STARS

2010

Comparison Of Learning Experiences And Outcomes Between A Serious Game-based And Non-game-based Online American History Course

Taryn Hess
University of Central Florida

Showcase of Text, Archives, Research & Scholarship

COMPARISON OF LEARNING EXPERIENCES AND OUTCOMES BETWEEN A
SERIOUS GAME-BASED AND NON-GAME-BASED
ONLINE AMERICAN HISTORY COURSE

by

TARYN LEIGH SYBOL HESS
B.S. Florida State University, 2002
M.S. Florida State University, 2005

A dissertation submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy
in the College of Education
at the University of Central Florida
Orlando, FL

Summer Term
2010

Major Professor: Glenda A. Gunter

ABSTRACT

The use of online courses continues to increase despite the small amount of research that exists on the effectiveness of online educational environments. The little research that has been conducted has focused on evaluating factors taken into consideration during the adoption of online learning environments. One notable benefit often cited is the ability to incorporate multimedia such as video games. Although game researchers and developers are pushing for the use of video games for educational purposes, there is a lack of research on the effectiveness of serious video games. When paring the increasing use of online educational environments, the push to use serious video games, and the lack of research on the effectiveness of online learning environments and video games, there is a clear need for further investigation into the use of serious video games in an online format. Based on current literature, no other known study has conducted an analysis comparing a serious game-based and non-game based online course; making this a unique study.

The purpose of this study was to compare student learning experiences and outcomes between a serious game-based and non-game based online American History course. The data sources were data provided from Florida Virtual School (FLVS) and student and teacher interviews. Random samples of 92 students were statistically analyzed. A group of 8 students and 4 teachers were interviewed. FLVS data provided were analyzed using an independent t-test and the Mann-Whitney test and the student and teacher interview were analyzed using thematic analysis.

Results of an independent t-test revealed that there was a significant (p < .01) difference in the mean number of days necessary to complete the course (M_{GB} = 145.80, SD_{GB} = 50.64, M_{NGB} = 112.63, SD_{NGB} = 49.60). The Mann-Whitney results indicated a significant difference between course performance and the type of American history course (Z = -5.066, p < .01); students in the serious game-based online course had an A average whereas students in the non-game-based online course had a B average. The thematic analysis of the relationship between student performance and motivation in both courses indicated that students and teachers of the game-based online course provided more reasons for student motivation than the students and teachers in the non-game-based online course. The thematic analysis of what aspects do students perceive as helpful and/or hindering to their learning indicated that students and teachers of the game-based online course provided more desirable, more helpful, less undesirable, and less hindering aspects for their course than the students and teachers in the non-game-based online course. As a result of the unique nature of this study, the findings provide new information for the fields of research on online learning, serious video gaming, and instructional design as well as inform instructional-designers, teachers, education stakeholders, serious video game designers, and education researchers.

To all of those who have supported me along my journey,

words can not describe the depth of my gratitude.

ACKNOWLEDGMENTS

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS/ACRONYMS

FLDOE   Florida Department of Education

FLVS   Florida Virtual School

IRB   Internal Review Board

MMOG   Massively Multiplayer Online Game

OLE   Online Learning Environment

SDT   Self-Determination Theory

SSS   Sunshine State Standards

USDOE   United States Department of Education

VR   Virtual Reality

CHAPTER ONE: INTRODUCTION

Over the past eight years, the use of online courses has increased drastically. In post-secondary institutions, it is estimated that online courses have had a nineteen percent annual growth rate from fall 2002 to fall 2008; this growth of online courses far exceeds that of traditional enrollment at post-secondary institutions (Allen & Seaman, 2010). In K-12 education, a reported forty seven percent increase was seen during the 2007-2008 school year with an expected twenty two percent increase in students taking online courses by the 2009-2010 school year (Picciano & Seaman, 2009).

As online environments continue to increase, many researchers argue that the effectiveness of the design and pedagogical techniques used in these environments should be assessed (Chen, 2007; Harden, 2008; Huett, Moller, Foshay, & Coleman,, 2008; Ke & Hoadley, 2009; Lee, 2005; Maltby & Mackie, 2009; Picciano & Seaman, 2007; USDOE, 2009; Watson & Ryan; 2007). While little research exists on the effectiveness of online learning environments (Chen, 2007; Huett et al., 2008; Lee, 2005; United States Department of Education [USDOE], 2009), many researchers have evaluated factors often taken into consideration when online learning environments are adopted (Allen & Seaman, 2010; Adams & DeVaney, 2009; Falloon, 2010; Huett et al., 2008; Leijen, 2008; Leijen, Admiraal, Wildschut, & Simons, 2008; Picciano & Seaman, 2009; USDOE, 2009).

One of the beneficial factors associated with online learning environments is the ability to incorporate multimedia such as educational or serious video games (Annetta, Mangrum, Holmes, Collazo, & Cheng, 2009; Delwiche, 2006; Ke, 2008; Martineau, 2009; Sheehy, Ferguson, & Clough, 2008; USDOE, 2009). While video games are often thought of as only for entertainment purposes, game researchers and developers are creating video games for educational settings in hopes of tapping into student's interests (Annetta et al., 2009; Annetta & Park, 2006; Barab et al., 2005; Brown & Bell, 2004; Delwiche, 2006; Gunter, Kenny, & Vick, 2006; Ke, 2008; Kirkley & Kirkley, 2005; Sheehy, Ferguson, & Clough, 2008; Virvou, Katsionis, & Manos, 2005; Yee, 2006). Although games appear to be a method of linking authentic, engaging, and appealing learning activities to student interests (Annetta et al., 2009; Annetta & Park, 2006; Barab et al., 2005; Dalgarno & Lee, 2010; Gunter, Kenny, & Vick, 2007; Ke, 2008; Kirkley & Kirkley, 2005; Virvou et al., 2005), there are pros and cons for the use of games for educational purposes.

Some of the noted benefits of using games are that they promote social collaboration, enhance computer literacy skills, improve attention, increase reaction time, teach problem solving skills, encourage active self-regulated learning, enhance understanding through emotional connections, alternative learning approach, and they are fun (Annetta et al., 2009; Annetta & Park, 2006; Barab et al., 2005; Brown & Bell, 2004; Buckley & Anderson, 2006; Delwiche, 2006; Faria & Wellington, 2004; Gunter & Kenny, 2008; Ke, 2008; Kirkley & Kirkley, 2005; Sheehy et al., 2008; Yee, 2006). Gender differences, accessibility, frustration, aggression, staffing concerns, lack of

instructional design models for gaming, ease of development, lack of understanding of educational benefits, and lack of quality serious video games are all considered negative factors to using video games in educational settings. (Annetta et al., 2009; Annetta & Park, 2006; Brandt, 2008; Buckley & Anderson, 2006; Delwiche, 2006; Gentile & Gentile, 2008; Ke, 2008; Sheehy et al., 2008; Virvou et al., 2005; Yee, 2006).

As a result of the overarching push to use video games in education and the lack of incorporating adequate instructional design principles, researchers argue for additional research into the effectiveness of video games intended for the classroom (Buckley & Anderson, 2006; Delwiche, 2006; Ke, 2008; Kirkley and Kirkley, 2005; Rice, 2005; Virvou et al., 2005). Virvou, Katsionis, and Manos (2005) explain that, while the motivational advantages are clearly noted, the criticism of educational games may be warranted. As a result, there is a need to further investigate the educational effectiveness of the design of educational games. Also the authors' state that "Such investigation may lead to useful guidelines for the design of effective educational software games. Indeed, educational software games should be designed in such a way that they are educationally beneficial for all students, even those that are not familiar with computer games" (p. 54).

When paring the increasing use of online educational environments, the push to use serious video games, and the lack of research on the effectiveness of these games, there is a clear need for further investigation into the use of serious video games in an online format. Thus, this study sought to compare student learning experiences and outcomes between a serious game-based and non-game based online American

3

History course. Based on current literature, no other known study has conducted an analysis comparing a serious game-based and non-game based online course; making this a unique study. As a result of the unique nature of this study, the findings provide new information for the fields of research on online learning, serious video gaming, and instructional design as well as inform instructional-designers, teachers, education stakeholders, serious video game designers, and education researchers.

Purpose

The purpose of this study was to compare student learning experiences and outcomes between a serious game-based and non-game based online American History course. The study investigated the amount of time that students took to complete their course as well as student performance in their course. The study identified students' intrinsic motivation as based on Self-Determination Theory (Deci & Ryan, 2000; Ryan & Deci, 2000). The study examined whether there is a relationship between students' assessment performance and their intrinsic motivation in their course. Furthermore, the study examined student's perception on what aspects of their course helped and/or hindered their learning in relation to their intrinsic motivation.

Research Questions

1. Will the amount of time that students take to complete a serious game-based online American history course differ from the amount of time students take to complete a non-game-based online American history course?

2. Will student performance in a serious game-based online American history course differ from student performance in a non-game-based online American history course?

3. What is the relationship between student performance in both courses and intrinsic motivation, as determined by the Self-Determination Theory?

4. What aspects of a serious game-based online American history course and a non-game-based online American history course do students perceive as helpful and/or hindering to their learning?

Hypotheses

In order to answer the quantitative questions the researcher stated the following null statistical hypotheses:

There is no statistically significant difference between the amount of time it takes students to complete the serious game-based online course and the non-game-based online course.

There is no statistically significant difference between students' performance in the serious game-based online course and the non-game-based online course.

Theoretic Framework

This study used the Self-Determination Theory (SDT) as its theoretic framework. The SDT is a motivation theory focused on the development and functioning of

personality within social contexts (Deci & Ryan, 2000; Ryan & Deci, 2000). Ryan and Deci (2000) describe the theory as being grounded in the idea that people are naturally active organisms, "…with innate tendencies toward psychological growth and development, who strive to master ongoing challenges and to integrate their experiences into a coherent sense of self" (p.68). This natural tendency is explained as an active engagement that requires support from the social environment to maintain the innate psychological needs of competence, autonomy, and relatedness (Deci & Ryan, 2000; Ryan & Deci, 2000).

Significance of the Study

This study is significant in that it provides research based evidence on the experiences of a serious game-based online American history course and a non-game-based online American history course. It is significant to instructional-designers, teachers, education stakeholders, serious video game designers, and education researchers. The study provides evidence that the serious game-based course was effective based on the student performance data. The amount of time students take to complete their courses can be used by teachers and educational stakeholders when considering whether to implement either of these approaches of teaching and learning American history. The results for aspects that helped and/or hindered learning were found for each course can be helpful for instructional designers and serious video game designers when developing new serous video game and online courses. The results of

the study are significant to educational researchers who are considering the use of

serious video games in their research as well as can be helpful for researchers in the

design of their research and for future studies.

Assumptions of the Study

The following assumptions were made while investigating the research

questions:

1. Study participants responded honestly to interview questions.

2. Study participants were representative of all students and teachers within online

   American history courses.

Limitations of the Study

Since qualitative data is not generalizable, the subsequent findings can not be

generalized and are bound to the students who are enrolled in these courses at Florida

Virtual School (FLVS) (Marshall & Rossman, 2006). While the thematic analysis found

students to have high intrinsic motivation and a relationship between intrinsic motivation

and course performance this data can not be generalizable. The quantitative data used

in this study can only be generalized for high school students who are taking or have

taken their high school American history course in a fully-online format. The amount of

time students took to complete their course can not be equated to time on task as data

was limited on the amount of time students took to complete tasks as well as the depth

and breadth of assignments for each course. The amount of time students took to complete their course can not be equated to student engagement as this is not a direct measure of student satisfaction, motivation or engagement but is rather a measure of the date students enrolled in their course to the date students completed their course. As data was not provided nor was an analysis was not conducted on the similarities and differences between the content depth and breadth of assignments in each course, the performance findings are limited in their generalizability.

Overview of Dissertation

The chapters of this dissertation are organized in the following order. Chapter two is a review of the literature focused on online learning, serious video games, and the self-determination learning theory. Chapter three describes the methodology employed in this study which includes the research design, instruments, and procedures. Chapter four explains the data analysis and findings of the research study. Chapter five discusses the conclusion of the research study concluding with recommendations for future studies.

Operational Definitions

Autonomy: within the SDT, is an "…internal perceived locus of causality" or an internal perception of the cause of success or failure" (Ryan & Deci, 2000, p.70).

Competence: within the SDT, is "…the need to be effective in one's interactions with the environment" (Jang, Reeve, Ryan, & Kim, 2009, p. 644).

Educational Setting: is an environment in which learning occurs. For this study, the educational setting encompasses the student's online course, the physical setting where they log-in and interact with their course, and other computer based settings in which they engage while engaged with their course.

Serious Video Game: is an interactive video game designed and aligned with educational standards to support teaching and learning.

Intrinsic Motivation: is motivation that comes from inside a person (a student likes and/or enjoys doing something and wants to do well) rather than from an external force (extra credit, money, rewards).

Multimodal Learning: "…using many modes and strategies that cater to individual learners' needs and capacities" (Stansbury, 2008, para 1).

Relatedness: within the SDT, is characterized as a sense of security and connectedness or "the need to feel belongingness and connectedness with others" (Ryan & Deci, 2000, p.73).

Social Interaction: is the exchanging of information and ideas when interacting with others. For this study, this exchange is specifically between their peers, teacher, and interactive portions of the game.

Triangulation Convergence Model: is methodology for researchers to collect both quantitative and qualitative data at the same general time but in separate instances on the same phenomenon (Creswell & Plano-Clark, 2007). At a later time, they unite the

data sets together to synthesis findings. It is used when researchers want to "compare results or to validate, confirm, or corroborate quantitative results with quantitative findings" (p. 65).

Triangulation Design: is a mixed methods research design that uses both qualitative and quantitative approaches to gather data on the same phenomenon. The intent stated by Creswell and Plano-Clark (2007) is to "…bring together the differing strengths and nonoverlaping weaknesses of quantitative methods with those of qualitative methods" (p.62).

Serious Game-Based Online Course: is a Web-based video game designed to meet the standards required of a full credit high school course while supporting teaching and learning. In this study, the video game was designed for the teaching and learning of American history.

Online Learning Environment: is a Web-based platform created to support teaching and learning. For this study, this online learning environment is their serious video game course.

CHAPTER TWO: LITERATURE REVIEW

Background

In an effort to compare student learning experiences and outcomes between a serious game-based and non-game based online American History course, this chapter reviews the literature on online learning environments, multimedia in online learning environments, and serious video games. Additionally, it reviews literature on the Self-Determination Theory.

Online Learning Environments

An educational setting is an environment in which learning occurs. In this study, the learning environment has an online component due to its Web-based platform. Since the courses were online, it is felt that a brief literature review should be done to explain the impact this has on learning.

Online learning, also regarded as Web-based, e-learning, distributed learning, and distance learning, is learning that occurs across different geographic, organizational, and other boundaries (Annetta & Park, 2006; Bromham & Oprandi, 2006; Chou & Liu, 2005; Kalay, 2004; Keller, 2005; Martins, Gilson, & Maynard, 2004; Ruiz, Mintzer, & Leipzig, 2006; Westbrook, 2006). This can take place using multiple methods (video conferences, CDs, telephones, computers, blogs, wikis) however in recent times it is increasingly conducted via the Internet (Adams & DeVaney, 2009; Beldarrain, 2006; Chou & Liu, 2005; Hall, 2009; Hall, 2007; Harden, 2008; Huett et al.,

2008; Kalay, 2004; Keller, 2005; Kim & Bonk, 2006; Lee, 2005; Leijen et al., 2008; Persky, 2009; Ruiz et al., 2006; United States Department of Education, 2009; Westbrook, 2006).

Online learning environments (VLE) are increasingly being used as an alternative option for traditional learning in education (Adams & DeVaney, 2009; de Freitas, Rebolledo-Mendez, Liarokapis, Magoulas, & Poulovassilis, 2010; Evergreen Education Group, 2009; Hall, 2009; Hall, 2007; Harden, 2008; Kim & Bonk, 2006; Petrakou, 2010; USDOE, 2009; Watson & Ryan, 2007). In the Sloan Consortium's report on *Online Education in the United States*, it was reported that 4.6 million students are taking post-secondary online courses with a reported nineteen percent annual growth increase from fall 2002 through fall 2008. This increase far exceeds the annual student enrollment increase of one and a half percent at post-secondary institutIons (Allen & Seaman, 2010).

In Watson and Ryan's (2007) K-12 nationwide report, twenty five states had supplemental online programs, four states had significant full-time programs, thirteen states had both supplemental and full-time programs, and eight without supplemental or full-time programs. Growth indicators were reported as seventy two percent of all responding programs having significant increases in their student enrollment in the 2006-2007 school year (Watson & Ryan, 2007). In the 2009 nationwide report, twenty states had supplemental online programs, eleven states had significant full-time programs, fourteen states had both supplemental and full-time programs, and five without supplemental or full-time programs; an increase of three additional states having

online programs from 2007. For the 2008-2009 school year, growth was reported as being the greatest among the larger state online schools with a total of sixteen or sixty four percent of all states with online school programs showing an increase in their enrollment; six states or twenty four percent found no change and three states or twelve percent found a decrease of no more than ten percent in their enrollment (Watson, Ryan, & Wicks, 2009).

In 2009 the Sloan Consortium released a K-12 nationwide report, the number of students enrolled in an online course in the 2007-2008 school year was estimated at slightly over one million students which is an increase of 47% since the 2005-2006 school year. This growth is expected to continue with an estimated 22.8% increase in students taking online courses by the 2009-2010 school year (Picciano & Seaman, 2009).

Noting this increasing growth of VLEs, assessing the effectiveness of the design and pedagogical techniques used in these environments should be researched (Chen, 2007; Harden, 2008; Huett et al., 2008; Ke & Hoadley, 2009; Lee, 2005; Maltby & Mackie, 2009; Picciano & Seaman, 2007; USDOE, 2009; Watson & Ryan; 2007). Huett et al. (2008) state that "Unfortunately, little research currently exists to inform decisions about online learning in K-12 schools" (p. 5). They continue by explaining that due to instructional designer's position they are "…uniquely qualified to help fill this research gap" (p. 5). Lee (2005) conducted a literature review of e-learning literature resulting in the push for more research evaluating the effectiveness of such environments. Along with this finding, she explains that a straightforward design approach should be used

that emphasizes interaction. Chen's (2007) formative research project on virtual reality (VR) learning environments was used to explore the robustness of a new instructional-design model. The implications for improvement upon the design theory are to adapt help seeking features from instructors and peers. The pilot also provided feedback for the evaluation process to be used for future formative research on this same instructional design VR model (Chen, 2007).

The United States Department of Education (2009), a meta-analysis of literature on online learning in K-12 from 1994 through 2006, found "…no experimental or quasi-experimental studies…" (p. xiv). In response to this finding their search criteria was extended to 2008 resulting in the location of only five published studies involving K-12 learners. An additional key finding from the meta-analysis was that "Students who took all or part of their class online performed better, on average, than those taking the same course through traditional face-to-face instruction" (p. xiv).

Although it appears that there is a lack in research on the effectiveness of these environments, many researchers have evaluated factors that are taken into consideration during the adoption of these types of learning environments. Saving money, student and teacher motivation, keeping up with technology, flexibility, increased access to different courses, convenience, and interactive multimedia are a few of the noted benefits to adopting online environments (Allen & Seaman, 2010; Annetta & Park, 2006; Beldarrain, 2006; Bromham & Oprandi, 2006; Chou & Liu, 2005; Falloon, 2010; Huett et al., 2008; Kalay, 2004; Keller, 2005; Lee, 2005; Leijen, 2008; Picciano & Seaman, 2009; Ruiz et al., 2006; USDOE, 2009; Watson & Ryan, 2007;

Westbrook, 2006). In addition, there are drawbacks to using this type of environment. Student can feel isolated, frustrated, anxious, and confused resulting in a decrease in content interest (Adams & DeVaney, 2009; Leijen, Admiraal, Wildschut, & Simons, 2008; Picciano & Seaman, 2009; Westbrook, 2006). Teachers and staff can feel frustrated and confused if they do not receive proper support resulting in their lack of acceptance of using online environments. Also, organizations have to come up with large up-front investments in hardware and software to manage these environments as well as economic and policymaking implications that are a result of VLEs (Allen & Seaman, 2010; Adams & DeVaney, 2009; Leijen, Admiraal, Wildschut, & Simons, 2008; Picciano & Seaman, 2009; Westbrook, 2006).

Multimedia in Online Learning Environments

One of the noted benefits of online environments is the ability to incorporate multimedia. Interactive graphics, videos, podcasts, online interactive environments, and serous video games are all forms of multimedia (Annetta et al., 2009; Beldarrain, 2006; Dalgarno & Lee, 2010; Delwiche, 2006; Martineau, 2009; USDOE, 2009; Watson & Ryan, 2007). Multimedia are often used as a teaching and learning strategy to enhance retention through the use of multiple modes of learning and increase higher order thinking while gaining student's attention and interest (Annetta et al., 2009; Barab et al., 2005; Chuang & Chen, 2009; Delwiche, 2006; Ke, 2008; Livingstone, Kemp, & Edgar, 2009; Martineau, 2009; Metiri Group, 2008; Stansbury, 2008; USDOE, 2009).

15

Although the use of multimedia is considered an effective way to delivery content that gains student attention and interest, the effectiveness of its use to enhance learning is unclear in the literature. Research is mixed ranging from having positive (being more effective than traditional one dimensional learning) to neutral (having no perceived influence) effects on learning (Livingstone, Kemp, & Edgar, 2009; Metiri Group, 2006; USDOE, 2009).

Stansbury's (2008) analysis on how multimedia can improve learning, links neuroscience research on memory and processing to the use of multimedia in education. Considering knowledge of memory and processing, incorporating media into learning is stated as being "…more effective than traditional, unimodal learning, which uses a single mode or strategy" (para. 1). It is also stated that when visual references are added to auditory contexts students "…learn more than students who use only text" (para. 2), which is cited as a direct result of improving retention through the use of multiple modes of learning. In addition, this report notes that the implementation of multimedia has a significant effect on student academic gains; students using interactive media have minor academic gains (9 percentile points) compared to interactive multimedia that engages higher-order thinking (32 percentile points) (Stansbury, 2008).

The Metiri Group's (2006) meta-analysis on learning through media states, "researchers have shown that significant increases in learning can be accomplished through the informed use of visual and verbal multimodal learning" (p. 12). In contrast within the same report, they cite a meta-analysis of over 650 empirical studies that

"…compared media-enabled distance learning to conventional learning found pedagogy to be more strongly correlated to achievement than media" (p. 15).

In the United States Department of Education's (2009) report on practice in online learning, it states both support for multimedia use for learning as well as that empirical evidence shows that learning is not positively or negative affected by multimedia enhancements. The report states that "…many researchers have hypothesized that the addition of images, graphics, audio, video, or some combination would enhance student learning and positively affect achievement" (p. 41). Despite this the majority of studies to date have found that "…these media features do not affect learning outcomes significantly" (p. 41). Despite the finding that media does not appear to affect learning outcomes, it was noted that "…some evidence suggest that the learner's ability to control the learning media is important" (p. 48).

Livingstone, Kemp, and Edgar's (2009) study on the use of virtual or online worlds for education found that there is a demand by educators for interactive online worlds and that some of these online worlds are proving to be useful for educators. In addition they found that scaffolding is necessary when using different e-learning technologies like interactive online environments. They state "…we saw that effective use of e-learning technologies, including virtual worlds, requires that learners focus on learning, not on technology" (p. 148). They explain that scaffolding can be accomplished through the careful development of narratives that provide "…goals and a means of assessing progress towards achieving those goals" (p. 148).

<u>Serious Video Games</u>

Educational or serious video games are a form of interactive multimedia designed and aligned with educational standards to support teaching and learning. These games are often referred to as Edutainment – a combination of entertainment with education – however a trend in the educational gaming field is swaying away from the use of this terminology as it focuses heavily on entertainment rather than education (Abrams, 2009; Hall, 2009). Video games are thought of as only being appropriate for entertainment despite their original purpose as an instructive tool for the military. It was only when the toy industry began marketing video games, circa 1969, that they became viewed as entertainment (Abrams, 2009).

Although video games are widely regarded as entertainment, the notion of using them for educational purposes has resurfaced. The momentum of this previous concept of incorporating gaming and education has pushed some researchers and developers to revisit the use of serious video games (Abrams, 2009; Annetta et al., 2009; Annetta, Murray, Laird, Bohr, & Park, 2006; Annetta & Park, 2006; Barab et al., 2005; Brown & Bell, 2004; Chuang & Chen, 2009; Delwiche, 2006; Gunter, Kenny, & Vick, 2008; Gunter, Kenny, & Vick, 2006; Hall, 2009; Ke, 2008; Kenny & Gunter, 2007; Kirkley & Kirkley, 2005; Liu & Lin, 2009; Sheehy, Ferguson, & Clough, 2008; Virvou, Katsionis, & Manos, 2005; Yee, 2006). The goal of using these video games is to tap into student's interests of gaming as a method of motivating student learning. Despite what appears to be a good fit between video games, student interests, and learning, there are pros and cons to the use of video games in education. Benefits to using games are cited as

social collaboration, enhance computer literacy skills, improving attention, increasing reaction time, teach problem solving skills, considered safe learning environments, increasing participation, alternative learning approach, encourage active self-regulated learning, enhance understanding through emotional connections, increasing motivation, and they are fun (Annetta et al., 2009; Annetta & Park, 2006; Buckley & Anderson, 2006; Chuang & Chen, 2009; Delwiche, 2006; Hall, 2009; Gunter & Kenny, 2008; Ke, 2008; Markovic, Petrovic, Kittl, & Edegger, 2007; Moshirnia, 2007; Sheehy et al., 2008; Yee, 2006). Some of the negative factors to using serious video games are gender differences, accessibility, frustration, aggression, staffing concerns, lack of instructional design models for gaming, ease of development, lack of understanding of educational benefits, and lack of quality serious video games (Annetta et al., 2009; Annetta & Park, 2006; Brandt, 2008; Buckley & Anderson, 2006; Delwiche, 2006; Gentile & Gentile, 2008; Ke, 2008; Moshirnia, 2007; Sheehy et al., 2008; Virvou et al., 2005; Yee, 2006).

Ke (2008) states "Skeptics toward game-based learning contend that the effectiveness of computer games on learning is still a mystery" (p. 1). They claim that a common cynicism on using computer games for learning "…lies in the lack of an empirically-grounded framework for integrating computer game into classrooms" (p. 1). This is in conjunction with Delwiche's (2006) assessment that "Researchers continue to document the educational potential of games, but there have been few attempts to explain their effectiveness in the context of an overarching theoretical perspective" (p. 161). Also, Kirkley and Kirkley (2005) explain that currently existing instructional methodologies,

19

Do not adequately address how to design and deliver learning in the context of mixed reality and virtual reality or how to move seamlessly between these modalities as well as traditional technologies within an instructional environment. This requires using, adapting and envisioning models of instructional design that are flexible, adaptive and based on innovative instructional methods as well as new technologies. With movements towards developing learner-centered approaches, user needs and goals will drive the design rather than traditional design processes. (p. 49)

As a result of the overarching push to use serious video games and the lack of adequate design principles, researchers argue for additional research on the effectiveness of serious video games and their pedagogical design (Buckley & Anderson, 2006; Delwiche, 2006; Ke, 2008; Kirkley and Kirkley, 2005; Liu & Lin, 2009; Rice, 2005; Torrente, Moreno-Ger, & Fernandez-Manjon, 2008; Moshirnia, 2007; Virvou et al., 2005). Virvou et al. (2005) explain that the motivational advantages and criticism of using software games are clearly noted therefore there needs to be further investigation software games for education. In doing so they state that "Such investigation may lead to useful guidelines for the design of effective educational software games. Indeed, educational software games should be designed in such a way that they are educationally beneficial for all students, even those that are not familiar with computer games" (p. 54).

Serious Video Games in Online Learning Environments

Online video games have been in existence since the early 1990s in the form of massively multiplayer online games (MMOGs). Today MMOGs have millions of subscribers with the largest MMOG, *World of Warcraft,* having 8.5 million subscribers.

These games are played using computers and/or gaming consoles over the Internet. Subscribers have to pay a monthly fee to access the online game and to interact with other subscribers (Achterbosch, Pierce, & Simmons, 2007; Childress & Braswell, 2006; Yee, 2006).

The interactivity, accessibility, flexibility, and student interest of these MMOGs have many educators and researchers looking toward using them for educational purposes. Unlike regular video games, MMOGs are accessible over the internet which increases the availability for students to interact within these environments (Annetta et al., 2006; Annetta & Park, 2006; Dalgarno & Lee, 2010; Delwiche, 2006; Hew & Cheung, 2010; Kenny & Gunter, 2007; Torrente, Moreno-Ger, & Fernandez-Manjon, 2008; Yee, 2006). Even though there is a push to incorporate MMOGs and education, few empirical studies exist on the effectiveness of using these games for learning (Dalgarno & Lee, 2010; de Freitas et al., 2010; Delwiche, 2006; Watson & Ryan, 2007). In turn, many researchers and educators argue for the need of research evaluating the effectiveness as well as different factors that impact the use of MMOGs for educational purposes (Dalgarno & Lee, 2010; de Freitas et al., 2010; Hew & Cheung, 2010; Watson & Ryan, 2007).

Delwiche's (2006) study on the use of MMOGs to teach undergraduate students ethnography and game design, examined the use of two different online gaming environments; Everquest and Second Life. The findings suggest that accessibility to the online environment and the use-ability of the game impact student learning and that students prefer to play with other people. In addition, it was concluded that learning did

21

occur in both of these environments however it is emphasized that game-based

assignments are "…most effective when they build bridges between the domain of the

game world and the overlapping domain of professional practice" (p. 169).

Dalgarno and Lee's (2010) literature review on the use of 3-D online

environments for educational purposes, found the need for research on the design,

development, and use of 3-D online environments for learning. One finding is that most

published sources on the use of 3-D technology in education are "…anecdotal evidence

or personal impressions that cannot be usefully generalized beyond the local context"

(p. 23). They concluded that "…the continued development of and investment in 3-D

games, simulations, and online worlds for educational purposes should be considered

contingent on further investigation into the precise relationships between the unique

characteristics of 3-D VLEs and their potential learning benefits" (p. 10).

de Freitas, Rebolledo-Mendez, Liarokapis, Magoulas, & Poulovassilis' (2010)

meta-analysis on evaluative frameworks for learning activities in online worlds, found

that a transition to the use of immersive learning experiences is occurring in the use of

online worlds for educational purposes. They state that, "The motivational capacities of

game-play when brought together with the social interactions of online worlds may be a

powerful teaching combination in the future" (p. 80). One finding of the analysis is that

"…the uses of virtual worlds for learning is still a relatively new field, and as this

preliminary study has shown there is a significant learning curve when using virtual

world applications to support learning" (p. 80). The analysis concludes that capabilities

of hardware and accessibility can significantly reduce effectiveness, the ability to control

avatars can impact engagement and motivation, orientation to the environment is

necessary to maximize engagement, and the use of established pedagogical principles

and well-structured session are necessary for providing enriched experiences for the

learner. In addition, the study concludes that "…more work is needed to find out ways of

engaging more learners with how to structure the activities, and greater support in

advance of trialing is required" (p. 80).

Hew and Cheung's (2010) meta-analysis of empirical studies on the use of

immersive 3-D online worlds in education settings examined all published journals and

conferences proceedings from present day to March 2008. It found that online worlds

were used for communication spaces, simulation of space, and experiential spaces. In

addition, most research focused on participants' affective domain, learning outcomes,

and social interaction; students were found to like using these online worlds however

disliked accessibility and communication problems related to these environments. The

meta-analysis concluded with the need for future research to examine sociocultural

factors, methods to utilize online worlds in multiple cultural contexts, the influence of

countries on online worlds, and how different geographical context influence online

worlds.

<div align="center">Self-Determination Learning Theory</div>

In this study students' intrinsic motivation as based on Self-Determination Theory

for both a serious game-based and non-game based online American History course

were identified (Deci & Ryan, 2000; Ryan & Deci, 2000). The Self-Determination Theory

(SDT) was used as the study's theoretic framework.

Self-Determination Theory

Self-Determination Theory (SDT) is a motivation theory focuses on the development and functioning of personality within social contexts (Deci & Ryan, 2008; Deci, Vallerand, Pelletier, & Ryan, 1991; Deci & Ryan, 2000; Ryan & Deci, 2000; Vansteenkiste, Lens, & Deci, 2006). Ryan and Deci (2000) describe the theory as being grounded in the idea that people are naturally active organisms, with innate tendencies toward psychological growth and development, who strive to master ongoing challenges and to integrate their experiences into a coherent sense of self. This natural tendency is explained as an active engagement that requires support from the social environment to maintain the innate psychological needs of competence, autonomy, and relatedness (Deci & Ryan, 2008; Deci & Ryan, 2000; Deci et al., 1991; Ryan & Deci, 2000; Deci & Ryan, 2008; Vansteenkiste, Lens, & Deci, 2006). The theory has two distinct classes of behaviors that set it apart from other motivation theories; intentional or motivated and controlled. Motivated actions are self-regulated and autonomous which is in contrast to controlled actions that are completed in an act of compliance instead of by choice (Deci & Ryan, 2008; Deci et al., 1991; Ryan, Koestner, & Deci, 1991).

The impact that intrinsic motivation has on the learning process is clearly noted throughout motivation literature related to self-regulation (Byman & Kansanen, 2008; Deci, Eghrari, Patrick, & Leone, 1994; Deci & Ryan, 2008; Deci & Ryan, 2000; Deci et al., 1991; Ryan & Deci, 2000; Deci & Ryan, 2008; Jang, Reeve, Ryan, & Kim, 2009; Metiri Group, 2008; Ryan, Kuhl, & Deci, 1997; Vansteenkiste, Lens, & Deci, 2006;

Williams & Deci, 1996; Xie, DeBacker, & Ferguson, 2006). Deci, Vallerand, Pelletier, and Ryan (1991) found in their meta-analysis on intrinsic motivation that students who had more self-determined forms of motivation for doing school work are "…more likely to stay in school, to achieve, to evidence greater conceptual understanding, and to be well adjusted..." (p. 332) when compared to students with less self-determined types of motivation. Ryan and Deci's (2008) meta-analysis on the use of SDT as an approach to psychotherapy, states that "…an atmosphere of autonomy support, which has often been found to facilitate satisfaction of all three psychological needs, is critical to clients' active engagement" (p. 187).

In educational settings, the goal of this theory is to enhance these intrinsically motivated behaviors while addressing student innate psychological needs (Deci et al., 1991). This is accomplished through the promotion of behaviors and activities that build students interest in learning, a valuing of education, and a confidence in their own capabilities and attributes (Deci et al., 1991). Ryan and Deci (2008) noted specific actions used to support self-directed behavior, in their meta-analysis of SDT research, as "…understanding and acknowledging individuals' perspectives, providing them with unconditional regard, supporting choice, minimizing pressure and control, and providing a meaningful rationale for any suggestions or requests" (p. 188). Along with these actions, Byman and Kansanen (2008) argue that curriculum plays a significant role in influencing student motivation. As a result, they suggest further research into the theoretical underpinnings and programs that drive curriculum development and the

need for curriculum developers to "…take into account the normative nature of learning and teaching in school" (p. 618) when designing curriculum.

Cho (2004) conducted a study on developed design strategies to promote student's regulation of their learning. "Cognitive, meta-cognitive, resource management, and affective activities…" (p. 175) were listed as being vital to self-regulated learning. The specific design strategies that were listed alongside these activities are goal setting, self-monitoring, self-evaluation, repetition, time management, help seeking, constructive feedback, encouragement, and self-checks. The findings from this study are that self-regulated learning skills are not improved in short periods of time and autonomy and responsibility should be given to students to regulate their own learning when practicing these design strategies. Also, it was found that simply exposing students to these skills is not enough and that additional and continuous interaction needs to be promoted.

Summary

Student enrollment into VLEs is far exceeding the regular annual enrollment increase at post-secondary institutions. The Sloan Consortium reported that 4.6 million students are taking post-secondary online courses; a reported nineteen percent annual growth increase from fall 2002 through fall 2008. While the use of VLEs is a rapidly increasing, there is a lack in research on the effectiveness of these environments.

Despite the lack of effectiveness research, many factors have been identified as benefitting and hindering the use of these environments. Benefits are noted as saving money, student and teacher motivation, keeping up with technology, flexibility,

increased access to different courses, convenience, and interactive multimedia. The drawbacks are cited as students and teachers can feel isolated, frustrated, and anxious, organizations become financially burdened by the management of hardware and software, and government organizations are burdened with making economic and policymaking decisions related to online learning. While interactive multimedia, such as serious video games, have been found to benefit online learning environments by tapping into student interest, many researchers and educators are pushing for the need to evaluate the effectiveness of using such tools.

CHAPTER THREE: METHODOLOGY

The purpose of this study was to compare student learning experiences and outcomes between a serious game-based and non-game based online American History course. The study examined student performance and the amount of time that students took to complete their course. The study identified students' intrinsic motivation as based on Self-Determination Theory (Deci & Ryan, 2000; Ryan & Deci, 2000). The study examined whether there is a relationship between students' assessment performance and their intrinsic motivation in their course. Furthermore, the study examined student's perception on what aspects of their course helped and/or hindered their learning in relation to their intrinsic motivation. In this chapter, the methodology, sample population, context, instrumentation, and data analysis are explained.

Research Questions

The research questions were developed based on several components of the Self-Determination Theory (SDT) as well as specific FLVS data that were provided to the researcher. According to the SDT, active engagement requires support from the social environment and the environment must maintain students' innate psychological needs of competence, autonomy, and relatedness (Deci & Ryan, 2000; Ryan & Deci, 2000). In addition to these components of the SDT, literature states that the amount of time taken to complete a course, student performance, and student perception of the

usefulness of different features of their course are linked to student intrinsic engagement, satisfaction, and intrinsic motivation (Douglas, Miller, Kwansa, & Cummings, 2007; Singh & Lee, 2008; Sitzmann & Ely, 2010; Stallings, 1980; Xie, DeBacker, & Ferguson, 2006; Wells, de Lange, & Fieger, 2008; Zahner, 2006). From these components of the SDT theory and the related literature linked to the provided FLVS data, the following research questions were developed.

1. Will the amount of time that students take to complete a serious game-based online American history course differ from the amount of time students take to complete a non-game-based online American history course?

2. Will student performance in a serious game-based online American history course differ from student performance in a non-game-based online American history course?

3. What is the relationship between student performance in both courses and intrinsic motivation, as determined by the Self-Determination Theory?

4. What aspects of a serious game-based online American history course and a non-game-based online American history course do students perceive as helpful and/or hindering to their learning?

Mixed Methods Research

For this study, the mixed methods triangulation convergence model was used (Creswell & Plano Clark, 2007). This consisted of using qualitative and quantitative methods to investigate the same event. The use of multiple methodologies triangulates

the data which supports the validity and reliability of the data and enhances the

confidence in the study's findings (Glesne, 2006). Creswell & Plano Clark (2007)

describe the mixed methods triangulation convergence model consisting of one

concurrent phase. Thus, both methods were "…collected, analyzed and interpreted at

approximately the same time" (p.81). Then the different results were converged during

the interpretation phase of data analysis; the data collection and data analysis

processes are described within chapter 3, the results are described within chapter 4,

and the comparison, contrast, and interpretation of the results are combined in the

discussion sections of chapter 5 (see Figure 3.1).
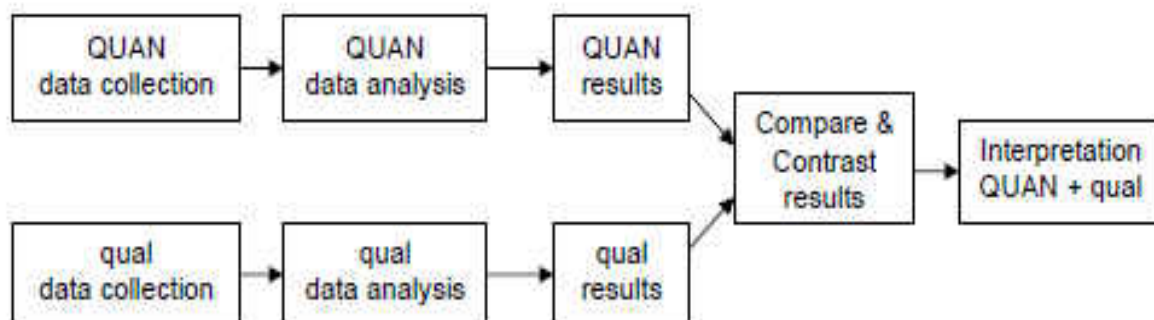
Figure 3.1 Research Design: Triangulation Convergence Model

In this design, Creswell & Plano Clark (2007) state that the researcher "collects

and analyzes quantitative and qualitative data on the same phenomenon" (p.64). The

rationale for this approach is "…to obtain different by complementary data" used to

"compare and contrast quantitative statistical results with qualitative findings" (p.62).

These are then used together to reach a "…valid and well-sustained conclusions about a single phenomenon" (p.65). The intent is to "…bring together the differing strengths and non-overlapping weaknesses of quantitative methods (large sample size, trends, generalization) with those of qualitative methods (small N, details, in depth)" (p.62).

Mixed Methods research methodologies call for the researcher to declare the rationale for the chosen timing, weight, and mixing of data sources (Creswell & Plano Clark, 2007). The purpose for explicitly stating these factors is to design and conduct a manageable study that is situated around a framework that logically guides the research methodology (p. 79). For this study, the timing was chosen based on the practical use of having both instruments used to gather data within the same timeframe as well as it fits with the data analysis procedure being implemented to address the study's questions. The mixing methodology, merging data sets, was chosen to allow for comparing and contrasting the different data results (Creswell & Plano Clark, 2007).

Rigor in the Research

Rigor will be warranted through the use of multiple data collection methods, valid and reliable data, and an efficient research design (Black & Deci, 2000; Glesne, 2006; Williams & Deci, 1996). The use of multiple data collection methods ensures triangulation (Glesne, 2006). Also, this study will follow an efficient research design. Cited by Creswell and Plano Clark (2007),

> The design makes intuitive sense, …and it has become a framework for thinking about mixed methods research. It is an efficient design, in which both types of data are collected during one phase of the research at roughly the same time. Each type of data can be collected and analyzed separately and independently,

using the techniques traditionally associated with each data type. This lends itself to team research, in which the team can include individuals with both quantitative and qualitative expertise (p. 66).

The study was examined and approved by both the University of Central Florida's Internal Review Board (IRB) and Florida Virtual School (FLVS) (see Appendices D, E, and F). The University of Central Florida's Internal Review Board, the FLVS, students, parents, and teachers were informed that all documentation regarding this research (digital recordings & transcriptions) will be kept in a secure location and destroyed once it is no longer needed for this study.

<div align="center">Study Population</div>

Florida Virtual School

The population of this study was 9th to 11th grade students enrolled in American history courses in FLVS. The school is fully accredited and it was founded in 1997. The school served over 71,000 students through their more than 90 available courses during the 2008-2009 school year (see Figure 3.2). All courses at FLVS have a continued enrollment process meaning students can enroll in courses throughout the year. The enrollment participation by school type for the same school year was Public and Charter 64%, Home School 29%, and Private 7%. The gender ratio of the school for the 2008-2009 school year was 58% Female and 42% Male (FLVS, 2010e). Both middle and high school level courses are taught including Advanced Placement (AP) and honors. Florida

Virtual School also provides students outside of the state access through their Florida Virtual Global School.

Florida Virtual School has received multiple state, national, and international awards for their excellence in promoting e-learning, education, and educational leadership. The school is nationally recognized as a leader in their field and was recently ranked as number one in the nation on promoting online learning by the Center for Digital Education (Florida Department of Education [FLDOE], 2008; FLVS, 2008).
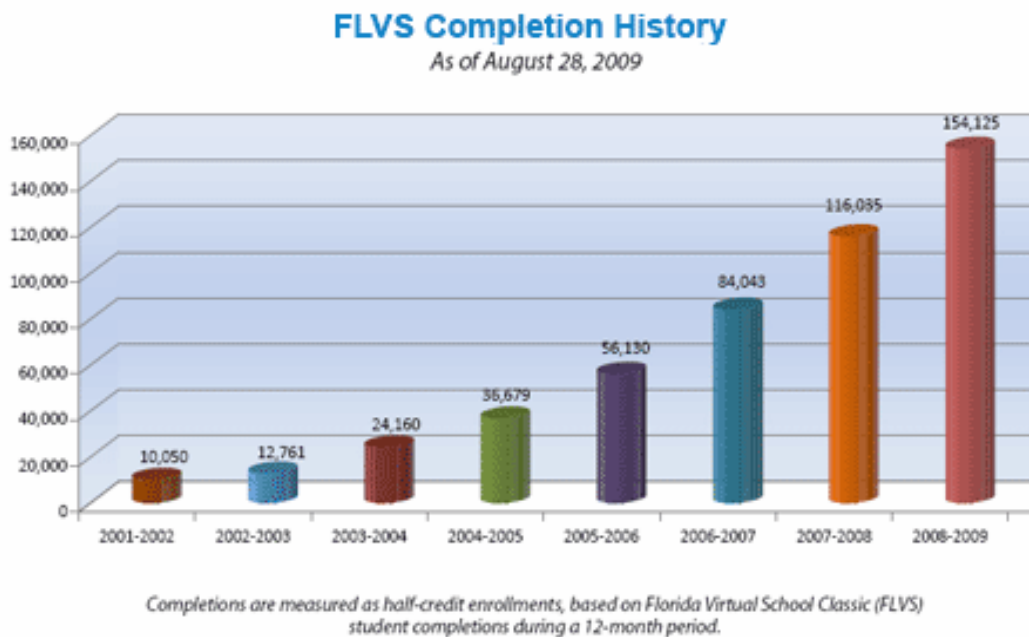
Figure 3.2 FLVS Completion Half-Credit Enrollment History 2001 through 2009

Sample

The quantitative sample for this study was derived from all high school students who completed the non-game-based online course and the serious game-based online course from April 22, 2009 until February 1, 2010. A total of 92 students from each

course were randomly selected (n = 184). The sample size was derived from a normality analysis of the samples for each course. After outliers were removed for each course, the total numbers of remaining students were 92 in the serious game-based online course and 5,510 for the non-game-based online course. In order to have equal samples from each course 92 students were randomly sampled from the non-game-based course; matching the size of the serious game-based online course.

The qualitative sample for this study was all students who were willing to participate in interviews and all of the participating teachers for both courses. All students that were currently enrolled in the non-game-based online course and the serious game-based online courses were invited to participate in interviews; approximately 200 students. Students were notified by their teachers via email, phone, and through their course home pages. Out of all of the invited students, eight (four from each course) submitted their parents informed consent form, their informed assent form, and completed an interview. Four teachers (two from each course) were interviewed; these were each teacher from the sections participating in the study.

Students

Student 1 (NGS1), student 2 (NGS2), student 3 (NGS3), and student 4 (NGS4) were interviewed from the non-game-based online course. Student 1 decided to enroll at FLVS to improve his GPA. He was taking five courses at FLVS while he was enrolled in his American history course. He stated that he felt he was performing "better than I probably was in regular school". Student 2 chose to enroll at FLVS due to the

convenience and flexibility. He decided to take American history online because he "…felt like I was always pretty strong in that subject area". Student 3 decided to enroll at FLVS because of the flexibility. She stated that she decided to take this American history course because it's a required course for 11th grade. Student 4 chose to enroll in his American history course at FLVS to meet the necessary requirements and because it was convenient.

Student 5 (GS5), student 6 (GS6), student 7 (GS8), and student 8 (GS8) were interviewed from the serious game-based online American history course. Student 5 decided to enroll at FLVS because she "…wasn't being challenged enough at my other school and I was sick a lot". She chose to take this game-based course because "…it sounded fun and I needed the credit". Student 6 stated he enrolled at FLVS because it would "…help me get more classes done". He chose to take this serious game-based online course because "It is a video game, I haven't had a school course like that before I though it would be kind of interesting". Student 7 decided to enroll at FLVS because he is homeschooled. He stated that he wanted to take this serious game-based online course because it "…looked like fun and entertaining". Student 8 decided to enroll at FLVS and to take this serious game-based online course because at "…the start of the summer and I was looking for something to do and my mom was online looking around at stuff and knows that I like to play games and saw that the game course and told me about it so I decided to see what it was like so I took the course".

Teachers

Teacher 1 (NGT1) and teacher 2 (NGT2) were interviewed from the non-game-based online course. Teacher 1 decided to teach at FLVS because she is a mom with three small kids and needs the flexibility. Teacher 2 decided to teach at FLVS because she felt "it was an opportunity to still be teaching but not be in the traditional classroom". Teacher 3 (GT3) and teacher 4 (GT4) were interviewed from the serious game-based online American history course. Teacher 3 decided to teach at FLVS because he was thought that FLVS was a good school and that he felt that students should be given options like gaming. He stated "I've always thought that if you could blend you know the content delivery and a video game that would be a really good match". Teacher 4 explained that she decided to teach at FLVS because of the flexibility.

Educational Setting

For this study, the educational setting was a non-game-based online American history course and a serious game-based online American history course. Both courses were designed to meet the Florida Sunshine State Standards (SSS) required of a full credit high school course of American history. A teacher facilitated each course by interacting with the student throughout the course and assessing student work (FLVS, 2009a). A traditional Pace chart was given to students to focus them to work on two to three lessons per week; this was given to all students who attend FLVS courses. The school estimates that this equates to a rate of three to five hours of study time a week per course. Although students were given this guideline to follow, they were allowed to

complete assignments ahead of time, reducing the normal 16-18 week course completion time period (FLVS, 2008).

Regardless of the course, students were required to meet minimum hardware and software requirements, as required by FLVS. All students had a) computer, b) printer, c) CD ROM drive, d) Microsoft Office, Open Office or Google Docs, e) portable storage device (CD, USB), h) audio speakers, microphone or headset, g)128k Internet Connection however broadband is strongly recommended, and h) 10 Gigabytes Free HDD Space. Additional requirements were listed for both personal computers (PC) and Macintosh computers for any students enrolled in courses at FLVS. PC requirements are listed as a) Pentium III, b) Windows XP, or Vista, c) 512 MB RAM, d) Internet Explorer version 7.0 or higher or Firefox version 2.0 or higher, and e) Sound card. The Macintosh requirements were listed as a) Power Mac G3 (350 MHz), b) OSX, c) 256 MB Ram, and d) Safari browser or Firefox version 2.0 or higher. In addition students are required to have a) Sun Java 1.4.2 JRE or higher, b) Sun Java 3D 1.3 or higher – for some courses, c) Flash 9.0 or higher, d) Shockwave (operating system dependent), and e) Acrobat Reader 7.0.9 or higher (FLVS, 2010d).

Non-Game-Based Online American History Course

The non-game-based online course is a full credit of high school American history and follows all Florida Sunshine SSS requirements for high school American history. The course is guided by a FLVS teacher throughout the entire course. Teachers evaluate progress and provide interventions through the variety of assessments built

into a course, as well as through contact with the student via email, telephone, and discussion boards. Assessments are listed as being in the form of "…self-checks, multiple choice questions, writing assignments, projects, research papers, essays, oral assessments, and discussions" (FLVS, 2010a, para. 7). In this course, students interact through a content delivery system (e.g. Blackboard, WebCT, eCollege, etc.) designed specifically for this course. The course has a home page that links to different modules. Each module has lessons and assignments students complete on a self-paced rate. Students submit the assessments through the content delivery system through an uploading area specific to the particular assessment.

In this course, students act as a researcher to apply the rules of evidence and render personal verdicts. Throughout the course, students review content on American history that ranges from the development of America from its first settlers to today's status. The course is divided into two segments. The content areas covered in segment 1 are geography, Native Americans, early explorers, settling of early America, colonies, Declaration of Independence, American revolution, constitutional convention, Louisiana purchase, War of 1812, slavery, civil war, reconstruction, civil rights act, voting rights act, 14th Amendment, and the civil rights movement. The content areas covered in segment 2 are manifest destiny, American imperialism, Spanish American War, old west, industrial revolution, immigration, populist movement, Harlem renaissance, modernism in the 1920's, prohibition, women's suffrage, trials of the 1920's, World War I, the great depression, World War II and the Holocaust, Cold War, Korean War,

Vietnam War, and a survey of each decade from 1950 to the early 2000's (FLVS, 2010a).

Serious Game-based Online American History Course

The serious game-based online course is a full credit of high school American history and follows the Florida SSS for American history just like the non-game-based online course. In contrast, this course is a serious video game that is supervised by a FLVS teacher. The teacher evaluates progress through assessments built into the video game, as well as through contact with the student via email and telephone (FLVS, 2010b). It is the first known course to be an online video game used for the purpose of teaching and learning American History at the high school level. Florida Virtual School (2009) described student's assessments and interactions in this serious game-based online course as:

> The student will assemble information while engaging in the game, assess their knowledge in game-based challenges, and complete assignments themed to the story-line of the game. Assessments will be in the form of mini-games, multiple choice questions, writing assignments, projects, essays, oral assessments, and discussions. Their instructors will evaluate progress and provide interventions through the variety of assessments built into a course, as well as through contact with the student in other venues. (p. 1)

This course is considered by FLVS as an action adventure computer game. Students interact throughout the game with two avatars; Eddie Flash and Libby Whitetree. Students use these avatars to interact with characters, clues, objects, and assessments. The game environment takes place in a many areas, set up as buildings, within the high tech future city of Coverton. The premise is that this city is being

corrupted by forces of a group called Conspiracy Inc. who want to take over the world. In order to accomplish this task, agents from this group are revising history. Students must go through the city to fix the damage done by Conspiracy Inc. Students accomplish this through the collection of clues (pieces of history), interrogating citizens and agents, and correcting history through their assessments. The course is divided into two segments. The content areas covered in segment 1 are creating a nation, a nation divided, impact of economic expansion, civil rights, and boom and bust. The content areas covered in segment 2 are rise of a world power, Cold War Conflict, social revolution, domestic changes, and global society (FLVS, 2010b).

The current course completed beta testing on May 15th, 2009. At this time the course was transferred to the final version of the serious video game (Email, March, 26, 2009). Due to the innovative nature of this course being one of the first known serious game-based online courses, FLVS notifies all parents and students who are interested in enrolling in this course aware of its innovative teaching and learning environment and that they may encounter challenges due to the courses current beta form (FLVS, 2008). Regardless of type of computer, students enrolled in this American history course had to meet additional hardware requirements with the recommended requirements a) dual-core processor, 2.0 GHz, b) 1.5 GB RAM Windows XP; 2 GB RAM Windows Vista, c) 3D Graphics process with support for Shader Model 2.0 and at least 256MB of Graphics Memory, and d) High speed internet connection (FLVS, 2010c).

Researcher

       The researcher's role in this study was to gather FLVS data from contact, create interview questions, conduct one-on-one interviews with participants, safely maintain all data sources, analyze data sets, converge data sets, and synthesize conclusions. Also, the researcher reflected on her own experiences and beliefs associated with online learning and qualitative research and became aware of the methodological literature for interpreting data and constructing final narratives to ensure valid and reliable results for the qualitative portions of this study (Glesne, 2006; Marshall & Rossman, 2006).

Instrumentation

Interviews

       The qualitative analysis for this study came from interviews with a sample of eight students (four from each course) and four teachers (two from both courses). Interviews were used as a means to gain in-depth detailed information (Creswell & Plano Clark, 2007). The purpose of mixing quantitative and qualitative methods in this study was to gain an in-depth understanding of the differences and commonalities between these online learning environments (OLE).

       The interview questions were used to gather details on the student's interaction, socialization, patterning, emotions, motivation, and learning strategies (see Appendices 2 and 3). The interview questions were developed with the study's purpose, goals, research questions, and the data provided from FLVS in mind. Also, established methods of question development from the qualitative methodology literature will be

used to ensure validity and to aid the converging process (Bryman, 2007; Creswell & Tashakkori, 2007; Dellinger & Leech, 2007; Glesne, 2006; Marshall & Rossman, 2006; Tashakkori & Creswell, 2007; Teddlie & Yu, 2007; White & Gunstone, 1992).

Florida Virtual School Data

Florida Virtual School provided a set of quantitative data on all students of both the serious game-based and the non-game-based online American history course. The data represented all students who completed their respected course from April 22, 2009 until February 1, 2010; from this a random sample of 92 students were selected for this study. Number of previous completed courses, number of currently courses currently active in, final grade, gender, ethnicity, activation date, completion date, and free or reduced lunch were provided on an individual student basis.

<div align="center">Data Collection</div>

Student Interviews

A total of eight students were interviewed; four from the serious game-based online course and four from the non-game-based online course. Students and their parent completed informed assent and consent forms in order to participate in the interview (see Appendices H and I). Students were interviewed over the phone and were asked a variety of questions ranging from the amount to times they resubmit assignments to how they were performing in their course to what aspects of the course motivated them (see Appendix A). Interview length ranged from eight minutes to twenty

five minutes long. All student interviews were recorded using a digital voice recorder and were transcribed within a week to ensure the voice of each student.

Teacher Interviews

Four teachers were interviewed during this study; two teachers from the serious game-based online course and two from the non-game-based online course. Teachers completed an informed consent form in order to participate in the study (see Appendix J). The teachers' provided insight into the amount to times students resubmit assignments, how students are performing, what aspects of the course motivate students, what parts of the course help and hinder students learning, how students interact, students belonging in the course, and the effectiveness of the course (see Appendix A). Interviews lasted from seventeen to thirty eight minutes in length and were conducted over the telephone. All teacher interviews were recorded using a digital voice recorder and were transcribed within a week to ensure the voice of each teacher.

Florida Virtual School Data

The quantitative data was provided directly from Florida Virtual School for students of both the serious game-based online American history course and the non-game-based online American history course. The research contact person at FLVS gathered the number of previous completed courses, number of currently courses currently active in, final grade, gender, ethnicity, activation date, completion date, and free or reduced lunch on an individual student basis for all students who completed their

respected course from April 22, 2009 until February 1, 2010. The data was provided to the researcher in two separate excel spreadsheet for each course. The data was then combined into one spreadsheet and then uploaded into SPSS for analysis.

<div align="center">Data Analysis</div>

The data collected was analyzed using both statistical analysis techniques and qualitative coding techniques. The qualitative and quantitative data were analyzed separately to find relationships between variables and emerging themes; interviews and FLVS data. Then the results were compared and contrasted to decipher any interactive and relational outcomes as based on the Triangulation Convergence Model.

Quantitative Data Analysis

The quantitative data for this study comprised of data provided directly from FLVS. Statistical analyses were conducted using SPSS for the activation date, completion date, and final grade. As specified by the research questions and due to the nature of the data, the research questions, and the number of variables two different statistical analyses were performed. Independent t-test was used to examine the differences sought for course duration for both courses; the serious game-based online course and the non-game-based online course. The Mann-Whitney test was selected to analyze the differences between student performance for both courses (Cohen, Manion, & Morrison, 2007; Glass, & Hopkins, 1996). The Mann-Whitney test was selected due to the categorical, ordinal nature of the dependent variable (grades), the goal was to

determine a difference between the two course groups, and the two groups were independent and randomly sampled; all assumptions of the Mann-Whitney test were met. In addition, number of previous completed courses, number of currently courses currently active in, gender, race, and free or reduced lunch, data provided by FLVS, were analyzed for the pragmatic purpose of providing demographic information for each course.

Qualitative Data Analysis

Comprised of eight student and four teacher interviews, the qualitative data was analyzed using thematic analysis. Glesne (2006) describes this as "…a process that involves coding and then segregating the data by codes into data clumps for further analysis and description" (p. 147). Following Marshall and Rossman (2006) guidelines, the researcher organized the data, immersed in the data, developed categories and themes, coded the data, interpreted data, and searched for alternative understandings (p. 156).

Student and teacher interviews were analyzed using Marshall and Rossman's (2006) guidelines for qualitative thematic analysis. After all audio recordings were transcribed the transcriptions were organized. The researcher immersed in the data by reading and re-reading the interview transcripts and listening to the original audio files to clarify transcriptions. During this process, the researcher compared student and teacher responses within and across the different courses to become intimately familiar with the data. Resulting from the immersion process, different patterns and themes emerged

that were similar and contrasting across the interviews. Data was then coded consistently throughout all transcripts using key words and highlighting. The following emerging themes were found, a) social interaction, b) performance in course, c) motivation, d) innate psychological needs, e) helpful and hindering aspects to learning, f) desirable aspects, g) and undesirable aspects.

These emerging themes were interpreted in such a way as to address specific research questions of this study. Time in course, social interaction, performance in course, motivation, and innate psychological needs were interpreted to address research question 3. Helpful and hindering aspects to learning, desirable aspects, and undesirable aspects were interpreted to address research question 4. In addition, critical analysis was used to interpret alternative meanings from the emerging themes. These were used to provide other plausible explanations and assertions for future research.

Timeline

Florida Virtual School (FLVS) provided access to each of the four teachers via email and telephone early August. After teachers were assigned, they were individually informed of the study and were sent the informed assent and consent forms for the students to complete the survey. In addition, they were given a recruitment letter, approved by the University of Central Florida's IRB, to be used in their classroom to inform students of the study (see Appendix K). The teachers were interviewed from late August to mid September.

From mid September to early October, student survey responses were low. Therefore in an effort to encourage students from these two classes to participate in the research survey, an addendum to the study was submitted to the University of Central Florida's IRB. The addendum was approved on October 12, 2009 allowing the researcher to provide Community Service Certificates to all students who complete the self-regulated learning survey, twenty five dollar American Express gift cards to students who participate in the individual interviews, and to allow student interviews to be conducted over the telephone. Data collection continued for the survey through January, 2010.

Student individual interviews began on December 23, 2009 and ended on January 13, 2010. Eight total students were interviewed over the telephone. All interviews were audio recorded and were conducted by the researcher with an FLVS staff member sitting in on the interview.

The FLVS data was requested early December however due to unforeseen circumstances the originally requested data was unavailable. Therefore, a new list of requested data was created based on available data. The final group of FLVS data was provided to the researcher on February 18, 2010.

CHAPTER FOUR: ANALYSIS AND RESULTS

The purpose of this study was to compare student learning experiences and outcomes between a serious game-based and non-game based online American History course. Qualitative and quantitative data sources were collected as based on the triangulation convergence model (Creswell & Plano-Clark, 2007). Qualitative data was collected through student and teacher interviews and the quantitative data was provided by Florida Virtual School (FLVS). This chapter provides demographic results along with the results of the following questions that guided the study:

1. Will the amount of time that students take to complete a serious game-based online American history course differ from the amount of time students take to complete a non-game-based online American history course?

2. Will student performance in a serious game-based online American history course differ from student performance in a non-game-based online American history course?

3. What is the relationship between student performance in both courses and intrinsic motivation, as determined by the Self-Determination Theory?

4. What aspects of a serious game-based online American history course and a non-game-based online American history course do students perceive as helpful and/or hindering to their learning?

<u>Demographic Data</u>

Since FLVS provided demographic data with the requested performance and course completion data, the differences between gender, ethnicity, number of previously completed course, number of courses currently enrolled, and free or reduced lunch between those enrolled in the serious game-based online course and those enrolled in the non-game-based online course (n = 184) were analyzed. In table 4.1, the serious game-based online course had a higher percentage of male students and significantly lower percentages of females when compared to the non-game-based online course.

Table 4.1 Descriptive Statistics for Gender

Gender	Game	%	Non-Game	%
Males	51	55.4	28	30.4
Females	41	44.6	64	69.6
Total	92	100	92	100

In the serious game-based online course, the large majority of students were Caucasian or White Non-Hispanic (see Table 4.2).

Table 4.2 Descriptive Statistics for Ethnicity in Serious Game-Based Course

Gender	Game	%
African American	3	3.3
Asian	1	1.1
Hispanic	8	8.7
Multi-Ethnic	2	2.2
Native American	2	2.2
Not Listed	2	2.2
White Non-Hispanic	74	80.4
Total	92	100

In the non-game-based online course, the majority of students (69.6%) were Caucasian or White Non-Hispanic (see Table 4.3).

Table 4.3 Descriptive Statistics for Ethnicity in Non-Game-Based Course

Gender	Non-Game	%
African American	6	6.5
Asian	3	3.3
Hispanic	10	10.9
Multi-Ethnic	7	7.6
Native American	1	1.1
Not Listed	1	1.1
White Non-Hispanic	64	69.6
Total	92	100

Students in the serious game-based online course on average had competed twice as many online courses when compared to students in the non-game-based online course (see Table 4.4).

Table 4.4 Descriptive Statistics for Number of Previous Courses Completed

Course	N	Completions	Mean
Game-Based	92	1111	12.1
Non-Game-Based	92	470	5.11
Total	184		

Students in the serious game-based online course on average were enrolled in significantly more online courses ($M = 2.30$) when compared to students in the non-

game-based online course (*M* = 1.30) while they were taking their American history

course (see Table 4.5).

Table 4.5 Descriptive Statistics for Courses Currently Active

Course	N	Active Courses	Mean
Game-Based	92	212	2.30
Non-Game-Based	92	120	1.30
Total	184		

In the serious game-based online course, 82.6 percent of the students in the sample did

not have free or reduced lunch. In the non-game-based online course, 78.8 percent of

the students did not have free or reduced lunch (see Table 4.6).

Table 4.6 Descriptive Statistics for Free or Reduced Lunch

Free or Reduced Lunch	Game	%	Non-Game	%
No	76	82.6	72	78.8
Yes	16	17.4	20	21.2
Total	92	100	92	100

<u>Research Question 1</u>

Will the amount of time that students take to complete a serious game-based

online American history course differ from the amount of time students take to complete

a non-game-based online American history course?

An independent t-test was used to compare the mean of the amount of time it took students to compete their American history courses. The amount of time was determined by calculating the number of days between the end date and activation date for each student. This continuous dependent variable (number of days) was a good candidate for running an independent t-test to determine the difference between the two course types.

Since the populations were found to be normal and equal variances were assumed, a random sample of 92 were selected from the non-game-based online course. As listed in Table 4.7, the results of the t-test (t (184) = 4.49, p < .01) indicated that there was a significant difference in the mean number of days necessary to complete both courses. On average, the students in the serious game-based online course took longer period of time to complete their course based on total number of days than the students in the non-game-based online course.

Table 4.7 t-Test Results and Group Statistics for Days to Complete

Course	N	M	SD	Standard error mean	t	df	Sig (2-tailed)
Game	92	145.80	50.64	5.28	4.49	182	0.000
Non-Game	92	112.63	49.60	5.17			

<u>Research Question 2</u>

Will student performance in a serious game-based online American history course differ from student performance in a non-game-based online American history course?

The Mann-Whitney test was selected to analyze the difference between student performance and the type of American history course (Cohen, Manion, & Morrison, 2007; Glass, & Hopkins, 1996). Student performance was determined by student's final grade which was provided by FLVS. The dependent variable, final grade, was measured on an ordinal scale of 2 through 5, where a grade of D was equal to 2; a grade of C was equal to 3; a grade of B was equal to 4; and a grade of A was equal to 5. Since this dependent variable was of a categorical, ordinal nature and the goal is to determine a difference between the two course groups, the Mann-Whitney test was selected to analyze the relationship.

As listed in Table 4.8, the students in the serious game-based online course had a higher mean rank value as compared to the students in the non-game-based online course.

Table 4.8 Ranks of Final Course Grade

Course	N	Mean Rank	Sum of Ranks
Game	92	108.16	9950.50
Non-Game	92	76.84	7069.50
Total	184		

The test, Z = -5.066, $p < .01$, suggested that there was a statistically significant difference in course grade when comparing performance among students in the two courses (see Table 4.9).

Table 4.9 Test Statistics of Final Course Grade

	Final Course Grade
Mann-Whitney U	2791.500
Z	-5.066
Asymp. Sig. (2-tailed)	0.000

Although the Mann-Whitney test is not a direct comparison of means, the actual mean values supplement this result as well. The students in the serious game-based online course had a mean grade of 4.88 and standard deviation of 0.33 (an A average, 97.8%). Those in the non-game-based online course had a mean grade of 4.41 and standard deviation of .76 (a B average, 88.2%) (see Table 4.10).

Table 4.10 Descriptive Statistics of Final Course Grade

	N	*Mean*	Std. Deviation	Minimum	Maximum	Grade %
Game	92	4.88	0.33	4	5	97.8
Non-Game	92	4.41	0.76	2	5	88.2

Qualitative Data Analysis

Qualitative data comprised of eight student and four teacher interviews; non-game-based online course students (NGS), serious game-based online students (GS), non-game-based online course teachers (NGT), and serious game-based online teachers (GT). The data was analyzed using thematic analysis. Glesne (2006) describes this as "…a process that involves coding and then segregating the data by

codes into data clumps for further analysis and description" (p. 147). Following Marshall and Rossman (2006) guidelines, the researcher organized the data, immersed in the data, developed categories and themes, coded the data, interpreted data, and searched for alternative understandings (p. 156).

The following emerging themes were found, a) social interaction, b) performance in course, c) motivation, d) innate psychological needs, e) helpful and hindering aspects to learning, f) desirable aspects, g) and undesirable aspects. These emerging themes were interpreted in such a way as to address specific research questions of this study. Time in course, social interaction, performance in course, motivation, and innate psychological needs were interpreted to address research question 3. Helpful and hindering aspects to learning, desirable aspects, and undesirable aspects were interpreted to address research question 4.

Research Question 3

What is the relationship between student performance in both courses and intrinsic motivation, as determined by the Self-Determination Theory?

Based on the motivation theory of self-determination, students are naturally active organisms with innate psychological needs. This natural tendency is explained as an active engagement that requires support from the social environment to maintain the innate psychological needs of competence, autonomy, and relatedness (Deci & Ryan, 2000; Ryan & Deci, 2000). The eight students and four teachers interviewed for the

study provided statements on their performance and motivation within their courses.

Therefore the following emerging themes found from the thematic analysis were used to

explain the relationship between student performance and intrinsic motivation.

1. Social interaction

2. Innate psychological needs

3. Motivation

4. Performance in course

Social Interaction

When students in the serious game-based online course where asked if they

were actively engaged in their course they all replied positively stating "yes" or "yeah".

The teachers of serious game-based online course supported their student active

engagement when interviewed. As GT3 stated "…I would definitely say the majority of

them are actively engaged in the course." Also, GT4 said,

> Most of them are spending anywhere from an hour to an hour and a half in the
> game, and as far as being engaged… [the game] is definitely something that
> automatically engages them because they are trying to eliminate agents and
> [trying to] find the next clue umm, and things like that so it is pretty natural…
> engagement that goes on.

The serious game-based online students described their social interaction as

occurring with many different aspects of the game. According to GS5 she interacted

with, "The characters and some of the other kids in my class, we have the discussion

board so we can talk to each other and ask for help with the assessments and stuff."

While GS6 described his social interaction as, "…a point and click and it gives you a

description of whatever and then you find a clue so basically yeah like again a

scavenger hunt kind of thing you find clues to get the points for the assessments." Also,

GS7 described his interaction as, "…I talk to my teacher very much, um well I interact

with the characters in the game and I call my teacher every month, and sometimes I

reply to the other student in the discussion forum". Additionally, GS8 stated,

> Well they have it set up so that like every couple of missions there's a
> [discussion] forum, there's a [discussion] forum set up that you can go to it
> whenever you want to with stuff about you can give, like ask for advice, give
> advice there's questions that you have to take as part of the class, like you have
> to write responses to the questions on the forum and answer to someone's
> response and stuff and also there is other stuff, interesting topics that they put
> out there to talk with the people its not part of the course but its interesting topics
> that they think we might want to talk about with other people and then you have
> the calls and stuff that you have to your instructor.

The serious game-based online course teachers explain their student's social

interaction as occurring in the discussion boards, the student-to-student game play

forum, the underground help gathering, and through Facebook. In contrast to the

student's response, the teachers did not explicitly state that they were part of students'

interactions rather they stated they would post something for students to respond.

When students were asked, do you feel that these social interactions help you

learn American history, they all responded by saying "yes" or "yeah." As GS6 stated,

"Yeah, cause one of the objects might be a um like a poster, or something that might be

related to the topic that you are going to answer the questions on so it's not just like a

coffee table or whatever." The following comments were made by GS8,

> Actually yeah they do, I mean when I go on there in the forums, when I do, I look
> at how the people respond, I see stuff that they know about that I don't know… it
> changes the way I look at it and it stuff that I didn't know about that subject that I

57

learn from their point of view, the way they see, like they have the same answers but they put it in a different way which is other stuff that I didn't know so I learn more about it from what they say.

The serious game-based online course teachers both stated they felt that they interactions were effective. As GT3 responded, "I think they are effective, I personally believe that face-to-face mixed with this would be more effective" while GT4 stated,

I would say effective… personally I think that any kind of change to interact with each other they're going to learn from each other um that is just a natural part of learning… you learn a lot from your peers and I think they can learn a lot from each other.

When the non-game-based online course students were asked if they were actively engaged in their course all replied positively. As NGS4 stated, "I was really engaged, like there is a lot of stuff that was more interesting than regular school." The non-game-based online course teachers stated for the most part that students seem to be actively engaged; however, the teachers did not seem to be as convinced as the serious game-based online course teachers of their student engagement. As NGT1 commented, "I'd say yes for the most part" and NGT2 stated,

I don't know, I think some of them are, some of them are genuinely learning and want to be there and want to learn as much as they can and some of them want to get the class done and move onto other things, so they are engaged in that they want to get done.

When the non-game-based online course students described their main interactions they commonly described interacting with their teacher. As NGS1 stated, "Like say if I'm having problems with an assignment I usually just call my teacher that's about it." While NGS4 explained, "I talked to the teacher a lot and I emailed her and

58

she told me how I was doing a lot, it was like a weekly monthly thing …so how I was

doing so I could talk to her if I had any questions." Additionally, NGS3 described her

interaction discussion groups,

> Well um, mostly my teacher the only time I felt like I ever, was interacting with the other students was that we had the discussion groups some of our assignments we have to post things on that, and you have to post comments on other people's posts, if you agreed with them or if you didn't, its why you thought it was right or why you thought it was wrong.

Also in contrast to the teachers of the serious game-based online course, the

non-game-based online course teachers stated that their students are do not interact.

As NGT2 commented, "They don't, they do discussion postings where they reply to

somebody but its not really interaction they are just doing it for grades." In agreement

with NGT2, NGT1 stated, "They don't… they have the discussion boards and they have

to reply to one another's posts based on content, but its cut and dry, I know that they

would love to have more interaction and that is one thing we've always expressed that

our students would like more of."

Students in the non-game-based online course responded positively when asked

if their social interactions of their course was effective at helping them learn, for instance

NGT4 stated "Oh I think they did, because with out them I would've just, if I didn't know

something I wouldn't have talked to someone or ask them or ask anyone if I was doing

okay, I could have just submitted assignments and wouldn't have known if I did good or

not, but the teacher gave me feedback." The teachers of the non-game-based online

course responded in contrast to the students. When referring to students social

interactions in their course, NGT1 commented "…I think they're minimally effective…".

While NGT2 stated they were "Ineffective." Further commenting NGT2 explained why she felt these interactions were ineffective,

> Its just very evident when they do their postings… there's just nothing, and the kids don't go back and check the discussion postings and respond to the students that responded to them… plus the kids are all at different places in the class, so… I think putting a social networking thing in the class would be a mistake because the kids would spend time doing that instead of their work.

Innate Psychological Needs

When the students in the serious game-based online course were asked, how much material covered so far in their class that they feel like they have learned, GS5, GS6, and GS7 stated, "Most of the material." while GS8 stated, "All of the material." One hundred percent of the students stated that they feel more competent at American history and that their course has made them more competent at American history. The teachers who taught the serious game-based online course agreed that students' competence of American history has increased as a result of this course. NGT3 stated most of the material, "at least in the 80 percent range" and NGT4 stated half of the material, "they are leaning quite a bit".

When asked, what do you feel is the reason for your success, and if you have any your failures in this course, GS7 said, "Successes I actually like doing the game and learning American history I like doing it so that helps me succeed, I think… and I can't think of any failures." As GS6 commented, "I have more of a reason to push myself because it's a different way of learning." While GS5 explained, "Uh, successes I feel more motivated than I would in a normal class, and I don't really have any failures in the course". When describing their students' successes and failures, GT3 stated they

are a result of, "…their commitment to this course, their desire to learn, their support from their parents, their support form their teacher, and their motivation for this kind of environment you know being motivated by game play." The following interview comments were made by GT4, "I would say engagement would probably most contribute to their success, that it is not a pull and tug for parents to get them to play the game and that they actually enjoy it..."

When asked, how do you feel about this course, one hundred percent of the students in the serious game-based online course stated that they liked their course. As GS5 said, "I love it, I wish all of my classes were like this." Although all of the students stated that they felt like they belong in their course, GS6 and GS7 felt that they were not connected with other people in their course. The following interview comments were made by GS6,

> Researcher (R): Okay, do you feel like you belong so in other words, do you feel like you are a part of this course or do you feel like you are isolated and all-alone?
>
> GS6: Um, I feel like I am supposed to be in the course
>
> R: So a part of this course?
>
> GS6: Yeah
>
> R: Okay and do you feel connected with other people in this course?
>
> GS6: Um, (pause) with other people?
>
> R: Uh huh
>
> GS6: Um, nah not really

61

When the teachers who taught the serious game-based online course were asked if they thought their students felt connected to other people within this course, they both responded negatively. As GT4 stated, "No and I think that is something we're working on." While GT3 explained, "I feel like several feel connected to me but two each other no". Responding to whether they felt if students feel a sense of belonging to this course, again they responded negatively. The following comments were made by GT4, "…I think that would be something that you would have to ask them I really don't know…".

When the students in the non-game-based online course were asked how much material covered so far in their class that they feel like they had learned students NGS1, NGS2, and NGS4 stated, "Most of the material.", while NGS3 stated, "Half of the material." The non-game-based online course teacher's responses were the same as the students, as NGT2 stated, "Half of the material" and NGT1 replied, "Most of the material". In addition, these teachers felt that students were more competent as a result of their course. All of the students stated that they felt more competent as a result of their course, as NGS4 commented,

> R: Okay and at this point in your course, do you feel more competent at American history?
>
> NGS4: Yes, I really liked it and I learned a lot of it I feel like I learned a lot from it compared to some of the other courses I've taken before
>
> R: Okay and do you feel that your course helped you feel more competent?

NGS4: Yeah, I really felt better than I did like after I did the assignments I really felt like I understand this

Students in the non-game-based online course stated that they enjoyed their course. As NGS3 stated, "I really enjoyed it, I felt like I really learned from it". When asked, what do you feel is the reason for your success, and if you have any, your failures in this course, students stated that their teacher, the class format, and taking notes were all helpful. As NGS4 stated in a study interview,

> I think I was successful because it was a lot more interesting it had a lot more variety than [traditional] school courses, I know I lot of times in [traditional] school courses I had to do the same things over and over and I just wasn't interested in this course I had many things to do… this really got me engaged.

The non-game-based online course teachers stated they felt that the reason for students' successes and failures in their courses are different for each student. As NGT1 replied, "I think a lot of their success is (pause) not having the pressure of you know going to an actually classroom every single day… I think a lot of it is again time management and motivation..." While NGT2 stated,

> I think it comes down to the individual student, and their responsibility and motivation, their sense of responsibility and their internal motivation, I think that is the only reason

Despite the fact that the four interviewed students stated that they felt like they belong in their non-game-based online course, none of them felt that they were connected to other people in their course.

R: Do you feel like you belong so in other words, do you feel like you are a part of this course or do you feel like you are isolated and all-alone?

NGS4: I felt like I belonged [be]cause if I was doing something wrong the teacher would tell me and I would ask her questions and she would call me and she really wanted students to learn she was helpful

R: And did you connect with other people in the course, did you feel connected with other people in the course?

NGS4: Not really

The teachers who taught the non-game-based online course both explained that they do not think their students feel connect with others in their course and they were not sure of whether their students felt that they belonged to their course. As NGT2 stated, "I don't think they feel isolated from me but I don't think that they feel connected to other students." While NGT1 explained,

NGT1: um I don't think they feel isolated or all-alone but in a sense where you know they have met to turn to or their parents but I would think socially in the sense of being around other peers yes, (pause) and interacting with others yes

R: okay, so your saying socially they feel maybe a little isolated?

NGT1: I think so and again the number 1 thing we hear back from students is that they wish they could interact more with their classmates

Motivation

When asked what aspects of their course motivated them, GS7 stated "I think it is a lot more interesting than ordinary reading out of a book or something and I'd like to see what happens next in the story or something." While GS6 "I think just because it was a game… [and] um it's interactive". The following interview comments were made by GS8 when describing his motivation,

> I don't really know, I mean I do need to get it done, because there is a time limit and stuff that is set before, and I did try to get it finished up before school started and that didn't really work out, so I am trying to see if I can get it done before Christmas break is over so I can take the next half in the summer.

The teachers of serious game-based online course stated that they felt students were motivated by many aspects of the game as well as outside factors. As GT3 stated the following as motivating aspects of the course, "the game play aspects", "parents", "personal goals", "wanting to complete missions", and "wanting to solve the mysteries and wanting to get through to the next level". While GT4 explained,

> I think that getting finished, um because it is a game… they just want to get to the next mission, so they can complete [the game] and I think that that's really what kind of drives them to complete is to go to that next mission uh and to keep moving.

When the non-game-based online course students were asked, what aspects of your course motivated you, NGS1 stated, "I feel really good about it, like I said this is one of my favorite courses… I like doing this course." While NGS2 explained, "… just getting it done, so I don't have to worry about it later, and also I think you have a time limit." In a similar response to the students, NGT1 described her students as being

motivated by the fact that "they can get done sooner than they can in a traditional school". While NGT2 explained the benefits of having an online environment motivate her students as,

> They get to ask questions without being worried about what other students think, they tend to be a little bit more inquisitive then they would be normally um I think they like the anonymity of online because you don't see race, you don't see disability, you don't see looks you don't see weight you don't see any of that so it can often times make them, those students that are that maybe have been shy in public school or traditional school they really over come that and really excel in this environment and I think that is a good motivation, and a lot of times like the ESE kids they don't want you to know that because they don't want to be you know labeled that themselves they know they can do it, because sometimes it is just a matter of the learning environment works better for them because they are less distracted… they can really focus on what they want to learn and they have control over how much they can learn.

Performance in Course

Students in the serious game-based online course explained that overall they felt they were performing well in their course. When asked 'How do you feel you are performing in your course', GS5 responded by stating, "Brilliant". While GS8 commented, "I'm doing good, I mean I was ahead of schedule, I got a good grade got an A". Students' responses to how many times they had to re-submit assignments were varied. As GS5 said, "None, never" and GS6 said, "Not a lot, I get it mostly done the first time." While GS8 commented, "I've only re-submitted 2 or 3 because I was trying to see if I could get a better grade on them". When students were asked 'how are you performing on your assessments in your course', GS6 stated, "Um, good the uh assessments aren't hard but they are you have to kind of do the work to know what it is talking about." While GS8 explained, "Well, instead of tests we did projects where you

66

had to make something…like the one I am doing right now you've got to take the facts and set them straight in a like a poem or song announcement of some kind so actually I'm doing pretty good, I got good grades on those… but I'm not really creative." And finally when students were asked what their grade is in their course, GS5 stated, "100%", GS6 replied, "I have an A", GS7 said, "A", and GS8 commented "Right now 90 something."

Students in the serious game-based online course explained that overall they felt they were performing well in their course. The serious game-based online course teachers agreed. The following interview comments were made by GT3 stated,

> Absolutely, I have anecdotal evidence from lots of students and lots of parents that says my child has never been inspired to learn this before and they are liking it and they are doing it at a higher level than they have ever learned before, I've had students thank me for making learning fun for them, I think that through tutoring and through one on one help that yes this has been a really positive experience for students increasing their competence and looking at history in a different light not associating it with seeing it with just shear boredom and drudgery and making history really come alive to them.

Despite GT3's overall positive remarks, he did expressed some concern regarding student overall performance,

> I think that technical issues have really impacted that I think that the technical issues have interrupted a state of flow for a lot of kids the flow where kids are challenged and supported it's more like a state of being and when kids are playing the game and they get error messages or things happen technical problems that's interrupted so to go back to the questions you asked how do you think kids are performing in the course, overall, I think that they are doing well. Umm it's a mixed bag it really is I can't really um (pause) it's just a mixed bag it's just all over the place right now.

When the serious game-based online teachers were asked, how many times do you students generally re-submit assignments to you, GT3 stated, "…generally between 2 and 3 [times]." While GT4 said, "I would say they only resubmit only once on average, I've never had a student resubmit more than twice". Additionally, GT3 stated that students often resubmit for different reasons,

> Most of the time when a student has a problem with an assignment um and it's lack of following directions we'll explain to them in my feedback what they have to do and most of the time they get it its that one re-submission however sometimes even when I give them the feedback whether you know they are taking the easy road or being lazy or they just truly don't understand they then resubmit again.

When students in the non-game-based online course were asked 'How do you feel you are performing in your course' NGS1 stated, "A lot better than I probably was um in regular school um because of learning environment and stuff"." While NGS3 said, "I felt like I was performing really strongly, the teacher gave great feedback and she always loved what I did, and so that made me really want to do the class more the fact that she really loved what I did." Additionally, NGS4 said, "I think I performed pretty well I looked at my grade at the end and I had an A and I knew what I was doing".

Student responses to how many times they had to re-submit assignments were varied. As NGS3 stated, "Um, it was rare in that class, like um, maybe like 1 or 2 a module." While NGS4 replied, "Um, I had to resubmit some of my assignments several times because I mislabeled the file, I put it for the wrong assignment and I had to bring it back or once like I had to do the little interview thing but I forgot to put the one part of

the interview but I didn't have to do that for anything else". Additionally, the following comments were made by NGS2 during a study interview,

R: How many times do you have to re-submit assignments to your teacher?

NGS2: Um, you mean because I didn't do it well or because the format

R: You can actually resubmit for both of those reasons, so maybe you got a bad grade, or maybe you did poor on something and you want to fix it, or maybe the formatting was wrong so for any of those reasons

NGS2: Um, the only reason I had to resubmit an assignment is because the format

R: So not very often

NGS2: Well actually at least 10...

R: Okay

NGS2: …because when you save it, it is kind of tedious to save it in an RTF file, and sometimes I forget that

When the non-game-based online course students were asked 'how are you performing on your assessments in your course' NGS2 stated, "Oh um, I've done pretty well, I've understood the material pretty well, overall I've understood the material and done well on the tests and assignments and grasped all of the concepts of what I had to do for the assignments, um and I mean since this is my second time doing it I kind of already understood how everything worked." While NGS4 replied, "My assessments, I know I did good I got lots of feedback from the teacher on how good I was doing and I

69

knew what I was doing." And then when students were asked what their grade is in their course NGS2 stated, "well I think the first semester I think I had a B but it was pretty high but then the second semester I got an A, I think that's still pretty good for me". While NGS1, NGS3, and NGS4 reported they had As.

Both of the teachers of the non-game-based online course stated that they felt their students were performing well overall in their course and in their course assessments. As NGT1 commented, "I think they are doing pretty well." While NGT2 stated, "I think they are doing great." When the non-game-based online course teachers were asked, how many times do you students generally re-submit assignments to you, NGT1 stated "About 25% of the students do that and of those 25% that do that they do it multiple times." As NGT2 replied, "As often as they'd like to um I don't know on average what the number is but if a student is not happy with their grade they absolutely can go back and resubmit." Additionally NGT1 explained that students typically resubmit to better their grade, "I'm going to say about half of the students… resubmit because… they are just not happy with the grade that they've received and they just want to improve their grade..."

Table 14.11 provides a summary of the social interaction theme found during the student and teacher interviews.

Table 4.11 Social Interaction and Innate Psychological Needs Summary

Themes	Game-Based and Non-Game-Based Interviews
Social Interaction	GS: All stated active engagement with characters, other students, in game objects, and their teacher and that these interactions were effective at helping them learn
	NGS: All stated active engagement with their teacher and other students, and that these interactions were effective at helping them learn
	GT: Most students were actively engaged, interacted through discussion boards, outside of class help, and Facebook, and that these interactions were effective at helping them learn
	NGT: Some students were actively engaged, students do not interact enough, and the interactions are ineffective at helping them learn
Innate Psychological Needs: competence, autonomy, & relatedness	GS: All felt more competent, successes were perceived as being a results of liking the game, different way of learning, and motivation, reported no failures, and felt that they belonged but were not connected
	NGS: All felt more competent, successes were perceived as being a results of enjoyment, class format, and interest, reported no failures, and felt that they belonged but were not connected to others
	GT: Majority of students competence has increased as a result of the class, successes and failures are the result of desire to learn, motivation, parental and teacher support, and enjoyment, are not aware of student's sense of belonging, that students are connected to the teacher but not to peers
	NGT: Majority of students competence has increased as a result of the class, successes and failures are the result of responsibility and motivation, are not aware of student's sense of belonging, and that students are not connected with others

Note: GS = game-based students, NGS = non-game-based students, GT = game-based teachers, and NGT = non-game-based teachers

Table 14.12 provides a summary of the innate psychological needs, motivation, and

performance emerging themes converged with related statistical results.

Table 4.12 Motivation and Performance Summary

Themes	Game-Based and Non-Game-Based Interviews and Statistics
Motivation	GS: Interest, interaction, game, story, and self-paced
	NGS: Interest and self-paced
	GT: Game play aspect, parents, personal goals, complete missions, solve mysteries, and get to the next level
	NGT: Self-paced and anonymity
Performance in course	GS: Performing well
	NGS: Performing well
	GT: Students performing well
	NGT: Students performing well

Note: GS = game-based students, NGS = non-game-based students, GT = game-based teachers, and NGT = non-game-based teachers

Research Question 4

What aspects of a serious game-based online American history course and a

non-game-based online American history course do students perceive as helpful and/or

hindering to their learning?

In an effort to determine what aspects of each American history course are

helpful to learning, the student and teacher interviews were analyzed to gain insight on

what students perceive as being helpful and/or hindering to their learning. The following

emerging themes were found and used to explain what students perceive as helpful and hindering to their learning.

1. Desirable Aspects

2. Undesirable Aspects

3. Helpful and Hindering Aspects

Desirable Aspects

When students in the serious game-based online course were asked what parts of the course they liked, GS7 replied, "…there's no, dry spots like it is always something interesting." While GS5 stated, "I like the actual assessments, and then after the lesson there is this sort of game thing its sort of like, you have to unscramble the words and stuff and the sentence, its what I like, I just like the way it is presented, kind of not boring". Additionally GS8 stated,

> I like the fact that they've, the fact that they've actually made it into a game and its not just regular it is not your usual class, just doing worksheets listening to the person talk and stuff like that I'm mean I like the fact that they've made it more interesting.

In concurrence with the serious game-based online students, GT3 stated he thought students liked the "graphics", "game play", "narrative", "mini games", "discovering new boards and different tasks", "agent challenges and eliminations", and "tutoring other and giving game play advice". While GT4 stated,

> Game play, I think that they just enjoy the fact that it's a video game and they can say I am taking a video game for American history they just like that, I think that its just that part of it Kids like that it's a video game and that they can say that.

73

When students in the non-game-based online course were asked what parts of the course they liked, NGS4 explained, "I could do it when it was convenient for me so a lot of the assignments I felt like I could do better, like I liked to learn reading about this stuff." While NGS3 stated, "I really liked the virtual the way it is set up, I can look at my grade book easily and see my activities." Additionally, NGS3 described what she liked as,

> I really liked at the end of the each module and you had the phone conference with the teacher and you really go over everything that when you have to take the quiz and the exams your teacher helps you go through it so that if you took a long time to go over a module you are refreshed before you have to do the quiz or the exam.

In contrast to student's responses on what they liked, NGT2 stated, "Things that are not deemed as busy work." In conjunction with students, NGT2 said, "[students] like getting done faster". While NGT1 replied, "… I think they really do enjoy the more interactive assignments where they're conducting interviews."

Undesirable Aspects

When students in the education video game course were asked what parts of the course they disliked, GS7 stated, "Sometimes I have to walk around and find the assessments, sometimes it takes a while for me to find the assessments." While GS5 said, "The only thing I really don't' like is the characters voices are kind of high pitched." The following interview comments from GS8 explained that he didn't dislike anything in particular but that he felt the difficulty level of the game could have been a little higher.

R: Okay and what parts do you dislike?

GS8: Huh, long pause, the uh, the fact that when you do it like it kind of what's the word, I'm not sure how to say that

R: Are you thinking about how you are interacting in the game? how the game loads, or graphics?

GS8: Well the game itself is pretty good, the graphics are good, the controls and all of that stuff, they could have actually made it more difficult to get to the stuff …

R: Okay

GS8: … there's cameras and stuff that you've got to avoid but it's kind of easy to get around

R: So the difficulty level could have been a little higher?

GS8: Yes

Regarding what students disliked in their course, GT4 stated, "to be honest, I really don't know… I haven't heard a lot of complaints". In addition, the following interview comments were made by GT3.

R: What parts do you think the students dislike?

NGT4: Umm right now it is probably the technical issues (pause) honestly that is probably the significant thing right now that is bothering them but I would say that they kind of get a lot of them get bogged down on those projects that at the end of the mission that they just want to keep playing like not the end game where they have to write that paragraph it's the oh I have to stop and do a project and really think about what I've just learned that …

R: Yeah

NGT4: …that seems to significantly be um maybe hinder may not be the right word but that [it]… makes them want uh I want to keep going, they'd like to continue the game play

When the teachers of the non-game-based online course were asked what they thought their students disliked, NGT2 said, "discussion postings and… boundaries, in terms of submitting assignments." Although students did not state they did not like essays or discussion postings, they did state they disliked the process of submitting assignments, As NGS4 explained, "sometimes it was confusing to submit assignments, sometimes when I was logged in for too long it asked me to log back out." Additionally, NGS3 explained that many times they completed assignments that were not required which was frustrating.

NGS3: The only thing that… gets on my nerves, is that… one time I accidently did an honors assignment (pause)

R: You did something that you didn't have to do

NGS3: Yeah, because it was there and I accidently clicked on it and then I realized later that I didn't have to do it because it was there

Helpful and Hindering Aspects to Learning

When students in the serious game-based online course were asked what aspects of their course helped and/or hindered their learning, GS5 stated "It's the way it is presented, with all the pictures and the videos and everything." While GS6 explained

he liked, "…its something different than a regular course you know um, I just wondered how it would track my progress because it was a video game and it seemed kind of interesting, just like how you do the assessments..."

The serious game-based online course teachers stated that there are many aspects of their course that help students learning. As GT3 stated, "stimulating", "good graphics", "storyboards", "students who are auditory learners can listen to history", "there is a lot of discovery", "a lot of choice", "students can explore on their own", "they can choose what they want to learn", and that the game "reinforces what the students just learned". While GT4 stated, "the text is written in a very considerate way, its written so that that there is a flow of reading and I think that that helps student learn because they aren't getting caught in vocabulary or verbage that's stopping them from being able to continue".

Also, the serious game-based online course teachers stated there were some hindrances to their course. As GT3 stated, that he would like to have "…more storyboards". While GT4 explained, "honestly right now it has only been these tech issues that have really hindered their learning."

In the non-game-based online course, when students were asked what aspects of their class helped and/or hindered their learning they provided contrasting responses. Similar to some of the students of the serious game-based online course, NGS1 and NGS2 of stated that the videos helped their learning. While NGS4 replied, "Well, the course is online so I could do more stuff like research on hand and stuff.. and look at the links and look up stuff I don't know." Finally, NGS3 stated,

I have ADD, and so sitting in a normal classroom was really hard for me to keep engaged and focused on the teacher and with the virtual school, you're forced to be focused because there isn't someone telling me what to do, so it is like I am forcing myself to be engaged so that I get the work done.

When the teachers of the non-game-based online course were asked what aspects of their course help students learn, NGT2 replied, "…having interactive things that the kids do and get them experiencing things helps them, we don't have much of that and…they get to really control what they are learning…" While NGT1 stated, "I think the content is pretty cut and dry, very self-explanatory and… interacting with different websites." The teachers stated many variables as hindering student learning, for instance NGT1 said, "Honestly the number one thing I think is time management." While NGT2 commented,

R: What aspects of the course do you think hinder your students learning?

NGT2: I think the assignments not having a deadline hinders their learning because they just feel that they can submit anytime, it's a real hindrance to you know success of learning it is just one of those things that teaches them that they can turn things in at any time and that is just inaccurate.

R: Okay, anything else?

NGT2: Um, I think that sometimes they take too many classes, online and traditional school, and they don't have the ability yet to really focus on time management and doing what it takes period, no matter what, and so they something falls behind… I think that they're social life after school hinders their

learning, which is fine I want them to be involved, just don't register for classes

when you know that you aren't going to be able to do it.

In contrast to the serious game-based online students, NGS2 of the non-game-based

online course provided hindrances to their learning,

> I guess just the fact that there's not really a teacher there, the material is there but if, sometimes if, I just read it… I don't always understand it,… I think if a teacher knew more about the subject she could probably go more in-depth with that material than whatever is on the page.

Table 14.13 provides a summary of the desirable and undesirable aspects found

during the student and teacher interviews.

Table 4.13 Desirable and Undesirable Aspects Summary

Theme	Game-Based and Non-Game-Based Student and Teacher Interviews
Desirable Aspects	GS: Story, areas of the game, assessments, presentation of content, and not a regular course
	NGS: Online, videos, access to grades, and phone conference with teacher
	GT: Graphics, game play, narrative, mini games, discovering new boards, agent challenges and eliminations
	NGT: Interactive assignments, not busy work, and self-paced
Undesirable Aspects	GS: Ease of game play and character voices
	NGS: Submitting assignments and unclear assignments
	GT: Technical issues, mid-term, and final
	NGT: Essays, discussion postings, and submitting assignments

Note: GS = game-based students, NGS = non-game-based students, GT = game-based teachers, and NGT = non-game-based teachers

Table 14.14 provides a summary of the helpful and hindering aspects found during the

student and teacher interviews.

Table 4.14 Helpful and Hindering Aspects Summary

Theme	Game-Based and Non-Game-Based Student and Teacher Interviews
Helpful Aspects	GS: Pictures, videos, assessments, different than regular course, and scavenger hunt
	NGS: Videos, format and based online
	GT: Stimulating, good graphics, storyboard, audio, discovery, and self-paced
	NGT: Oral history interview, self-paced, and straight forward content
Hindering Aspects	GS: None
	NGS: Lack of a teacher
	GT: Less technical issues
	NGT: Not having a deadline, time management, and not having a teacher in front of them

Note: GS = game-based students, NGS = non-game-based students, GT = game-based teachers, and NGT = non-game-based teachers

Summary

In summary, the purpose of this study was to compare student learning

experiences and outcomes between a serious game-based and non-game based online

American History course. The data analysis of this study used statistical and descriptive

information to draw its conclusions. The qualitative and quantitative data sources were collected as based on the triangulation convergence model (Creswell & Plano-Clark, 2007). Qualitative data was collected through student and teacher interviews and the quantitative data was provided by Florida Virtual School (FLVS).

The demographic results of the study found the serious game-based online course had a higher percentage of males (55.4%) while the non-game-based online course had a higher percentage of females (69.6%). In both courses Caucasian or White Non-Hispanic students were the majority; serious game-based online course (80.2%) and the non-game-based online course (69.6%). Students in the serious game-based online course on average completed twice as many courses (M_{GB} = 12.1, M_{NGB} = 5.11) and were enrolled in significantly more courses (M_{GB} = 2.30, M_{NGB} = 1.30) than students in the non-game-based online course. Additionally, both courses the majority of students did not have free or reduced lunch; serious game-based online (82.6%) and non-game-based online (79%).

An independent t-test was used to compare the mean amount of time it took for students to complete their course. The results revealed that there was a significant (p < .01) difference in the mean number of days necessary to complete the course. On average, the 92 students in the video game-based course were engaged for a longer period of time in number of days (M = 145.80, SD = 50.64) in the course than were the students in the non-game-based online course (M = 112.63, SD = 49.60). This result states that students in the game-based course took longer to complete their course than students in the non-game-based online course.

The Mann-Whitney test was used to compare the student performance between the courses (Cohen, Manion, & Morrison, 2007; Glass, & Hopkins, 1996). The results of the statistical analysis found a significant difference between course performance and the type of American history course (Z = -5.066, p < .01). The students in the game-based course had a higher mean rank value (M_r = 108.16) as compared to the students in the traditional online course (M_r = 76.84). Although the Mann-Whitney test is not a direct comparison of means, the actual mean values supplement this result as well. While the students in the game-based course had a mean grade of 4.88 and standard deviation of 0.33 (an A average, 97.8%), those in the non-game-based online course had a mean grade of 4.41 and standard deviation of .76 (a B average, 88.2%).

Thematic analysis was used to analyze student and teacher interviews of which a number of emerging themes were found. Social interaction, innate psychological needs, motivation, and performance in course were analyzed to address the relationship between student performance and motivation in both courses. All of the interviewed students from both courses stated they were actively engaged and that they thought that their social interactions were effective at helping them learn. Despite this similarity students in the serious game-based online course stated they interacted with more features in their course than the non-game-based students. The teachers of the serious game-based online course stated most students were engaged while the teachers of the non-game-based online course stated that some of the students were actively engaged. Students and teachers in both courses stated they felt more competent and that they belonged to their course but were not connected to others. While all students

and teachers stated the students were motivated, the serious game-based online students and teachers provided more reasons for student motivation than the students and teachers in the non-game-based online course. Additionally, all students and teachers from both courses stated that students were performing well in their courses.

Desirable, undesirable, and helpful and hindering aspects were the emerging themes that were used to analyze the final research question; what aspects do students perceive as helpful and/or hindering to their learning. The students and teachers of both courses stated the many aspects of each course format as desirable (game play, assessments, graphics, online videos, etc.) while only citing a few aspects as undesirable (character voices, submitting assignments, technical issues, etc.). Students and teachers of the serious game-based online course stated the graphics, videos, assessments, and online game format of the course as being helpful to learning and technical issues as hindering learning. Students and teachers of the serious game-based online course stated the videos and online format as being helpful to learning and lack of a teacher, lack of deadlines, and time management as hindering learning.

CHAPTER FIVE: DISCUSSION AND CONCLUSION

The purpose of this study was to compare student learning experiences and outcomes between a serious game-based and non-game based online American History course. The study identified students' intrinsic motivation, students' performance, and student perception on what aspects of their course helped and/or hindered their learning in relation to their intrinsic motivation. The questions that guided the study were:

1. Will the amount of time that students take to complete a serious game-based online American history course differ from the amount of time students take to complete a non-game-based online American history course?

2. Will student performance in a serious game-based online American history course differ from student performance in a non-game-based online American history course?

3. What is the relationship between student performance in both courses and intrinsic motivation, as determined by the Self-Determination Theory?

4. What aspects of a serious game-based online American history course and a non-game-based online American history course do students perceive as helpful and/or hindering to their learning?

Since no other known study has conducted an analysis comparing a serious game-based and non-game-based online course this study is unique. Therefore the findings of this study provide new information for the fields of research on online learning, serious video gaming, and instructional design. Quantitative data was provided by Florida Virtual School (FLVS) and qualitative data was gathered through eight student and four teacher interviews. A random sample of 92 students was selected for the FLVS data and a t-test and Mann-Whitney were used to analyze the data. For the qualitative data, thematic analysis was conducted on all interviews of which themes emerged – social interaction, innate psychological needs, motivation, performances, desirable aspects, undesirable aspects, and helpful and hindering aspects.

In addition to the addressing specific research questions, results on specific demographics were found. Students in the serious game-based online course were found to have taken more previous courses and were currently enrolled in more courses. Both courses had a majority of Caucasian students and non-free or reduced lunch students. The non-game-based online course had an significantly higher percentage of female students (69.6%) and the serious game-based online course had a significantly higher percentage of male students (54.5%).

<u>Research Question 1 Discussion</u>

Will the amount of time that students take to complete a serious game-based online American history course differ from the amount of time students take to complete a non-game-based online American history course?

85

The results revealed that there was a significant ($p < .01$) difference in the mean number of days necessary to complete the course. On average, the 92 students in the video game-based course were enrolled in their course for a longer period of time than the students in the non-game-based online course. This result states that students in the game-based course took significantly longer to complete their course than students in the non-game-based online course.

Although the amount of time taken to complete courses has been linked to satisfaction among students (Zahner, 2006), it is unclear whether students in the game-based course were more satisfied than students in the non-game-based online course. While students in the serious game-based online course performed better, it is unclear whether the assignments of both courses were exactly the same. In addition, although this does not directly equate to academic achievement, it does give a glimpse into the level of intrinsic engagement students are putting forth into their classes (Sitzmann & Ely, 2010; Stallings, 1980; Xie, DeBacker, & Ferguson, 2006). Therefore the results suggest that students in the serious game-based online course could have been more satisfied in that they were also found to have performed significantly higher and reported additional motivational aspects than students in the non-game-based online course.

Despite this suggestion, no prior findings exist that can be used to compare or support this finding. In turn, students in the serious game-based online course, although they performed higher and reported motivational aspects, could have taken longer due to other factors such as additional and more in-depth assignments than students in the

non-game-based online course. Further studies investigating the amount of time taken to complete each course should consider student satisfaction, motivation, and depth and breadth of assignments. Also, this finding should be helpful for teachers and educational stakeholders when considering whether either of these approaches to teaching and learning American history are appropriate for their own student populations.

Research Question 2 Discussion

Will student performance in a serious game-based online American history course differ from student performance in a non-game-based online American history course?

The results of the statistical analysis found a significant difference between course performance and the type of American history course. Results indicated that students in both courses performed well however student in the serious game-based online course had an A average whereas students in the non-game-based online course had a B average. Although both courses were high school American history courses at the same online school and followed Florida Sunshine State Standards (SSS), it is unclear the degree to which the content of these courses match each other.

For this study, the main purpose of looking at student performance was to delineate whether the different pedagogical practices used for these courses has an impact on student achievement. Therefore, student performance was used an indicator of the effectiveness of the different courses teaching methodologies (Berthold & Renkl,

2009; Borodzicz & van Haperen, 2002; Meltzer, 2002; Richland, Bjork, Finley, & Linn, 2005). Therefore this finding suggests that for this group of students in the serious game-based online course and the non-game-based online course, the serious game-based online course was more effective.

As a lack of research is available that compares student performance between such courses, no prior research can be used to explain or support this suggested finding. Furthermore, it is unknown the extent to which the content of both courses match each other. Future studies conducting an analysis on student performance should consider the similarities and difference between the content in each course. In addition, the results inform instructional-designers, teachers, education stakeholders, and educational game designers by providing evidence that the serious game-based online course was effective based on the student performance data.

<u>Research Question 3 Discussion</u>

What is the relationship between student performance in both courses and intrinsic motivation, as determined by the Self-Determination Theory? In order to address this question, the student and teacher interviews and the FLVS data were analyzed.

Intrinsic motivation has a direct impact on learning (Byman & Kansanen, 008; Deci & Ryan, 2008; Deci & Ryan, 2008; Jang et al., 2009; Metiri Group, 2008; Vansteenkiste, Lens, & Deci, 2006; Xie, DeBacker, & Ferguson, 2006). It has been found that students who are intrinsically motivated are "…more likely to stay in school,

to achieve, to evidence greater conceptual understanding, and to be well adjusted..." when compared to students with less self-determined types of motivation (Deci, et al., 1991, p. 332). In the SDT, intrinsic motivated actions are self-regulated and autonomous (Deci & Ryan, 2008; Deci et al., 1991; Ryan, Koestner, & Deci, 1991). Therefore in an effort to support the development of intrinsically motivated actions for the purpose of learning, "an atmosphere of autonomy support, which has often been found to facilitate satisfaction of all three psychological needs, is critical to active engagement" (Deci & Ryan, 2008, p. 186).

According to the SDT theory, active engagement requires support from the social environment (Deci & Ryan, 2000; Ryan & Deci, 2000). Along with support from the social environment for active engagement, it is necessary for the environment to maintain students' innate psychological needs of competence, autonomy, and relatedness (Deci & Ryan, 2000; Ryan & Deci, 2000). Within the SDT, competence is "the need to be effective in one's interactions with the environment" (Jang, Reeve, Ryan, & Kim, 2009, p. 644).

In order to address Research Question 3, a thematic analysis was conducted on all qualitative data to examine student motivation. The intrinsic motivation results indicate that students in both courses were intrinsically motivated through their positive social interactions and through the support of their innate psychological needs. Along with this, students in the game-based course reported an additional motivation than their non-game-based online course peers in that they were motivated by their desire to interact with the game. As previously concluded in the second research question, it was

found that students performed well in their course however students in the serious game-based online course performed significantly higher.

Students in the serious game-based online course appear to have higher levels of intrinsic motivation which is evident by their interviews and the teacher interviews. This intrinsic motivation finding coupled with the performance results suggest that student intrinsic motivation is positively related to student performance in both courses and that students in the serious game-based online course performed higher and had more intrinsic motivation. This finding as based on Gunter, Kenny, and Vick's (2008) conclusions further suggests that the serious game-based online course was effective in that students of the game-based course responds were focused on the many ways in which they positively interacted and enjoyed the course; intrinsic motivation. Despite this suggestion, no prior findings exist that can be used to compare and support this finding when comparing serious game-based online and non-game-based online American history courses. Future studies examining performance and intrinsic motivation should consider incorporating robust intrinsic motivation instruments to further analyze the relationship between performance and motivation in similar environments to this study.

Furthermore, the results from this study inform instructional-designers, teachers, education stakeholders, and educational game designers by providing research based evidence of specific aspects that students found motivating in their courses. When coupling the performance data with the student perceived intrinsic motivation data,

90

evidence is provided that students were motivated in their courses and that they performed well.

Research Question 4 Discussion

What aspects of a serious game-based online American history course and a non-game-based online American history course do students perceive as helpful and/or hindering to their learning?

Student perception of the usefulness of different features of their course has been found to be a positive indicator of student satisfaction, support for learning, and intrinsic motivation (Douglas et. al., 2007; Gunter, Kenny, & Vick, 2008; Singh & Lee, 2008; Wells, de Lange, & Fieger, 2008). In an effort to examine student perception of the usefulness of their course features, this study investigated what aspects of a serious game-based and a non-game-based online course that students perceived to be helpful and hindering to their learning. In order to address Research Question 4, a thematic analysis was conducted on all qualitative data to examine student's perception of helpful and hindering aspects of their courses.

The results indicate that students in the serious game-based online course found many aspects of their class helpful to their learning. Some of the aspects of the course were the fact that it is a game, scavenger hunts, interest, and the non-traditional format. For the non-game-based online course, the results indicate that students found the videos and the format of the course helpful. While students in both courses cited helpful aspects, students in the serious game-based online course provided more aspects than

students in the non-game-based online course. The findings for the serious game-based online course found no hindrances to student learning. In contrast the non-game-based online course findings indicated that the lack of a physical teacher was a hindrance to student learning. Therefore the results suggest that students in the serious game-based online course could have been more satisfied, had greater intrinsic motivation, and could have been provided additional support when compare to students in the non-game-based online course.

As a lack of research is available that compares student satisfaction and helpful and hinder aspects of their course between two such courses, no prior research can be used to explain or support this suggested finding. Therefore, future studies investigating helpful and hindering aspects of online courses should consider student satisfaction and the degree to which support differs between the two courses. In addition, these results should be helpful for instructional designers and serious video game designers when developing new serious video game and non-game-based online courses.

<div align="center">Significance</div>

The results from this study inform instructional-designers, teachers, education stakeholders, and educational game designers by providing research based evidence that the serious game-based online course was effective based on the student performance data. The student perceived intrinsic motivation data provides evidence of specific aspects that students found motivating in their courses. When coupling the

<div align="center">92</div>

performance data with the student perceived intrinsic motivation data, evidence is

provided that students were motivated in their courses and that they performed well.

Also, the amount of time students take to complete their courses should be helpful for

teachers and educational stakeholders when considering whether to implement either of

these approaches of teaching and learning American history. The results for aspects

that helped and/or hindered learning were found for each course should be helpful for

instructional designers and serious video game designers when developing new serious

video game and non-game-based online courses. Additionally, the results of the study

are significant to educational researchers who are considering the use of serious video

games in their research. The findings of this study should be helpful for researchers in

the design of their research as well as future studies.

Conclusion

As the use of online environments for educational purposes continues to

increase (Allen & Seaman, 2010; Picciano & Seaman, 2009), many researchers argue

that the effectiveness of the design and pedagogical techniques used in these

environments should be assessed (Chen, 2007; Harden, 2008; Huett et al., 2008; Ke &

Hoadley, 2009; Lee, 2005; Maltby & Mackie, 2009; Picciano & Seaman, 2007; USDOE,

2009; Watson & Ryan; 2007). While little research currently exists on the effectiveness

of online learning environments (Chen, 2007; Huett et al., 2008; Lee, 2005; United

States Department of Education [USDOE], 2009), researchers have evaluated factors

often taken into consideration when online learning environments are adopted (Allen &

Seaman, 2010; Adams & DeVaney, 2009; Falloon, 2010; Huett et al., 2008; Leijen,

2008; Leijen et al., 2008; Picciano & Seaman, 2009; USDOE, 2009). One of the notable

beneficial factors is the means to incorporate multimedia such as serious video games

(Annetta et al., 2009; Delwiche, 2006; Ke, 2008; Martineau, 2009; Sheehy, Ferguson, &

Clough, 2008; USDOE, 2009) of which game researchers and developers are pushing

to increase the use of in educational settings (Annetta et al., 2009; Annetta & Park,

2006; Barab et al., 2005; Brown & Bell, 2004; Delwiche, 2006; Ke, 2008; Sheehy,

Ferguson, & Clough, 2008; Virvou, Katsionis, & Manos, 2005; Yee, 2006).

While games appear to be a clear method of linking authentic, engaging, and

appealing learning activities to student interests (Annetta et al., 2009; Annetta & Park,

2006; Barab et al., 2005; Dalgarno & Lee, 2010; Ke, 2008; Kirkley & Kirkley, 2005;

Virvou et al., 2005), there are pros and cons for the use of games for educational

purposes. Social collaboration, enhance computer literacy skills, improve attention,

increase reaction time, teaching problem solving skills, encourage active self-regulated

learning, enhance understanding through emotional connections, alternative learning

approach, and enjoyment are considered a few of the benefits to using multimedia

(Annetta et al., 2009; Annetta & Park, 2006; Barab et al., 2005; Brown & Bell, 2004;

Buckley & Anderson, 2006; Delwiche, 2006; Faria & Wellington, 2004; Gunter & Kenny,

2008; Ke, 2008; Kirkley & Kirkley, 2005; Sheehy et al., 2008; Yee, 2006). Some of the

factors of using multimedia that are considered to negatively impact learning are gender

differences, accessibility, frustration, aggression, staffing concerns, lack of instructional

design models for gaming, ease of development, lack of understanding of educational

benefits, and lack of quality serious video games (Annetta et al., 2009; Annetta & Park,

2006; Brandt, 2008; Buckley & Anderson, 2006; Delwiche, 2006; Gentile & Gentile,

2008; Ke, 2008; Sheehy et al., 2008; Virvou et al., 2005; Yee, 2006). Therefore, when

pairing the increasing use of online educational environments, the push to use serious

video games, and a lack of research on their effectiveness, this study sought to

compare student learning experiences and outcomes between a serious game-based

and non-game based online American History course.

The study identified students' intrinsic motivation, students' performance, and

student perception on what aspects of their course helped and/or hindered their

learning. Qualitative and quantitative data sources were collected as based on the

triangulation convergence model (Creswell & Plano-Clark, 2007). Qualitative data was

collected through student and teacher interviews and the quantitative data was provided

by FLVS.

The demographic results of the study found the serious game-based online

course had a higher percentage of males (55.4%) while the non-game-based online

course had a higher percentage of females (69.6%). In both courses Caucasian or

White Non-Hispanic students were the majority; serious game-based online course

(80.2%) and the non-game-based online course (69.6%). Students in the serious game-

based online course on average completed twice as many courses (M_{GB} = 12.1, M_{NGB} =

5.11) and were enrolled in significantly more courses (M_{GB} = 2.30, M_{NGB} = 1.30) than

students in the non-game-based online course. Additionally, in both courses the

majority of students did not have free or reduced lunch; serious game-based online

(82.6%) and non-game-based online course (79%).

Results of an independent t-test revealed that there was a significant (p < .01)

difference in the mean number of days necessary to complete the course. On average,

the 92 students in the serious video game-based course took a longer period of time to

complete their course (M = 145.80, SD = 50.64) than the students in the non-game-

based online course (M = 112.63, SD = 49.60). Although the results of the Mann-

Whitney test indicated that students in both courses performed well, students in the

serious game-based online course had an A average whereas students in the non-

game-based online course had a B average, a significant difference between course

performance and the type of American history course (Z = -5.066, p < .01) was found.

Thematic analysis was used to analyze student and teacher interviews of which a

number of emerging themes were found. Social interaction, innate psychological needs,

motivation, and performance in course were analyzed to address the relationship

between student performance and motivation in both courses. Active engagement and

the belief that the social interactions were effective at helping them learn were a shared

response among all interviewed students from both courses. Despite this similarity

students in the serious game-based online course stated they interacted with more

features in their course than the non-game-based online students. The teachers of the

serious game-based online course stated most students were actively engaged while

the teachers of the non-game-based online course stated that some of the students

were actively engaged. Students and teachers in both courses stated they felt more

competent and that they belonged to their course but were not connected to others. While all students and teachers stated the students were motivated, the serious game-based online students and teachers provided more reasons for student motivation than the students and teachers in the non-game-based online course. Additionally, one hundred percent of the sample students and teachers from both courses stated that students were performing well in their courses.

For the final research question, what aspects do students perceive as helpful and/or hindering to their learning, the emerging themes analyzed were desirable, undesirable, and helpful and hindering aspects. The students and teachers of both courses stated the many aspects of each course format as desirable (game play, assessments, graphics, online videos, etc.) while only citing a few aspects as undesirable (character voices, submitting assignments, technical issues, etc.). Students and teachers of the serious game-based online course stated the graphics, videos, assessments, and online game format of the course as being helpful to learning and technical issues as hindering learning. Students and teachers of the serious game-based course stated the videos and online format as being helpful to learning and lack of a teacher, lack of deadlines, and time management as hindering learning.

Since no other known study has conducted an analysis comparing a serious game-based and non-game-based online course this study is unique. Although the unique nature of the study makes the results significant to educational researchers who are considering the use of serious video games in their research, this caused a challenge in locating research to support the many findings of this study. Therefore

results from this study could be used to guide research in many areas related to online and serious game-based online educational environments.

Limitations of the Study

As qualitative data is not generalizable, the subsequent findings can not be generalized and are bound to the students who are enrolled in these courses at FLVS (Marshall & Rossman, 2006). Although the thematic analysis found students to have high intrinsic motivation and a relationship between intrinsic motivation and course performance this data can not be generalizable. The quantitative data used in this study can only be generalized for high school students who are taking or have taken their high school American history course in a fully-online format. The amount of time students took to complete their course can not be equated to time on task as data was limited on the amount of time students took to complete tasks as well as the depth and breadth of assignments for each course. The amount of time students took to complete their course can not be equated to student engagement as this is not a direct measure of student satisfaction, motivation or engagement but is rather a measure of the date students enrolled in their course to the date students completed their course. As an analysis was not conducted on the similarities and differences between the content depth and breadth of assignments in each course, the performance findings are limited in their generalizability.

Recommendations for Future Research

The following suggestions for future research were derived from the findings in the study.

1. Future research should be conducted to investigate the relationship between the amount of time students took to complete their course and students time on task, student satisfaction, student motivation, and students engagement in their course.

2. Future research should be conducted with an experimental design, a control and treatment group, in order to further evaluate the effectiveness of serious game-based online courses and non-game-based online courses.

3. Future research efforts should allow for a large randomized sample in order to further investigate the effectiveness of the serious game-based online course.

4. Future research should be conducted to investigate the relationship between the amount of time students take to complete their course and student performance.

5. Future research should conduct an analysis of the degree to which content for each course matches each other and the depth and breadth of assignments for each course to further support the performance findings of this study.

6. Future research should be conducted to review the relationship between satisfaction and performance with the game-based course.

7. Future research should be conducted to determine the characteristics of students who benefit from serious game-based online courses.

8. Future research should be conducted to determine what factors contribute to higher performance, such as time on task and pedagogical approach, in the game-based course.

9. Future research should conduct an analysis of the degree to which teacher's skills and pedagogical beliefs differ between the serious game-based online course and non-game-based online.

APPENDIX A: STUDENT INTERVIEW PROTOCOL

Student Interview Protocol

Two different set instruments will be used for each course. The only difference between the two instruments will be the within the description when describing the students' virtual American history and virtual American history educational video game courses.

I would like to thank you for participating in this study. Your input will help improve both this (virtual American history course/ virtual American history educational video game course as well as help inform future educational video games). It should take approximately 30 minutes for the entire interview.

1. Why did you choose to enroll at FLVS?

2. What influenced your decision to take this course (American history / Conspiracy Code)?
3. Describe what your normal educational setting looks like, in other words what your surroundings, both virtually and in real-life, look like when you are working in your class (American history / Conspiracy Code)?

4. How much time do you spent in your course? Approximately per week.
5. When you are logged-into your course are you actively engaged?
6. How many times do you have to re-submit assignments to your teacher?
7. How do you feel you are performing in your course (American history / Conspiracy Code)?
8. How are you performing on your assessments in your course (American history / Conspiracy Code)?
9. What grade do you have in your course (American history / Conspiracy Code)?

10. What aspects of your course motivate you?
11. What aspects of your course help your learning?
12. What aspects of your course hinder your learning?

Okay now, I want you to think about how you socially interact within your course. When answering this next group of questions I would like you to reflect on your communications and exchanges within your class and think about the different ways you interact.

13. In what ways do you interact socially within your course (American history / Conspiracy Code), in other words who and what do you interact with?

14. How do you interact?
15. Do the social interactions of this course effectively help you better learn American history? Yes No
16. How are they (the social interactions of this course) effective or ineffective at helping your learning?

17. Do you feel that you are learning the content of this course, in other words are you learning about American history?
18. On a scale of 1 to 5, 1-being all of the material and 5-being none of the material, how much of the material covered so far do you think you have learned in this course?
    1 - all of the material
    2 - most of the material
    3 - half of the material
    4 - some of the material
    5 - none of the material

    SDT: Innate Psychological Needs

19. At this point in your course, do you feel more competent at American history?
20. Do you feel that your course has helped you feel (or hindered you to feel) more competent at American history?
21. What do you feel is the reason for your success or failure in this course?
22. How do you feel about this course?
23. Do you feel like you belong?
24. In other words, do you feel like you are a part of this course or do you feel like you are isolated and all-alone?
25. Do you feel connected with other people in this course?
26. Whom do you feel connected to?

27. Overall, do you think the format of this class is effective at helping you learn?
28. What parts of this course do you like?
29. What parts do you dislike?
30. What parts of this course do you think need to be improved?
31. What parts of this course do you think work well?
32. Please provide any additional feedback that you feel is important in improving this course (American history / educational video game – Conspiracy Code)

    Thank you again for participating in this study. Your input is very valuable and will help improve both this educational video game and future educational video games.

33. Do you have any questions for me regarding my research?

Thank you very much for your time, your input will help a lot in trying to improve this game and other educational video games!

APPENDIX B: TEACHER INTERVIEW PROTOCOL

Teacher Interview Protocol

Two different set instruments will be used for each course. The only difference between the two instruments will be the within the description when describing the students' virtual American history and virtual American history educational video game courses.

I would like to thank you for participating in this study. Your input will help improve both this (virtual American history course/ virtual American history educational video game course as well as help inform future educational video games). It should take approximately 25-35 minutes for the entire interview.

1. Why did you decide to teach at FLVS?
2. What influenced your decision to teach this course (American history / Conspiracy Code)?
3. Approximately, how much time do you spend working with your students per week?
4. How do you interact with your students?
5. Are your students actively engaged in your course?

6. Please describe the types of assignments that are part of your class (American history / Conspiracy Code)?
7. How many times do you have student re-submit assignments to you?
8. How are your students performing on the assessments in your course (American history / Conspiracy Code)?
9. Overall, how do you feel your students are performing in your course (American history / Conspiracy Code)?

10. What aspects of the course do you think motivate your students?
11. What aspects of the course do you think help your students learn?
12. What aspects of the course do you think hinder your students learning?

Okay now, I want you to think about how your students socially interact within your course.

13. In what ways do your students interact socially within your course (American history / Conspiracy Code)?
14. Do you think that the social interactions of this course are effective or ineffective at helping your students learn?
15. Why? Please Explain Further.

16. Do you feel that your students are learning American history?

17. On a scale of 1 to 5, 1-being all of the material and 5-being none of the material, how much of the material covered in your class, do you think the students learn?

    1 - all of the material
    2 - most of the material
    3 - half of the material
    4 - some of the material
    5 - none of the material

SDT: Innate Psychological Needs

18. Do you feel that your course has increase student's competence of American history?
19. What do you feel is the reason for many of your students your success and failure in this course?
20. Do you think your students feel as sense of belonging to this course?
21. In other words, do your students feel like they are a part of this course or do you think they feel isolated and all-alone?
22. Do you think your students feel connected with other people in this course?
23. Who do you think they feel connected to?

24. Overall, do you think the format of this class is effective at helping students learn?
25. What parts of this course do you think the students like?
26. What parts do you think the students dislike?

27. What parts of this course do you think need to be improved?
28. What parts of this course do you think work well?
29. Please provide any additional feedback that you feel is important in improving this course (American history / educational video game – Conspiracy Code)

30. Thank you again for participating in this study. Your input is very valuable!

31. Do you have any questions for me regarding my research?

Thank you very much for your time!

APPENDIX C: FLVS APPROVAL LETTER

Research Approval Letter from Florida Virtual School

Florida VirtualSchool

Date: March 10, 2009

Title of proposal: Motivated Strategies for Learning in a Virtual Educational Video Game Course

To: Taryn Hess

This letter is to officially notify you of the approval of your project by the Florida Virtual School. This project should be conducted in full accordance with the attached FLVS guidelines which must be signed and returned prior to data collection. Your research tools have been approved. If any changes are made to these tools, please submit the modifications to the FLVS Research Committee for approval. If direct student contact is requested, all researchers involved are required to be fingerprinted at our office in Orlando.

You are authorized to implement this study as of the 10th of March, 2009. This approval is valid March 10th, 2009 through March 10th, 2010. If this contract expires, you will have to complete an addendum.

FLVS will do our best to meet your timeline; however, unforeseen circumstances may delay the process. We will notify you immediately if a delay occurs.

When research is complete, the researcher must provide notification that the study is finished and send any publication information to the contact below. We reserve the right to review information prior to publication and to have access to all research findings.

If you have any questions, please contact Dr. Stacey Rimmerman, Research and Evaluation Specialist, at 850-438-1249 or email at srimmerman@flvs.net

Sincerely,

Jennifer Whiting
Director of Curriculum Research and Discovery
Florida Virtual School
407-513-3369
Please sign the guidelines below and email back to SRimmerman@flvs.net

APPENDIX D: UCF IRB APPROVAL LETTER

Research Approval Letter from the University of Central Florida's IRB

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901, 407-882-2012 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Notice of Expedited Initial Review and Approval

From : **UCF Institutional Review Board**
FWA00000351, Exp. 10/8/11, IRB00001138

To : **Taryn Sybol Hess and Glenda A. Gunter**

Date : **July 13, 2009**

IRB Number: SBE-09-06305

Study Title: **Evaluation of Self-Regulated Learning in a Virtual Educational Video Game Course**

Dear Researcher:

Your research protocol noted above was approved by **expedited** review by the UCF IRB Chair on 7/8/2009. **The expiration date is 7/7/2010.** Your study was determined to be minimal risk for human subjects and expeditable per federal regulations, 45 CFR 46.110. The category for which this study qualifies as expeditable research is as follows:

6. Collection of data from voice, video, digital, or image recordings made for research purposes.

7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

The IRB has approved a consent procedure which requires participants to sign consent forms. Use of the approved, stamped consent document(s) is required. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Subjects or their representatives must receive a copy of the consent form(s).

For parental permission, the IRB has determined that the signature of one parent is sufficient for participation. Adequate provisions are included to solicit assent from all children participants in this research.

All data, which may include signed consent form documents, must be retained in a locked file cabinet for a minimum of three years (six if HIPAA applies) past the completion of this research. Any links to the identification of participants should be maintained on a password-protected computer if electronic information is used. Additional requirements may be imposed by your funding agency, your department, or other entities. Access to data is limited to authorized individuals listed as key study personnel.

To continue this research beyond the expiration date, a Continuing Review Form must be submitted 2 – 4 weeks prior to the expiration date. Advise the IRB if you receive a subpoena for the release of this information, or if a breach of confidentiality occurs. Also report any unanticipated problems or serious adverse events (within 5 working days). Do not make changes to the protocol methodology or consent form before obtaining IRB approval. Changes can be submitted for IRB review using the Addendum/Modification Request Form. An Addendum/Modification Request Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at http://iris.research.ucf.edu.

Failure to provide a continuing review report could lead to study suspension, a loss of funding and/or publication possibilities, or reporting of noncompliance to sponsors or funding agencies. The IRB maintains the authority under 45 CFR 46.110(e) to observe or have a third party observe the consent process and the research.

On behalf of Tracy Dietz, Ph.D., UCF IRB Chair, this letter is signed by:

Signature applied by Janice Turchin on 07/13/2009 11:18:11 AM EDT

IRB Coordinator

APPENDIX E: UCF IRB ADDENDUM APPROVAL LETTER

UCF IRB Addendum Approval Letter

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Exempt Human Research

From: **UCF Institutional Review Board #1**
          FWA00000351, IRB00001138

To: **Taryn Sybol Hess, Glenda A Gunter**

Date: **October 16, 2009**

Dear Researcher:

On 10/16/2009, the IRB approved the following activity as human participant research that is exempt from regulation:

Type of Review:	Addendum/Modification Request Form
Project Title:	Evaluation of Self-Regulated Learning in a Virtual Educational Video Game Course
Investigator:	Taryn Sybol Hess
IRB Number:	SBE-09-06305
Funding Agency:	None

At the time of this Addendum/Modification Request, it was determined that your study meets Exempt Category # 1. Therefore, the study no longer has an expiration date. As with all human research, you need to follow your consent process with research participants. This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these changes affect the exempt status of the human research, please

APPENDIX F: IRB INFORMED ASSENT STUDENTS SURVEY

IRB Informed Assent Students Survey

University of
**Central
Florida**

Student Assent Form – American History Research Project

My name is Taryn Hess. I am doing a research project on your American History course to investigate the effectiveness of your course. The study will also examine your views on how the game helped or hindered your own learning along with what motivated you, what learning strategies you used, and how you interacted in your course. I am interested in your own experience and whether you feel that this course was an effective way of learning American History. This research is part of my studies at the University of Central Florida.

As a way to study this, I would like to you to take a web-based survey. The web-based survey will ask you questions about how you interact, what motivates you, what learning strategies you use, and what point you are current at your class.

In addition, a small group of students (9 to 10) will be asked to participate in the second portion of this study; an individual interview. An interview consent form will need to be completed to participate in the interview portion of the research project.

Only Dr. Glenda Gunter, my professor at UCF, and I will see your individual survey responses and the audio recordings from interviews. I will destroy the research notes and audio recordings at the end of the study. You will be provided with a CODE to use when completing the survey. And if you participate in the individual interview your name will be replaced with a false name (pseudonym) so that nobody will know it was you in my study.

This will not affect your grade if you decide you don't want to do this. You can stop at any time and you do not have to answer a question if you do not want to. You will not get extra credit for doing this.

Since we understand that your time is valuable and that if you choose to participate you are taking your own time to provide feedback, all students who choose to participate in the survey will receive a community service certificate. Would you like to take part in this research project?

Please check that you would like to participate in the web-based survey for this research project:

_____ I want to take part in the web-based survey.

Please sign and print your name, and write the email address you would like the survey to be sent to:

_____   _____
      Student's Printed Name   Date

_____
      Student or Parent Email Address

APPENDIX G: IRB INFORMED CONSENT PARENTAL SURVEY

University of
**Central
Florida**

Parental Informed Consent Form: American History Research Project

Researchers at the University of Central Florida (UCF) study many topics. To do this we need the help of people who agree to take part in a research study. You are being asked to allow your child to take part in a research study which will include about 200 people. You can ask questions about the research. You can read this form and agree right now for your child to take part, or take the form home with you to study before you decide. You will be told if any new information is learned which may affect your willingness to allow your child to continue taking part in this study. Your child is being invited to take part in this research study because he or she is a student in an American History course at Florida Virtual School. You must be an emancipated minor according to the laws of the State of Florida or an adult 18 years of age or older to be able to give this permission and sign this form for your child to take part in this research study.

The person doing this research is Taryn Hess of the Department of Educational Research, Technology, and Leadership at The University of Central Florida. Because the researcher is a Doctoral student, she is being guided by Dr. Glenda Gunter, a UCF faculty supervisor in the Department of Educational Research, Technology, and Leadership. Dr. Glenda Gunter is an Associate Professor and Co-Chair of the Instructional Technology program and Program Coordinator of the Educational Technology and eLearning Masters program at UCF.

Study title: Evaluation of Self-Regulated Learning in a Virtual Educational Video Game Course

Purpose of the research study: The purpose of this study is to evaluate the effectiveness of a virtual educational video game course. This study will investigate the commonalities and differences between a virtual American History educational video game course and a virtual American History course. Furthermore, the study will examine whether there is relationship between students' motivation for learning and their learning in their American History course.

What your child will be asked to do in the study: Your child will be asked to participate in a web-based survey. The web-based survey consists of 17 multiple choice questions that should take them approximately 10 to 15 minutes to complete. The student will answer demographic, motivation, and self-regulated learning strategy questions pertaining to their American History course. All students will be encouraged to participate in the web-based survey.

In addition, individual interviews will be conducted with approximately 9 to 10 students. Your child does not have to participate in the individual interview to partake in the web-based survey. The individual interviews will focus on student's interaction within their course and their perception of the effectiveness of their course for learning American History. They will be held over the telephone or at a FLVS office. The interview will last approximately 30 minutes. A separate interview consent form will be necessary to participate in the interview portion of this research project.

Voluntary participation: You should allow your child to take part in this study only because you want to. There is no penalty for you or your child for not taking part, and neither you nor your child will lose any benefits. You have the right to stop your child from taking part at any time. Just tell the researcher or a member of the research team that you want your child to stop. You will be told if any new

information is learned which may affect your willingness to allow your child to continue taking part in this study.

Location: The survey will be web-based and your child will receive the URL address after your Informed Consent and their Assent Forms are submitted. They will receive the URL via email from the researcher.

Time required: The web-based survey will require approximately 10 to 15 minutes of time to complete.

Audio or video taping: There will be no audio or video taping during the web-based survey portion of this research project.

Risks: In some cases, students may feel or react emotionally to questions regarding their course based on their individual experience in their course. If they perceived their experience as positive, neutral, or negative, they may revisit these emotions when explaining their experience within the course. Students will be provided with a CODE used to replace their name in the survey they are asked to complete. As there is always a risk that a hacker can break into a computer, there is a risk that a hacker will be able to retrieve this email. Therefore, a hacker could use the code to identify your child. However, there are no perceived risks that are greater than minimal daily-life risks for taking part in this study. Your child does not have to answer every question or complete every task. Neither you nor your child will lose any benefits if your child skips questions or tasks. Your child does not have to answer any questions that make him or her feel uncomfortable.

In any research study involving confidential information, there is always a risk of breaching confidentiality. For this study, due to the nature of the questions, this risk is minimal since we are collecting data that is not viewed as sensitive in nature; minimal demographic information, student motivation, learning strategies, student interaction, and effectiveness of course. In addition, we are only collecting student names for the sake of initial identification. Immediately after data has been collected, students' names will be replaced with identification numbers.

Benefits: The direct benefits to your child are that they may become more aware of their motivation and learning strategies used within their classroom environments. This may help them understand their own learning. Your child will also learn about how research is conducted. In addition, this study will not only benefit your child's knowledge of their motivation and learning strategies, it will help inform educators, instructional designers, and administrators on the effectiveness of virtual educational environments along with student motivation and learning strategies used in educational video game courses.

Compensation or payment: Since we understand that your time is valuable and that if you choose to let your child participate they will be taking their own time to provide feedback, all students who choose to participate in the survey will receive a community service certificate.

In addition to this opportunity, the students who participate in the individual interviews will receive an American Express gift card.

Confidentiality: Your child's identity will be kept confidential only the researcher will know the identity of your child. The researcher will make every effort to prevent anyone who is not on the research team from knowing that your child gave us information, or what that information is. For example, your child's name will be replaced with a code number that will be assigned to the information they share. The list connecting your child's name to this number will be kept on a password protected computer that only the researcher has access to. When the study is done and the data have been analyzed, the list will be destroyed. Your child's information will be combined with information from other children who took part in this study. When the researcher writes about this study to share what was learned with other researchers, she will write about this combined information. Your child's name will not be used in any report, so people will not know how he or she answered or what he or she did.

There are times when the researcher may have to show your child's information to other people. For example, the researcher may have to show your child's identity to people who check to be sure the research was done right. These may be people from the University of Central Florida or state, federal or local agencies or others who pay to have the research done.

Study contact for questions about the study or to report a problem: Taryn Hess, Doctoral Student, Instructional Technology Program, College of Education, tsybol@mail.ucf.edu or Dr. Glenda Gunter, Faculty Supervisor & Dissertation Chair, Department of Educational Research, Technology, and Leadership at (407) 823-3502 or by email at ggunter@mail.ucf.edu.

IRB contact for you and your child's rights in the study or to report a complaint: Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901.

How to return this consent form to the researcher: Please sign and email or fax this consent form. If you choose to email, please scan your signed form and attach the scanned file to your email and send directly to Taryn Hess at tsybol@mail.ucf.edu. If you choose to fax the signed form, please fax to Taryn Hess at 407-347-7072. Please maintain a copy for your personal records.

By signing this letter, you give me permission to report your responses anonymously in the final manuscript to be submitted to my faculty supervisor as part of my course work.

☐ I have read the procedure described above

☐ I voluntarily agree for my child to take part in the web-based survey portion of this research

☐ I am at least 18 years of age

☐ I am an emancipated minor per Florida state law

_____   _____   _____
Signature of parent   Printed name of parent   Date

_____
Printed name of child

_____
Student or Parent Email Address to send Web-Based Survey

_____   _____
Principal Investigator   Date

APPENDIX H: IRB INFORMED ASSENT STUDENTS INTERVIEW

IRB Informed Assent Students Interview

University of
Central
Florida

Student Assent Form – American History Research Project Interview

My name is Taryn Hess. I am doing a research project on your American History course to investigate the effectiveness of your course. The study will also examine your views on how the game helped or hindered your own learning along with what motivated you, what learning strategies you used, and how you interacted in your course. I am interested in your own experience and whether you feel that this course was an effective way of learning American History. This research is part of my studies at the University of Central Florida.

As a way to study this, I would like to you to participate in one individual interview. The interview will consist of questions about interaction, emotions, and patterns along with how effective you feel the course is, how much it helped or hindered you learn, what you liked and didn't like in the course, and what you would change if you had the chance.

Only Dr. Glenda Gunter, my professor at UCF, and I will listen to the audio recordings from interviews. I will destroy the research notes and audio recordings at the end of the study. And if you participate in the individual interview your name will be replaced with a false name (pseudonym) so that nobody will know it was you in my study.

This will not affect your grade if you decide you don't want to do this. You can stop at any time and you do not have to answer a question if you do not want to. You will not get extra credit for doing this.

Since we understand that your time is valuable and that if you choose to participate you are taking your own time to provide feedback, all students who choose to participate in the individual interviews will receive a $25 American Express gift card. Would you like to take part in this research project?

Please check each off that you would like to participate in the individual interview for this American History research project:

_____ I want to take part in an interview.

Please print your name and date:

_____   _____

Student's Printed Name   Date

121

APPENDIX I: IRB INFORMED CONSENT PARENTAL INTERVIEW

University of
Central
Florida

Parental Informed Consent Form: American History Research Project Interview

Researchers at the University of Central Florida (UCF) study many topics. To do this we need the help of people who agree to take part in a research study. You are being asked to allow your child to take part in a portion of a research study which will include about 9 to 10 people. You can ask questions about the research. You can read this form and agree right now for your child to take part, or take the form home with you to study before you decide. You will be told if any new information is learned which may affect your willingness to allow your child to continue taking part in this study. Your child is being invited to take part in this research study because he or she is a student in an American History course at Florida Virtual School. You must be an emancipated minor according to the laws of the State of Florida or an adult 18 years of age or older to be able to give this permission and sign this form for your child to take part in this research study.

The person doing this research is Taryn Hess of the Department of Educational Research, Technology, and Leadership at The University of Central Florida. Because the researcher is a Doctoral student, she is being guided by Dr. Glenda Gunter, a UCF faculty supervisor in the Department of Educational Research, Technology, and Leadership. Dr. Glenda Gunter is an Associate Professor and Co-Chair of the Instructional Technology program and Program Coordinator of the Educational Technology and eLearning Masters program at UCF.

Study title: Evaluation of Self-Regulated Learning in a Virtual Educational Video Game Course

Purpose of the research study: The purpose of this study is to evaluate the effectiveness of a virtual educational video game course. This study will investigate the commonalities and differences between a virtual American History educational video game course and a virtual American History course. Furthermore, the study will examine whether there is relationship between students' motivation for learning and their learning in their American History course.

What your child will be asked to do in the study: Your child will be asked to participate in an individual interview. The individual interviews will focus on student's interaction within their course and their perception of the effectiveness of their course for learning American History.

Voluntary participation: You should allow your child to take part in this study only because you want to. There is no penalty for you or your child for not taking part, and neither you nor your child will lose any benefits. You have the right to stop your child from taking part at any time. Just tell the researcher or a member of the research team that you want your child to stop. You will be told if any new information is learned which may affect your willingness to allow your child to continue taking part in this study.

Location: The individual interviews will be held in over the phone or in person at the Metrowest Florida Virtual School Office, which ever is your preferred location for the interview.

Time required: The individual interview is only 1 session and it will require approximately 30 minutes of time.

Audio or video taping: If your child participates in the individual interview, they will be audio recorded during this study. If you do not want your child to be audio taped, he or she may not be able to

be to participate in the interview portion of the study. Discuss this with the researcher or a research team member. If your child is audio taped, the tape will be kept in a locked, safe place until what your child says has been written down. Once it is written down, the tape will be erased or destroyed. The individual interview is the only portion of this research study that will be audio recorded.

Risks: In some cases, students may feel or react emotionally to questions regarding their course based on their individual experience in their course. If they perceived their experience as positive, neutral, or negative, they may revisit these emotions when explaining their experience within the course. The students name will not be used in this research study. Their name will be replaced with a pseudonym for the purpose of protecting their confidentiality. Therefore, there are no perceived risks that are greater than minimal daily-life risks for taking part in this study. Your child does not have to answer every question or complete every task. Neither you nor your child will lose any benefits if your child skips questions or tasks. Your child does not have to answer any questions that make him or her feel uncomfortable.

In any research study involving confidential information, there is always a risk of breaching confidentiality. For this study, due to the nature of the questions, this risk is minimal since we are collecting data that is not viewed as sensitive in nature; minimal demographic information, student motivation, learning strategies, student interaction, and effectiveness of course. In addition, we are only collecting student names for the sake of initial identification. Immediately after data has been collected, students' names will be replaced with identification numbers.

Benefits: The direct benefits to your child are that they may become more aware of their motivation and learning strategies used within their classroom environments. This may help them understand their own learning. Your child will also learn about how research is conducted. In addition, this study will not only benefit your child's knowledge of their motivation and learning strategies, it will help inform educators, instructional designers, and administrators on the effectiveness of virtual educational environments along with student motivation and learning strategies used in educational video game courses.

Compensation or payment: Since we understand that your time is valuable and that if you choose to let your child participate they will be taking their own time to provide feedback, all students who choose to participate will receive a $25 American Express Gift Card.

Confidentiality: Your child's identity will be kept confidential only the researcher will know the identity of your child. The researcher will make every effort to prevent anyone who is not on the research team from knowing that your child gave us information, or what that information is. For example, your child's name will be replaced with a pseudonym that will be assigned to the information they share. The list connecting your child's name to this pseudonym will be kept on a password protected computer that only the researcher has access to. When the study is done and the data have been analyzed, the list will be destroyed. Your child's information will be combined with information from other children who took part in this study. When the researcher writes about this study to share what was learned with other researchers, she will write about this combined information. Your child's name will not be used in any report, so people will not know how he or she answered or what he or she did.

There are times when the researcher may have to show your child's information to other people. For example, the researcher may have to show your child's identity to people who check to be sure the research was done right. These may be people from the University of Central Florida or state, federal or local agencies or others who pay to have the research done.

Study contact for questions about the study or to report a problem: Taryn Hess, Doctoral Student, Instructional Technology Program, College of Education, tsybol@mail.ucf.edu or Dr. Glenda Gunter, Faculty Supervisor & Dissertation Chair, Department of Educational Research, Technology, and Leadership at (407) 823-3502 or by email at ggunter@mail.ucf.edu.

IRB contact for you and your child's rights in the study or to report a complaint: Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901.

How to return this consent form to the researcher: Please sign and email or fax this consent form. If you choose to email, please scan your signed form and attach the scanned file to your email and send directly to Taryn Hess at tsvbol@mail.ucf.edu. If you choose to fax the signed form, please fax to Taryn Hess at 407-347-7072. Please maintain a copy for your personal records.

By signing this letter, you give me permission to report your responses anonymously in the final manuscript to be submitted to my faculty supervisor as part of my course work.

☐ I have read the procedure described above

☐ I voluntarily agree for my child to take part in the research

☐ I am at least 18 years of age

☐ I am an emancipated minor per Florida state law

☐ I agree to have my child audio recorded and to participate in interviews

☐ I do not agree to have my child audio recorded or to participate in interviews

_____   _____   _____
Signature of parent   Printed name of parent   Date

_____
Printed name of child

_____   _____
Principal Investigator   Date

APPENDIX J: IRB INFORMED CONSENT TEACHER INTERVIEW

Teacher Informed Consent Form: American History Research Project

Researchers at the University of Central Florida (UCF) study many topics. To do this we need the help of people who agree to take part in a research study. You are being asked to participate in a research study which will include about 200 people. You can ask questions about the research. You can read this form and agree right now, or take the form home with you to study before you decide. You will be told if any new information is learned which may affect your willingness to continue taking part in this study. You are being invited to take part in this research study because you are a teacher in an American History course at Florida Virtual School. You must be an adult 18 years of age or older to be able to participate in this research study.

The person doing this research is Taryn Hess of the Department of Educational Research, Technology, and Leadership at The University of Central Florida. Because the researcher is a Doctoral student, she is being guided by Dr. Glenda Gunter, a UCF faculty supervisor in the Department of Educational Research, Technology, and Leadership. Dr. Glenda Gunter is an Associate Professor and Co-Chair of the Instructional Technology program and Program Coordinator of the Educational Technology and eLearning Masters program at UCF.

Study title: Evaluation of Self-Regulated Learning in a Virtual Educational Video Game Course

Purpose of the research study: The purpose of this study is to evaluate the effectiveness of a virtual educational video game course. This study will investigate the commonalities and differences between a virtual American History educational video game course and a virtual American History course. Furthermore, the study will examine whether there is relationship between students' motivation for learning and their learning in their American History course.

What your child will be asked to do in the study: You will be asked to participate in an individual interview. You will be asked to questions related to your students' motivation and self-regulated learning strategy questions pertaining to their American History course.

Voluntary participation: You should participate in this study only because you want to. There is no penalty for you not taking part and neither will you lose any benefits. You have the right to stop your participation at any time. Just tell the researcher or a member of the research team that you want to stop. You will be told if any new information is learned which may affect your willingness to continue taking part in this study.

Location: The individual interviews will be held in person at the Metrowest Florida Virtual School Office or via telephone if requested.

Time required: The individual interview is only 1 session and it will require approximately 30 minutes of time.

Audio or video taping: If you participate in the individual interview, you will be audio recorded during this study. If you do not want to be audio taped, you may not be able to be to participate in the study. Discuss this with the researcher or a research team member. If you are audio taped, the tape will be kept in a locked, safe place until what you say has been written down. Once it is written down, the

tape will be erased or destroyed. The individual interview is the only portion of this research study that will be audio recorded.

Risks: In some cases, you may feel or react emotionally to questions regarding their course based on your own experience teaching this course. If you perceive your experience as positive, neutral, or negative, you may revisit these emotions when explaining your experience with this course. Therefore, there are no perceived risks that are greater than minimal daily-life risks for taking part in this study. You do not have to answer every question or complete every task. You will not lose any benefits if you skip questions or tasks. You do not have to answer any questions that make you feel uncomfortable.

In any research study involving confidential information, there is always a risk of breaching confidentiality. For this study, due to the nature of the questions, this risk is minimal since we are collecting data that is not viewed as sensitive in nature; minimal demographic information, student motivation, learning strategies, student interaction, and effectiveness of course. In addition, we are only collecting names for the sake of initial identification. Immediately after data has been collected, all names will be replaced with identification numbers.

Benefits: The direct benefits to you and your students are that you may become more aware of your students motivation and learning strategies used within their classroom environments. This may help you understand their learning. In addition, this study will not only benefit your students knowledge of their motivation and learning strategies, it will help inform educators, instructional designers, and administrators on the effectiveness of virtual educational environments along with student motivation and learning strategies used in educational video game courses.

Compensation or payment: There is no compensation, payment or extra credit for your child's part in this study.

Confidentiality: Your identity will be kept confidential only the researcher will know your identity. The researcher will make every effort to prevent anyone who is not on the research team from knowing that you gave us information, or what that information is. For example, your name will be replaced with a pseudonym that will be assigned to the information you share. The list connecting your name to this pseudonym will be kept on a password protected computer that only the researcher has access to. When the study is done and the data have been analyzed, the list will be destroyed. Your information will be combined with information from other teachers who took part in this study. When the researcher writes about this study to share what was learned with other researchers, she will write about this combined information. Your name will not be used in any report, so people will not know how you answered.

There are times when the researcher may have to show your information to other people. For example, the researcher may have to show your identity to people who check to be sure the research was done right. These may be people from the University of Central Florida or state, federal or local agencies or others who pay to have the research done.

Study contact for questions about the study or to report a problem: Taryn Hess, Doctoral Student, Instructional Technology Program, College of Education, tsybol@mail.ucf.edu or Dr. Glenda Gunter, Faculty Supervisor & Dissertation Chair, Department of Educational Research, Technology, and Leadership at (407) 823-3502 or by email at ggunter@mail.ucf.edu.

IRB contact for you and your child's rights in the study or to report a complaint: Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901.

How to return this consent form to the researcher: Please sign and email or fax this consent form. If you choose to email, please scan your signed form and attach the scanned file to your email and send directly to Taryn Hess at tsybol@mail.ucf.edu. If you choose to fax the signed form, please fax to Taryn Hess at 407-347-7072. Please maintain a copy for your personal records.

By signing this letter, you give me permission to report your responses anonymously in the final manuscript to be submitted to my faculty supervisor as part of my course work.

☐ I have read the procedure described above

☐ I voluntarily agree to take part in the research

☐ I am at least 18 years of age

☐ I agree to be audio recorded and to participate in interviews

☐ I do not agree to be audio recorded or to participate in interviews

_____   _____   _____
Signature of teacher   Printed name of parent   Date

_____
Printed name of teacher

_____   _____
Principal Investigator   Date

APPENDIX K: RECRUITMENT LETTER

Original Recruitment Letter for Virtual Educational Video Game Course

Note: this recruitment letter will be used by the instructors in the Course as one method of informing students about their involvement in the study. It will outline the fundamentals of the study and the required informed and assent forms to participate. Teachers and FLVS staff will be able to answer any direct questions that students have using the information in this letter. If there are any questions that pertain to information found outside of this letter the teacher will direct students to contact the research team; Taryn Hess and/or Dr. Glenda Gunter.

University of
**Central
Florida**

The University of Central Florida is conducting research here at Florida Virtual School on our Conspiracy Code course. Researchers, Taryn Hess and Dr. Glenda Gunter will be investigating the effectiveness of our course by asking you to complete a survey and to participate in an interview.

All students enrolled in Conspiracy Code are eligible and are encouraged to participate in the web-based survey and to elect to participate in an interview session. All students who participate in the web-based survey will be included in the study. Only a handful of students will be randomly chosen to participate in the interviews. The interviews will be held at the Metrowest FLVS office building. Specific meeting times for the interviews will be determined by FLVS staff, your availability, and the research team.

The benefits of participating are that as a student you will be able to tell us what is good and bad about your course. You will be able to inform us on the effectiveness of this course's ability to teach you American History. In addition, you will be helping teachers and video game designers to create better educational video games. You will also learn about your own motivation and learning strategies that you use when you are in your American History course.

The web-based survey is short and only requires 10 to 15 minutes to complete. The individual interview is only 1 session and it will require approximately 30 minutes of time. At the interview, an audio recording device will be used to make sure we record exactly what you say. This is very important to ensure that your opinions and the information you share is accurate.

If you are interested in participating in the study please download and complete **both** the Parental Informed Consent and the Student Assent Forms. Then email them to

131

tsybol@mail.ucf.edu or Fax them to the number located on the form. It is necessary to state that you will not receive any compensation for participating in this research.

If you have any additional questions please forward them to the research team, their contact information is below:

Taryn Hess, Doctoral Student
Instructional Technology Program, College of Education
tsybol@mail.ucf.edu

Dr. Glenda Gunter, Faculty Supervisor & Dissertation Chair
Department of Educational Research, Technology, and Leadership
(407) 823-3502
ggunter@mail.ucf.edu

If you have a problem connecting to the Parental Consent and Student Assent Forms please copy & paste the following URL into your Internet browser:
http://pegasus.cc.ucf.edu/~ta773758/ResearchConsentForms_Parent&Student

IRB contact for you and your child's rights in the study or to report a complaint: Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901.

LIST OF REFRENCES

Abrams, S. S. (2009). A gaming frame of mind: Digital contexts and academic implications. *Educational Media International, 40*(4), 335-347.

Achterbosch, L., Pierce, R., & Simmons, G. (2007). Massively multiplayer online role-playing games: The past, present, and future. *Computers in Entertainment, 5*(4).

Adams, N. B., & DeVaney, T. A. (2009). Measuring conditions conducive to knowledge development in virtual learning environments: Initial development of a model-based survey. *The Journal of Technology, Learning, and Assessment, 8*(1).

Allen, I. E., & Seaman, J. (2010). Learning on demand: Online education in the United States, 2009: Sloan Consortium.

Annetta, L., Mangrum, J., Holmes, S., Collazo, K., & Cheng, M.-T. (2009). Bridging Realty to Virtual Reality: Investigating gender effect and student engagement on learning through video game play in an elementary school classroom. *International Journal of Science Education, 31*(8), 1091-1113.

Annetta, L., Murray, M. R., Laird, S. G., Bohr, S. C., & Park, J. C. (2006). Serious games: Incorporating video games in the classroom. *EDUCASE Quarterly*, 16-22.

Annetta, L., & Park, J. C. (2006). Game on: Graduate science education students creating role playing video games in a 3-D virtual environment through synchronous online instruction. Paper presented at the Annual Conference of the Association for Science Teacher Education.

Barab, S., Thomas, M., Dodge, T., Carteaux, R., & Tuzun, H. (2005). Making learning fun: Quest atlantis, a game without guns. *Educational Technology Research & Development, 53*(1), 86-107.

Beldarrain, Y. (2006). Distance education trends: Integrating new technologies to foster student interaction and collaboration. *Distance Education, 27*(2), 139-153.

Bell, D. M., & Espie, C. A. (2002). A preliminary investigation into staff satisfaction, and staff emotions and attitudes in a unit for men with learning disabilities and serious challenging behaviors. *British Journal of Learning Disabilities, 30*(1), 19-27.

Black, A., & Deci, E. L. (2000). The effects of instructor's autonomy support and students' autonomous motivation on learning organic chemistry: A self-determination theory perspective. *Science Education, 84*, 740-756.

Berthold, K., & Renkl, A. (2009). Instructional aids to support a conceptual understanding of multiple representations. *Journal of Educational Psychology, 101*(1), 70-87.

Boettcher, J., & Conrad, R. (1999). *Faculty guide for moving teaching and learning to the Web*. Mission Viejo, CA: League for Innovation in the Community College.

Borodzicz, E., & van Haperen, K. (2002). Individual and group learning in crisis simulations. *Journal of Contingencies and Crisis Management, 10*(3)**,** 139-147.

Brandt, M. (2008). *Video games activate reward regions of brain in men more than women, Stanford study finds*. Retrieved from http://www.bio-medicine.org/medicine-news-1/Video-games-activate-reward-regions-of-brain-in-men-more-than-women--Stanford-study-finds-10927-1/.

Bromham, L., & Oprandi, P. (2006). Evolution online: Using a virtual learning

    environment to develop active learning in undergraduates. *Journal of Biological*

    Education, 41(1), 21-25.

Brown, B., & Bell, M. (2004). *CSCW at play: There as a collaborative virtual*

    environment. Paper presented at the CSCW, Chicago, Illinois.

Bryman, A. (2007). Barriers to integrating quantitative and qualitative research. *Journal*

    of Mixed Methods Research, 1(1), 8-22.

Buckley, K. E., & Anderson, C. A. (2006). A theoretical model of the effects and

    consequences of playing video games. In P. Vorderer & J. Bryant (Eds.), *Playing*

    Video Games - Motives, Responses, and Consequences (pp. 363-378).

    Mahwah, NJ: LEA.

Byman, R., & Kansanen, P. (2008). Pedagogical Thinking in a Student's Mind: A

    conceptual clarification on the basis of self-determination and volition theories.

    Scandinavian Journal of Educational Research, 52(6), 603-621.

Byrnes, J. P., & Fox, N. A. (1998). The educational relevance of research in cognitive

    neuroscience. *Educational Psychology Review, 10*(3), 297-342.

Childress, M., & Braswell, R. (2006). Using massively multiplayer online role playing

    games for online learning. *Distance Education, 27*(2), 187-196.

Chuang, T., & Chen, W. (2009). Effect of computer-based video games on children: An

    experimental study. *Educational Technology & Society, 12*(2), 1-10.

Chen, C. J. (2007). Formative research on the instructional design process of virtual

    reality based learning environments. Proceedings from ASCILITE: Singapore,

    149-156.

Cho, M. (2004). The effects of design strategies for promoting students' self-regulated

    learning skills on students' self-regulation and achievements in online learning

    environments. Washington D. C.: Association for Educational Communications

    and Technology.

Chou, S. & Liu, C. (2005). Learning effectiveness in a Web-based virtual learning

    environment: A learner control perspective. *Journal of Computer Assisted*

    Learning, 21(1), 65-76.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education* (6th ed.).

    New York, NY: Routledge.

Creswell, J. W., & Plano Clark, V. L. (2007). *Designing and conducting mixed methods*

    research. Thousand Oaks, CA: Sage.

Creswell, J. W., & Tashakkori, A. (2007). Editorial: Developing publishable mixed

    methods manuscripts. *Journal of Mixed Methods Research, 1*(2), 107-111.

Dalgarno, B., & Lee, M. J. W. (2010). What are the learning affordances of 3-D virtual

    environments. *British Journal of Educational Technology, 41*(1), 10-32.

de Freitas, S., Rebolledo-Mendez, G., Liarokapis, F., Magoulas, G., & Poulovassilis, A.

    (2010). Learning as immersive experiences: Using the four-dimensional

    framework for designing and evaluating immersive learning experiences in a

    virtual world. *British Journal of Educational Technology, 41*(1), 69-85.

Deci, E. L., Eghrari, H., Patrick, B. C., & Leone, D. R. (1994). Facilitating internalization: The self-determination theory perspective. *Journal of Personality, 62*(119-142).

Deci, E. L., & Ryan, R. M. (2008). Self-determination theory: A macrotheory of human motivation, development, and health. *Canadian Psychology/Psychologie canadienne, 49*(3), 182-185.

Deci, E. L. & Ryan, R. M. (2000). The "what" and the "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*(4), 227–268.

Deci, E. L., Vallerand, R. J., Pelletier, L. G., & Ryan, R. M. (1991). Motivation and education: The self-determination perspective. *Educational Psychologist, 26*(3 & 4), 325-346.

Dellinger, A. B., & Leech, N. L. (2007). Toward a unified validation framework in mixed methods research. *Journal of Mixed Methods Research, 1*(4), 309-332.

Delwiche, A. (2006). Massively multiplayer online games (MMOs) in the new media classroom. *Educational Technology & Society, 9*(3), 160-172.

Dillman, D. A. (2000). Mail *and internet surveys: The tailored design method* (2nd ed.). New York: John Wiley & Sons.

Douglas, A., Miller, B., Kwansa, F., & Cummings, P. (2007). Students' Perceptions of the Usefulness of a Virtual Simulation in Post-Secondary Hospitality Education. *Journal of Teaching in Travel & Tourism, 7*(3), 1-19.

Evergreen Education Group. (2009). Keeping pace with k-12 online learning: An annual review of state-level policy and practice. Evergreen, CO: Author.

Falloon, G. (2010). Using avatars and virtual environments in learning: What do they have to offer. *British Journal of Educational Technology, 41*(1), 108-122.

Faria, A. J., & Wellington, W. J. (2004). A survey of simulation game users, former-users, and never-users. *Simulation & Gaming, 35*(2), 178-207.

Florida Department of Education (2008). Press release: Governor Crist praises Florida's virtual education for leading the nation. Retrieved from http://www.fldoe.org/news/2008/2008_12_09.asp.

FLVS (2010a). *American history: Course overview*. Retrieved from http://www.flvs.net/areas/flvscourses/Pages/Course%20Catalog/CourseListing.aspx?CourseID=24.

FLVS (2010b). *Conspiracy code: Course overview.* Retrieved from http://www.flvs.net/areas/flvscourses/ConspiracyCode/Pages/CourseOverview.aspx.

FLVS (2010c). *Conspiracy code – American history course: System requirements.* Retrieved from http://www.flvs.net/areas/flvscourses/ConspiracyCode/Pages/SystemRequirements.aspx.

FLVS (2010d). *Hardware/software requirements.* Retrieved from http://www.flvs.net/areas/flvscourses/Pages/HardwareRequirements.aspx.

FLVS (2010e). *2008-2009 FLVS enrollment summary*. Retrieved from http://www.flvs.net/areas/aboutus/Documents/EnrollmentSummary.pdf.

FLVS (2009a). *American history: Conspiracy code*. Retrieved from

   http://www.flvs.net/students_parents/VSACourseDetail.php?CourseID=748.

FLVS (2009b). Conspiracy code: Product overview. Orlando, FL: FLVS.

FLVS (2008). Florida virtual school: An online e-learning solution. Retrieved from

   http://www.flvs.net/.

Fullagar, C. J., & Mills, M. J. (2008). Motivation and Flow: Toward an Understanding of

   the Dynamics of the Relation in Architecture Students. *Journal of Psychology,*

   142(5), 533-556.

Gentile, D. A., & Gentile, J. R. (2008). Violent Video Games as Exemplary Teachers: A

   Conceptual Analysis. *Journal of Youth and Adolescence, 37*(2), 127.

Glass, G. V. & Hopkins, K. D. (1996). *Statistical methods in education and psychology*

   (3rd ed.). Boston, MA: Allyn and Bacon.

Glesne, C. (2006). Becoming qualitative researchers: An introduction (3rd ed.). New

   York: Pearson.

Gunter, G., & Kenny, R. (2008). Digital booktalk: Digital media for reluctant readers.

   Contemporary Issues in Technology aMilnd Teacher Education, 8(1), 84-99.

Gutner, G, A., Kenny, R. F., & Vick, E. H. (2008). Taking educational games seriously:

   Using the RETAIN model to design endogenous fantasy into standalone

   educational games. *Educational Technology Research & Development, 56*, 511-

   537.

139

Gunter, G., Kenny, R., & Vick, E. (2006). *A case for formal design paradigm for serious games.* A paper presented at the International Digital Media and Arts Association and the Miami University Center for Interactive Media Studies, Oxford, Ohio.

Guild, P. B. (1997). Where do the learning theories overlap? *Educational Leadership, 55*(1), 30.

Hall, B. (2009). Five learning trends for 2009. *Chief Learning Officer, January*, 18.

Hall, J. (2007). Design trends. *American School & University, January*, 59-63.

Harden, R. M. (2008). E-learning: Caged bird or soaring eagle. *Medical Teacher, 30*, 1-4.

Hew, K. F., & Cheung, W. S. (2010). Use the three-dimensional (3-D) immersive virtual worlds in K-12 and higher education settings: A review of the research. *British Journal of Educational Technology, 41*(1), 33-55.

High, R. (2000). Dealing with 'outliers': How to maintain your data's integrity. *Computer News, 15*(3), 14-16.

Huett, J., Moller, L., Foshay, W. R., & Coleman, C. (2008). The evolution of distance education: Implications for instructional design on the potential of the Web. *Tech Trends, 52*(5), 63-67.

Jang, H., Reeve, J., Ryan, R. M., & Kim, A. (2009). Can self-determination theory explain what underlies the productive, satisfying learning experiences of collectivistically oriented Korean students? *Journal of Educational Psychology, 101*(3), 644-661.

Kalay, Y., E. (2004). Virtual learning environments. *ITcon, 9*, 195-207.

Ke, F. (2008). A case study of computer gaming for math: Engaged learning from gameplay. *Computers & Education, In Press*.

Ke, F., & Hoadley, C. (2009). Evaluating online learning communities. *Education Tech Research Development, 57*, 487-510.

Kenny, R. F., & Gunter, G. A. (2007). Endogenous fantasy - based serious games: Intrinsic motivation and learning. *International Journal of Social Sciences, 2*, 8-13.

Keller, C. (2005). Virtual learning environments: Three implementation perspectives. *Learning, Media, & Technology, 30*(3), 299-311.

Kim, K., & Bonk, C. J. (2006). The future of online teaching and learning in higher education. *EDUCASE Quarterly*, 22-30.

Kirkley, S. E., & Kirkley, J. R. (2005). Creating next generation blended learning environments using mixed reality, video games and simulations. *TechTrends, 49*(3), 42-89.

Kolis, M. & Dunlap, W. (2004). The knowledge of Teaching: The K3P3 model. *Reading Improvement, 41*(2), 97-107.

Lee, K. (2005). E-learning: The quest for effectiveness. *Malaysian Online Journal of Instructional Technology, 2*(2), 61-71.

Leijen, A., Admiraal, W., Wildschut, L., & Simons, P. R. (2008). Students' perspectives on e-learning and the use of a virtual learning environment in dance education. *Research in Dance Education, 9*(2), 147-162.

Liu, E. Z. F., & Lin, C. H. (2009). Developing evaluative indicators for educational

computer games. *British Journal of Educational Technology, 40*(1), 174-178.

Maltby, A., & Mackie, S. (2009). Virtual learning environments help or hindrance for the

disengaged student. *ALT-J, Research in Learning Technology, 17*(1), 49-62.

Markovic, F., Petrovic, O., Kittl, C., & Edegger, B. (2007). Pervasive learning games: A

comparative study. *New Review of Hypermedia & Multimedia, 13*(2), 93-116.

Martins, L. L., Gilson, L. L., & Maynard, M. T. (2004). Virtual teams: What do we know

and where do we go from here? *Journal of Management, 30*(6), 805-835.

Marshall, C. & Rossman, G. B. (2006). *Designing qualitative research* (4th ed.).

Thousand Oaks, CA: Sage.

McAuley, E., Duncan, T., & Tammen, V. V. (1989). Psychometric properties of the

intrinsic motivation inventory in a competitive sport setting: A confirmatory factor

analysis. *Research Quarterly, 60*(1), 48-58.

Meltzer, D. E. (2002). The relationship between mathematics preparation and

conceptual learning gains in physics: A possible "hidden variable" in diagnostic

pretest scores. *American Journal of Physics, 70*(12), 1259-1268.

Metiri-Group. (2008). Multimodal learning through media: What the research says:

Cisco.

Moshirnia, A. (2007). The educational potential of modified video games. *Issues in

Informing Science and Information Technology, 4*.

Park, B. (2006). The science of learning meets the art of teaching. *Education Canada,

46*(4), 63-66.

Persky, S., Kaphingst, K. A., McCall, C., Lachance, C., Beall, A. C., & Biascovich, J. (2009). Presence relates to distinct outcomes in two virtual environments employing different learning modalities. *CyberPsychology & Behavior, 12*(3), 263-268.

Petrakou, A. (2010). Interacting through avatars: Virtual worlds as a context for online education. *Computers & Education, 54*(4)*,* 1020-1027.

Picciano, A. G., & Seaman, J. (2009). K–12 online learning: A 2008 follow-up of the survey of U.S. school district administrators. Boston: Sloan Consortium.

Pool, C. R. (1997). Maximizing learning. *Educational Leadership, 54,* 11.

Rice, J. W. (2005). *Evaluating the suitability of video games for K-12 instruction*. Paper presented at the Association for Educational Communications and Technology International Convention.

Rice, J. W. (2006). *New media resistance: Barriers to implementation of computer video games in the classroom*. Paper presented at the American Educational Research Association Annual Meeting.

Richland, L. E., Bjork, R. A., Finley, J. R., & Linn, M. C., (2005). Linking cognitive science to education: Generation and interleaving effects. In B. G. Bara, L. Barsalou, & M. Bucciarelli (Eds.). *Proceedings of the Twenty-Seventh Annual Conference of the Cognitive Science Society,* 1850-1855.

Ruiz, J. G., Mintzer, M. J., & Leipzig, R. M. (2006). The impact of e-learning in medical education. *Academic Medicine, 81*(3), 207-212.

Ruthven, K., Hennessy, S., & Deaney, R. (2005). Incorporating internet resources into classroom practice: Pedagogical perspectives and strategies of secondary-school subject teachers. *Computers & Education, 44*, 1-34.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78.

Ryan, R. M., Koestner, R., & Deci, E. L. (1991). Ego-involved persistence: When free-choice behavior is not intrinsically motivated. *Motivation and Emotion, 13*(3), 185-204.

Ryan, R. M., Kuhl, J., & Deci, E. L. (1997). Nature and autonomy: An organizational view of social and neurobiological aspects of self-regulation in behavior and development. *Development and Psychopathology, 9*(4), 701–728.

Stansbury, M. (2008). Analysis: How multimedia can improve learning. *eSchool News*. Retrieved from http://www.eschoolnews.com/news/top-news/index.cfm?i=53243&page=1

Sheehy, K., Ferguson, R., & Clough, G. (2008). Learning and teaching in the panopticon: Ethical and social issues in creating a virtual. *International Journal of Social Sciences 2*(2), 89-96.

Singh, N., & Myong Jae, L. (2008). Exploring Perceptions Toward Education in 3-D Virtual Environments: An Introduction to Second Life *Journal of Teaching in Travel & Tourism, 8*(4), 315-327.

Sitzmann, T., & Ely, K. (2010). Sometimes you need a reminder: The effects of

    prompting self-regulation on regulatory processes, learning, and attrition. *Journal*

    of Applied Psychology, 95(1), 132-144.

Strother, M. A. (2007). A mind for adventure. Reclaiming Children and Youth: The

    Journal of Strength-based Interventions, 16(1), 17.

Sykes, J. (2001). The role of the teacher-librarian in the 21st century. *School Libraries in*

    Canada, 21(2), 5.

Tashakkori, A., & Creswell, J. W. (2007). Editorial: Exploring the Nature of Research

    Questions in Mixed Methods Research. *Journal of Mixed Methods Research,*

    1(3), 207-211.

Teddlie, C., & Yu, F. (2007). Mixed methods sampling: A typology with examples.

    Journal of Mixed Methods Research, 1(1), 77-100.

Torrente, J., Moreno-Ger, P., & Fernandez-Manjon, B. (2008). *Learning models for the*

    integration of adaptive educational games in virtual learning environments. Paper

    presented at the International Conference on E-learning and Games, Nanjing,

    China.

United States Department of Education (2009). *Online learning: A meta-analysis and*

    review of online learning studies. Report from the Office of Planning, Evaluation,

    and Policy Development.

Vansteenkiste, M., Lens, W., & Deci, E. L. (2006). Intrinsic versus extrinsic goal

    contents in self-determination theory: Another look at the quality of academic

    motivation. *Educational Psychologist, 41*(1), 19-31.

Virvou, M., Katsionis, G., & Manos, K. (2005). Combining software games with

education: Evaluation of its educational effectiveness. *Educational Technology &*

Society, 8(2), 54-65.

Wang, Y. (2006). Technology projects as a vehicle to empower students. *Educational*

Media International, 43(4), 315-330.

Watson, J., & Ryan, J. (2007). *Keeping pace with k-12 online learning: A review of*

state-level policy and practice. Retrieved from

http://www.kpk12.com/downloads/KeepingPace_2007.pdf.

Watson, J., Ryan, J., & Wicks, M. (2009). Keeping pace with K-12 online learning

Annual Review of State-Level Policy and Practice. Retrieved from

http://www.kpk12.com/downloads/KeepingPace_2007.pdf.

Wells, P., de Lange, P., & Fieger, P. (2008). Integrating a virtual learning environment

into a second-year accounting course: Determinants of overall student

perception. Accounting & Finance*, 48*(3), 503-518.

Westbrook, V. (2006). The virtual learning future. *Teaching in Higher Education, 11*(4),

471-482.

White, R. & Gunstone, R. (1992). *Probing understanding*. London, New York,

Philadelphia: The Falmer Press.

Williams, G., & Deci, E. L. (1996). Internalization of biopsychosocial values by medical

students: A test of self-determination theory. *Journal of Personality and Social*

Psychology, 70(4), 767-779.

Xie, K., DeBacker, T. K., & Ferguson, C. (2006). Extending the traditional classroom through online discussion: The role of student motivation. *Journal of Educational Computing Research, 34*(1), 67-89.

Yee, N. (2006). The demographics, motivations, and derived experiences of users of massively multi-user online graphical environments. *Presence, 15*(3), 309-329.

Zahner, S. J. (2006). Partnerships for learning population-based public health nursing: Web-delivered continuing education for public health nurse preceptors. *Public Health Nursing, 23*(6), 547-554.