).

H_a: There is a difference in test scores between students in the experimental group and the control group (H_a: $\mu_1 \neq \mu_2$).

The results of the ANOVA for the dependent variable (pretest) and independent variable (group) indicated there was no significant difference at a significance level of $p < 0.05$ in the means between the experimental group (M = 69.70) and the control group (M = 63.13), $F(1, 40) = 2.78$, $p = 0.1034$, eta-squared 0.06. No residuals were indicated for the pretest. The minimum and maximum studentized residuals were within ±3 range (min = -1.59, max = 2.45) (Table 8).

The results of the ANOVA for the dependent variable (posttest) and independent variable (group) indicated there was a difference at a significance level of $p < 0.05$ in the means between the experimental group (M = 82.00) and the control group (M = 72.72), $F(1, 40) = 5.84$, $p = 0.0203$, eta-squared 0.13. The Tukey HSD revealed there was a significant difference between the groups, HSD = 7.76, $\alpha = 0.05$. No residuals were indicated for the posttest. The minimum and maximum studentized residuals were within ±3 range (min = -2.47, max = 1.90). The null hypothesis (H_o: $\mu_1 = \mu_2$) of no difference in test scores between students in the experimental group and the control group was rejected. The Pearson Product Moment Correlation (r) for the two variables (gameplay and posttest) was $r = 0.36$, $p < .05$. The variance (r^2) was $r^2 = 0.13$. There was a medium, significant positive correlation between

gameplay and posttest scores. The effect size *d* = .36 indicated gameplay had a positive effect upon student performance. (Table 8).

Table 8

Descriptive Statistics for Pretest and Posttest by Group

							95% CI	
Variable	N	M	SD	SEM	Min	Max	LL	UL
PRETEST								
Experimental	24	69.70	10.78	2.20	50.00	88.63	65.14	74.24
Control	18	63.13	14.78	3.48	45.45	93.18	55.78	70.48
POSTTEST								
Experimental	24	82.00	11.01	2.25	52.27	97.72	77.35	86.65
Control	18	72.72	13.88	3.27	52.27	95.45	65.82	79.62

Differences in student scores on class presentations. The second research question in this study asked, Was there a significant difference in the academic performance between students who engage in gameplay and students who do not?

Research question two examined student academic performance on an assignment other than tests. Students in the experimental and control groups presented a PowerPoint presentation to their classmates at the conclusion of the study. An ANOVA was used to investigate if students who engaged in gameplay utilizing *Civilization IV: Colonization* scored higher on a presentation rubric than students who conducted traditional research on the same United States history topics (Exploration of the New World, Colonization, the Colonial Era, and the American Revolution). The following hypotheses were tested:

$H_{o:}$ There is no difference in project presentation scores between students in the experimental group and the control group (H_o: $\mu_1 = \mu_2$).

H_a: There is a difference in project presentation scores between students in the experimental group and the control group (H_a: $\mu_1 \neq \mu_2$).

The results of the ANOVA for the dependent variable (presentation) and the independent variable (group) indicated there was a difference at a significance level of $p < 0.05$ in the means between the experimental group ($M = 91.88$) and the control group ($M = 84.33$), $F(1, 40) = 11.00$, $p = 0.0019$, eta-squared 0.22. The Tukey HSD revealed there was a significant difference between the groups, HSD = 4.59, $\alpha = 0.05$. No residuals were indicated for the presentation scores. The minimum and maximum studentized residuals were within ±3 range (min = -2.45, max = 1.93) (Table 9). The null hypothesis (H_o: $\mu_1 = \mu_2$) of no difference in presentation scores between students in the experimental group and the control group was rejected. The Pearson Product Moment Correlation (r) for the two variables (gameplay and presentation) was $r = 0.46$, $p < .01$. The variance (r^2) was $r^2 = 0.22$. There

was a medium, significant positive correlation between gameplay and presentation scores. The effect size *d* = .46 indicated gameplay had a positive effect upon student performance.

Table 9

Descriptive Statistics for Presentation by Group

							95% CI	
Variable	N	M	SD	SEM	Min	Max	LL	UL
PRESENTATION								
Experimental	24	91.88	5.23	1.07	82.00	100.00	89.67	94.08
Control	18	84.33	9.39	2.21	67.00	98.00	79.67	89.00

Summary of quantitative findings. Quantitative data was collected from three measurement instruments - a pretest of students' knowledge on topics in United States history, a posttest test on the same topics, and a presentation rubric. Students in the experimental group engaged in gameplay for approximately 45 minutes one day a week for six weeks. Students in the control group were provided the same amount of time as the experimental group to conduct individual research.

The pretest test data analysis indicated there was no significant difference in the mean scores of the experimental group (M = 69.70) and the control group (M = 63.13). The posttest data analysis and the presentation data analysis indicated there was a significant difference in the mean scores for the posttest and presentation means for the experimental group (M = 82.00; M = 91.88) and the control group (M = 72.72; M = 84.33). Playing *Civilization IV: Colonization* appeared to have an effect upon student knowledge. However, whether the effect was due to gameplay or gameplay in conjunction with other factors such as classroom discussion required additional qualitative analysis.

Qualitative Results

This section presents an analysis of qualitative data from student interviews, focus group interviews, class discussions, student gameplay log sheets, digital video recordings, observations and teacher-researcher reflections. This qualitative data analysis was conducted through a two-phase process. The initial data analysis focused on individual student interviews conducted with students in the game-play class and the traditional instruction class. The second phase of the data analysis represented a deep drive into data collected from the game-play experimental group. The qualitative research questions and their accompanying analyses are presented next.

Historical understanding as a result of gameplay. The third research question in this study asked, What was the level of understanding of historical content among students who engage in gameplay and students who do not?

Six students were interviewed at the conclusion of the study. Three students were randomly selected from the experimental (*Civilization IV: Colonization* gameplay) group and three students were randomly selected from the control (traditional instruction) group. An eight question semi-structured interview protocol was used that focused on students' understanding of eight content topics relevant to the instructional unit featured in this research (See Table 10 and Appendix H). All interviews were digitally recorded. Inductive analysis, constant comparison and keywords in context methods were used to the code the student interviews (Glaser and Strauss, 1967; Glesne, 1999; Merriam, 1998).

Table 10

Content Topics and Questions

Topic	Question
Exploration and Colonization	Why did European nations explore and colonize the New World?
Mercantilism	Can you explain what mercantilism is?
Colonialism	Explain the relationship between a colony and its mother country.
Impact of Colonization	What impact did colonization have upon the native populations?
Colonial Economy	Describe the economy/economic focus of the English colonies.
Colonial Discontent	Why did the relationship between the colonies and England deteriorate?
Trade Restrictions	What was the purpose of the Navigation Acts? How did the Navigation Acts affect the colony economy?
Taxation and Representation	Why did the colonists object to Parliament imposing taxes on them?

As a result of the coding process, students were assigned to one of five levels of understanding for each of the eight content areas (Table 11). The lowest level (L-1) was an indication that the student offered no response or little to no understanding. At the highest level, (L-5), students were considered to have offered a complete understanding in which they elaborated and provided explanations and/or examples.

Student responses to the eight content topic questions will be presented in two sections. The first section presents the questions and responses which suggested a difference in understanding between students from the experimental group and the control group. The second section presents the questions and responses which suggested there was no difference in understanding between students from the two groups.

Table 11

Levels of Understanding per Question

Group	Q-1	Q-2	Q-3	Q-4	Q-5	Q-6	Q-7	Q-8
Experimental (gameplay)								
*Nathan	L-4	L-5	L-3	L-5	L-4	L-5	L-1	L-4
Faith	L-3	L-4	L-3	L-4	L-5	L-2	L-3	L-1
Dylan	L-2	L-2	L-3	L-5	L-3	L-5	L-4	L-2
Control (traditional)								
Erin	L-4	L-1	L-3	L-1	L-2	L-1	L-2	L-1
Elisa	L-3	L-1	L-2	L-3	L-1	L-1	L-2	L-2
Nelson	L-2	L-4	L-3	L-5	L-1	L-4	L-3	L-3

Note: * denotes OHI student. L-1 = Level 1 - No Response or Little to No Understanding; L-2 = Level 2 - Limited Understanding – student response is finite or narrow; L-3 = Level 3 - Partial Understanding – student response is incomplete; fragmentary response; missing key components; L-4 = Level 4 - Satisfactory Understanding – student response is adequate; acceptable response; missing a key component or did not elaborate; L-5 = Level 5 - Complete Understanding – student response is comprehensive: broad, full response; elaborates, provides explanations and/or examples. Pseudonyms were used for student identification.

Difference in understanding between gameplay and non-gameplay students. Analysis of student responses suggested students in the experimental group developed a deeper understanding of content for four of the eight content topic questions (questions 2, 4, 5, and 6) than students in the experimental group. Responses for each of the four questions is presented next.

Mercantilism. Students were asked to define mercantilism. In general, the students who engaged in gameplay had a better understanding of mercantilism than the students who did not engage in gameplay (Table 12). Two of the three students in the traditional instruction group were unable to provide a response to the question at all. All three gameplay students demonstrated some understanding of the concept of mercantilism.

Table 12

Levels of Understanding for Mercantilism

Experimental (gameplay)
Nathan, 5; Faith, 4; Dylan, 2
Control (traditional)
Erin, 1; Elisa, 1; Nelson, 4

Students who played *Civilization IV: Colonization* were more successful in describing mercantilism. Nathan was able to define mercantilism as an economic system between a mother country and its colony. He understood the relationship between the two revolved

around trade in which the colony provided raw materials to the mother country which in turn produced manufactured goods and exported the items to its colony.

Teacher: Can you define the word mercantilism? Explain what mercantilism is?

Nathan: What that policy means is that it basically, like it benefits, what it does is that you have a, let's say, you have a colony right in the Americas or whatever and you have resources and stuff. You would actually send those resources to, you would send the raw materials from there and send them to the mother country.

Teacher: Okay, and is there any other part of that?

Nathan: I mean, I mean you would actually get the, the actual resources, like the raw materials would go back to the mother country and they would actually manufacture, make manufactured goods out of it.

Teacher: Good. Where would the mother country sell its manufactured goods?

Nathan: Mainly in the colony.

Faith was also able to explain mercantilism. She focused her explanation on the concepts of trade and raw materials. Faith explained mercantilism, but not to the degree that Nathan did. Faith's initial explanation was broad and lacked specifics. She understood there was a relationship between a colony and its mother country but was not to able provide specific examples without follow-up questions.

Faith: It's about trading.

Teacher: Okay, you're correct, but what about trade?

Faith: Like North America supplying for the mother country.

Teacher: What does the mother country do in return?

Faith: Provide for them...

Teacher: Okay...

Faith: Give them money I guess, just the whole trading and...

Teacher: Okay, what were the colonies in North America sending toEurope?

Faith: Raw materials.

Teacher: Okay, raw materials and what would Europe send back?

Faith: Tools, like, would they send money, money, food?

Teacher: Okay, they may have sent food, but one of the things sent back was tools - manufactured goods.

Faith: Oh yeah, manufactured goods, stuff. I knew that.

Only one of the students in the control group could define mercantilism. Nelson understood there was a relationship between a colony and its mother country but was not able to provide specific examples without follow-up questions. He required five follow-up questions in order to explain mercantilism.

Nelson: It means that a colony is only there to benefit the mother country.

Teacher: Good, the colony exists for the benefit of the mother country. Now, can you explain what that benefit is? How a colony functions under mercantilism?

Nelson: Their stuff goes to, the majority of their stuff, goes to the mother country.

Teacher: Okay...

Nelson: rum, raw materials.

Teacher: Okay, good. Raw materials go to the mother country, then what happens?

Nelson: The mother country turns them into whatever it's used for.

Teacher: And then what do they do with it?

Nelson: Sell it.

Teacher: To whom?

Nelson: Back to us.

Gameplay appeared to have an effect upon student comprehension and understanding of mercantilism. All three students who engaged in gameplay were able to define mercantilism in varying degrees. Only one of the three students who did not engage in gameplay was able to explain mercantilism.

Impact of colonization. Students were asked to describe the impact colonization had upon the native populations. The gameplay students provided more information than the students in the control group (Table 13).

Table 13

Levels of Understanding for Impact of Colonization

Experimental (gameplay)
Nathan, 5; Faith, 4; Dylan, 5
Control (traditional)
Erin, 1; Elisa, 3; Nelson, 5

Nathan and Dylan, two of the three students who played *Civilization IV: Colonization,* demonstrated a complete understanding of the impact of colonization. Both

mentioned disease, population decline, warfare, initial good relations, loss of land, massacres and exchange of goods. Faith also demonstrated satisfactory understanding of the impact of colonization upon native peoples. She mentioned good relations, teaching the colonists, loss of land and warfare as direct impacts of colonization on the native peoples. Faith did not mention disease, but did state that the native peoples had no rights.

Nelson was the only student in the traditional group who demonstrated a complete understanding of the impact of colonization upon native peoples; however, his response required six follow-up questions. Erin demonstrated little understanding of the impact of colonization upon native peoples beyond loss of land.

Teacher: What impact did colonization have upon the native populations?

Erin: Like the Indians?

Teacher: Yeah.

Erin: Well, they didn't like the Indians. They treated them bad. They called them savages.

Teacher: They just called them names?

Erin: Yeah, it was like I don't like you savage, just kidding. They pushed them out of their land. Yeah, that's all I know, remember.

Teacher: What would happen after the colonists pushed the Indians off their land?

Erin: Well, the Indians would be just landless.

Teacher: Landless?

Erin: Yeah.

Elisa was able to provide more information than Erin, but she was unsure of her responses and could not elaborate.

Teacher: What impact did colonization have upon native populations?

Elisa: (no response)

Teacher: What happened to the natives when the Europeans settled...

Elisa: They started going away, right?

Teacher: Who started going away?

Elisa: The Native Americans.

Teacher: Okay, why did they go away?

Elisa: Because other people were invading their territory.

Teacher: Okay, yeah, they took their land. What else happened?

Elisa: I think they were dying?

Teacher: Why were they dying?

Elisa: Because of diseases and the droughts.

Teacher: Okay, very good, because the diseases that were introduced wiped out a lot to the population. Now, what did the Native Americans do when the Europeans took their land? Did they accept it?

Elisa: No, they wanted to fight for it, I think.

Elisa and Erin were eventually able to describe the native populations' loss of land, however only Elisa mentioned disease and only after numerous follow-up questions.

Gameplay seemed to have had an effect upon student comprehension and understanding of the impact of colonization upon native populations. All three students who

engaged in gameplay were able to provide multiple examples of the effects of colonization, especially disease. Only one of the three students who did not engage in gameplay fully explained the impact colonization had upon the native peoples.

Colonial economy. The fifth question was specific to the English colonies. The students were asked to describe the economy or economic focus of the English colonies. Students who engaged in gameplay described the economy of the English in greater detail than the students who did not engage in gameplay (Table 14).

Table 14

Levels of Understanding for Colonial Economy

Experimental (gameplay)
Nathan, 4; Faith, 5; Dylan, 3
Control (traditional)
Erin, 2; Elisa, 1; Nelson, 1

Students in the group who played the *Civilization IV: Colonization* developed a greater understanding of the economic focus of the English colonies than the students who did not engage in gameplay. Faith demonstrated complete understanding of the colonial economy.

Teacher: Describe the economy or economic focus of the English colonies

Faith: The New England colonies was like shipbuilding and trading and I remember this to, it's in my PowerPoint. The southern colonies was like farming and tobacco, rice and indigo and naval stores?

Teacher: Yeah, naval stores are correct.

Faith: And the middle colonies, wasn't it agriculture?

Faith did identify the colonial economy by region and was the only student to address the middle colonies. Nathan addressed cash crops and agriculture as well as the New England colonies, but did not mention the middle colonies.

Teacher: Describe the economy or economic focus of the English colonies. What did they produce? What was their purpose?

Nathan: Their purposes were, were just trying to make cash crops and stuff at that time because mainly what they, first came, when they first came to Jamestown they were looking for gold and stuff. Later on, they focused on agriculture because they found out that they that the gold that their gold was actually tobacco and stuff.

Teacher: Okay, what exactly is a cash crop?

Nathan: A cash crop is a crop actually that they actually get cash, like say you could get, like the most cash you wanted. The most money, whatever you could get.

Teacher: Okay...

Nathan: And a lot of consumers would want it.

Teacher: Okay, where were the cash crops produced? What part of the colonies?

Nathan: In the southern.

Teacher: Okay, what about the northern colonies, New England?

Nathan: The New England colonies were more of the trading, industry pretty much because they were around the water and so you had shipbuilding and numerous different things going on.

Dylan provided the least descriptive explanation of the colonial economy of the three students who engaged in gameplay.

Dylan: It was primarily towards, like tobacco and the coasts area because that's where they could get their ships to go in and out and get the resources.

Teacher: Okay, you mentioned tobacco, where is tobacco grown?

Dylan: In the south.

Teacher: In the south, so what were they producing in the north?

Dylan: Like, is it lumber and, let me think, well, I know they are doing fishing up there.

Teacher: Okay, so lumber and fishing.

Dylan and Nathan did make the connection to geography in their responses to the question. Faith did not make a reference to geography.

The students who did not engage in gameplay had difficulty describing the economic focus of the English colonies. Elisa stated the economy was not good and could only remember cotton. When I asked where cotton was produced, she was not sure if it was in the south or north. Elisa stated the northern colonies had textile mills. She had incorrectly described the economic focus of New England and the South during the early 1800s - not the colonial economy. Nelson could only remember Virginia and tobacco. When asked why Virginia produced tobacco, he responded, "That guy, I don't remember what his name was,

but they were there for gold first, right?" Erin's response was not much better than Elisa's and Nelson's, but she was able to identify a few agricultural products. She was unable to connect corn to the middle colonies and incorrectly stated the northern economy focused on the manufacturing of clothes.

Teacher: Can you describe the economy or economic focus of the English colonies?

Erin: What do you mean?

Teacher: What were the colonies producing economically? Were they making things? Were they trading in certain things? Were they growing certain things?

Erin: All the colonies or just in general?

Teacher: Anything you remember.

Erin: Oh, I don't know exactly which colony did what, but I know some of them were producing tobacco. I want to say cotton. I could be wrong. Cotton and rum maybe and corn and, that's all I remember.

Teacher: Okay, agricultural products.

Erin: Yeah.

Teacher: Where would the cotton and tobacco have been grown, in the northern colonies or the southern colonies?

Erin: Southern?

Teacher: Why southern?

Erin: I don't know. I was going to say Jamestown 'til you said northern or southern, but then I was like I might not be right.

Teacher: Actually, Jamestown is where tobacco starts.

Erin: Okay, yeah, I was right.

Teacher: Okay, that would be southern, right?

Erin: Yeah.

Teacher: Okay, what about the northern colonies? What did they do if the cotton and tobacco was in the south?

Erin: They made clothes?

Teacher: They made clothes?

Erin: Yeah.

A lack of understanding of the colonial economy was evident among the students who did not engage in gameplay. The students who did engage in gameplay described the colonial economy in greater detail. However, only two of the gameplay students made a reference to geography and none of the students addressed the influence of climate on economic development.

Colonial discontent. The sixth question was specific to the relationship between the colonies and Great Britain. Question six asked students to explain why the relationship between England and the colonies began to deteriorate. Two of the students who engaged in gameplay described the reasons for dissent in the colonies in greater detail then the students who did not engage in gameplay (Table 15).

Table 15

Levels of Understanding for Colonial Discontent

Experimental (gameplay)
Nathan, 5; Faith, 2; Dylan, 5
Control (traditional)
Erin, 1; Elisa, 1; Nelson, 4

Two of the students in the traditional group, Elisa and Erin, did not provide an explanation beyond a desire for self-government or trade restrictions. Nelson was the only student in the control group who provided a satisfactory explanation for the deteriorating relationship between the colonies and Great Britain.

> Teacher: Can you tell me why the relationship between the colonies and England deteriorated?
>
> Nelson: They wanted to be represented. They were paying taxes and they didn't have any representation in Parliament.
>
> Teacher: Okay, so the colonists were being taxed and they didn't like being taxed without representation in Parliament, correct?
>
> Nelson: Yeah.

Nelson did identify taxes and no representation, but he did not explain why the taxes were imposed in the first place. He provided no additional information such as trade restrictions or loss of colonial self-government, nor did he reference the French and Indian War.

Among the students who engaged in gameplay, Faith could only recall taxes and was uncertain of her response. Dylan and Nathan referred to the French and Indian War, taxes and control by the British government.

Teacher: Why did the relationship between the colonists and England deteriorate?

Dylan: Because they felt like they were being used; because of taxation without representation. They started taxing like crazy after the wars and stuff and they just felt that England was just trying to take over and then control them. They are over here and they're over there. So they could be their own country.

Teacher: You mentioned taxing after war, what war? Do you remember?

Dylan: The French and Indian War.

Nathan provided a rather elaborate explanation for the deterioration in relations between the colonists and England.

Nathan: Well, they deteriorated because, well, well at first when we were, well during the time when England, I mean Great Britain and the U.S. and the colonies, we were pretty much like in our self-government and stuff, like taking steps forward for self-government at the time when they, when they kind of neglected us somewhat because we were thousands of miles away from Great Britain to the colonies. So that, that's one reason but then the immediate reasons why it happened is that you, you have to look at the last Indian, French and Indian War, the French and Indian War of 1754, that lasted from 1754 to 1763 and that war literally made Britain become bankrupt, and so what happened there is that they, what they did was that they actually, they,

they, started to impose taxes on the colonies, so they could, so they could help revive their own economy.

Teacher: Okay, so if I understand you correctly, England began to put taxes on the colonists...

Nathan: Yes...

Teacher: To pay for the war.

Nathan: Exactly.

Nathan not only referred to the French and Indian War, but addressed salutary neglect, development of self-government and England's financial troubles following the French and Indian War. The students who engaged in gameplay developed a greater understanding of why the relationship between the colonies and England deteriorated.

No difference in understanding between gameplay and non-gameplay students. Analysis of student responses suggested there was no difference in understanding between students in the experimental group and the control group for four of the eight content topic questions (questions 1, 3, 7, and 8). Responses for each of the four questions is presented next.

Exploration and colonization. The first question of the semi-structured interview asked students to explain why European nations explored and colonized the New World. None of the students, regardless of group assignment, fully explained or elaborated on the reasons for exploration and colonization of the New World. There were no differences in the range of scores for the two groups (Table 16). Responses varied in depth as well as content for students in both groups.

Table 16

Levels of Understanding for Exploration and Colonization

Experimental (gameplay)
Nathan, 4; Faith, 3; Dylan, 2
Control (traditional)
Erin, 4; Elisa, 3; Nelson, 2

Two students, Nathan (gameplay) and Erin (traditional) were able to answer the question at level 4 with some detail and examples. Nathan correctly identified God, Glory and Gold, as reasons for European exploration, but did not explain or elaborate. He correctly associated Spain with the three "G's." Nathan also identified the order in which the European nations explored and colonized the New World. He did mention trade and resources, but did not specifically address Asia or the spreading of Christianity.

Teacher: Why did European nations explore and colonize the New World?

Nathan: Well, they wanted to colonize so they could, find the three “Gs,” - God, Gold, and Glory and, you also have to think about like the different, like the different, hold on, the different colonies and stuff, like the Spanish, French, and the English too. What they wanted and stuff.

Teacher: Okay, with which country do you associate the three “Gs” out of those that you mentioned?

Nathan: Mainly Spain.

Teacher: Okay, so Spain starts its exploration for God, Glory and Gold.

Nathan: Uh-huh.

Teacher: Why did France and England get involved in colonization?

Nathan: Because, well they got into colonization because of trade and resources.

Erin's response focused on trade. She also mentioned religion, but she incorrectly identified self-government as a reason for colonization.

Erin: They want to find new routes

Teacher: Find new routes for what?

Erin: For trade.

Teacher: Okay, trade, were they looking for anything other than trade?

Erin: I don't remember.

Teacher: What about colonization? Why did they set up colonies?

Erin: For religious purposes?

Teacher: Okay, religion. Can you remember anything else?

Erin: For governing?

Two other students, Dylan (gameplay) and Nelson (traditional), also offered correct responses, but only in the area of exploration. They could not explain reasons for colonization. Dylan was able to recall that Europeans explored for gold and personal fame but did not explain what these mean. He confused the order in which the European nations explored and colonized the New World. He did recall the search for the Northwest Passage but did not explain why or where the Europeans were trying to go. Dylan did not mention

trade with Asia nor did he address religion or explain reasons for establishing colonies beyond gold, glory and curiosity.

Teacher: Why did European nations explore and colonize the New World?

Dylan: For gold, glory and curiosity.

Teacher: Okay, for gold, glory and curiosity. Was that all European nations or one in particular?

Dylan: That was England, and then Spain and France went for it, like try to find the Northwest passage and all that stuff.

Nelson could only recall trade routes. He did not provide any elaboration beyond wealth.

Teacher: Why did European nations explore and colonize the New World?

Nelson: They were looking for trade routes.

Teacher: Trade routes, anything else?

Nelson: Money.

Teacher: Okay, any others besides trade routes and money?

Nelson: Not that I can remember, no. I'm sure there are plenty of more.

None of the students interviewed, regardless of group assignment, fully explained or elaborated on the reasons for exploration and colonization of the New World. Gameplay appeared to have no effect upon student comprehension and understanding of exploration and colonization of the New World.

Colonial relations. Question three asked students to explain the relationship between a colony and its mother country. Five students described this relationship as one in which the

mother country controlled the colony, or basically told them what to do (Table 17). None of the students were able to provide any depth in their responses.

Table 17

Levels of Understanding for Colonialism

Experimental (gameplay)
Nathan, 3; Faith, 3; Dylan, 3
Control (traditional)
Erin, 3; Elisa, 2; Nelson, 3

Faith (gameplay), and Erin (traditional), described the relationship between a mother country and a colony as being similar to that of a mother and a child, but did not provide specifics beyond control, punishment, or trade.

Teacher: Explain the relationship between a colony and its mother country.

Faith: Their relationship?

Teacher: Yes.

Faith: It's like the mom and the kid, I guess. The mother country, like is the head over the colonies and the colonies have to do everything for the mother country. Like, everything they do is for the mother country.

Teacher: Okay, so the mother country tells the colonies what to do and they're supposed to do it, right?

Faith: Yeah.

Teacher: And what happens if they disobey?

Faith: They went to war, right?

Teacher: That could be one of the results.

Faith: They could be punished

Faith identified the relationship between a colony and its mother country as one of control, similar to that of a parent and child. If a colony did not obey its mother country, it would be punished. Her only focus was punishment. She made no reference to the protection and well-being of a colony. Erin's response was similar to Faith's, but she did mention trade.

Erin: A mother country and a colony is kind of like a mom and a child. Like, kind of looks over the, the mother country looks over the colony and basically tells them what to do, when to do it, and if they don't do it, they get punished.

Teacher: Okay, anything else besides protecting and punishing?

Erin: To trade with them sometimes, I guess.

Teacher: Okay, can you expand upon trade or don't you remember anything beyond trade?

Erin: Like, well the colonies would make stuff to trade, make of the stuff and they would trade it with the mother country for more stuff so they could get more stuff, I think.

Erin defined the relationship as similar to a parent and child. A mother country is supposed to protect, but also punished a colony. She did mention trade, but lacked specifics and indicated that a colony makes, or produces goods for the mother country. Erin lacked an understanding

of the trading relationship between a colony and its mother country. Elisa's (traditional) response only mentioned control and following orders. She was unsure of her response and was unable to answer my follow-up questions.

> Elisa: The mother country would be like, that's in charge of the colony.
>
> Teacher: Okay, good and what would be the role of the colony? What would they do?
>
> Elisa: They would, they would like have to agree with what the mother country would tell them to do or something like that?
>
> Teacher: Yeah, they would and what did the mother country want colonies to do? Do you remember?
>
> Elisa: No.

Nelson (traditional) did mention political control as well as control of trade, but did not elaborate. His response was short and lacked explanations or specifics.

> Nelson: Well, the mother control rules them.
>
> Teacher: Okay, so a mother country has complete rule over a colony and it controls…
>
> Nelson: Trade.

The remaining two students, Nathan (gameplay) and Dylan (gameplay), addressed economics as they explained the relationship between a mother country and its colony.

> Nathan: A colony and its mother country? They were pretty much, well pretty much, it's that they worked together pretty much. They had to produce, the raw materials that they needed, that the mother country wanted. Then they sent them over to the mother country.
>
> Teacher: Okay, then the mother country did what with the raw materials?

Nathan: They made them into manufactured goods.

Nathan focused on economics, essentially restating his understanding of mercantilism. Dylan also focused on economics and provided specific examples of trade items.

Dylan: Well, the colony was supposed to go to the new land or whatever and make money for the mother country, and send back money, pay them and pretty much work for them.

Teacher: So, the colony was supposed to work for the mother country. What type of work did they do?

Dylan: They did tobacco and other types of farming and fishing and those types of things.

Teacher: So, raw resources, and what would the mother country do with them?

Dylan: They would take those and sell them or trade them, give them goods for their goods.

Gameplay appeared to have no effect upon student comprehension and understanding of the relationship between a colony and its mother country. Five of the six students interviewed were able to explain the relationship as a form of control, but provided little explanation beyond control. None of the students addressed trade restrictions, military protection, nor did they explain political control.

Trade restrictions. Students were asked to explain the purpose of the Navigation Acts as well as how the Navigation Acts affected the colony economy. Responses varied and none of the students could fully answer both parts of the question (Table 18).

Table 18

Levels of Understanding for Trade Restrictions

Experimental (gameplay)
Nathan, 1; Faith, 3; Dylan, 4
Control (traditional)
Erin, 2; Elisa, 2; Nelson, 3

Responses from the students who engaged in gameplay varied. Nathan stated the Navigation Acts had something to do with smuggling, but did not explain why smuggling occurred. Faith offered a limited response, but provided some explanation of the Navigation Acts.

> Faith: Wasn't the Navigation Acts, it was like where they could only trade with the mother country. They couldn't trade with anybody else.
>
> Teacher: Okay, so what impact did they have on the colonies?
>
> Faith: It limited who they traded with, like they couldn't trade with France or anybody else.

Faith was not able to explain the impact of the Navigation Acts upon the colonial economy, nor did she address the colonial response to the Navigation Acts. Dylan was the only student who knew that the Navigation Acts limited colonial economic growth. As Dylan put it, "They couldn't, they couldn't grow or progress because they only traded with England and

that's not giving them enough to continue on.” None of the students from the gameplay group mentioned that the Navigation Acts were passed to protect British manufacturing from colonial competition.

Students in the control group had an even more limited understanding of the Navigation Acts. Erin stated the Navigation Acts had "something to do with trade" and "restricted trade." Elisa stated the Navigation Acts "led to trade restrictions." However, neither Erin nor Elisa had an understanding of the Navigation Acts beyond trade restrictions. Nelson stated the Navigation Acts imposed trade restrictions and only let the colonists trade with England.

Students in both groups had a limited understanding of the Navigation Acts. They understood, in general, that the acts placed restrictions on colonial trade. They could not explain the purpose beyond trade restriction, or how the Navigation Acts affected the colonial economy.

Taxation and representation. Students were asked to explain why the colonists objected to Parliament imposing taxes upon them. Only one of the students could explain that the colonists’ objected to Parliament’s taxation policies because they did not elect members to Parliament.

Table 19

Levels of Understanding for Taxation and Representation

Experimental (gameplay)
Nathan, 4; Faith, 1; Dylan, 2
Control (traditional)
Erin, 1; Elisa, 2; Nelson, 3

Students in the group that played *Civilization IV: Colonization* were able to describe some of the colonists objections. Nathan offered the most detailed response to the question, referencing virtual representation and consent of the governed.

> Teacher: Why did the colonists object to Parliament putting taxes on them?
>
> Nathan: Because it was per virtual representation, because what they viewed, what the British viewed was that they saw that if they were a part of their colony, they were pretty much represented even though they weren't over, it's like virtual representation. And so, what the colonies thought at the time, is that they thought that, taxation without representation was their motto. And so, so they felt that, that they shouldn't pay the taxes because of consent of the governed.

Nathan also referred back to England's debt from the French and Indian War.

> Teacher: What were the colonists essentially saying to Parliament?
>
> Nathan: They were pretty much saying they will not pay their, pay taxes

to Parliament.

Teacher: Okay, why?

Nathan: Because they did not want to pay off their debt.

Faith stated that the colonists did not want to pay taxes, but was unable to explain or elaborate. Dylan offered a summary of the concept of taxation without representation. He described it by saying, "you can't tax us without us, without us having a voice… the mother country figured they didn't need a voice." However, he could not explain "voice" nor was he able to explain why Parliament felt the colonists "didn't need a voice."

Students in the control group were less successful in their responses. Erin had little to no understanding of why colonists opposed Parliament's taxes. Elisa had a limited understanding of colonial opposition to Parliament's taxes. She remembered the colonial slogan *no taxation without representation,* but could not explain what that meant. When I asked her to explain its meaning, she replied "It means that they don't want to be taxed for things." Nelson only demonstrated a partial understanding of why the colonists opposed Parliament. He stated the colonists opposed Parliament's taxes "because they weren't represented. They didn't have any say in anything". He did not explain how or why the colonists believed they were not represented. Erin said that the colonists did not think it was right they had to pay taxes.

Nathan was the only student to mention virtual representation and consent of the governed in his explanation for colonial opposition to Parliament's taxes. Playing *Civilization IV: Colonization* did not appear to have an effect upon student understanding and comprehension of colonial opposition to Parliament's taxation policies.

Follow-up and probing questions. My role as teacher-researcher was not limited just to adopting a researcher perspective in determining if playing *Civilization IV: Colonization* is a better approach to helping students understand historical content. My role as their teacher required me to help students understand content. This often involved the use of follow-up and probing questions. As I interviewed the students, I used numerous follow-up and probing questions. The students who engaged in gameplay required fewer follow-up and probing questions than the students who did not engage in gameplay (Table 20).

Table 20

Follow-up and Probing Questions per Interview Question

Group	Q-1	Q-2	Q-3	Q-4	Q-5	Q-6	Q-7	Q-8	Total
Experimental									**60**
*Nathan	3	2	1	1	3	1	9	1	21
Faith	2	5	4	3	2	1	1	7	25
Dylan	1	2	2	1	2	1	2	3	14
Control									**69**
Erin	1	1	2	3	9	2	5	3	26
Elisa	4	1	2	6	3	3	1	5	25
Nelson	2	4	2	6	2	1	1	0	18

Note: *indicates OHI (Other Health Impaired)

Summary of qualitative findings. Students who engaged in gameplay utilizing *Civilization IV: Colonization* demonstrated a higher level of understanding of historical content as measured in the interview sessions than students who did not engage in gameplay (Table 11). There was a notable difference in student explanations for questions two, four, five, and six. Student responses for questions three, seven, and eight were similar regardless of engagement in gameplay. There was essentially no difference in the responses for question one.

The next section focuses more closely on the learning experiences of the students who played *Civilization IV: Colonization.* The section is divided into three parts, which address student self-reported learning on the gameplay log sheets and observations of gameplay, focus group interviews, and a summary of the findings. As with the individual student interviews with gameplay and non-gameplay students, pseudonyms are used to identify students in the control group. Table 21 shows student pairs for gameplay sessions.

Table 21

Gameplay Students and Pairings Using Pseudonyms

Pairing	Student	Race	Gender	Student	Race	Gender
1	Juan	H	M	Katrina	H	F
2	Noel	AA	F	Katie	C	F
3	Brian	H	M	Mary	C	F
4	Daniel	C	M	Amy	C	F
5	Seleni	H	F	Yasmine	H	F
6	Tom	C	M	Casey	C	F
7	Charles	C	M	Jane	C	F
8	Dylan	AA	M	Nathan	C	M
9	Adam	C	M	Larry	AA	M
10	Kim	H	F	Nick	C	M
11	Heidi	C	F	Faith	C	F
12	Linda	C	F	Iris	AA	F

Note: C = Caucasian; AA = African American; H = Hispanic; M = Male; F = Female. Students were permitted to choose their partner during the first gameplay session. Students played *Civilization IV: Colonization* with the same partner throughout the study.

Civilization IV: Colonization Gameplay Learning

A major component of the study and analysis of data focused on student self-reported learning from *Civilization IV: Colonization* gameplay experiences, and issues students encountered while playing *Civilization IV.* Students who engaged in gameplay recorded their experiences on student gameplay log sheets (see Appendix G) at the conclusion of each gameplay session. The analysis of the log sheets as well as observations and discussions during gameplay are presented in order, gameplay sessions one through six.

Gameplay session one: Learning to play *Civilization IV*. The first session focused on familiarization with *Civilization IV.* Students were permitted to choose their partner for the gameplay sessions. Twelve groups were formed, each with two players. Students were provided a copy of the instruction manual for *Civilization IV: Colonization* to be used as a reference during gameplay. Students were shown how to log in and save their game as well as told to use the same laptop for each gameplay session. Students were told to open the tutorial for *Civilization IV* and begin playing. Students used the tutorial for *Civilization IV* because *Civilization IV: Colonization* did not have a tutorial.

At the end of the gaming session, students were told to exit the tutorial. The tutorial provided the students the opportunity to explore, build a city, construct an obelisk, and defend their city against an attack. Students were told *Civilization IV: Colonization* would look and play differently, but the basics of moving units, exploring, building and defending would be similar to the *Civilization IV* tutorial. Students were provided a copy of the student log sheet. Instructions were provided on how to record their experiences and activities on the sheet and they were told they would complete the log sheets after each gameplay session,

beginning with the next session. Students were reminded to review the manual prior to the next session.

Gameplay session two: **The game begins.** Session two was the first day of actual gameplay utilizing *Civilization IV: Colonization.* Eleven of the twelve pairs of students returned their data log sheets at the conclusion of the gameplay session. The pairs of students self-reported engagement in 21 distinct concepts and activities (See Figures 12 and 13). Eleven groups indicated they actively engaged in exploration and the establishment of settlements. Seven groups reported they focused on developing good relationships with the Native peoples or other European nations and their colonies. Six groups indicated they began to improve their settlements with the construction of docks, warehouses, a town hall and a church. Five groups reported they formed military alliances with native peoples.

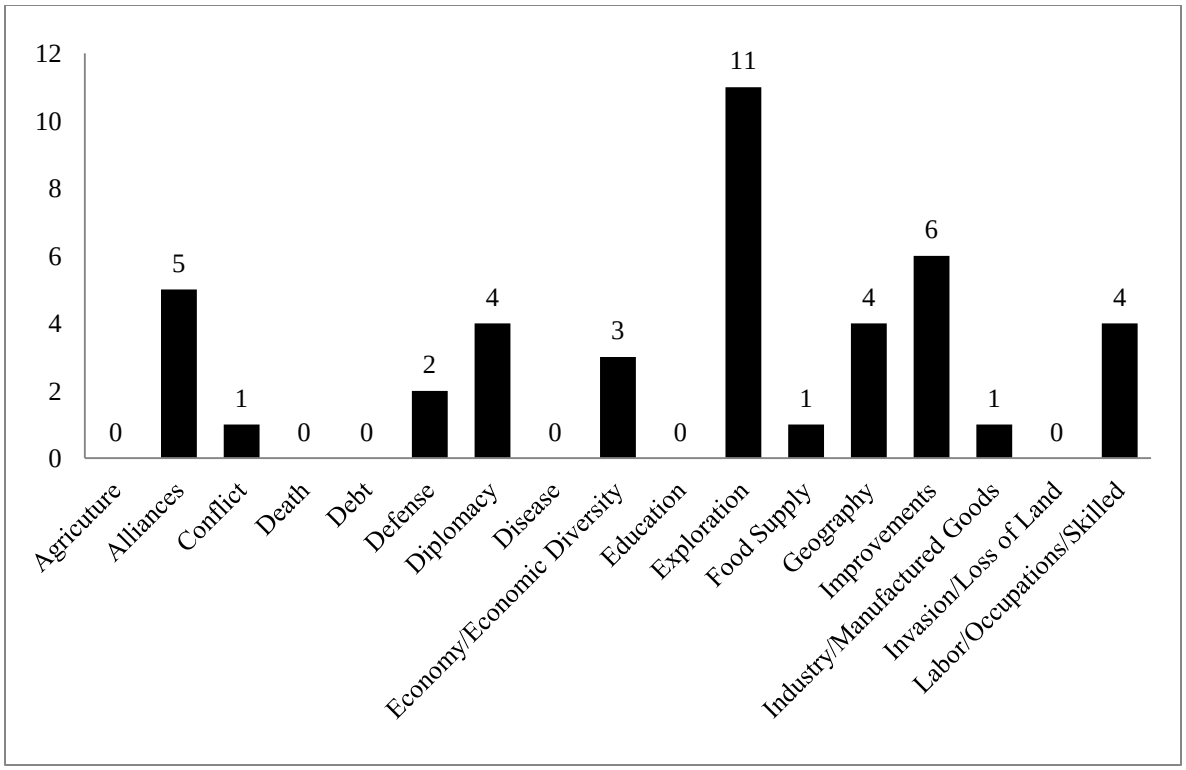

Figure 12. Gameplay Session Two: Group Self-Reported Concepts and Activities

Note: The numbers at the top of the bars indicate number of groups

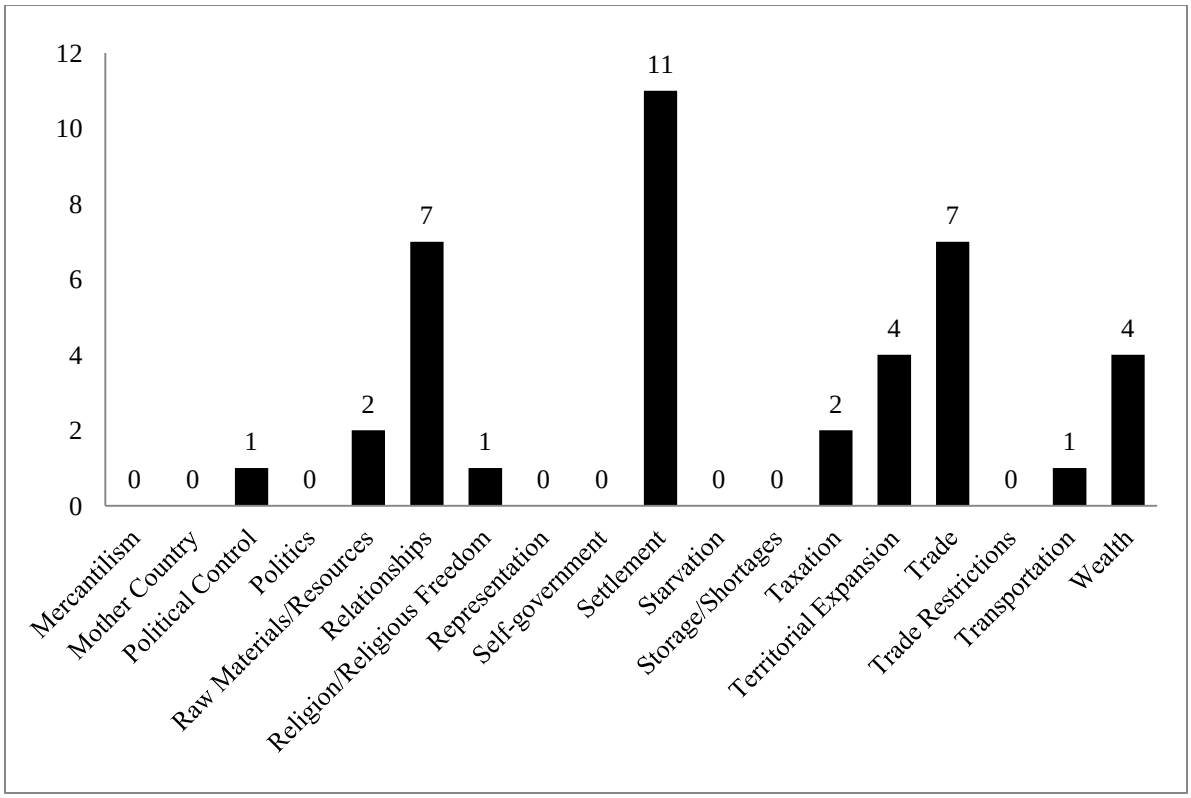

Figure 13. Gameplay Session Two: Group Self-Reported Concepts and Activities

Note: The numbers at the top of the bars indicate number of groups.

The first day of gameplay focused on exploration and the establishment of settlements. Students had to find a suitable place to establish their colony, maintain friendly relations with the native peoples, develop and sustain trade and focus on the protection of their settlements. Discussions among the groups focused on survival, trade and establishing good relationships. At one point during gameplay, Noel and Katie had returned to Europe and discussed what they needed to bring back to their colony. Their discussion focused on type of worker and supplies.

Noel: What should we take? Should we take a carpenter or tools?

Katie: What about weapons?

Noel: We don't have enough money. Let's get the carpenter. We need food to survive.

Noel and Katie decided to load their ship with a carpenter and food supplies. They decided weapons and additional tools were too expensive or not as necessary to the survival of their settlement as food and a carpenter. They had prioritized the needs for their colony's survival. The need to survive was also evident in a discussion between Charles and his partner Jane. They had to decide whether or not to accept a trade offer from the Dutch. They chose to accept the offer. I asked them why; Charles stated, "To keep the peace, sustain ourselves...so we don't have to make them mad". Charles and Jane had decided it was in their best interest to develop a good relationship with the Dutch and obtain trade items for their colony. Charles and Jane's understanding of the need to maintain peaceful relations, develop trade and the importance of geography was evident in their gameplay summary of events. They realized in order to conduct trade and prosper, they had to develop a specialized labor force, maintain peaceful relations and have access to the sea:

> We became New France. We landed in the New World. We settle[d] inland instead of settling [in] our capital Quebec. We met the Dutch, Incas, Apaches and several other tribes or nations. We have declared peace between all of us...We form[ed] a second settlement called Montreal. The Aztecs were worried about us becoming too powerful so we bought the land for gold. Our ship has taken many trips to Europe and have already brought two experts, one fisherman and a silver miner...Montreal is on the coast we can ship our raw materials for money.

Students who did not understand the relationship between geography and economic development were able to develop an understanding of how they were connected. Kim and Nancy (Nancy withdrew from the study at the conclusion of this session and was replaced by Nick) established their first settlement in the Caribbean early during the first gameplay session and improved it by constructing a dock and a warehouse to facilitate trade. Their next development was a rum distillery:

Teacher: I see you have built a warehouse. What else have you developed?

Nancy: A distillery.

Teacher: Why?

Nancy: It's alcohol!

Teacher: Besides alcohol, why a distillery? (no response) Where is your colony?

Kim: The Caribbean.

Teacher: Why build a rum distillery in the Caribbean? (no response) What is used to make rum?

Kim: Sugar cane.

Teacher: Where is it grown?

Kim: In the Caribbean.

Nancy: So we made a good choice?

As the students' teacher, I was able to discuss with them how geography influenced economic development not only for the Caribbean, but the English colonies as well. *Civilization IV: Colonization* helped students visualize and understand how economic activity was influenced by geography. Kim emphasized this point on her log sheet by

indicating the most important thing she did was create a "rum distillery in Caribbean where sugar cane is grown".

The main issue reported by students during the first day of gameplay was learning how to play *Civilization IV: Colonization.* Eight of the eleven groups indicated on the gameplay log sheets they were confused and did not know what they were doing. Linda wrote the game was hard to work and the instruction packet was not helpful. Casey "wanted better instructions to help us...". Yasmine and Seleni wrote "It was kind of frustrating playing a game in which you start from nothing [and] don't know how to work it" and added they wished they had "paid more attention in the tutorial". Brian wrote, "I don't really understand the game but I'm getting the hang of it".

The initial difficulty of learning how to play *Civilization IV: Colonization* was evident during the gaming session. I showed several pairs of students how to load and unload their ships, sail to Europe, sell and purchase goods, select settlers and return to their colony. Several groups focused on exploration and did not build up their settlements. I had to tell the students to sail back to Europe to pickup supplies and sell their goods if they wanted their settlement to survive.

Gameplay session three: Expanding engagement with concepts and game activities. Session three was the second day of gameplay. Students logged in to their laptop computers, opened their saved games and resumed playing. Eleven of the twelve pairs of students returned their data log sheets at the conclusion of the gameplay session. *S*tudents self-reported engagement in 25 distinct concepts and activities (See Figures 14 and 15). Unlike the previous gaming session which focused on exploration and establishment of

settlements, this session's emphasis was trade, development of specialized labor, maintaining good relationships, economic diversity and territorial expansion. Eight groups indicated they actively engaged in trade with their mother country, native peoples or other European nations and their colonies. Seven groups reported developing a specialized labor force as well as maintaining good relationships with their mother country, native peoples or other nations. Six groups reported they diversified their economy as well as expanded their territory. Five groups reported they focused on defense, continued to explore unknown lands and improved their settlements.

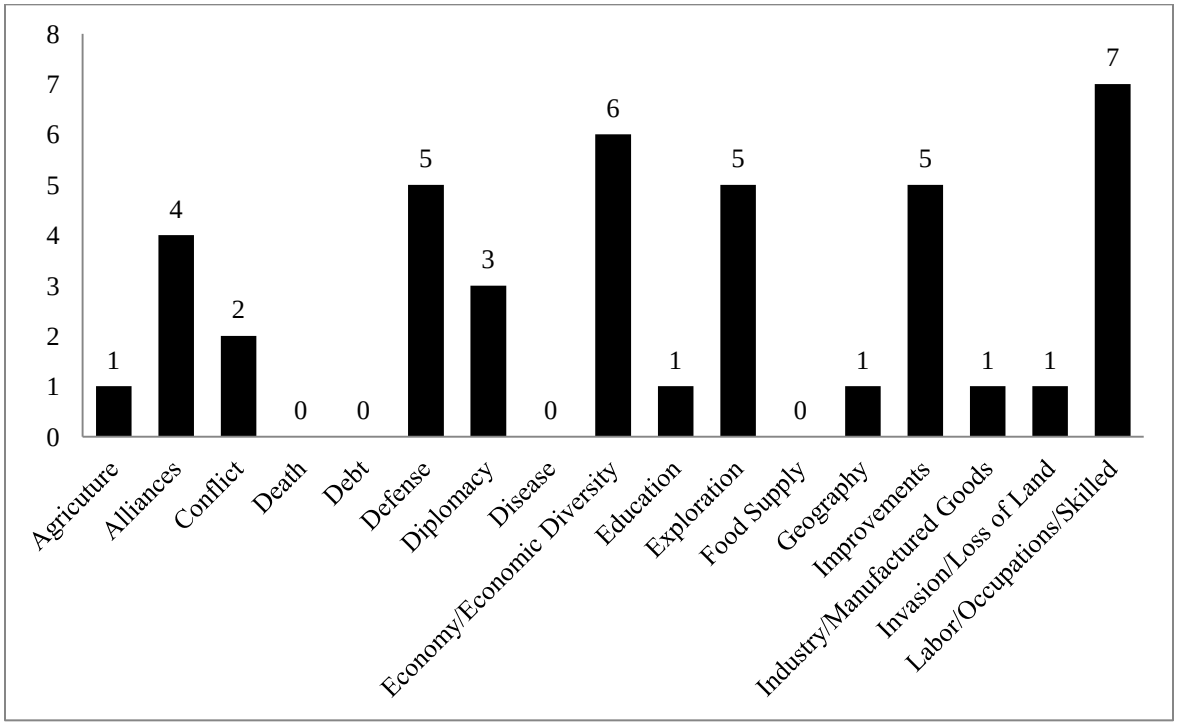

Figure 14. Gameplay Session Three: Group Self-Reported Concepts and Activities

Note: The numbers at the top of the bars indicate number of groups.

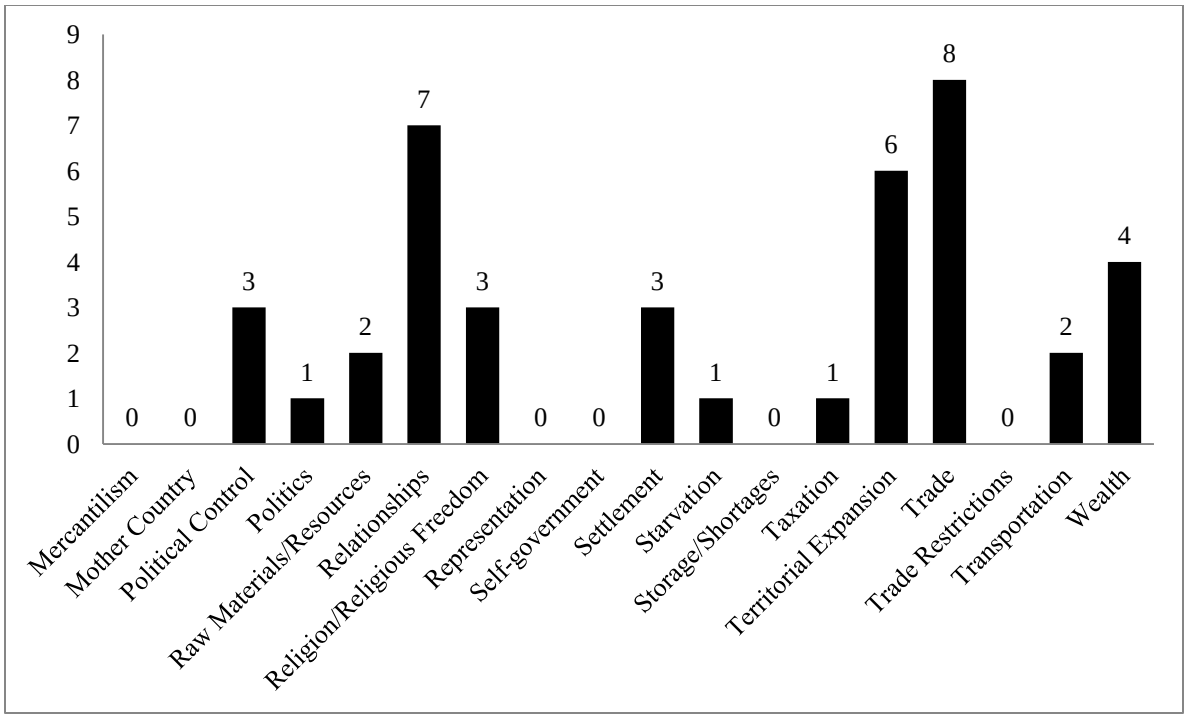

Figure 15. Gameplay Session Three: Group Self-Reported Concepts and Activities

Note: The numbers at the top of the bars indicate number of groups.

The second day of gameplay focused on development of colonial economies, diversification of labor force and territorial expansion. Students self-reported the construction of lumber mills, warehouses, docks, a wagon train to transport resources and goods, a church and a school. Students increased the number and variety of settlers: fishermen, rum distiller, blacksmith, lumberjack, indentured servants, free colonists and veteran soldiers. Charles and Jane wrote that they created a wagon train to improve trade between their two settlements and were producing cotton and tobacco. They changed the occupation of one of their settlers to a farmer in order to produce more food. Charles and Jane also wrote that their docks were nearly complete so they could increase the trade of their coastal settlement. Charles and Jane

realized they needed to diversify their economy and improve their transportation abilities in order to become prosperous. They also realized they needed to increase their food production so their colony's population could continue to grow.

Several groups reported experiencing problems with their king. Their king was demanding payment or taxes. Juan and Katrina made their king mad because they refused to pay his taxes. Katie and Noel as well as Heidi and Faith made their king mad. Heidi wrote "we liked making the king mad; but I know it wasn't smart" and wanted to know what would happen when you made the king mad. Heidi realized they did not make a good decision. She knew there would be ramifications, but she did not know what. At this point in the game, three groups had defied their king. The other groups desired to remain on good terms with their king and paid their taxes. Dakota and Amy wrote that they talked to the king twice and paid the gold he demanded.

Students experienced and reported less confusion playing *Civilization IV: Colonization* at the conclusion of this session of gameplay than the previous session. Three groups wrote they were still confused on how to play the game. A fourth group indicated they were having trouble getting their ship to go where they wanted it to and a fifth group wrote it was still trying to figure out how to sell goods.

Gameplay session four: Expansion and conflict. Session four was the third day of gameplay. Students logged in to their laptop computers, opened their saved games and resumed playing. All twelve pairs of students returned their data log sheets at the conclusion of the gameplay session. Students self-reported engagement in 28 distinct concepts and activities (See Figures 16 and 17). Students continued to focus on relationships with other

peoples and nations as well as with their mother country. Economic diversity and continued improvements to their colonies were the second priority for nine of the twelve groups. This session saw an increase in defensive actions as well as more reports of military alliances and conflict. Students continued to establish settlements, expanded their territory, focused on acquiring wealth and increased trade. More groups self-reported issues with taxation, political control and politics.

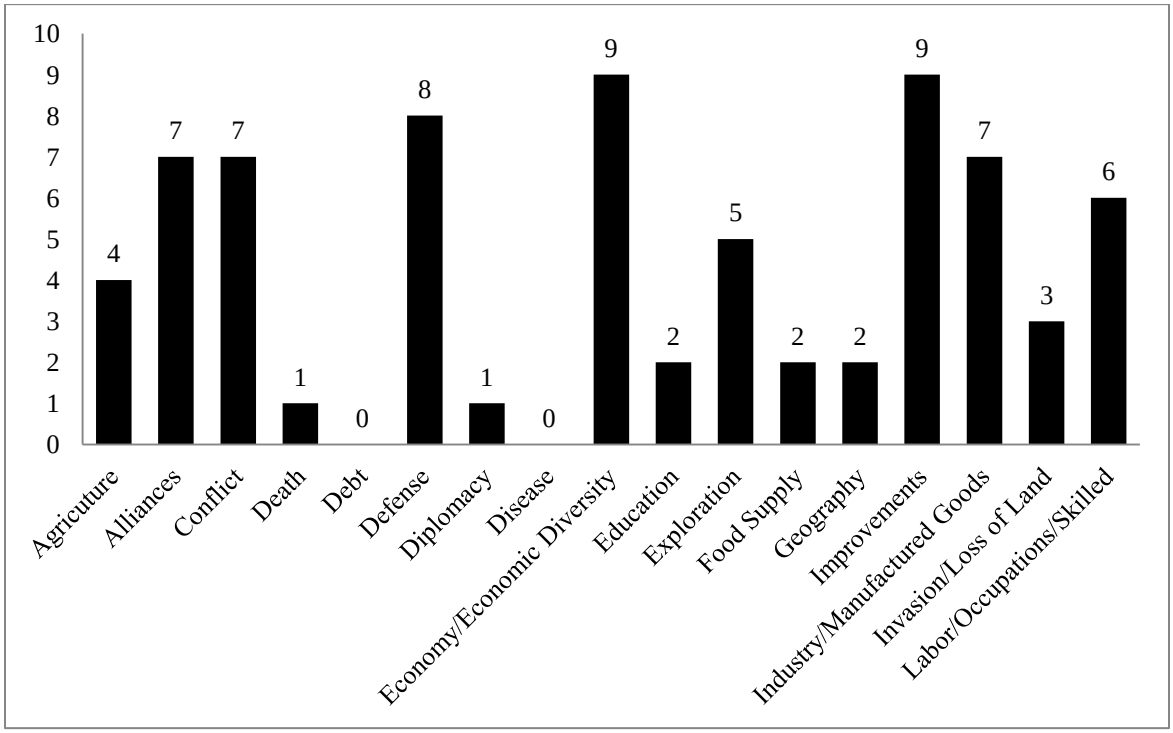

Figure 16. Gameplay Session Four: Student Self Reported Concepts and Activities

Note: The numbers at the top of the bars indicate number of groups.

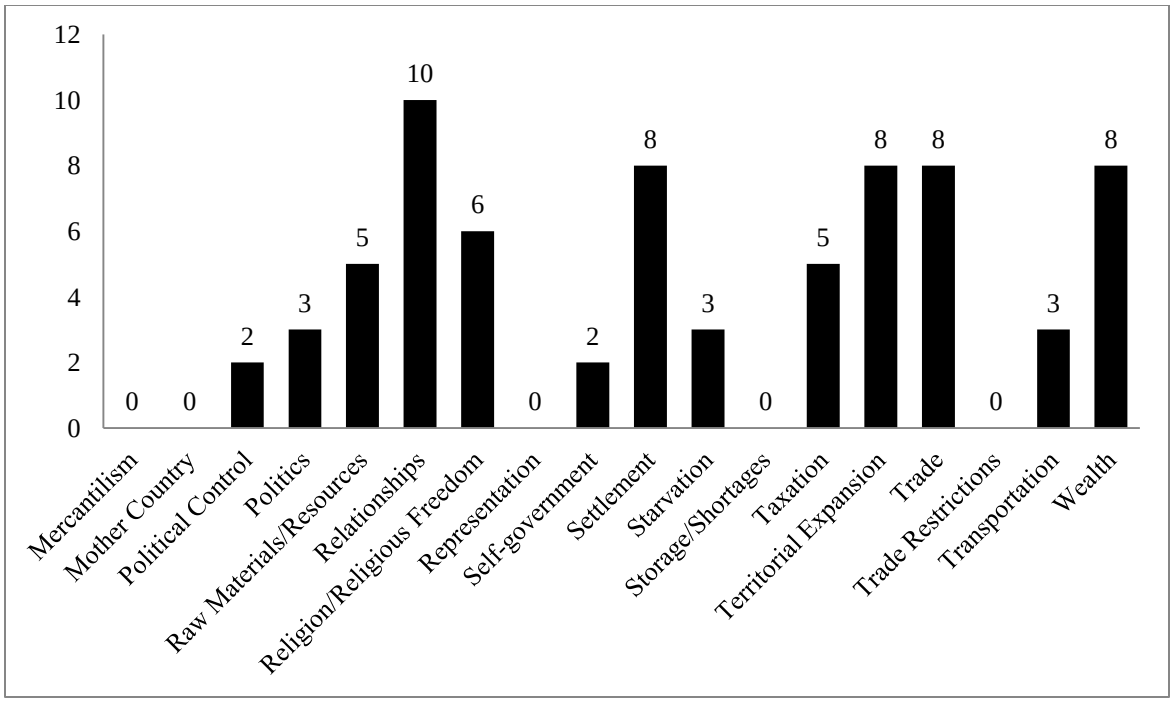

Figure 17. Gameplay Session Four: Student Self Reported Concepts and Activities

Note: The numbers at the top of the bars indicate number of groups.

On the third day of gameplay, students began to focus on the effects of territorial expansion, possible conflict and the need for defense in addition to the continued development of their colonial economies. Seven of the twelve groups reported they formed military alliances and either engaged in conflict or sought means to avoid conflict. Five self-reported they were tired of the king demanding or increasing their taxes.

Juan and Katrina built a stockade around one of their settlements, created a weaver's shop in another settlement, engaged in husbandry, opened new trade routes, formed two military alliances, had their ship sunk by the Spanish king and engaged in a war against a native tribe. They indicated they did not want to go to war because of the trouble they were

having with their king, but they had to because of the military alliance their colony entered into with another colony.

Katie and Noel were able to avoid conflict and focused on increasing their wealth. They exported lumber and rum to Europe and sold tools to another colony. Katie and Noel had expanded their trading partners beyond their mother country to other nations and colonies and continued to improve their settlements. They wrote, "we have to be smart about decisions we make in relations with neighboring colonies. We don't want to go to war".

Four groups self-reported engagement in warfare because of territorial expansion. Three of the groups indicated they were attacked, and two of groups lost a settlement. One group initiated the attack and gained territory. A fifth group also expanded territory, but purchased the land from the native peoples. Playing *Civilization IV: Colonization* appeared to provide these students with a greater understanding of the consequences of territorial expansion.

As gameplay progressed, student discussions became more focused on decision-making and what was best for their colony. Students began making decisions based upon concepts such as supply and demand, specialization of labor and economic diversification. After observing Juan and Katrina, I asked them what they had built in their settlement.

Juan: Built a cigar shop and an armory.

Teacher: Why cigars?

Juan: Price is going up.

Teacher: Why is that important?

Juan: Popularity is going up.

Teacher: So, why make cigars?

Juan: To make money.

Juan and Kim had based their production of cigars upon the concept of supply and demand. They knew the popularity and price of cigars was increasing, so they chose to make cigars in order to maximize profit as well as diversify their economy. Amy and Daniel were observed discussing a new profession for one of their colonists. She asked Daniel if they should get a farmer instead of another fisherman. Daniel agreed to acquiring a farmer. After Daniel agreed to the farmer, their ship arrived from Europe. It had a master rancher on board. Amy asked Daniel what he wanted to do with the master rancher. Daniel replied he did not know because he did not know what a master rancher did. Amy told him to look it up in the manual. He could not find the description for the master rancher. He then asked me, "What does a rancher do?" I told him he raises livestock. They decided to take the master rancher and located him outside their settlement. Amy and Daniel had made a decision to increase their agricultural production by adding another farmer to raise crops and a master rancher to raise livestock.

An issue with which three of the twelve groups began dealing was the lack of food and starvation. Amy and Daniel were one of the three groups which indicated their people were starving. They wrote they needed to build more storage units and had to learn how to "maintain a healthy colony and reduce the amount of starving citizens." Their solution was to add a farmer and a master rancher in order to increase their food supply. Heidi and Faith wrote they were losing cotton because they lacked storage. They determined that without storage for their cotton, they could not trade or make enough money to purchase what they

needed, such as food. Because of their lack of cotton and money, they were unable to acquire enough food for their colonists. Linda and Iris experienced starvation as well. They wrote, "It is frustrating when colonists are starving [because of] insufficient funds." They decided they had to build farms and increase trade to accumulate more money.

As gameplay progressed, students had to make more decisions, deal with complex issues and solve problems. Students also made connections to class content. They related starvation and lack of food to the experiences of Jamestown's settlers. They also connected warfare from territorial expansion to the French and Indian War and the Mexican War.

Gameplay session five: A turn inward. Session five was the fourth day of gameplay. Students logged in to their laptop computers, opened their saved games and resumed playing. All twelve pairs of students returned their data log sheets at the conclusion of the gameplay session. Students self-reported engagement in 26 distinct concepts and activities (See Figures 18 and 19). There was a decline in self-reported concepts and activities from the previous session's total of 28 self-reported concepts and activities. None of the twelve groups reported anything in regards to exploration, geography, politics, or raw materials and resources. However, three groups did report two new concepts - trade restrictions or the inability to trade and religion or religious freedom. There was a decline in reports of conflict, defense concerns, economic diversity, establishment of settlements, territorial expansion and trade. Students self-reported an increase in improvements to their settlements, concern for more skilled labor, and storage problems. There was a slight decrease in concern for relationships (declined from ten groups to nine groups).

Students appeared to turn their attention inward, almost adopting an isolationist mentality. They focused on improving their colonies. They added churches, lumber mills, lumber yards, schools, and warehouses. Specialized labor included weavers, carpenters, and rum distillers. One group reported they now had a surplus of food in one of their settlements.

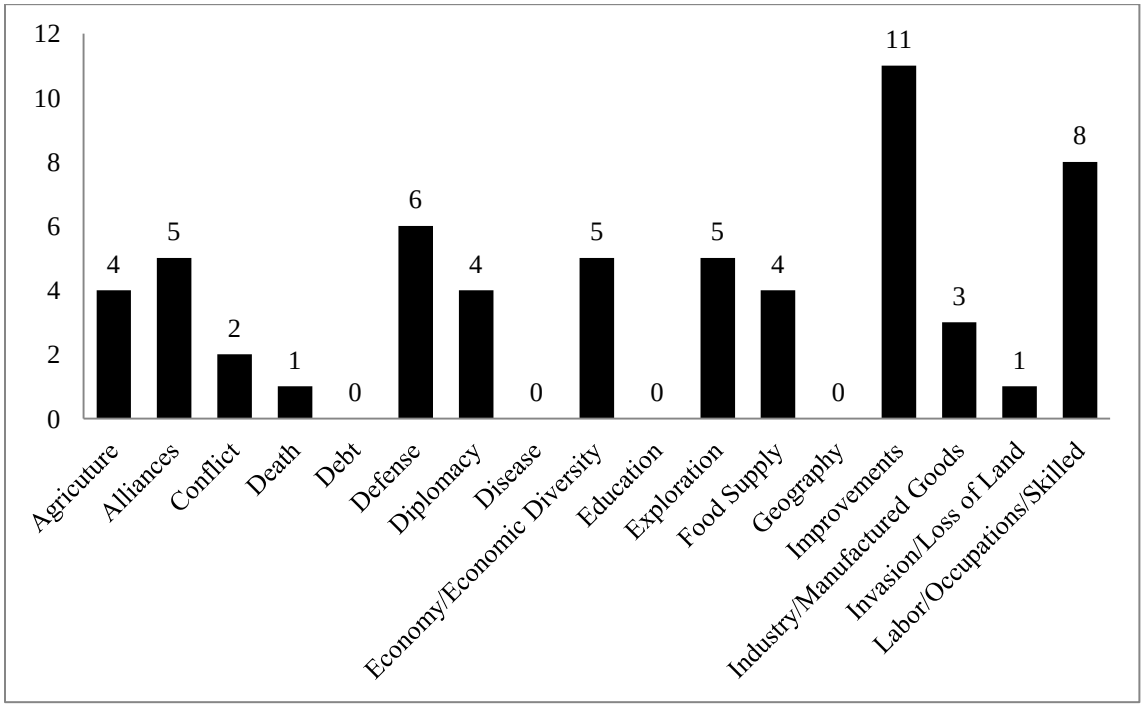

Figure 18. Gameplay Session Five: Student Self Reported Concepts and Activities

Note: The numbers at the top of the bars indicate number of groups

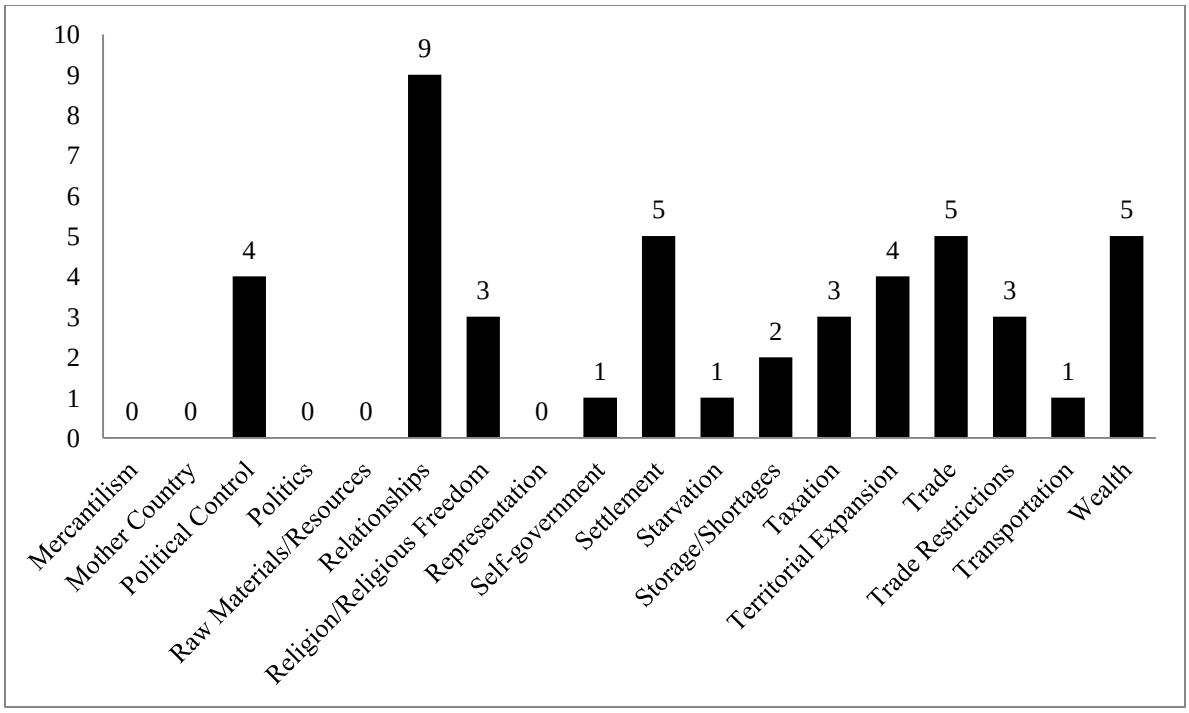

Figure 19. Gameplay Session Five: Student Self Reported Concepts and Activities

Note: The numbers at the top of the bars indicate number of groups.

The shift to domestic issues and concerns appeared to be the result of the previous session's numerous conflicts due to territorial expansion or problems with the mother country. Juan and Katrina wrote, we "had to kiss the king's ring because if not, he was going to kill our ships again". They added, "rebelling equals war and being defeated, trading equals money and also the increase in supplies in settlements." Daniel and Amy wrote, "We made many negotiations with different Indian tribes. We built up our settlements and moved many people and goods into them".

The focus on internal concerns and development of settlements was evident in observations of student gameplay. Linda and Iris were discussing what items to trade. They

decided to sell sugar. I asked them why sugar? Their response revolved around the concept of supply and demand.

Linda: We selected sugar because we don't need it.

Teacher: Why?

Iris: We have a surplus.

Teacher: Any other reasons?

Linda: It's worth more money.

Linda and Iris had a surplus of sugar and lumber. However, the sugar was more valuable than lumber. They had evaluated the price of goods, examined what they had and sold the commodity which made them the greatest profit. Linda and Iris were looking for ways to solve their food shortage. The sale of sugar increased their money supply. They also discussed whether or not to start exploring again. India asked Linda if she thought they should explore new lands. Linda responded, "No, not when we can't feed these people". Linda wanted to focus on increasing their current trade in order to solve their food shortage, rather than look for new lands to settle.

Although the focus of the session's gameplay was on not offending other nations or the mother country, several groups reported they were getting fed up with having to give into the king's demands as well as pay his increasing taxes. Tom and Casey wrote, "We kissed the king's ring AGAIN!". Dylan and Nathan were sick of paying taxes and refused to provide money to the king for his navy. Adam and Larry reported that the king raised their taxes three times.

Civilization IV: Colonization not only promoted discussion and problem solving among students, it appeared to help students make connections to class content such as colonial complaints against Great Britain and the consequences of territorial expansion such as The French and Indian War, The Mexican War and Manifest Destiny .

Gameplay session six: Ending the game. Session six was the final session of gameplay. Students were told this would be the last session of gameplay. When there were twenty minutes remaining in the session, students were instructed to save their games and record their accomplishments. All 24 students returned their data log sheets at the conclusion the gameplay session. Students self-reported engagement in 27 distinct concepts and activities (See Figures 20 and 21).

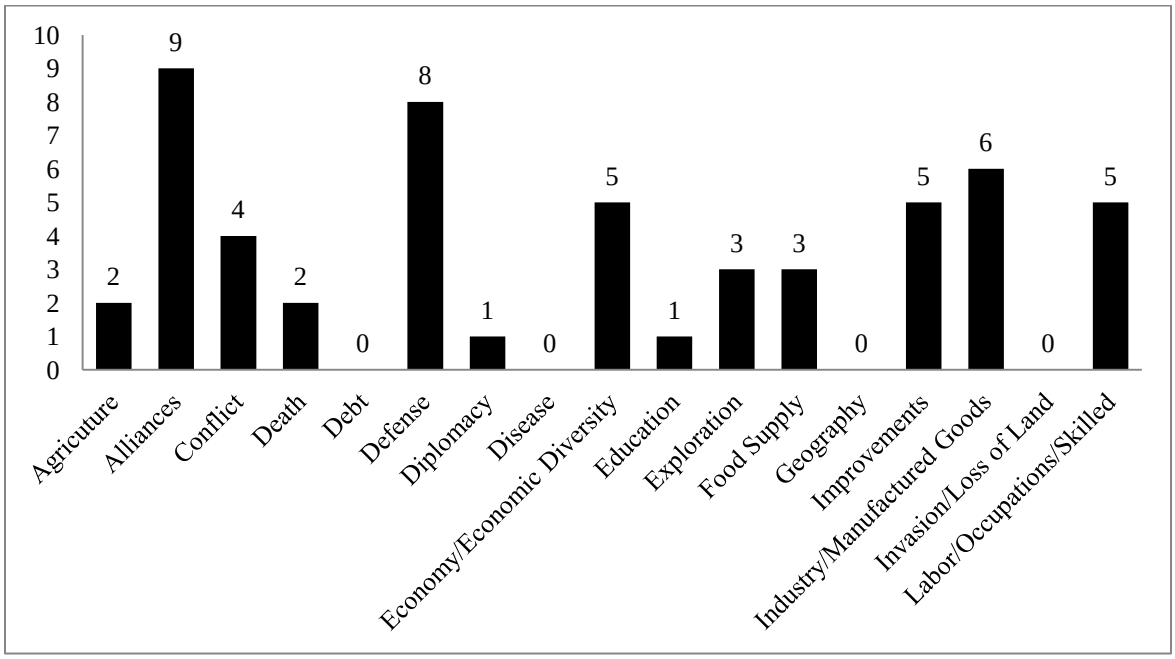

Figure 20. Gameplay Session Six: Student Self Reported Concepts and Activities

Note: The numbers at the top of the bars indicate number of groups

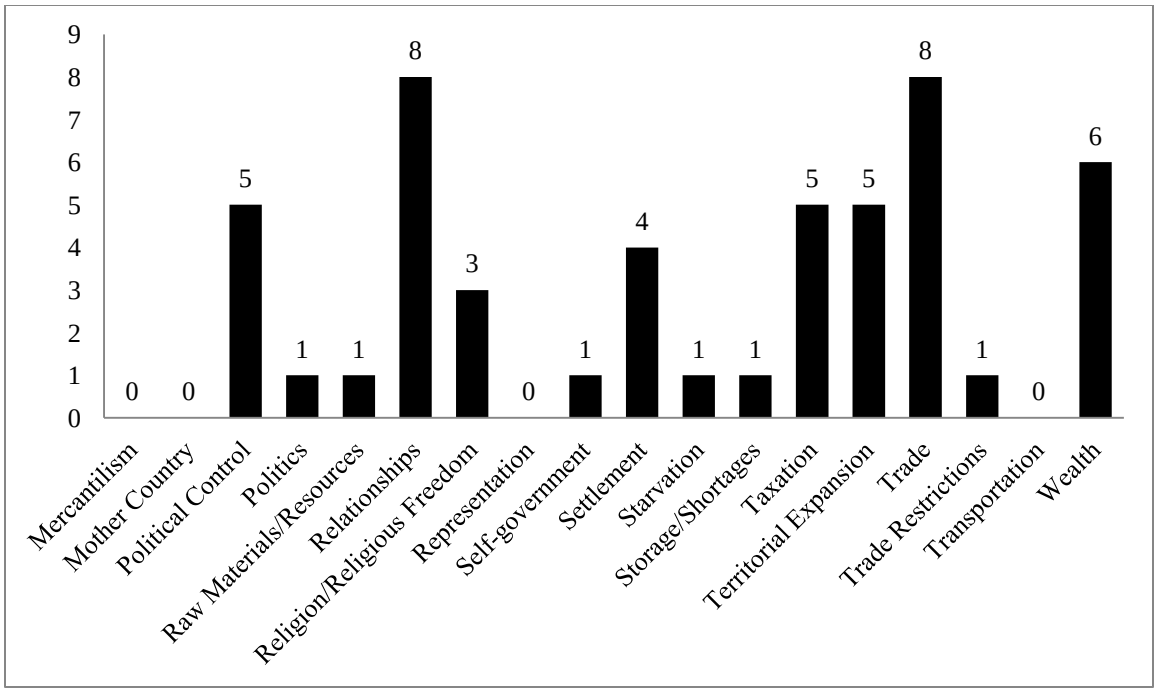

Figure 21. Gameplay Session Six: Student Self Reported Concepts and Activities

Note: The numbers at the top of the bars indicate number of groups

Students continued to focus on trade and relationships, but also turned their attention back to military alliances, defense, and territorial expansion. The majority of the groups prepared for war. The decision to prepare for war was influenced by one of three factors. The first reason was to gain as much territory and wealth as possible before ending the game. The second reason was to rebel against the king because of taxes and oppression. The third reason was just for the fun of it. Students wanted to see what would happen.

Adam and Larry wrote that they went to war because they expanded into a native tribe's territory. Their territorial aggression was responsible for their conflict. Juan and Katrina, as well as Linda and Iris, decided to rebel against their king. Both groups said they

decided to rebel because of their king's taxes. Juan and Katrina also wrote that they were tired of the king attacking their ships because they refused to pay taxes. Faith and Heidi decided to declare war on the Spanish and a native tribe to see what would happen. The other groups, although they entered into alliances and built up their defenses, continued to focus on the development of their colonies. Katie and Noel formed alliances and built a stockade, but avoided war. They improved their agricultural output by acquiring an expert farmer from a native tribe. They continued to trade in cotton, tobacco and guns. They recruited a preacher for one of their settlements and added a cigar maker, a coat maker and built a rum distillery.

Charles and Jane wrote that they had recruited into their colony eleven free colonists, two indentured servants, a converted native, nine expert farmers, seven expert fishermen, two blacksmiths, four distillers, three tobacconists, a pioneer, two scouts, and two preachers. They had also become very wealthy through their sale of food crops and manufactured goods.

Student Perceptions of Gameplay

The fourth research question asked, What were the student perceptions of computer gaming on their learning? This question is addressed below in two separate sections. The first section focuses on gameplay connections to class content making use of data from student self-reported learning recorded on the gameplay log sheets. The second section focuses on student perceptions of learning based upon the focus group interview.

Gameplay connections to class content. The students who played Civilization IV: *Colonization* made connections between the content and experiences in the game and class

content. They also suggested that playing the game helped them to understand content that was discussed in class. Below, are examples of the connections students made as they occurred over the five days of gameplay.

First day of gameplay: Opening encounters. Gameplay logs from the first day provided ample evidence that students benefited from playing the game. Brian wrote in his gameplay log that the game helped him to understand how people arrived in the New World and traded with the natives. Amy wrote that the game helped her see where the Europeans explored and how they lived. Daniel wrote in his log that the game related to "the things we have discussed in class. It gave a visualization." Casey wrote about how the game showed how difficult it was to start a settlement. Her partner Tom wrote, "It related to our talk about the first settlement and its struggles." Kim wrote that she had to apply "what we know about the formation of colonies to the game." Heidi and Faith said playing the game helped them understand how the Europeans explored new lands. Linda explained how the game helped her understand how difficult it was to start a colony. Her partner Iris agreed, saying "It showed how hard it was to get a colony started with the resources they had." Six of the eleven groups (ten of 22 students) that turned in their log sheets at the conclusion of the first day of playing *Civilization IV: Colonization* indicated the game was helpful to their understanding of class content.

Second day of gameplay: New complexities. On the second day of gameplay, eight of the eleven groups (12 of 22 students) said that the game included concepts discussed in class or helped them understand what was covered in class. Katrina and Juan described how the game included information about taxes, the need to trade for an economy to grow and

defiance of the king can lead to war. Katie went further, describing how she related to the colonists' frustration about taxes because she did not want to pay taxes as well as pay for the construction of a ship for the king. Focusing on local politics, Tom described how he noticed that the game required alliances between "Indians and white men" during the initial years of colonization. Charles and Jane noticed these connections, saying that they, "focused on things like our economy, politics, religion just like the early colonists...we had to develop trade, relationships." Kim described the ways in which the game focused on trade, economics and exploration in relation to concepts discussed in class. Heidi and Faith summed up how the game concepts related to concepts they were learning in class saying that to have "a prosperous settlement you must make or build things within your colony." Iris even made a connection to Jamestown and Plymouth when she wrote the game showed what would happen if there was a lack of food for the colonists.

Third day of gameplay: Economic and territorial growth. On the third day of gameplay, eleven of the twelve groups (21 of 24 students) said playing the game improved their understanding of economics and the consequences of territorial expansion. Mary and Brian described how the game emphasized the importance of trade for economic growth and that it was a good idea to remain on friendly terms with the native peoples. Amy and Daniel wrote the game showed them how big an issue land was during the colonial period. Yasmine and Seleni went further, describing how the game helped them to understand the effects of expansion and why the native peoples attacked the colonists. Casey and Tom noticed the game connected to the development of trade and conflict over land. They were able to make connections to The French and Indian War and the Mexican War as examples of how

conflicts can occur over border disputes. Nathan and Dylan described the ways the game related to concepts such as war, economics, and trade. Adam and Larry wrote the game showed "how hard it is to maintain and prosper in a new environment." Kim and Nick noticed the game related economics and trade to geography. They described the importance of geographic location for transportation, trade, and food production. Heidi and Faith said playing the game helped them to visualize the conflict between settlers and the Native Americans. Charles and Jane wrote playing the game related to multiple concepts from class, "We had to know how to make food and learn about trade just like the early settlers had to do. We dealt with economics, politics and other issues just like the early Americans had to do." Katie went one step further saying the game required her to exercise good judgment and caution in her decision-making, in effect be diplomatic, "We have to be smart about decisions we make...We don't want to go to war."

Fourth day of gameplay: Choices and consequences. On the fourth day of gameplay, eleven of the twelve groups (21 of 24 students) said they continued to benefit from playing the game. Katrina and Juan wrote about how the game helped them to understand that one of the consequences of defying a king could be war. They also wrote that if you disobeyed your king, he could force you in submission. Katrina and Juan's king was not happy with their refusal to pay taxes, so he sank their ship and told them they would have to purchase a new one from him if they wanted to trade. Faith and Heidi agreed with Katrina and Juan. They said the game "related to what happens when you don't obey your king." Daniel and Amy described how the game related to Manifest Destiny and war. Adam and Larry also wrote that the game reinforced the concept of Manifest Destiny. Yasmine and

Seleni said playing the game helped them understand how important trade was, "if trade was cut off, your colony was in trouble." Tom and Casey wrote that the game helped them to realize how important it was to have a diversified economy, a variety of occupations and skilled labor in order to have economic growth. Nathan and Dylan said, "the game teaches about trade and commerce and making a productive economy." Kim and Nick noticed the game's concepts related to concepts discussed in class and said playing the game "required us to apply what we knew about relationships with other colonies as well as economics and trade." Katie and Noel wrote the game required them to "think realistically, one wrong move can make or break you!" Brian and Mary said playing the game helped them understand how difficult it was for a colony to prosper without supplies or tools. Linda said playing the game continued to help her to better understand colonial life and its hardships.

***Fifth day of gameplay: Final connections*.** On the final day (sixth session) of gameplay, eleven of the twelve groups (17 of 24 students) said playing *Civilization IV: Colonization* reinforced concepts discussed in class or helped them develop a greater understanding of what was discussed in class. Juan and Katrina said the game helped them realize "you could not trade without ships". They described how vital ships were to trade as well as how vulnerable ships were to attack during the colonial period. Katie noticed the game stressed the importance of alliances, trade and good decision-making. Amy and Daniel wrote that the game related directly to exploration, the establishment of settlements, conflict, defense and foreign relations. Seleni and Yasmine described how playing the game showed them the importance of geographic location to economic growth. Casey and Tom wrote that the game helped them understand the complexities of trade. Charles and Jane described how

playing the game required them to focus on the economy and political issues just like the colonists did. Nathan wrote the concepts in the game related to mercantilism. Adam wrote that playing the game helped him relate to the colonists' decision to rebel against Great Britain. Kim and Nick said playing the game helped them understand the connection between increased food supplies and population growth as well as how geography influenced economic activity. Heidi said that the game related directly to the consequences that may occur "when you anger a king". Linda described how playing the game helped her understand why the colonists wanted their freedom. Iris wrote about how the game helped her understand why starvation and death was a problem for Jamestown's colonists.

Student responses during the focus group interview and the gameplay debrief sessions suggested that students thought playing *Civilization IV: Colonization* helped them gain a better understanding of the exploration process, colonial development and eventual demands for independence from Great Britain. Responses were assigned to one of four categories: Greater Understanding; Personal Connections; Class Content; or Interactive Learning.

Greater understanding. All students in the focus group indicated the game was beneficial to their understanding of these historical periods. Adam said that he did not learn anything new, but the game helped him to understand the importance of trade.

> I didn't necessarily learn, but I got a better understanding and a bigger grasp of how important trade was. What kind of items they traded, you know. I mean people talk about trade, they traded things between other people. One guy in a colony made this and traded with another guy in the colony. The game put a bigger perspective on how trade works.

Tom and Juan both indicated that they gained a greater understanding of the relationship between a colony and its mother country as well as consequences for defying a king.

Tom: I got a better grasp on how important it was to please the mother country. You did not want to...(group laughs)

Teacher: Okay, what would happen if you displeased your mother country?

Juan: You would get your ship destroyed or you wouldn't be able to trade with the mother country.

Teacher: Okay, so they put restrictions on your trade; they destroyed your ships. What else did the mother country demand of its colonies?"

All: Taxes!

Early in the gameplay sessions, Juan and his partner decided not to pay their king the taxes he demanded despite warnings there would be consequences. As a result, the king sent his navy to attack Juan's shipping and cut off trade with Juan's settlement. All of the students indicated they got tired of having to pay taxes to their king. The frustration with having to obey the king and pay taxes appeared early on during gameplay and was evident by the first class debrief/discussion at the conclusion of the second gameplay session.

Teacher: As you are shutting down and saving your game, there are a couple of questions I want to ask you guys. What are some of the things you have done within your game up to this point?

Juan: Got the king mad.

Teacher: Okay, why did you get the king mad?

Katrina: We didn’t want to kiss his lovely ring.

Teacher: You didn't want to kiss his lovely ring? (class laughs)

Teacher: So, you defied the king.

Seleni: Oh, we did too.

Mary: You guys are horrible. (class laughs)

Amy: We gave him gold.

Teacher: Okay, everyone wants to make the king mad? What happens if you make a king mad?

Nick: War.

Teacher: It can be war, it can be death. (discussions among students)

When Faith and Heidi were asked what occurred during their gameplay session, Faith said Heidi had angered the king by refusing to pay taxes and as a consequence they could not trade.

Faith: Well, she kind of made the king mad…

Heidi: I'm not really sure which king it was…

Faith: It was the Spanish king…

Heidi: He wanted to raise our taxes!

Faith: Zero to two percent and she said No! Then she said I'm not going to trade with you. So then he came back and said zero to five percent and we disagreed.

Teacher: Okay, you're sailing under the Spanish flag, correct?

Both: We're Dutch.

Teacher: Okay, you're Dutch and the Spanish king is making demands on you.

Heidi: Apparently, I don't know who he thinks he is!

Not only did the students gain a greater understanding of the relationship between a colony and its mother country, they also developed a greater understanding of economics - specifically supply and demand. Juan learned it was hard to engage in trade if no one wants what you have to offer.

Teacher: Okay, Juan.

Juan: I didn't like how you could only trade specific stuff. Like being able to only trade rum and stuff. It would just like, let you trade gold and sometimes we'd like, have rum and my rum would be like wasting away and stuff. It wouldn't let me trade with, the Indians didn't want to trade it, so I was confused on the whole trading part, because I couldn't trade anything with the other people because they didn't want, like what I wanted.

Teacher: They didn't want what you had?

Juan: Yeah.

Teacher: Isn't that kind of the basics of business? If you have a product you've got to meet a demand and if people don't want your product, you'll go out of business.

Juan: Yeah, but I'd give them like, all my gold for maybe opening their boundaries and they're like no.

Teacher: Okay, so not everyone cooperated with you.

Personal connections. As discussions continued within the focus group, students reported that playing the game helped them make personal connections to the colonists. Linda explained,

I really liked being able to see what they had to go through, like I guess the hardships and like somebody said the relationships. How hard it was to form treaties and keep people fed and all the other hard things they had to go through.

I asked Linda if her settlements suffered from starvation. She replied, "Yes, all of them except for one." I then asked Linda if playing the game connected directly to anything we discussed in class or what she had read.

Linda: I remember like you saying something about how important the location where they settled was. You had to be careful where you settled because you didn't know if the land was already taken or if, I guess you had to be near the water. You had to be able to trade. Just things like that, and during the game, I guess you really saw that. I guess it was reinforced again. Since I remembered you said that, it helped during the game.

Teacher: One of the individuals who played the game, who is not in here, I remember their first settlement. They made it very far inland and they weren't successful.

Linda: Yeah.

Teacher: Why weren't they successful?

Juan: No harbors.

Teacher: No harbors, they couldn't trade. They couldn't move goods around. Where did you guys establish your settlements?

Adam: On the coast.

Four Students: Islands.

Teacher: Okay, islands, islands and on the coast. Easy access.

All of the students in the focus group indicated they understood the importance of geography - specifically water - to establishing a successful settlement and the conduct of trade.

Class content. Students indicated that gameplay related to concepts discussed in class, thus improving their understanding of the historical content. Comments on the student gameplay log sheets in response to the question about how gameplay related to concepts discussed in class included information about how more food equals more population; location affected jobs; consequences when you disappoint the king; rebellion; mercantilism; expansion; warfare; settlement, colonization, and geography; rebelling equals war and being defeated, trade equals money and an increase in supplies in the settlements. Kim and her partner, Nick, made a connection to class content while playing the game.

Nick: It says our population in Guadalupe has increased.

Kim: Oh! Our population increased!

Nick: You get that excited?

Kim: Yes! Our population increased due to an abundance of food. See, the more food you get, the more people go [to your colony]. This is exactly what we learned...

Nick: In history.

Kim: Yes.

Kim not only made the connection between food supply and population growth, but also the influence of geography upon economics as well as the need to diversify the economy and develop specialized labor.

Kim: I liked exploring around, visiting different tribes and also across the seas. And also seeing how like, depending what area you were in, the different jobs you would have to need. I liked that.

Teacher: What do you mean by jobs?

Kim: Like you needed, maybe if you were near, like somewhere there was a lot of sugar, or sugar cane, you'd have a rum distiller for example because you can make rum out of that. Or if you were somewhere near water you could have a fisherman.

Teacher: Okay, so your jobs were specific to your geography, your locale.

Kim: Yes.

Interactive learning. Several students said that they felt the interactive nature of the game helped them to understand historical content and what it might have been like to be an explorer or a colonist. Noel and Katie commented on their gameplay data sheet that the game required them to think "realistically, one wrong move can make or break you!" Kim and Nick commented that they were able to "apply what we know about relationships with other colonies [such as] trade and economics." Juan stated that he "liked how we could interact with the characters and stuff. Make treaties and trade and basically just walk around." Kim said that she liked "exploring around, visiting different tribes and also [exploring] across the seas.

Students said they believed that they developed a greater understanding of the historical content covered in class because of the game. They felt playing the game enabled them to make a personal connection to the historical events. They also felt the interactive

nature of the game was a benefit as well. Lastly, students were able to make direct connections to historical content.

Peer interaction. Research question five asked, How did peer interaction during gameplay impact student learning? Students engaged in discussions about their gameplay experiences throughout the six week period. They not only discussed the game with their partners during the gaming sessions, but also outside the classroom. Topics often focused on what students were trading during the game, and other issues such as, what problems they were, what they were building, and how students accomplished their goals. Students offered advice to each other and discussed issues and moves with their partners. During the focus group interview students said that they discussed the game outside of class as well. More often than not, students followed the advice of their peers.

> Teacher: Did you discuss the game outside of the game play sessions with your partner or other people who were playing the game to see what they were doing?
>
> All: Yeah, yes.
>
> Teacher: Okay, what did you discuss, Linda?
>
> Linda: Like with other, I guess groups, we, just between classes or whatever, kind of mentioned like, did y'all have, did you come across this or whatever, and they'd be like no. We would just kind of see what we had done and they hadn't. That way you could kind of see what affected other things and that kind of stuff.
>
> Teacher: So, did those discussions influence what you did in the game? Well, I'm not going to do that or maybe I'll do this.
>
> Three Students: Yeah.

Juan: No.

Teacher: Juan, no?

Juan: No, other people were like, Oh, we kissed the ring and we were just like, Oh well, we've been rebelling the whole time, so we just stuck to rebelling against the king (laughter).

Tom: We actually decided to kiss the ring every time after we heard that they had blown up Juan's ships. (laughter)

Teacher: Okay, you learned from Juan's mistakes. You were not ready to rebel. Kim and Adam, you both mentioned that you discussed the game outside of class. What specific recommendations did you take from other people?

Adam: After people knew we had started a war with an Indian tribe, I really didn't take that much advice from other people, but I gave advice, don't take the Indians land (laughter) unless you pay for it. There was that, and this is one thing that came up because since our biggest thing we traded was cotton. We did that because it was the most valuable. And the king would keep taxing us and saying that we needed to kiss his ring. If we rebelled, we wouldn't be able to trade that item with Spain anymore. We kept kissing his ring so we could keep trading with that country. And so I told other people if you want to make large amounts of money with all your goods, just close your mouth and obey the king.

Teacher: Okay, Kim.

Kim: Well, from the start, we already had in mind that we weren't going to try to rebel at first. We were like we don't have any means to rebel; we don't have

anything, so we weren't. And then when we heard that people were rebelling already, and they weren't doing stuff and what would happen to them, it kind of reinforced yeah, we're not going to rebel. Not yet anyway. And, we talked mostly about trade with other people, like what kind of stuff were they trading and how were they trading with other nations or other tribes.

Decision-making discussions occurred frequently between gaming partners as they progressed through the game. At one point early in the game, Mary and Brian were discussing how to improve their economy.

Mary: What are we going to do?

Brian: We need more gold.

Mary: Okay, Oh, we need professions, like a weaver.

(They examined the professions list menu in order to make a selection)

Brian: We have a free colonist.

(A free colonist can be assigned to any occupation or trade)

Mary: Do you want to make him a fisherman so he can get fish that we can sell to get gold?

Brian: I guess that's good.

Mary and Brain converted their free colonist to a fisherman. They made this decision because their settlement was on the coast. They realized two things at this point in the game. First, they needed to diversify their economy and labor force; and second, a fisherman was a wise choice because of their geographic location. Later in the game, Mary and Brian had to decide if expansion was worth conflict with the native peoples.

(Brian moved a settler to an area outside their territory)

Mary: Okay, build a settlement. Are you going to build a dock?

Brian: I want to but...

(Message appeared on the screen from the leader of a nearby tribe. The leader was not friendly and indicated there would be problems if Mary and Brain stayed where they were).

Mary: Wait, why don't we think about it because we don't want to make enemies.

Brian: We can put him [move] over here, then....

(Brian moved the settler to another area outside their territorial boundaries. Another message appeared. The local tribe leader was not friendly).

Brian: He won't let us.

(Brian and Mary decided to stop expanding at this point and focus on improving their existing settlement).

Mary: Let's build a church.

Mary and Brian decided not to risk a war over territory at this time. They felt that they should improve their existing settlement and preserve peace. Other discussions involved geography and infrastructure. Katrina and Juan discussed the best place to establish their first settlement. Juan wanted to build their first settlement on an island.

Katrina: It says it's critical your first settlement be on the coast (she was looking at the instruction manual)

Juan: It's on the coast.

Katrina: No, it's not.

Juan: It's on an island.

Katrina: That's not the coast. The coast is over there.

Katrina pointed to the map of the laptop screen. Juan moved the cursor over to the area where Katrina pointed and started building the settlement. Katrina and Juan both realized the importance of locating on the water, but Katrina was able to see beyond just locating on the water. She understood that in order to grow and prosper, a colony not only needs access to water for transportation and trade, but it needs access to land in order to grow. Katrina knew the island was too small for the colony's growth.

As students continued play the game, they discussed what to buy and sell, who to recruit for their colony, what professions they needed in order to diversify their economy, whether or not to expand their territory and risk war, and whether or not to defy the king.

Student and teacher interaction during gameplay. The sixth research question asked, How did student-teacher interaction surrounding gameplay impact student learning? From data collected in the debrief sessions, it was apparent that discussions enabled students to make connections between gameplay and historical content thereby promoting transfer of knowledge from the game to factual knowledge.

Teacher: Okay, from what you have done with the game play from the sailing of the ships and establishing your settlements…what similarities can we make to what we discussed in U.S. history? Any similarities? Any connections?

Charles: Trade, economic policies…

Mary: Yeah, like certain jobs in certain regions or certain areas in the colonies…, like wars between colonies. Wars begin with simple things like defying the king or what not.

Teacher: Okay, now let's go over what Faith and Heidi said about a competing king wanting territory and having problems with taxes and wealth and you guys (Adam and Larry) having problems with Native Americans, and you (Charles and Jane) bringing in experts. What connections can we make to U.S. history? What have we studied in class?

Charles: Well, like you said, the first time we were here, economics and political issues. That everybody had to deal with living besides each other.

Teacher: Okay, let's go back to…you (Charles) brought in skilled craftsmen and tradesmen. Which colony that we studied emphasized all the different tradesmen and craftsmen they had in order to increase their population?

Charles: Pennsylvania.

Teacher: Yeah, Pennsylvania – William Penn. He wrote about how he had all these different tradesmen and craftsmen…

Charles: Because it makes it better. You can produce more goods, especially food. We wanted to get our population up as quickly as we could so we could produce many colonists and get our territory expanding. We were actually expanding our territory into Dutch lands.

In this example, Charles recalled the letter William Penn had written to a friend in England in which he described the number of craftsmen and artisans as well as the

number of houses and buildings in Philadelphia. Penn also discussed the abundance of food the farmers were producing, indicating that lack of food was not a problem for Philadelphia. The letter was written to encourage people to emigrate to his new city. In another instance, students were able to relate their food shortages and starvation to Jamestown's experiences.

Teacher: How many have had trouble in their colonies because their people were starving? (Katie laughs)

Heidi: Our people abandoned us!

Teacher: Okay. Which colonies did we look at when we studied exploration and colonization? How many had problems with starvation, not enough food? [long pause] Which colony specifically did we look at?

Larry: The first colony!

Teacher: What was the first colony established in Virginia?

Students: Jamestown!

Teacher: Jamestown...

Larry: That one! (class laughs)

Teacher: Yeah, that one. Why do you think you ran out of food?

Adam: Bad location.

Teacher: Possibly bad location, not bringing enough farmers? What did they bring with them?

Two Students: Gold miners.

Teacher: Gold miners, goldsmiths. They didn't bring enough farmers. You are making some of the same mistakes they did.

Another example of the productive value of teacher-student discussion occurred as students were talking about what they were producing in their colonies. This discussion led to another discussion on territorial expansion and war.

Teacher: You are making guns and cannon. Why?

Tom: We declared war on the Spanish.

Teacher: You declared war on the Spanish? Why?

Tom: Because they said we encroached on their land and they said if we gave them 2,000 coin they would be peaceful with us.

Teacher: So, they were mad because you guys were encroaching on their land, and they demanded…

Tom: They said our colony…the development of our colony was threatening their land.

Teacher: Okay, so they felt the development of your colony was threatening their land, so you wound up having to declare war on the Spanish. Can we connect that to anything we discussed or read about, learned about, the colonial period?

Kim: Yeah.

Teacher: Give me a specific example. (long pause/silence)

Teacher: Can anyone give me a specific example where one nation declared war upon another because of land transgressions?

Kim: The border dispute with Mexico…The Mexican War.

Teacher: Okay, the Mexican War. How about the colonial period?

Two students: The French and Indian.

Teacher: Yeah, the French and Indian War. The French built a fort in what was considered British territory by the British and so war broke out. And of course, we have the Mexican War.

The teacher-led discussions following the gameplay sessions played an important role in the students' abilities to connect their gameplay experiences to course content and factual knowledge. Whether the students would have been able to make the connections without the teacher-led discussions was not determined as that was not a focus of this study. However, the literature on computer gaming and student knowledge does indicate discourse is the key to student understanding.

Summary

This chapter presented findings for this mixed methods action research study using a variety of quantitative and qualitative data. The quantitative data was collected using a pretest/posttest to determine students' knowledge of historical content concerning exploration, colonization, the Colonial Period and The American Revolution and a teacher constructed rubric used to score student presentations. The data was analyzed according to the two quantitative research questions. An ANOVA was utilized to generate statistical data to assist in examining the research hypotheses. The qualitative data was collected from individual interviews, a focus group interview, student gameplay log sheets, observations, teacher reflections, and video recordings of student gameplay sessions.

The quantitative results indicated that posttest scores and presentation rubric scores were significantly higher for students in the experimental class that played *Civilization IV: Colonization* when compared to students in the traditional class that conducted individual research. The qualitative results added to and supported the quantitative findings. The results indicated students who played *Civilization IV: Colonization* developed a greater understanding of historical content, as measured through eight content-based interview questions, than students who did not engage in gameplay. There was a notable difference in student responses for four out the eight content-based questions asked of all students. The results also indicated students perceived playing the game as beneficial to their understanding of historical content; that student discussions while playing the game and outside of the classroom assisted students in their decision-making and learning processes; and that teacher-student discussion enabled students to relate game knowledge to historical knowledge.

Chapter 5: Discussion, Conclusion, and Recommendations

The purpose of this action research case study was to determine the effectiveness and impact of instructional uses of computer simulation games on student comprehension of major themes and concepts in United States history. This study addressed key issues about computer gameplay in an educational setting including, the impact of computer gameplay on students' content knowledge, the impact of social interaction during computer gameplay, and the impact of computer gameplay on students' perceptions of their learning.

This study was an action research project in which the researcher was also the teacher. Action research can provide a unique perspective and understanding about teaching and learning with the goal of improving and transforming education (Cochran-Smith & Lytle, 1998; Manfra, 2009; Megowan-Romanowicz, 2010). This action research examined how *Civilization IV: Colonization* could be used to promote students' understanding of European exploration and colonization of the New World and the events that led to the American Revolution.

Summary of Study

In this research, forty-two 11th grade students were randomly assigned to one of two groups. One group functioned as an experimental group and the other group served as a control group. The experimental group engaged in computer gameplay using Sid Meier's *Civilization IV: Colonization* during one class period a week over a six-week period. The control group participated in more traditional activities, conducting individual research on the same content topics the research group engaged. At the conclusion of the six-week period,

students from both groups created and presented a PowerPoint (PPT) presentation to their classmates. Students in the experimental group based their presentations on their gameplay experiences and learning associated with playing Civilization IV: Colonization. Students in the control group based their presentations on the individual research.

All 42 students were administered a test of their content knowledge about exploration, colonization, the Colonial Period and the American Revolution both prior to and after the six-week period. The test consisted of 44 multiple-choice questions. Student knowledge and understanding were also assessed through an evaluation of students' PPT presentations, student interviews, a focus group interview, gameplay log sheets, observation, and video recordings of gameplay discussions.

My role as the students' teacher and the researcher prevented me from assuming a purely detached role as researcher. I needed to collect data and remain as objective as possible while at the same time assisting my students in the learning process. Smith (2010) and Megowan-Romanowicz (2010) argue that such a dual stance does not present a conflict of interest and make the case that argued teachers can be researchers straddling the complimentary roles of practitioner and researcher. In fact, this what teachers do on a regular basis. According to Megowan-Romanowicz (2010), teachers should regularly examine their students' learning as well as their own classroom practice in order to improve instruction in the classroom.

Summary of Findings

This section reviews the results from this mixed methods study. The first section summarizes the findings of the quantitative analysis, the second section summarizes the findings of the qualitative analysis and the third section provides the personal reflections of the teacher as researcher.

Impact on Student Achievement

The first two research questions utilized quantitative data analysis to determine whether playing *Civilization IV: Colonization* would have an impact upon student academic performance. The results of the quantitative data analysis suggested students who engaged in gameplay utilizing *Civilization IV: Colonization* developed a greater understanding of some of the concepts covered in class than students who did not engage in gameplay.

The third research question utilized qualitative data analysis to determine if students in the experimental group developed a greater understanding of historical content than students in the control group.

Research question one. *What is the relationship between computer gaming as an instructional tool and student test scores among eleventh grade United States history students*?

The statistical analysis revealed there was no statistical difference in the pretest scores between the experimental group and the control group. The analysis revealed there was a statistical difference in the mean scores between the two groups for the posttest at $\alpha = 0.05$. The variance (r^2) was $r^2 = 0.13$. There was a medium, significant positive correlation between the two variables. The effect size $d = .36$ suggested gameplay had a positive effect

upon student performance. Students who engaged in gameplay achieved higher scores on the posttest than students who did not play *Civilization IV: Colonization*.

Research question two. *Is there a significant difference in the academic performance between students who engage in gameplay and students who do not*?

The analysis revealed there was a statistical difference in the mean scores between the experimental group and the control group for the project rubric at $\alpha = 0.05$. The variance (r^2) was $r^2 = 0.22$. There was a medium, significant positive correlation between the two variables. The effect size $d = .46$ suggested gameplay had a positive effect upon student performance. Students who engaged in gameplay achieved higher scores on the project rubric than students who did not play *Civilization IV: Colonization*.

Research question three. *What is the level of understanding of historical content among students who engage in gameplay and students who do not*?

Students who engaged in gameplay utilizing *Civilization IV: Colonization* demonstrated a higher the level of understanding of historical content as measured by the four of the eight content-based interview questions than students who did not engage in gameplay. There was a notable difference in student explanations for questions two, four, five, and six. Student responses for questions three, seven, and eight were similar regardless of engagement in gameplay. There was essentially no difference in the responses for question one. The analysis of the data suggested gameplay had a moderate effect on student understanding of historical content.

Student Perceptions of Learning

Research questions four and five utilized qualitative data analysis to determine student perceptions of learning as a result of playing *Civilization IV: Colonization.*

Research question four. *What are the student perceptions of computer gaming on their learning*?

Students indicated on the gamplay log sheets and in the focus interview that they believed playing *Civilization IV: Colonization* help them develop a greater understanding of historical content. The game enabled them to make personal connections to events and concepts discussed in class. They suggested the interactive nature of the game was a benefit because they had to make decisions that the colonists may have had to make. Students also suggested the game enabled them to visualize what life for the colonists must have been like. They also indicated playing the game helped them to realize colonization and development of successful and prosperous colonies was not an easy task.

Research question five. *How does peer interaction during gameplay impact student learning?*

Students not only discussed the game with their partners during gameplay, but continued these discussions beyond the gaming sessions with their partners as well as other students in the experimental group. Students stated they often followed the advice of others, shared information, offered suggestions, warnings, and guidance. Students had, in effect, created a social learning network. They engaged in social constructivism.

Vygotsky and social constructivists have stated learning is social and occurs through interaction and collaborative activities. Social interaction and cooperative learning appeared

to be a key component of student learning. The social constructivism gameplay students engaged in not only appeared to help them learn how to play the game, but helped them gain a better understanding of historical content and concepts as well.

Research question six. *How does student-teacher interaction surrounding gameplay impact student learning?*

Teacher-student discussions during gameplay as well as the teacher led discussions following gameplay sessions appeared to play an important role in the students' abilities to connect their gameplay experiences to factual knowledge. As the students' teacher, I was able to ask questions and guide student understanding, helping them to make connections to concepts such as the relationship between geography and economic development, and supply and demand. Whether students would have been able to make the connections without the discourse between student and teacher was not determined as that was not a focus of this study. However, the literature on computer gaming and student knowledge does indicate discourse is the key to student understanding.

Discussion

This research study supports existing literature that game-based learning may have benefits over traditional classroom practices (Gee 2007; Papert, 1998; Prensky, 2007; Schaffer, 2006). This research study supported other research, which suggested that students enjoy playing computer games (Annetta, 2008; Foster, 2009; Gee, 2005, 2007; Owston, 2009; Papert, 1998; Prensky, 2007, 2010), and in this case, when playing *Civilization IV: Colonization*, they were actively engaged in critical thinking and problem-solving as well.

Foster (2009), in a mixed method study using a computer game with eleven year olds, reported students did not feel as though they were learning, that gameplay was fun, yet the students actively engaged in critical thinking and problem solving. One question raised by Foster (2009) concerned whether or not what students were learning from gameplay transferred to academic performances. The results of this research suggested that such a transfer did occur supporting Goldstein's (2003) assertion that, computer games can help students develop strategic thinking skills that aid in the transfer of knowledge. The students who engaged in *Civilization IV: Colonization* gameplay had significantly higher scores on a content-based assessment and they had a greater understanding of historical content than students who did not play *Civilization IV: Colonization.*

Gameplay studies conducted by Blunt (2006), Charsky (2004), Foster (2009), Squire (2004), and Tisa (2006) reported active collaboration, problem-solving, critical thinking, and shared knowledge-building among gameplay participants. The findings of this study not only echoed the results of these previous computer game studies, but took those findings a step further by assessing student learning from computer gameplay in relation to specific historical content. This study also answered the call for more empirical studies of computer games in the classroom to determine the relationship between computer gaming and student learning, the development of specific content knowledge, and effective technology integration (Annetta, 2008; Arnseth 2006; Bolick, 2009; Lee & Freidman, 2009; Squire, 2003; Squire, 2004; Squire et al, 2005).

This study also supported previous research that game-based learning is active learning (Arnseth 2006; Gee, 2005; Papert, 1998). Students who participated in this research

project were observed discussing strategies, exchanging ideas, and making suggestions to each other. Students said that they learned from their mistakes as well as from others' mistakes. This study also supported previous research, which emphasized learning as a social activity through collaboration and the establishment of social networks (Annetta, 2008; Goldstein, 2003; Gordon, 2009; Oblinger, (2006) Papert, 1988; Pelletier & Oliver, 2006; Steinkuehler, 2004). Students said they discussed the game not only with their partner, but also outside the classroom as well. This research study also supported the literature concerning social constructivism which states that learning is a social activity which occurs through social interaction and collaborative activities.

This current study adds to previous research studies using *Civilization III* in a classroom setting. Squire (2004) examined the effect of playing *Civilization III* on a 9th grade World History class from a social activity perspective. He noted gameplay revolved around social practices in which students used gameplay to generate questions, reflected on their experiences, and collaborated with others. Squire (2004) concluded the various social practices throughout the gaming process were critical to student learning; however, his study did not examine student learning through traditional assessments. The findings reported in this research study supported Squire's findings of the importance of social interaction to the learning process while playing computer games and added to the existing research regarding the extent to which students learn traditional content through gameplay.

In another research study using *Civilization III* Charsky (2004) examined the use of concept mapping as a scaffolding technique, while playing *Civilization III*, to assist students in developing a greater understanding of historical content. Charsky (2004) concluded that

there was no significant difference in historical knowledge between students who used concept maps while playing the game and students who did not. He did note that the motivational level of students who were not using concepts maps was higher than students who were completing the concept maps throughout the research study. The research reported here did not use concept mapping as a scaffolding tool. Instead, it relied upon on student-teacher discussions as well as and student self-reported learning as the scaffolding tools.

This research study also built upon previous gameplay studies by the teacher-researcher. In a study of *Civilization III*, with a high school United States history class, Lee and Probert (2010) noted the potential of integrating *Civilization III* game concepts into specific curriculum content frames related to United States history. Lee and Probert (2010) described the importance of discourse between students and their teacher in developing students' understanding of concepts such as geography and diplomacy. Their research did not attempt to assess student learning through traditional measures such as standardized tests. The research study reported here using *Civilization IV*: *Colonization* reinforced the importance of discourse among students and their teacher in developing a greater understanding of historical concepts. This study went one step further by using traditional assessments to determine the effect of gameplay upon students' understanding of key concepts in United States history.

In another mixed method research study using Cable in the Classroom's *eElections* Probert (2010), reported results similar to the current study. The *eElections* study examined two classes of civics students. One class played *eElections*, which is a computer simulation game of the presidential election process, while the other class engaged in a traditional role-

play of the election process. The results of that study suggested students who engaged in gameplay with *eElections* developed a greater understanding of the election process, as indicated by test scores and student interviews, than the students who engaged in a traditional role-play of the election process.

Both mixed method studies showed a notable difference in students' understanding of social studies content. Students who engaged in gameplay, in both studies, outscored students who did not engage in gameplay, on multiple choice tests and demonstrated a greater understanding of content as evaluated through student and focus group interviews.

Reflections of a Teacher-Researcher

A key component of teacher research is systematic reflection that focuses on the teaching process and methods utilized by the teacher to facilitate students' learning. In this section I reflect on the teaching and researching processes that I engaged toward better understanding how these processes affected each other.

In playing the roles of teacher and researcher, I had to follow a fine line. My first responsibility was to my students. If they did not understand important content while playing *Civilization IV: Colonization*, such as what husbandry or a tobacconist was, or if they had questions related to the gaming experience, I could not just be a detached observer. I was ethically committed to assisting them as their teacher. My teaching and research goals were overlapping. I wanted students to learn content in both classes and wanted to determine if the two experiences were demonstrably different with regard to that learning. I also wanted to

examine the gameplay experience in depth in terms of how students created meaning during gameplay and in terms of my interaction with students during gameplay.

One important thing I realized early in the research was that I needed to provide better and more in depth instruction at the beginning of gaming sessions. The tutorial that was included in *Civilization IV* did not adequately prepare students for playing the game. Additionally, I realized that six gaming sessions (one for tutorial play and five for *Civilization IV: Colonization*) of approximately 50 minutes each was not enough time for the students to complete the game. Consequentially, I had to carefully manage students' experience during gameplay to ensure that students would engage relevant content and to keep them on track in the game narrative.

As a teacher, I felt the students who played *Civilization IV: Colonization* were able to gain a better understanding of exploration and the colonization process than the students who conducted research. The data suggested the same, specifically that students in the gameplay class outgained students in the other class on the test of content knowledge and on the assessment of their project presentations. From my perspective, gameplay provided invaluable opportunities for student-teacher discourse in ways that were not possible in the control class where students conducted independent research projects.

Limitations

A critical question remains unanswered. Specifically, did the students who played *Civilization IV: Colonization* outperform students in the control group because of the ways I facilitated each class? This question suggests that the results reported in this research must be

tempered given the limitation of classroom-based research. In terms of limitations, it is important to remember that results of this study are specific to the group of students who participated in this research and the results cannot be expected to apply be repeated with a different group of students. Stake (1995) described the generalizability of results from case studies such as this as petite generalizations. A petite generalization pertains to a single case study and is not intended to establish or modify a generalization.

There are several specific limitations to the study. One of the most important limitations of this research is the fact that I actively participated in both classes. As the students' teacher, I engaged the students in discussions in order to relate gameplay to themes and concepts of United States History. I also supported students in the control class as the research addressed the same themes and concepts. Students in both classes were engaging in complex learning activities. In the control class, I provided students with regular feedback on their research. In the experimental class, I provided instructions and guidance throughout the six sessions of gameplay. The fact that only 42 students participated in this research further limits the extent to which the findings can be generalized.

Recommendations

The findings from this study should encourage teachers, teacher researchers, administrators, educational specialists and others concerned about improving teaching practices, student learning, technology integration and the development of innovate classrooms to consider how computer games might be useful as an instructional tool. The

following recommendations expand on the potential of *Civilization IV: Colonization* for teachers and administrators.

Before introducing a computer game such as *Civilization IV: Colonization*, it is imperative that the teachers understand the game. Students who do not play computer games or have limited experience playing simulation role-play games such as the *Civilization* series, may initially experience frustration and ask for advice on how to do something or what to do.

Teachers or researchers who plan to use this game or other similar computer games should plan to spend extended time on the gameplay. This version of the *Civilization* series is best experienced over a period of time that allows students an opportunity to reflect and think deeply about the content topics they are engaging. Gameplay also requires students to be closely involved in the gameplay experience.

Teachers must be flexible and should realize that computer games, such as *Civilization IV: Colonization*, are only tools - instructional materials to assist students in the learning process. Just as a teacher needs to make reading a book, watching a movie, or interpreting a primary source relevant for students, computer games need to be made relevant and support classroom instruction as well.

Administrators will need to ensure there are computers dedicated to gameplay. This may require reserving time each week for each gaming session or the purchase of additional computers. Administrators will also need to be flexible and willing to take risks. They need to look beyond test scores and allow their teachers to implement new teaching practices to improve student learning.

Conclusion

The findings of this research suggested that students who played *Civilization IV: Colonization* learned more than students who conducted research on similar topics. Furthermore, the findings suggested that the social interaction associated with gameplay aided students as they constructed knowledge about specific social studies concepts and ideas. These findings demonstrated the potential of *Civilization IV: Colonization* gameplay to support student learning. The positive results from this research should encourage further investigation into the impact of utilizing computer games in the classroom to improve student learning. The research on the relationship between computer gaming and student learning is limited (Annetta, 2008; Bolick, 2009; Lee & Freidman, 2009; Slavin, 2002; Squire, 2004; Squire, Giovanetta, Devine, & Durga, 2005). While this research might be considered a success, it also leaves an important questions unanswered; Did the students who played *Civilization IV: Colonization* outperform students in the control group because of the ways I facilitated each class? and, Would the students who played *Civilization IV: Colonization* outperform students in the control group if I had not facilitated each class?

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APPENDICES

Appendix A

Data Collection Sequence

Type	**Item**	**Date**	**Collection Method**	**Time/Quantity**
Quantitative	Pretest	8/10/12	Multiple choice	44 questions
Qualitative	Field Notes (researcher)	10/31/12	Observation	
		11/07/12	Observation	
		11/14/12	Observation	
		11/20/12	Observation	
		11/28/12	Observation	
		12/05/12	Observation	
Qualitative	Field Notes (observer)	11/07/12	Observation	
		11/14/12	Observation	
		11/20/12	Observation	
		11/28/12	Observation	
		12/02/12	Observation	
Qualitative	Student Log Sheets	11/07/12	Document	15 log sheets
		11/14/12	Document	16 log sheets
		11/20/12	Document	13 log sheets
		11/28/12	Document	13 log sheets
		12/05/12	Document	13 log sheets
Qualitative	Class Discussion	11/14/12	Semi-structured questions	10:12
		11/20/12	Semi-structured questions	15:23 (1st Period)
		11/20/12	Semi-structured questions	14:46 (4th Period)
Qualitative	Researcher Reflections	Continuous		
Qualitative	Digital recordings	11/07/12	Digital video recorder	K & J 34:51
		11/14/12	Digital video recorder	M & B 38:03
		11/20/12	Digital video recorder	M & B 58:54
		11/28/12	Digital video recorder	M & B 23:23
		12/05/12	Digital video recorder	Z & K 34:22
Quantitative	Posttest	12/12/12	Multiple choice	44 questions
Quantitative	Presentations	12/12/12	Rubric	4x6 max score 24 pts
		12/13/12	Rubric	4x6 max score 24 pts
Qualitative	Individual Interviews (3)	01/04/13	Semi-structured questions	Non-Game Player 8:12
			Semi-structured questions	Game Player 8:42
			Semi-structured questions	Game Player 10:28
Qualitative	Individual Interviews (3)	01/07/13	Semi-structured questions	Non-Game Player 6:52
			Semi-structured questions	Non-Game Player 8:00
			Semi-structured questions	Game Player 9:15
Qualitative	Focus Group Interview (5)	01/11/13	Semi-structured questions	Game Players 21:23

Appendix B

Pretest/Posttest: US History

1. What happened in Europe in the 1400's and 1500's that led people to explore the Americas and establish colonies there?

(a) The Black Plague caused many people to want to leave Europe
(b) Political and economic competition among European countries increased
(c) People needed to find new sources of manufactured goods
(d) Local nobles became more powerful and kings lost power.

2. In the late 1400s and early 1500s, what was a major reason for the European voyages of exploration?

(a) introduction of Enlightenment ideas
(b) desire to control Constantinople
(c) rapid industrialization
(d) need for alternate trade routes

3. A major impact of the Columbian exchange on Western Europe was the introduction of

(a) Christianity that led to the rise of the Catholic Church
(b) new food crops that improved the European diet
(c) new military technology that weakened local rulers
(d) diseases that drastically reduced the population of Europe

4. During the 1500's and 1600's, what was the major cause of death among Indians of the Americas?

(a) Warfare among tribes
(b) Warfare between Native Americans and Europeans
(c) Infections and diseases brought by Europeans
(d) Changing climatic conditions

5. Indentured servants were different from slaves because indentured servants

(a) came from the West Indies
(b) were freed at the end of their term
(c) were paid less money
(d) did much easier work

6. Which of the following people were most likely to become indentured servants in the English colonies?

(a) Convicted criminals sent to the colonies to work off their sentences.
(b) Puritans seeking religious freedom and a job working for a religious family.
(c) Poor workers willing to trade their labor for passage to America.
(d) Freed slaves who could not yet afford to buy their own farms or start businesses.

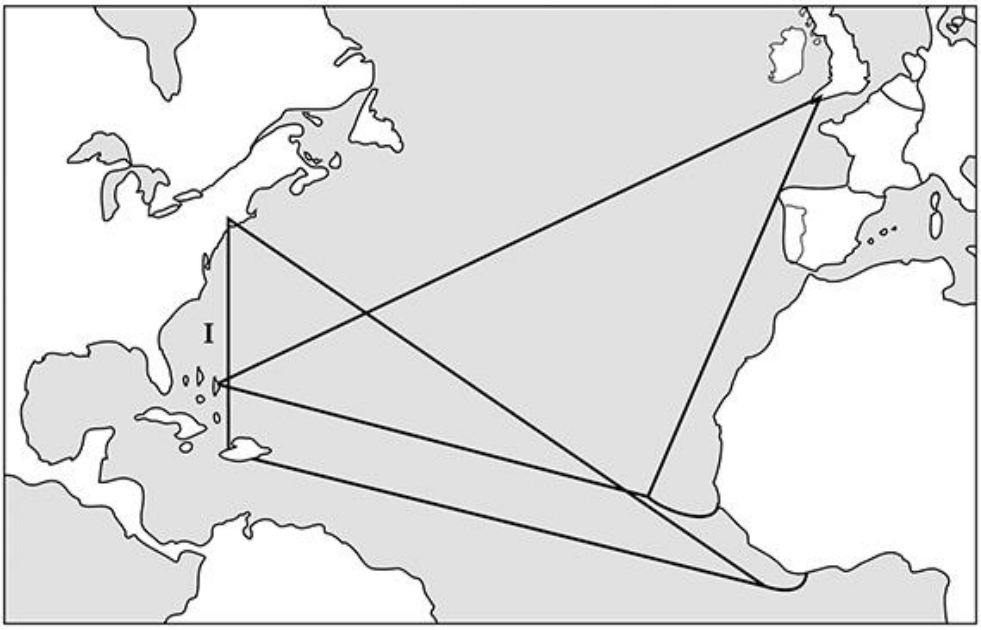
7. The British benefited from their mercantilist relationship with the American colonies primarily by

(a) supporting the growth of colonial industries
(b) prohibiting colonists from fishing and fur trading
(c) taking large amounts of gold and silver from the southern colonies
(d) buying raw materials from the colonies and selling them finished products

8. Which of the following best describes the British colonial policy called mercantilism?

(a) Encouraging colonists to sell manufactured goods to European countries
(b) Sending raw materials from Britain to the colonies
(c) Exercising British control over economic activities in the colonies
(d) Attempting to make the colonies economically self-sufficient

Use the map below to answer question #9.



9. In colonial times, what made up much of the trade that went along the route marked **I** on the map?

(a) Manufactured goods from the West Indies and slaves from North America
(b) Sugar and rum from the West Indies and grain and meat from North America
(c) Indigo from the West Indies and gold from North America
(d) Dried fish from the West Indies and oil and coal from North America

10. According to the European policy of mercantilism, colonies should

(a) benefit the mother country
(b) trade openly with various countries
(c) be left alone to manage their own affairs
(d) attempt to gain independence as soon as possible

Use the list below to answer question #11.

• Jamestown, founded in 1607
• Plymouth colony, founded in 1620
• New Amsterdam, founded in 1625

11. These early colonial settlements were similar in that each was located

(a) at the base of a mountain range
(b) near the coastline
(c) in an arid climate
(d) on offshore islands

12. What was an important difference between the English colonies in the Americas and those controlled by France, Portugal, and Spain?

(a) English colonies had more slaves than did other colonies.
(b) English colonists were allowed to form a type of self-government.
(c) Fewer people settled in the English colonies than in other colonies.
(d) Fewer people seeking religious freedom settled in the English colonies than in other colonies.

13. Before 1763, the British policy of salutary neglect toward its American colonies was based on the desire of Great Britain to

(a) treat all English people, including colonists, on an equal basis.
(b) benefit from the economic prosperity of the American colonies.
(c) encourage manufacturing in the American colonies.
(d) ensure that all mercantile regulations were strictly followed.

14. The first permanent English settlement in North America was

(a) St. Augustine
(b) Santa Fe
(c) Jamestown
(d) New Amsterdam

15. During the colonial period, goods were most commonly transported on

(a) rivers
(b) railroads
(c) canals
(d) turnpikes

16. The presence of which pair of geographic conditions discouraged the development of a plantation economy in the New England colonies?

(a) wide coastal plain and absence of good harbors
(b) rocky soil and short growing season
(c) numerous rivers and humid climate
(d) flatlands and lack of forests

17. What was the main cause of the French and Indian War (1754–1763)?

(a) disputed land claims in the Ohio River valley between the French and the British
(b) conflicts between American colonists and the French over control of the Great Plains
(c) taxation of American colonists without representation in Parliament
(d) violation of trade agreements between European nations and Native American Indians

18. During the first half of the 1800s, geographic factors influenced the economy of New England by

(a) encouraging the establishment of large plantations
(b) promoting the growth of trade and manufacturing
(c) increasing the region's reliance on slave labor
(d) supporting rice and indigo farming

19. Because of fertile land and a long growing season, plantations in the thirteen colonies developed in

(a) New England
(b) the Middle Atlantic region
(c) the South
(d) the upper Mississippi River valley

20. Which geographic feature contributed the most to the development of commerce throughout colonial America?

(a) mountains
(b) natural harbors
(c) grasslands
(d) interior lakes

21. Since the late 1700s, the Mississippi River has been a vital waterway because it

(a) divided the northern territories from the southern territories
(b) allowed American farmers direct access to Canadian markets
(c) connected the Great Lakes to the Atlantic Ocean
(d) provided farmers and merchants an outlet to the Gulf of Mexico

22. Maryland was among the first colonies to grant

(a) legal rights to American Indians
(b) religious toleration to all Christians
(c) the right of all colonists to own slaves
(d) full political rights to all free Black people

23. Anne Hutchinson was banished from Massachusetts in 1637 because she

(a) wanted women to have the right to vote
(b) expressed religious beliefs that threatened Puritan leaders
(c) tried to start a separate colony called Rhode Island
(d) refused to marry and have children

24. What is the main reason the Pilgrims and Puritans came to America?

(a) To practice their religion freely
(b) To make more money and live a better life
(c) To build a democratic government
(d) To expand the lands controlled by the king of England

25. The Great Awakening of the 1730's was important because it led people in the American colonies to

(a) increase toleration for Roman Catholics
(b) examine the different positions of men and women in society
(c) reaffirm that God gave kings their right to rule
(d) question the authority of church and government leaders

26. The Mayflower Compact and the Virginia House of Burgesses are most closely associated with

(a) abuses by absolute monarchs
(b) establishment of religious toleration
(c) steps toward colonial self-government
(d) adoption of universal suffrage

27. Which heading best completes the partial outline below?

I. _____

A. Mayflower Compact
B. House of Burgesses
C. New England town meetings

(a) Attempts to Overthrow British Rule
(b) Development of Self-Government in the American Colonies
(c) Establishment of British Parliamentary Control Over the Colonies
(d) Social Reform Movements in the American Colonies

28. *Federalism* is best defined as a principle of government that

(a) divides power between the central government and state governments
(b) includes a system of checks and balances
(c) allows the states to nullify national laws
(d) places the most power in the hands of the legislative branch

29. In the publication *Common Sense*, Thomas Paine argued that

(a) foreign nations would reject an independent American government
(b) the British government would be impossible to overthrow
(c) America was dependent on British trade and protection
(d) the American colonies should break away from England

30. American colonists showed their opposition to the British taxation and trade restrictions of the 1760s primarily by

(a) supporting the French against the British
(b) boycotting products from Great Britain
(c) overthrowing the royal governors in most of the colonies
(d) purchasing additional products from Native American Indian tribes

31. The main purpose for writing the Declaration of Independence was to

(a) declare war on Great Britain
(b) force France to support the Revolutionary War
(c) convince Great Britain to abolish slavery
(d) state the colonists' reasons for separating from Great Britain

32. The colonists' slogan, "No taxation without representation," expresses a belief in

(a) free trade
(b) economic interdependence
(c) the supremacy of Parliament
(d) the consent of the governed

33. Which heading best completes the partial outline below?

I. _____

A. Committees of Correspondence
B. Non-importation Agreements
C. Boston Tea Party
D. First Continental Congress

(a) Protests Against Slavery in the American Colonies
(b) British Parliamentary Actions to Punish Colonial Americans
(c) Colonial Responses to British Mercantile Policies
(d) Colonial Attempts to End the British Policy of Salutary Neglect

34. What was the most significant factor that led the American colonists to form the First Continental Congress in 1774?

(a) Religious conflict inside the colonies
(b) The desire of the colonists to write a Constitution to replace the Articles of Confederation
(c) Colonial frustration with laws passed by the British Parliament
(d) The desire of the colonists to stop the war between Britain and the colonies

35. One major consequence of the Seven Years' War (French and Indian War) was that the

(a) colonists decision to side with France led Britain to retaliate against them
(b) expense of fighting the war led Britain to tax the colonies directly for the first time
(c) loyalty of the colonists to the British side led Britain to grant them a high degree of self-government.
(d) elimination of the French threat in North America led Britain to concentrate on conquering all of the remaining Spanish colonies

36. Which of these was not one of the thirteen colonies that fought the American Revolution against the British?

(a) New Hampshire
(b) Massachusetts
(c) Maine
(d) Virginia

37. During the Revolutionary War, one outcome of the colonial victory at the Battle of Saratoga that helped ensure the final defeat of the British was the

(a) entrance of France on the American side
(b) recapture of New York City from the British
(c) mutiny of the British forces under General Howe
(d) defeat of British forces at Valley Forge, Pennsylvania

38. Which idea guided the development of the Articles of Confederation?

(a) A strong central government would threaten the rights of the people.
(b) All the people should be granted the right to vote.
(c) Most power should rest with the judicial branch.
(d) Only the central government would have the power to levy taxes.

39. During the Constitutional Convention of 1787, the Great Compromise resolved a conflict over

(a) presidential power
(b) the issue of nullification
(c) representation in Congress
(d) taxes on imports

40. Many people opposed ratification of the Constitution without a bill of rights because they

(a) were afraid the states would be too powerful without a bill of rights
(b) thought that a bill of rights would strengthen the President's power
(c) did not want the national government to have an army
(d) feared that the new national government would deny people their rights

41. The primary purpose of the *Federalist Papers* was to

(a) justify the American Revolution to the colonists
(b) promote the continuation of British rule
(c) encourage ratification of the United States Constitution
(d) support the election of George Washington as President

42. During the debate over the ratification of the Constitution, Anti-federalists argued that

(a) the new Constitution left too much political power to state governments
(b) a strong national government would gain respect from European nations
(c) checks and balances were unnecessary in a federal government
(d) the new Constitution would threaten the rights of individual citizens

43. The writers of the Constitution corrected an economic weakness under the Articles of Confederation when they

(a) granted Congress the power to levy and collect taxes
(b) created an executive branch headed by the president
(c) granted the president the authority to negotiate treaties
(d) created a two-house legislature

44. What is one feature of the political system created by the Constitution of the United States?

(a) guaranteeing equal legal rights to all persons
(b) requiring the federal government to maintain a balanced budget
(c) dividing powers between the national and state governments
(d) granting more power to the executive branch than to the other branches of government

Appendix C

Civilization IV: Colonization

PowerPoint Requirements:

Slide 1: Title and Name

Slide 2: Your country and why you chose it.

Slide 3: Where did you colonize? Why? How many settlements?

Slide 4: Where did your country actually colonize and why?

Slide 5: Economy of your colony/settlements. Why?

Slide 6: Types of colonists you recruited. Why?

Slide 7: Economy of the English colonies.

Slide 8: Who did your colony/settlements trade with? Why? What items?

Slide 9: Who did the English colonists trade with? Why? What items?

Slide 10: Your colony's/settlements' relations with other nations/peoples.

Slide 11: The English colonists' relations with other nations/peoples.

Slide 12: Difficulties you colonists/settlements experienced.

Slide 13: Difficulties the English colonists/settlements experienced.

Slide 14: Alliances you colonists/settlements established. Why?

Slide 15: Alliance the English colonists established.

Slide 16: Difficulties/problems your colonists/settlements had with your mother country.

Slide 17: Difficulties/problems the English colonists had with Great Britain.

Slide 18: What was the most important thing that happened during your gameplay sessions?

Slide 19: If you were to start a new game, what would you do differently?

Slide 20: How did the game relate to concepts covered/discussed in class?

Slide 21: Did the game help you understand exploration and colonization of the New World? Why or why not?

Appendix D

Exploration, Colonization and Revolution: Major Event: Wars

PowerPoint Requirements:

Slide 1: Title and Name

Slide 2: Picture/Image (Choose a picture/image which reflects your topic)

Slide 3: Countries involved.

Slide 4: Climate (What was happening prior to this event)

Slide 5: Catalyst or Spark (Describe people or events that caused the war to happen)

Slide 6: Long-term Causes (Events that built over time to cause the war)

Slide 7: Effect on Life - Social

Slide 8: Effect on Life - Social (Primary source document)

Slide 9: Effect on Life - Economic

Slide 10: Effect on Life - Economic (Primary source document)

Slide 11: Effect on Life - Political

Slide 12: Effect on Life - Political (Primary source document)

Slide 13: Key non-military people (contributions/role)

Slide 14: Key military personnel (contributions/role)

Slide 15: Major Battles and Outcomes

Slide 16: Turning Point (Explain why)

Slide 17: Final Battle

Slide 18: Treaty (components)

Slide 19: Impact/results of the war

Slide 20: Conclusion (Your analysis of the war and its impact upon North America)

Slide 21: References (use APA format)

Appendix E

Exploration, Colonization and Revolution: Major Event: Non-War

PowerPoint Requirements:

Slide 1: Title and Name

Slide 2: Picture/Image (Choose a picture/image which reflects your topic)

Slide 3: Country/Territory/Region/Colony involved

Slide 4: Climate (What was happening prior to this event)

Slide 5: Catalyst or Spark (Describe people or events that caused this event to happen)

Slide 6: Long-term Causes (Problems or issues over time that contributed to the event)

Slide 7: Effect on Life - Social

Slide 8: Effect on Life - Social (Primary source document)

Slide 9: Effect on Life - Economic

Slide 10: Effect on Life - Economic (Primary source document)

Slide 11: Effect on Life - Political

Slide 12: Effect on Life - Political (Primary source document)

Slide 13: Key people (contributions/role)

Slide 14: Key people (contributions/role)

Slide 15: Key people (contributions/role)

Slide 16: Impact (Describe how the event affected North America)

Slide 17: Impact (Describe how the event affected the Country/Territory/Region/Colony)

Slide 18: Quote (Important quote that reflects/symbolizes the event and person who said it)

Slide 19: Conclusion (Your analysis of the event and its results)

Slide 20: Conclusion (Your analysis of key people/who was the most significant and why)

Slide 21: References (use APA format)

Appendix F

PowerPoint Presentation Rubric

Name: _____
Topic: _____

Scoring	1	2	3	4
Required # of slides	Missing more than three slides	Missing two slides	Missing one slide	All slides present
Content	Does not seem to understand the topic very well.	Shows a good understanding of parts of the topic.	Shows a good understanding of the topic.	Shows a full understanding of the topic.
Comprehension	Student is unable to accurately answer questions posed by teacher or classmates about the topic.	Student is able to accurately answer a few questions posed by teacher or classmates about the topic.	Student is able to accurately answer most questions posed by teacher or classmates about the topic.	Student is able to accurately answer almost all questions posed by teacher or classmates about the topic.
Grammar/Spelling	More than 4 errors in spelling or grammar.	Four misspellings and/or grammatical errors.	Three or fewer misspellings and/or mechanical errors.	No misspellings or grammatical errors.
Volume	Volume often too soft to be heard by all audience members.	Volume is loud enough to be heard by all audience members at least 80% of the time	Volume is loud enough to be heard by all audience members at least 90% of the time.	Volume is loud enough to be heard by all audience members throughout the presentation.
Creativity	Use of font, color, graphics, effects etc. but these often distract from the presentation content.	Makes use of font, color, graphics, effects, etc. but occasionally these detract from the presentation content.	Makes good use of font, color, graphics, effects, etc. to enhance to presentation.	Makes excellent use of font, color, graphics, effects, etc. to enhance the presentation.
References	No references listed	References include a search engine	References present; not in proper format	References in APA format

Total Score: _____
Grade: _____
Comments:

Appendix G

Civilization IV: Colonization Log Sheet

Starting and ending years in the game today: _____

Events (things that occurred today):

Big ideas for the Day (if any of the following happened, please describe):

Built a settlement/town ____	Acquired territory____	Explored _____
Improved settlement/town_____	Defense ____	Conflict _____
Contact with another people____	Alliances_____	Wealth_____
Economic Development_____	Occupations_____	Trade Items_____
Create or change government Defense_____		

Appendix G

Things you learned today:

What was the most important thing that happened?

What was fun or not fun about playing the game?

Would you have done anything differently? If so, explain

What plans do you have for your colony?

How did the game play relate to concepts discussed in class?

What do you not understand or want to know more about?

Appendix H

Semi-structured Student Interview Protocol

1. Why did European nations explore and colonize the New World?

2. Define Mercantilism.

3. Explain the relationship between a colony and its mother country.

4. What impact did colonization have upon the native populations?

5. Describe the economy/economic focus of the English colonies.

6. Why did the relationship between the colonies and England deteriorate?

7. What was the purpose of the Navigation Acts? How did the Navigation Acts affect the colonial economy?

8. Why did the colonists object to Parliament imposing taxes on them?

Appendix I

Semi-structured Focus Group Interview Protocol

1. What did you like about the game?

2. What did you learn while playing the game? (follow up questions will focus on content items from the actual gameplay episode that preceded the interview)

3. Do you feel the game helped you to understand concepts covered in class? If so, why? If not, why?

4. Where there any things that happened in the game that you did not like or agree with? If so, why?

5. Do you remember learning or hearing about any of the things that came up in the game in your regular class, maybe during another activity or a lecture or in reading in the book? If so, please describe.

6. Describe _____(use a specific activity in the game)?

7. Can you explain _____ (use a specific concept from the game)?

Appendix J

Domestic Advisor Screen Shot

Appendix K

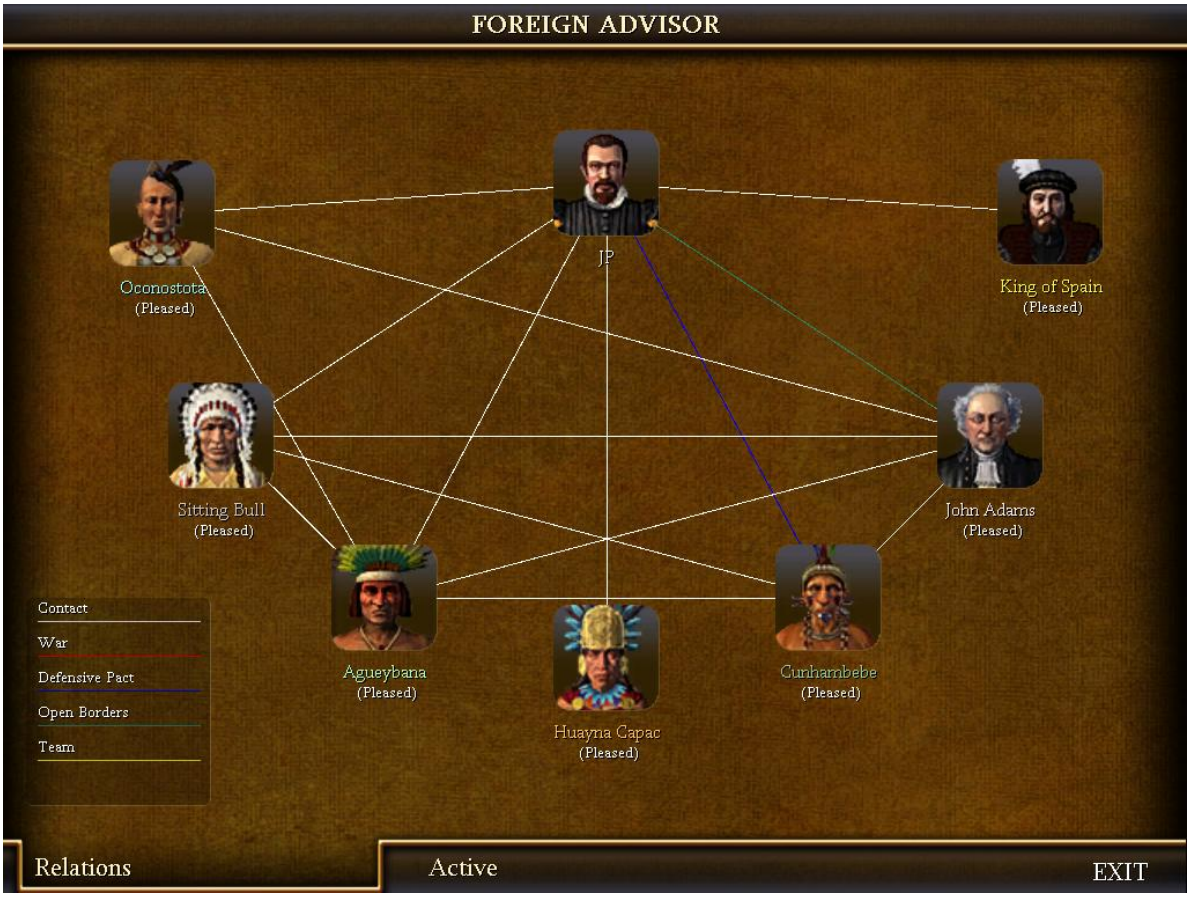
Military Advisor Screen Shot

Appendix L

Revolution Advisor Screen Shot

Appendix M

Foreign Advisor Screen Shot



Appendix N

NCES STANDARD: 2-6

PURPOSE: To ensure that educational tests used in NCES surveys for measuring and making inferences about education-related domains are valid, technically sound, and fair. To ensure that the administration and scoring of educational tests are standardized, that scales used over time are stable, and that the results are reported in a clear unbiased manner.

STANDARD 2-6-1: Instrument Development-All test instruments used in NCES surveys must be developed following an explicit set of specifications. The development of the instrument must be documented so that it can be replicated. The instrument documentation must include the following:

1. Purpose(s) of the instrument;

2. Domain or constructs that will be measured;

3. Framework of the instrument in terms of items, tasks, questions, response formats, and modes of responding;

4. Number of items and time required for administration;

5. Context in which the instrument will be used;

6. Characteristics of intended participants;

7. Desired psychometric properties of the items, and the instrument as a whole;

8. Conditions and procedures of administering the instrument;

9. Procedures of scoring; and

10. Reporting of the obtained scores.

GUIDELINE 2-6-1A: Relevant experts should review the domain definitions and the instrument specifications. The qualifications of the experts, the process by which the review is conducted, and the results of the review should be documented.

GUIDELINE 2-6-1B: All items should be reviewed before and after pilot and field tests. Pilot and field tests should be conducted on subjects with characteristics similar to intended participants. The sample design for pilot and field tests should be documented.

GUIDELINE 2-6-1C: Field test sample should include an adequate number of cases with the characteristics necessary to determine the psychometric properties of items.

GUIDELINE 2-6-1D: Empirical analysis and the model (e.g., Classical and/or Item Response Theory) used to evaluate the psychometric properties of the items during the item review process should be documented.

GUIDELINE 2-6-1E: When a time limit is set for performance, the extent to which the scores include a speed component and the appropriateness of this component to the defined domain should be documented.

GUIDELINE 2-6-1F: If the conditions of administration are allowed to vary across participants, the variations and rationale for them should be documented.

GUIDELINE 2-6-1G: Directions for test administrations should be described with sufficient clarity for others to replicate.

GUIDELINE 2-6-1H: When a shortened or altered form of an instrument is used, the differences from the original instrument and the implications of those differences for the interpretations of scores should be documented.

STANDARD 2-6-2: Validity - All test instruments used in NCES surveys must meet the purpose(s) stated in the instrument specifications. All intended interpretations and proposed uses of raw scores, scale scores, cut scores, equated scores, and derived scores, including composite scores, sub-scores, score differences, and profiles, must be supported by evidence and theory.

GUIDELINE 2-6-2A: Evidence of validity should be based on analyses of the content, response processes (i.e. the thought processes used to produce an answer), internal structure of the instrument, and/or the relationship of scores to a criterion.

GUIDELINE 2-6-2B: The rationale for each intended use of the test instruments and test proposed interpretations of the scores obtained should be explicitly stated.

GUIDELINE 2-6-2C: When judgments occur in the validation process, the selection process for the judges (experts/observers/raters) and the criteria for judgments should be described.

STANDARD 2-6-3: Reliability - The scores obtained by a test instrument must be free from the effects of random variations due to factors such as administration conditions and/or differences between scorers. The reliability of the scores must be adequate for the intended interpretations and uses of the scores.

The reliability must be reported, either as a standard error of measurement or as an appropriate reliability coefficient (e.g., alternate form coefficient, test-retest/stability coefficient, internal consistency coefficient, generalizability coefficient). Methods (including selection of sample, sample sizes, sample characteristics) of quantifying the reliability of both raw and scale scores must be fully described. Scorer reliability, rater to rater, and rater-year reliability must be reported when the scoring process involves judgment.

GUIDELINE 2-6-3A: All relevant sources of measurement errors and summary statistics of the size of the errors from these sources should be reported.

GUIDELINE 2-6-3B: When average scores for participating groups are used, the standard error of measurement of group averages should be reported. Standard error statistics should include components due to sampling examinees, as well as components due to measurement error of the test instrument.

GUIDELINE 2-6-3C: Reliability information on scores for each group should be reported when an instrument is used to measure different groups (e.g., race/ethnicity, gender, age, or special populations).

GUIDELINE 2-6-3D: Reliability information should be reported for each version of a test instrument when original and altered versions of an instrument are used.

GUIDELINE 2-6-3E: Separate reliability analyses should be performed when major variations of the administration procedure are permitted to accommodate disabilities.

Appendix O

Levels of Understanding: Student Interview

Question	Looking for	Level I	Level II	Level III	Level IV	Level V
Exploration and colonization	God, Gold, Glory; trade; religion; resources; water route to Asia					
Explain mercantilism	colonies serve mother country; raw materials; manufactured goods					
Relationship; colony and mother country	political control; rules colony; protection; economic control; colony subservient; regulation of trade					
Effect on Native Populations	disease; population decline; warfare/conflict; killed; loss of land					
Economic Focus of English colonies	**S**-agriculture; cash crops; example; **M**-mixed agriculture, staples, example; **NE**-fishing, trade/commerce, lumber, ship building					
Why did relationship deteriorate	French & War, taxation, restrictions, no political voice, no representation					
Navigation Acts	limited trade, restricted trade, England only, limited economic development, restricted development of manufacturing, smuggling					
Why object to taxation	no representation, no taxation without representation, no political voice, did not vote for members of Parliament, virtual representation					

Appendix P

Concept Evidence Data Sheet: Gameplay Day ____

Concepts/Content	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
agriculture												
alliances												
conflict												
death												
debt												
defense												
diplomacy												
disease												
economy/economic diversity												
education												
exploration												
food supply												
geography												
improvements												
industry/manufactured goods												
invasion												
labor/occupations												
loss of land												
mercantilism												
mother country												
political control												
politics												
raw materials/resources												
relationships												
religion												
representation												
self-government												
settlement												
skilled/experts												
starvation												
storage/shortages												
taxation												
territorial expansion												
trade												
trade restrictions												
transportation												
wealth												