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Abstract
This quantitative study explored the growing population of community college students and their exposure to serious electronic games. Serious gamers are students that spend a significant amount of time playing electronic games, specifically those games that have and educational intent or a measured learning outcome. These students have not been studied at any length regarding study habits or the impact of serious gaming on health, particularly in the community college setting. This exploratory study analyzed the differences in study habits and class attendance of community college students, with regard to exposure to serious electronic games. A Qualtrics based survey was administered to the student population and anonymous results were compiled. Serious gamer status was significantly associated with eating and exercise habits of the student, but not with study habits. An understanding of the health and exercise habits of community college students, in particular those that are serious gamers, was the purpose of the study.

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The Impacts of Serious Game Play on the Study Habits of the Community College Student: An Exploratory Study

By

Owen W. Johnston

Submitted in partial fulfillment

of the requirements for the degree

Ed.D. in Executive Leadership

Supervised by

Dr. Guillermo Montes

Committee Member

Dr. John Mavromatis

Ralph C. Wilson, Jr. School of Education

St. John Fisher College

May 2014

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Owen W. Johnston

2014

Dedication

This degree and dissertation is dedicated to my daughter, Olivia, that is no longer with us, but I hope looks in on us from time to time. It is dedicated to my wife, Kristy that put up with everything for the last three years even though she wasn't really given a choice, to my daughter Evelyn and son Orion who were born during "the process". Finally it is dedicated to my immediate and extended family including my grandfather, Orville Johnston, who had a thirst for knowledge that passed down to me as well as to my parents, grandparents and family who made me who I am today. It truly takes a village.

Biographical Sketch

Owen W. Johnston graduated from Archbishop Walsh High School in Olean, NY and attended Quincy University in Quincy, IL where he earned a Bachelor of Science in Marketing and Political Science in 1998. Owen earned his Masters of Business Administration from St. Bonaventure University in Allegany, NY in 2000. His studies at St. John Fisher College from 2011-2014 under the tutelage of the DEXL faculty earned him the degree of Doctor of Education in Executive Leadership in 2014.

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Abstract

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This exploratory study analyzed the differences in study habits and class attendance of community college students, with regard to exposure to serious electronic games. A Qualtrics based survey was administered to the student population and anonymous results were compiled. Serious gamer status was significantly associated with eating and exercise habits of the student, but not with study habits. An understanding of the health and exercise habits of community college students, in particular those that are serious gamers, was the purpose of the study.

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Chapter 1: Introduction

Thesis Statement

The students that make up the community college environment come in all types from valedictorians to GED recipients. This study explored the various study habits and class attendance habits of this wide ranging group of students related to their serious electronic gaming experiences.

Introduction

Community colleges (CCs) have evolved since their beginnings more than 100 years ago into affordable institutions that offer comprehensive areas of study for nearly anyone wishing to attend (Boggs, 2010). Originally designed to prepare students for transfer to upper division universities for those students that were not granted admission for economic, social or mobility barriers, community colleges now encompass nearly half of all the college students in the United States (NCES, 2011). CCs offer an affordable option to students of all backgrounds with an average cost per semester in 2009 of $2,544 (College Board, 2009). The affordability and evolution of community colleges gives students many more alternatives in choosing to move forward with their education than the standard 4-year school. CCs are certainly more diverse in their makeup of the student body based on their open enrollment policy and have become a melting pot (Cohen & Brawer, 2008). The ability for students to enroll in developmental classes to prepare themselves for their studies has helped the non-traditional students in particular in

enabling them to go back to school after working and further their education (Cohen & Brawer, 2008).

The White House has had interest in community colleges for more than 60 years, dating back to the Truman Commission (1947), in an effort to take the role of colleges in the United States from the "intellectual elite" to the average person (President's Commission, 1947). This report first coined the term community college in the U.S. for purposes of expanding postsecondary education as an attainable goal for anyone wishing to further their education. The report called for "every citizen, youth and adult, to be enabled and encouraged to pursue higher learning" (President's Commission, 1947). There are parallels to another administration's views on higher education, President Obama (2009) asked every American to "commit to at least one year of higher education or career training so that the US would once again have the highest proportion of college graduates in the world". Community colleges are a major focus of this President's educational agenda, as President Obama called for community colleges to increase their number of graduates by 5 million by 2020, which would double the number of current graduates (Obama, 2009). In an effort to assist community colleges, the Obama Administration pledged $2 billion in the Health Care and Education Affordability Reconciliation Act, signed into law on March 30, 2010. Specifically, the act allocates $2 billion for community college career training grants and trade adjustment assistance for workforce preparation.

Attainment of such levels of success in community colleges does not only come from governmental bodies, but from the hierarchy of community colleges as well. The top six community college organizations signed an agreement in April, 2010 that offered

to match President Obama's 2020 goal (AACC, 2010). Achieving this success, such as degree/certificate completion or matriculation to 4-year schools, within the CC landscape furthers what the AACC and Obama administration are focused upon. Within the past 10 years, about half of community college students are able to complete their studies or transfer to 4-year institutions (Berkner, He & Cataldi, 2002). The level of success for community college students is often measured by two indicators, continuity of enrollment and class attendance (Adelman, 2005). Improving both of these indicators may be a key to success for the student as well as the educational institution, in ensuring that the student graduates or matriculates in the proposed timeframe.

Technology has changed the landscape of teaching and learning at all levels of education. Changing the methods of instruction to incorporate some of the benefits of serious games may prove to be a useful tool for improving attendance and continuity of enrollment that community college students need for this advancement CCs pursue. Prensky (2005) argues that the students of today are not the ones that our educational system was designed to teach. Therefore, there is a breakdown of communication of what the student wants to learn and what the student needs to learn to thrive in the college environment. Technology may help to narrow this gap. Serious games, or games defined as "interactive, with or without a significant hardware component, that has a challenging goal, is fun to play and engaging, incorporates some scoring mechanism, and supplies the user with skills, knowledge or attitudes useful in reality" (Bergeron, 2006), are typically user-centered. These games have a purpose, a set of rules, and, given the right amount of design, can teach anything from how to wage battles to complicated medical procedures. These games can be used to enhance the learning process and enable the student to

develop the skills needed to learn the subject matter in a manner that may encode the material in a more permanent manner than that of simple lecture. Squire (2005) studied the use of computer games by American teachers and researchers for the purpose of teaching the same or similar content to what they were currently teaching in the curriculum. Squire showed that those students that were instructed via computers, simulations and technological instruction were more successful than those students that were taught solely with lectures.

There has been gaming research in such varied subject matter as history, sociology, anthropology and literature, to name a few; but serious games are more prevalent in the hard sciences as they "present the ideal playground to engage players in simulated complex decision making processes" (Graafland, Schraagen & Schijven, 2012). In the late 1980s, Butler (1988) noted the value in simulating events and multiple scenarios by giving the subjects an opportunity to make decisions based on the available criteria. This type of computer generated activity proves to be a valid use of computers in generation of scenarios that can have multiple outcomes with a given set of variables, both then and now. Prensky (2005) agreed with this notion and took it a few steps further. He believed that the students that are utilizing these simulations and strategies would be able to develop the necessary skills to their specific areas of study versus those students that do not utilize serious games.

The community college provides an interesting, if not unique environment to engage in a study, as it is typically the melting pot of college life (Pusser & Levin, 2008). There are students from all age groups, from varied socioeconomic groups and with such a diverse background that it should provide a sample of students that covers the entire

spectrum. Because of the less strict admission process that community colleges face versus their 4-year brethren, they provide an important role in higher learning in that nearly anyone can get in to further their education if they choose (Cohen & Brawer, 2008; Vaughn, 2006). The idea of this universal education can play an important role as many of the students that are there have such a diverse background and may provide a different insight than those that are at a private or more academically challenging school. These students may gain the skills of a trade, they may get an associate degree or they may matriculate to a bachelor degree track; any of these students may prove to have an interesting and important insight into the impact that gaming has on education.

Problem Statement

The research problem this study addressed is the potential differences in class attendance and study habits for community college students who play serious games versus those that don't. Serious games may be a tool that improves graduation rates. With nearly one quarter of all community college students leaving in their first year and never returning (Bradburn, 2002), it is important to gain an understanding as to why this occurs and what causes may be behind it. The study took into account those students who have been introduced to serious games and have experience with Game Based Learning (GBL) and examined how the participants spent their time as related to their academic endeavors and if they were attending classes. The purpose of the study was to gain an understanding as to these habits of the average community college student. Secondly to see if there was a pattern of behavior based on their serious gaming habits or their study habits that inhibit them from attending class regularly.

Theoretical Rationale

The cognitive theory of multimedia learning can be defined as the use of both words and images to convey a message or an idea (Mayer, 2001). The ability to take the words and images and shape them into a coherent learning module can be referred to as multimedia instruction. The term multimedia can be viewed in several ways; delivery-media view, presentation-mode view and sensory-modality view. Delivery-media view refers to the presentation of information using two or more delivery systems, for example a movie, which shows video and pictures while encompassing and overlaying audio into the delivery. Presentation-mode view also consists of two or more presentation modes, which focuses on the way the information is presented, such as with a PowerPoint presentation with narrative and verbal support of the slides. Sensory-modality view is somewhat different in that it refers to having two or more sensory systems of the learner are involved, which is the case with most multimedia presentations. The theory's foundation is that learners can better understand subject matter that is presented to them in both words and pictures, rather than with words alone (Mayer, 2001).

The cognitive theory of multimedia learning was developed by Richard Mayer in the mid to late 1990s in an effort to better understand the differences in today's learning environment versus the learning environments of the past (Mayer, 2001). First printed in 2001, the text "Multimedia Learning" is considered a seminal work on the subject of multimedia learning. Working alongside colleagues such as Moreno, Chandler, Anderson, Mars, Bore, Bryman, Tapangco, Fennell, Campbell, Farmer and Gallini, etc. for the past 20 years, Mayer has performed multiple experiments on whether multimedia learning has an effect on learning styles. He generally found measurable positive results.

Printed lessons, such as books and the Bible, and lectures have been the primary means of educating for centuries. Visual stimuli and narrative explanation can arguably date back tens of thousands of years, as images of hunting exploits and maps have been found on tablets and walls of caves across the world. In the early 20th century, John Dewey offered the approach that education and instruction can be better represented through the use of images (Dewey, 1913). The mind tends to capture and store images with greater regularity and ease than that of complex words and phrases, while a more narrative description with an image supporting it may prove to be a more useful tool in explaining a certain topic (Mayer, 2001). An example could be instructions on how to assemble something. With words alone, it would be difficult to assemble anything complex, but with the right combination of images and words it becomes easier.

Individuals process information at different rates. Overloading the individual with too much information too fast can have adverse effects with regard to learning (Mayer & Moreno, 2002). Cognitive load, or the amount of information the mind can understand at any one time (Chandler & Sweller, 1991), also can refer to the ability of the mind to process information better if it relates to information that is already understood (Mayer, 2001). Methods that build upon this previous set of knowledge, with the aid of additional images or narratives, promote the understanding of greater amounts of information in a shorter timeframe (Sweller, 1988). The easier it is to associate some type of new information with something that is already known and accepted, the faster the understanding of new subject matter. Gaming and problem solving may help the individual retain information better, if presented in a more clearly defined framework related to the subject matter (Chandler & Sweller, 1991). The hard sciences, for example,

are based on the premise that there is an underlying foundation of information. Many new ideas evolved from these underlying frameworks. Multimedia learning can be broken down into two major goals, remembering and understanding (Mayer, 2001). Remembering is typically measured with assessments that test the ability to reproduce what has been taught. Multiple choice tests and other objective exams are examples that test the ability to remember information. Understanding the information is somewhat different in that it requires the ability to transfer that information to a new or different set of variables. Things such as math equations and leadership strategies are some examples of the ability to understand the information presented.

There are twelve underlying principles of multimedia instruction that promote learning (Mayer, 2001):

- *coherence*, or learning without extraneous material
- *signaling*, or highlighting of essential material
- *redundancy*, or learning from animation and narration only
- *spatial contiguity*, or ensuring the corresponding graphics and printed text are in appropriate proximity
- *temporal contiguity*, or learning while speaking and corresponding test are presented at the same time
- *segmenting*, or lessons that are paced for the audience
- *pre-training*, or learning after there has been some previous introduction of subject matter
- *modality*, or learning from graphics and narration
- *multimedia*, or learning from both words and pictures

- *personalization*, or learning when words are spoken in a conversational style; *voice*, or learning when words are spoken in a human voice as opposed to computer generated voices
- *image*, or learning while the speakers image is on the screen

Two different approaches to multimedia instruction have evolved from multimedia learning, the technology-centered approach and the learner-centered approach (Mayer, 2001). The technology-centered approach involves the incorporation of available technologies to promote learning, such as the introduction of the tablet PC in recent years. An issue with technology-centered learning is that technology drives what and how information is transferred. Adapting to the ever-changing and demanding technologies rather than having the technology adapt to the educator or the learner has proven to be a difficult process to infuse into the mainstream. Focusing on placing the latest technology in the classroom or training center, rather than using technology to promote learning has stalled some efforts of multimedia learning (Mayer, 2001; Mayer & Moreno, 2002). Learner-centered multimedia instruction refers to the model of focusing on the nature of the human cognitive system (Mayer, 2001). The human cognitive system learns from both verbal and pictorial form and the position of multimedia learning is that a combination of the two will provide for a better learning environment.

The visual clues found in images, along with the narrative clues associated with the images, affect the mind in a different manner than that of lecture alone. Mayer (2001) suggests that the addition of different modes of information allow the user to retain more information than they would have otherwise.

A major criticism of multimedia learning or multimedia instruction is the premise of cognitive load. The balance between what the human mind can absorb and transfer to other sets of variables is unique to the individual. Each person can possess, retain and transfer a certain amount of information and that amount is different for each individual. The inability for all participants, all students or all subjects to work at the same pace and at the same level could also be considered a criticism of multimedia instruction, though it is a criticism of every type of instruction. Everyone enters college or their next level of study with a different skill set and a different base of knowledge. The ability to understand the entry level of each of the students and create a learning module or method that will best ensure that the information is retained by that student may prove difficult to measure. Giving the instructor the set of skills to determine the configuration of words and images, to promote learning may also prove difficult.

Serious games can have the ability to exercise the mind, help maintain focus and aid in developing critical thinking skills. These things are important in discussing and understanding the cognitive load of an individual. As each person can have varying amounts that they can comprehend and transfer at any given time, the ability to focus that ability and develop it can prove to enhance understanding and learning. Any instance that there may be a way to enhance learning and comprehension in a measurable way can be a useful tool to community college administrators. They can use that information to encourage students which types of technology and games they may want to pursue in helping with their newfound responsibilities as a college student.

Statement of Purpose

Study of serious gaming and the impacts that it has on certain aspects of the CC student are critical areas of research as the number of CC students increases. What impact serious games may have on graduation/matriculation rates, class attendance and study habits can influence the procedures used by college administration in encouraging students to follow certain paths. Further understanding of the impacts that serious gaming has on the health of the CC student is a key area of concern.

Research Questions

This study will examine whether the continued exposure to serious games impacts student achievement. More specifically, these three questions will be answered:

1. *Do traditional students engage in serious games at a higher rate than non-traditional students?*
2. *Do students that engage in serious game play, or gamers, miss more classes than those students that do not play serious games, or non-gamers?*
3. *Are there differences in study habits between serious gamers and non-serious gamers?*

Potential Significance of the Study

Serious games have been studied at length with regard to medicine (Graafland, et al., 2012) and education (Young, Slota, Cutter, Jalette, Mullin, Lai, Simeoni, Tran & Yukhymenko, 2013), but there is little information regarding the attendance and study habits of serious gamers in community colleges. This study will analyze the differences of students that engage in serious games and those that do not. As the students that regularly attend classes are more likely to complete their studies (Tinto, 1994), gaining an

understanding whether or not serious games has an impact on success is this area that should be investigated. With research generally focused on 4-year institutions regarding class attendance (Berkner, et al., 2002; Chen, Lambert & Guidry, 2010), there is a gap in the research of what occurs at 2-year institutions regarding attendance and study habits, which this study will review.

Chapter Summary

Community colleges face many of the same challenges that 4-year institutions face, enrollment and continuity of enrollment, high graduation and matriculation rates and overall success of the student and institution. These are the things that can dictate whether or not a school is successful. Gaining an understanding of the impacts or role that will ensure a student's success is something the White House is reviewing (Obama, 2009), the AACC (2010) is following, as well as the colleges themselves. This study will look into the role serious games may play in this process. Chapter 2 will address the background of SGs as found in the literature with a comprehensive literature review. Chapter 3 will discuss the research design and methodology of the study. Chapter 4 will explore the findings of the study and Chapter 5 will report the implications, limitations and opportunities for further research of the study.

Chapter 2: Review of the Literature

Introduction

Learning through different types of simulation games or Serious Games (SG) has been present in society for centuries. SGs give the user or participant the ability to develop strategies or to learn skills that can be used in other areas, which gives transferability to those strategies or skills (Becker, 2007). Certain specialties such as the military, medicine and some areas of education have recognized the usefulness of this transferability of skills and knowledge and have adopted the use of serious games in many ways. This review of literature will address these uses of serious games and simulation in these areas.

Background of Serious Games

The terms Serious Games, or Game-Based Learning can often be used synonymously (Corti, 2006), but for purposes of this study SGs will be used to describe the type of game that has a challenging goal and supplies the user with skills, knowledge or attitudes useful in reality (Bergeron, 2006). SGs can engage the individual for an extended period of time in a learning mode (Michael & Chen, 2006). They have the ability to teach the individual a new skill or to enhance a current skill set. In addition, they have the ability to make the person an expert in a particular skill set or subject over time (Ericsson & Krampe, 1993). Advances in technology have made these games more easily customizable and focused on particular scenarios. They can improve a persons' competency in a particular skill or subject if used correctly. While there may be

widespread confusion regarding what is in fact considered a serious game (Connolly, Boyle, E., MacArthur, Hainey, & Boyle, J., 2012), with proper development and research SGs may indeed fill a void in our educational system.

The development of these types of SGs has increased dramatically over the past 4 decades with the invention and development of the personal computer, the Internet and in turn, digital based games (Connolly et al., 2012). With this development of technology, games can be designed for a very unique and specific purpose. These games can be used in the fields of education, medicine and the military just to name a few. There have been studies that have shown the positive effects, specifically on training methods, of SGs and the enhanced abilities to prepare for unique experiences and specific tasks (Ericsson & Krampe, 1993; Subrahmanyam & Greenfield, 1994). The studies have shown that the repetitive nature of completing tasks with different input variables in the SG allows the participant to achieve the same or a similar outcome given different input variables. With the development of the personal computer more than 40 years ago, emerging technologies and increased social media outlets, games have entered into nearly every aspect of life. Computers and an Internet connection, for example, have become inherent in nearly every classroom in the United States following the No Child Left Behind Act. Entertainment games, or games for leisure activity, continue to evolve at a rapid pace, with sales figures more than doubling yearly since 1996 (Entertainment Software Association, 2010). If curriculum included more of these types of learning games that had an entertainment value along with the educational aspect, it is likely that students would be more successful (Prensky, 2006). Research has shown that serious games have improved learning and cognitive skills (Prensky, 2005). Educational games can also

allow students to achieve a greater understanding of situations and concepts. Students may learn how to interact with certain software, they may learn how to follow a specific series of instructions, or they may learn how to develop critical thinking skills when playing a serious game. In each instance, the student is in the process of learning, which may benefit them by increasing their general problem solving skills, learning skills or better achievement in school. Any increase in school achievement or learning should be an area to consider focusing research time and money.

Research Structure

Selection of appropriate terminology and relevant databases were key elements in finding suitable articles for the review of the literature. The following terms, or series of terms were used: game based learning, serious games, educational games, medical games, war-games and simulation games. The following databases were utilized: ERIC on ProQuest, APA PsychNET, ProQuest Educational Journals, Academic Search Complete, Education Research Complete and Teacher Reference Center. Several seminal books were included because they proved relevant to the research. The database searches yielded certain authors names that came up again and again. These names were then fed into the database to see if there were any additional articles deemed relevant.

History of Serious Games

In virtually any game there are a series of predetermined rules and strategies that promote an understanding of how the game is to be played. As the game is repeatedly played, higher levels of understanding are reached and cause and effect are some of the tools that are taken from the game. A game dated about 2600 BC, Ur is an example that games of strategy have been played for millennia (Halter, 2006). The game of Ur,

consisted of a series of squares and cases. Linkage of the squares and cases determined how each would interact with one another. It is almost like a Lego hybrid in the sense that only putting those certain cases and squares in a specific order will allow the participant to continue building on.

Another historical game, Go or Weiqi as it sometimes was called (Mihori, 1939), was likely developed about 1000 BC in India or China. The game, not unlike Ur, utilized a grid system where players set down dark or light colored stones depending on which side of the game board you were on and attempted to surround or capture the stones of a different color. Predetermined rules for the game other than the colors or the grid itself have not survived, but the understanding that games were developed to enhance the skills of reasoning, critical thinking and forward thinking is evident. Mihori (1939) went on to describe other significances behind the game of Go, such as the belief that it would lead the sons of the players to find wisdom.

Chess began as early as 600 AD, dating back to the Indian war game Chatarung (Murray, 1913). The game consisted of two players playing across from one another with a set group of pieces that could only move a predetermined amount of spaces, in a predetermined manner. The game later moved into Europe around 1000 AD, being introduced by Persian traders. Evolution of the game occurred over time and original pieces changed names and places, but the foundation of the game remained the same. The game as it exists then and today consists of a board with eight rows and eight columns. There are a total of 64 squares, shaded either light or dark and offset so no two colors of the same meet one another. There are a total of 16 pieces for each player set up into two rows. There are eight pawns, two of each of the following: rooks, bishops, and

knights, and a single king and queen. The white or lighter colored pieces always move first and each of the pieces are allowed to move in a different manner. Without too much detail, the purpose of the game is to prevent the king from being able to move without being captured or when there are imminent moves by the opposition to capture said king. The game itself promotes critical thinking skills, as knowing and understanding how each piece moves is crucial to being successful within the game. The 16th century and the advent of the printing press enabled the game to spread and gain more widespread attention (Murray, 1913). The United States adopted the game following the 1750 work by Benjamin Franklin titled, *The Morals of Chess*. Over the course of the next 200 years chess has remained one of the most played board games in the world (USCF, 2005).

Today, SGs as commonplace as *SimCity,* have shown children how to develop basic city structures and delivery of necessities (Gaber, 2007). Scrabble has been shown to produce high levels of critical thinking skills, while developing cognitive abilities (Halpern & Wai, 2007). Modern theories of effective learning, as developed by Boyle, Connolly, & Hainey (2011), show that learning is most effective when there is immediate feedback, it is active, experiential, and problem based. These are many of the common descriptors when developing serious games. Students today have the ability to handle many things at once, and the ability to multitask is a skill that has been developed through the use of games and of technology (Prensky, 2001). These skills can be useful if they are incorporated into the decision-making process of real life.

This history of strategic and critical thinking gaming lays the foundation for many of the serious games of today. The underlying theme is that the development of certain skills can be transferred to different scenarios while maintaining the overall rules or

procedures set forth. These games alone have had a long standing history of development and with the advent of the computer 50 years ago, these types of games will only continue to develop and become more focused.

Gaming in the Military-From War Games to Chess

As modern armed forces developed within the United States, war games and simulation-based learning has been the preferred method of instruction since their inception, as they help to develop critical thinking skills in context (Clapper, 2010). Prior to the modernization of weaponry and armies, the use of games within military establishments was primarily a German pursuit, as the German mindset behind war was based mainly on strategic advantages (Halter, 2006).Victories over superior numbers, among those who played the game, proved the idea to be a useful one. The game of Kriegsspiel, commonly referred to as war-gaming at the time, was such a game (Halter, 2006). The game was developed in the early 1800s and set out to simulate battlefield scenarios. Rudimentary topographical maps were developed and porcelain pieces or metal figurines were used to represent cavalries, artillery, infantry, etc. Interestingly the colors of red and blue were used to represent the red army versus whomever they would be battling, which was always blue in color. Each color or team had a specified time limit to move their pieces, taking into account terrain issues and practical issues with moving that amount of military. There was an umpire that would determine the available amount of time that each side would have used when trying to move from one place to another and historical data was also incorporated to determine the losses that each side would face given the onset of winter or disease, based on what had happened in the past. As the game developed, a better understanding of practicality and loss was included and

it gave the decision makers a baseline for understanding if their planned attacks or endeavors were worth the risks. This game evolved over the century and toward the end of the 19th century, it was present in the majority of the military academies throughout Prussia (Halter, 2006). With German victories over Austria and France in 1866 and 1871 respectively, other European powers began to show interest in these military training practices. Following the victory in Austria, Austrian military adopted many of the elements of German war-gaming. War gaming became widespread in Europe following the victory in 1871. The United States began to incorporate some of the elements of war gaming for their military academies in the middle 1880s.

Games that the military uses are often referred to as war games, but more importantly they are strategy games. They are intended to take a series of events, plug in a variety of changes or situations, and demand a decision. The U.S. war colleges, located throughout the U.S. at Newport, Rhode Island (Naval War College), Carlisle Barracks, Pennsylvania (Army War College), and Montgomery Alabama (Air War College), have developed the use of hundreds of simulation scenarios to imitate real world situations (Title 10, 2012). Today, computer models are used to imitate the desired level of analysis. Specialized programs can immediately provide feedback to the operator to allow them to know how they're performing. They also can tell the supervising officers where the gaps are in the training. One limitation of the computer generated model is that the computers are "fast, accurate, but dumb, while humans are slow, sloppy, but brilliant." (Title 10, 2012) This notion has been an area of concern for some time with regard to computer simulations and scenarios intended to imitate real world situations. While the computer programmers incorporate many variables, they simply cannot think

of everything and incorporate all possibilities into the program. The intent of these simulations is not to be able to do a specific task again and again, but to be able to read a situation and make the appropriate decision given the circumstances.

An interesting line from the beginning of the manual for war games states "war games are necessarily wide in scope, narrow in application and broad in purpose." (Title 10, 2012) This may be evident in its design, though the idea that there are multiple purposes for the war game is the overall intent of it. The ability to transfer the knowledge into any situation allows the participant to make decisions and solve problems as they arise. This is an essential characteristic of serious games, be it within the realm of war games, simulations or chess. The ability to take a step back when things are happening, evaluate all of the possible actions and come to a conclusion that is beneficial is the critical transferable skill.

Chess, being another example, has been a gaming tool used for millennia to develop these critical thinking skills that could be transferred to the battlefield, and thus, a war game. The game requires a set of pieces or arguably military representations of individuals or groups, a grid or a battlefield representation and a series of moves that can out strategize the opponent. Attempting to outdo the pieces or the army of the opposition is the key to victory, giving the game a very military feel. Chess is often considered a war game not only because of its origins, but the manner in which the game is played. The knowledge that is necessary to be successful at the game means that you must be able to anticipate moves in advance and respond to unanticipated moves with a measured response within a short time period. There are many parallels to current military games

in that it is unknown what or how the opposition will respond to a situation, but having an understanding of all of your options is the key.

Many of the games mentioned, such as Go, Ur, Kriegsspiel, and chess are games that effectively simulate possibilities and potential responses to the moves of the opposition. This is essentially trial and error or trial and repetition, as Bandura (1971) referenced. The preferred learning method of trial and repetition, ever present in flight simulators and military strategy, are inherently game-based environments. These types of simulation activities can improve learning and help to develop many complex tasks present in these types of environments (Clapper, 2010). The majority of games used in the military are games that involve strategy, repetition and simulation to make responses to certain variables become automatic in nature.

Gaming and Simulations in Medicine

Much like the military, medicine is based on recall to efficiently evaluate the situation, review the potential outcomes and come to a conclusion. As Gagne & Briggs (1979) showed, the importance of recall to the learning process, the ability to automatically respond to a given series of circumstances, e.g. a given set of symptoms, recollection and coming to the same conclusion over and over is crucial. The ability to immediately respond to certain symptoms would be vital for surgeons, nurses, EMTs, and doctors of any kind. The ability to cross-apply what has been learned, or literacy "across the board" as Becker (2007) put it, gives an advantage to the learner. This ability to take knowledge and cross-apply it to do different surgical procedures would prove useful and likely improve diagnoses and speed of surgical procedures. For example, if a specific

type of stitch was learned in sewing up a patient that improved healing, it would likely be cross-applied to other surgical procedures, rather than just the one it was first devised for.

Medicine has begun to adopt SGs using the same notions that repetition and practice can teach the participant to achieve better results. Canon-Bowers (2006) points out that simulations can improve learning, which is critical to medicine and surgical instruction due to the deliberate nature and changing situations. The ability to take information, interact and repeat the performance was one of the integral events of instruction noted by Gagne (1985). Given the same set of variables, and getting the same result is paramount to a proper and consistent practice of medicine. Gagne further discussed the importance of using case studies and comparison to other situations to remember what worked previously, and replicate those results under a similar but different set of circumstances.

Medical schools and the students therein are themselves competitive in nature, so gaming regarding procedures and results may be a logical step in the learning process. Many games have the same underlying premise that you achieve one level to access the next level. Much like competition in any area, whether competing against others or oneself, achieving the next level or goal shows success. Certain skills learned from the first level are likely to help you achieve the second level and so forth. Becker (2007) recognized successes from prior knowledge and the importance of this knowledge to be cross applied to different areas. This ability to recall what works or what has worked in the past can prove important in the changing nature of medicine. Yu-Hao Lee, Heeter, Magerko, & Medler (2012) furthered this area of research in showing the importance of

creative solutions to problems. Creative thinking and thinking outside normal procedures can give the student a competitive advantage in certain areas.

Recently, Graafland et al. (2012) reviewed available literature for such a connection between serious games and surgical procedures. This review was comprised of 25 articles covering 30 serious games for purposes of improving surgical skills. These games were either devised specifically for the medical task that they were being used for, or they were adapted from other areas to fit a medical task. The games were selected for purposes of the review because they were simulating certain training methods and were also stimulating and showed a reduction in medical error. These games were able to engage the participant and followed certain metrics in the strict environment that healthcare professionals operate in.

Graafland et al. (2012) used serious games in medicine as search criteria and only used peer reviewed journals as their basis for their review of the literature. Any game that was selected for the review was chosen because of its potential to increase the participants' competence in the particular subject matter. As with Becker (2007), transfer of skills was determined to be a key factor in the learning process. This ability to take the skills learned from one game or simulation and use those skills across different sets of variables was considered a key outcome. Further consideration was taken to ensure that these games measured what they were designed to measure. Of the 30 games found to fit into the criteria, 17 were designed specifically for their particular educational purpose and 13 were commercially available for alternative educational purposes, but could be cross applied to develop the skills particular for medical needs. The 17 games designed specifically for the tasks of furthering that particular skill set ranged from virtual reality

games mimicking an artery bypass to a knee replacement. Ten of the 17 games reviewed that were designed specifically for their medical purpose included a multiplayer function for teambuilding skills. Becker (2007), Prensky (2001), and Gagne (1985) have all studied the importance of learning as a group to improve skill assessment and offer a competitive advantage. These 17 games were shown to improve the required skill set when certain criteria were met.

The vast majority of these 17 reviewed games, 15, were administered via the computer while two were projected images that the participant then responds to. Prensky (2001, 2005) has noted the importance of visual stimuli in the learning process and how it is changing the pedagogy of learning. This visual stimulation can move the participants to higher levels of learning, if they are able to associate visual, audio and verbal imagery together (Prensky, 2001). Each of these games showed improvement from pre-test to post-test, however many of these games were not used currently in clinical practice as this is still an emerging method of training.

The 13 games that were selected for cross-skill assessment were used to measure psychomotor skills for laparoscopic procedures. These games were in no way designed for the medical field, as they included games for platforms such as Sega, Nintendo, and PlayStation, but they were selected to show that fine motor skills could be developed. A laparoscopic box trainer exercise was used to measure the participants' skills both before and after they were exposed to these games. In each of these cases there was improvement in the ability to manipulate the laparoscopic hardware, but association to the particular game could not be validated.

Further research in the medical field with regard to serious games is necessary to improve reduction in error for medical professionals. While cost of development of games for specific medical procedures can be high (Graafland et al., 2012), the benefits can be large if the games can prevent human error or human loss. Serious gaming can also aid in the development of platforms of games that can benefit more than one medical discipline. Cross-application of skills is useful in many areas as Becker (2007) has shown, thus improvement of and introduction of specific serious games for medical purposes can be a useful endeavor.

Background of Gaming and Simulations in Education

In the early 20th century John Dewey offered the approach that education and instruction can be better represented through the use of images (Dewey, 1913), which has been studied more than 90 years later showing similar results (Prensky, 2001, 2005). The mind tends to capture and store these images with greater regularity and ease than that of complex words and phrases, while a more narrative description with an image supporting it may prove to be a more useful tool in explaining a certain topic (Mayer, 2001). An example of this could be instructions on how to assemble something. With words alone it would be difficult to assemble anything complex, but with the right combination of images and words it becomes more achievable. Introducing a game that students perhaps race against one another to assemble the particular device adds another layer to the learning process. The students are now engaged on another level and are using the skills learned through lecture, through images and through hands-on experiences to get the desired result.

There often exists a stigma associated with the word game, particularly when it is associated with learning or education, and the following evidence and summary will attempt to remove some of that stigma. This stigma of gamers being children, teenagers or those locked in a basement choosing time in front of a television or computer screen rather than being outside has some falsehood to it (Grabstats, 2012). In reality, the average age of a video game player is 37 years old and many of these players have been playing games for more than 12 years (Grabstats, 2012).

Many of the characteristics that promote student or educational learning through simulation, and development of complex tasks through critical thinking, involve the use of serious games (Clapper, 2010). Bandura (1971) also promotes the belief that past behavior is likely to influence future behavior, meaning that repetition is one of the key elements to learning. That is, the learned response and critical thinking skills associated with serious games or GBL may be enhanced and copied across to other aspects of learning. This may prove to be an interesting point for purposes of this study, that these critical thinking skills may be used across other subjects or within other areas of life if they are learned and practiced. This was validated both by Jennett, Cox, Cairns, Dhoparee, Epps, & Tijs, (2008) and Weibel, Wissmath, Habegger, Steiner, & Groner, (2008) in showing that immersion in a particular game provided significant benefits to the end user versus those students that don't engage in immersion regarding a particular subject.

Empirical Evidence in Gaming for Education

The use of serious games in education has shown many positive results. Below are some of the many studies that incorporate game play and show educational benefits.

Technology and gaming are often synonymous as technology often facilitates gaming or simulation. Games like Oregon Trail, from the early 1980s, were many students' first introduction into both technology in the classroom and a serious game. While many of the students didn't understand that it was actually an educational game, this author being one of those, in fact they were learning history in the process. For purposes of this study and for some of the literature research, technology and gaming can be and often are synonymous.

Mayo (2009) researched the introduction of video games into the curriculum of high school math. Students were given a series of games that introduced logic-based mathematic questions involving college algebra. The students (N = 193) increased their test scores dramatically, ranging from 7% to 40% after introduction of the technology and video games. Furthermore, there was a significant increase in time spent doing homework, increasing over twofold when video games were the form of homework versus standard problem solving.

A similar study by Kebritchi (2008), which coincidentally also had 193 participants, found similar results. In this study, both geometry and algebra were studied using both a control group and an intervention group. This study consisted of 10 high school mathematics teachers, half of which used conventional lecture and problem based instruction while the intervention group used video games and technology as their method for instruction. Over the course of the semester the teachers followed the given curriculum set forth by the school, they simply changed their delivery method. The control group followed a strict, by the book method of instruction with homework assignments following different sections of the book in a particular order. However the

intervention group, while following the same timeline, were free utilize any methods with regard to video games that helped with the subject matter. The homework assignments were in game form and there were guidelines and rules, as with any serious game. These students spent more time studying and more time in non-school hours playing the serious games and using the source material in more of a fun manner. The two groups of students were tested at the beginning of the semester and again at the end of the semester. The students that were part of the intervention group scored nearly double than those in the control group.

Taiwan in particular has studied the use of technology and gaming as a platform for education for years and has shown that there is improvement in testing and learning as a result. In 2007, the Taiwanese government released the *Technology Education White Book* (2007) that called for a goal of over 90% of teachers integrating technology in the classroom by 2011. A study completed in 2010, sampled 1,120 teachers who filled out a questionnaire in an effort to answer the questions of -whether most teachers hold a learner-centered belief or teacher centered belief regarding technology during instruction, and -to determine any differences between teacher beliefs and teaching activities associated with the use of games or technology (Liu, 2011). Based on the reported number of teachers in the reported field numbered 100,000 (Ministry of Education, 2007) a sample size of 1,000 was necessary (Cohen, Manion, & Morrison, 2003) for a 95% reliability standard. The teachers were then graded in several key areas, their pedagogical beliefs (teacher-centered or learner-centered), their teaching activities (lecture based or constructivist) and their technology use (TATU). The TATU section had five item pairs. The sampled teachers responded to items on a two-point scale, with 1

for “lectured-based teaching activity” and 2 for “constructivist-based teaching activity.” The Kuder-Richardson reliability of the TATU section was 0.79. When the total score for the five items exceeded 7.5, the teacher frequently implemented constructivist-based teaching activities using technology. Conversely, when the total score was less than 7.5, the teacher frequently implemented lecture-based teaching activities. The second measure that Liu used was factors (Likert scale 1-never through 4-always) associated with technology integration (FATI).

In each of the three areas a statistical analysis was used to determine thresholds for inclusion into one area or the other (Liu, 2011). Statistical analysis was done to show the differences in teacher beliefs. Interestingly, 888/1120 (79%) of the teachers held learner-centered beliefs, while only 28% preferred technology to lecture, which does not prove consistent. Inconsistency between constructivist based teaching, or teaching with games and technology, and learner-centered teaching continues to exist. This can be related to the governmental implementation of technology in the classroom happening at a more rapid pace than teacher evolution, while teachers may know and believe in what learner-centered instruction is. Finally, teacher practices tend to correlate with implementation of testing practices, rather than testing having an effect on teacher beliefs. That being said, those teachers that tend to teach via a lecture based curriculum are likely teaching to the tests which technology or simulations and games have not accounted for (Liu, 2011).

Teacher centeredness, or teacher oriented instruction is the model that has been used for decades. A recent study from 2010 observed teacher stages of concern (SoC) as related to the use of technology and learning in the classroom (Dunn & Rakes, 2010).

The question presented by Dunn & Rakes (2010) was: Do learner-centered beliefs and teacher efficacy influence teachers' consequence concerns regarding the implementation of instructional technology? To attempt to answer that question, the authors utilized a quantitative methodology from test scores on a variety of standardized teacher testing, including the SoC Questionnaire (SoCQ) and a 5-item Likert survey. Also used were the teacher beliefs survey (TBS) and the teacher sense efficacy scale (TSES), with reliabilities of .86 and .92 respectively. Subjects participated via email and completed the three questionnaires anonymously. Using the SoC as the dependent variable and the TBS and TSES as independent variables, multiple regression analysis showed a correlation between teacher efficacy and learner centered beliefs. Also studied were the profiles provided by the SoCQ, providing a raw score for each of the major areas of the scale. The dominant low and high scores for the population will be represented when taking the mean score for each area of the scale. For this study, stages 0 and 1 showed an average score at or above 90, while stage 4 settled at 54. All other areas are statistically within the average. A low stage 4 shows that teachers have little concern regarding the effects of technology itself on their students, while a high stage 0 and 1 show that teachers have a significant amount of concern for the student awareness and information sharing (Dunn & Rakes, 2010). Overall, these numbers represent that teachers may not statistically care by what method students learn just that they are able to learn, be accountable and garner that information These results show that there is measured improvement when moving away from the standard, lecture based teaching methods and Prensky (2001) in particular has noted the changes in the landscape of education and stressed that these changes are due to the changes in the person that is being taught rather than in the system itself.

Further examples of this emergence of technology and gaming in education, was shown by a survey of 126 teachers from across the Texarkana Arkansas School District (TASD). It was completed following the 2010 school year. The teachers were given the survey to determine which areas technology played a perceived role in their classroom instruction. The results use means (M) and standard deviation (SD). The statements that provided the largest and most negative concerns of teachers were lack of technology (M = 1.74, SD .74), lack of time (M = 1.71, SD = .69) and perhaps most importantly school and national assessments (M = 1.66, SD = .73). Given this data, national and local assessments prove to have the biggest negative perceived impact on the inclusion of technology in the classroom. Another area that was notable and potentially an area of concern was the question of inclusion of students in how or what they learn, which showed that students would like to have a say in how they are being taught. This area of concern was also troubling when compounded with teachers allowing students to work at their own pace (M = 3.88, SD = .78). If students have no say in what they are learning and have no say as to the pace that they are learning, they may be set up for failure (Reigeluth & Yun-Jo, 2011-12).

A similar but larger study was completed in Taiwan in 2007. Three hundred thirty-two English teachers participated in a study to determine what influences games and technology integration had on the classroom (Yang & Huang, 2007). Questions that were to be answered by this study are: which concerns on the SoC will their score show with regard to technology (Yang & Huang, 2007)? What is the relationship between technology and the factors preventing the use (Yang & Huang, 2007)? Which behaviors will teachers perform as related to technology in English curriculum (Yang & Huang,

2007)? The Chronbach alpha score for the scale of measurement was 0.94, thus showing it is reliable. Also used was a Computer Literacy Scale (CLS), which uses a 5 point scale ranging from 1-5 in an effort to show teacher proficiency. The teachers were broken down into sub-categories of the following; (below 5 years, 6-10 years, 11-15 years, 15-20 years and more than 21 years). One notable and statistically significant difference that the data provided was the disparity between teachers that have been teaching for fewer than 5 years, versus teachers that have been teaching for more than 21. Data showed (M = 11.2) for the teachers with less experience and (M = 9.08) for those who have been teaching for more than 21. Obstacles to the use of technology in the classroom were the lack of preparation time (75%), lack of training (50%), lack of technological ability (63%) and hardware and software support (45%). This shows a significant problem with the incorporation of technology in the classroom.

An intervention study examined special education students in grades 9-12 to determine if using generative multimedia software, or a simulation, improved test scores in language arts (Rao, Dowrick, Yuen, & Boisvert, 2009). A sample of 130 students who were in the special education sector of a Hawaii high school enrolled in language arts, which many students in this category fail the equivalency exams for English (Rao et al., 2009). The intervention group consisted of 25 students, all of which were reading well below their grade level. The intervention was an eight week study which involved the use of a laptop and generation of multimedia projects using TeenACE, a software tool by IntelliTools allowing for easy integration of text, pictures and sound to simulate real world experiences (Rao et al., 2009). Protocols for testing were set up by the manufacturer and the students were tested at the beginning of the intervention and at the

end to show any significant change in language abilities. The students wrote five stories over the course of the eight weeks and a rubric was used to determine the improvements in the writing over the time period. The group improved from M = 8.1 to M = 9.5 over the 8 weeks, showing an average improvement of 1.4. Those showed a marked improvement of M = 5.3 pretest to M = 8.1 posttest. All students performed better at the end of the intervention ($t = 1.77$, $p = 0.03$) on average and the students that were at the lowest levels of reading ability marked the highest levels of improvement ($t = 2.705$, $p = 0.02$).

Each of these studies shows a measurable improvement when games or simulations were added to the educational landscape. When the student can apply these skills learned through the course of a game, in a positive manner, it is considered a successful experiment. The students' ability to recall things that didn't work is one of the areas that Becker (2007) highlighted as one of the areas that show improvement. If a student fails at something or there is a negative response during the game, they will employ a different strategy. This is much of the groundwork for games and simulations in any area of study from education to medicine to the military. Show improvement. Don't repeat what failed. Repeat what caused success. Simple responses to often complicated scenarios are the key.

Traditional Instruction Versus Computer Assisted or Simulated Instruction

There is cumulative evidence of the validity of computer assisted instruction (CAI) or simulated instruction versus traditional instruction (TI), as demonstrated by a 2004 analysis of 52 such studies of multimedia learning in Taiwan (Liao, 2004). These 52 studies were chosen compared CAI and TI to student achievement and met the

following criteria; they had to use students in Taiwan, had to provide quantitative results from both CAI and TI and had to be retrievable from scholarly sources. The total number of participants in the 52 studies was 4,981. Cohen's *d* effect sizes were calculated. In cases where the ES value was not available, the F and *t* values were used as a measure of effect size. In those 52 studies, the *ES* numbers were positive in 42 (81%) of the groups favoring CAI while 10 favored TI. The overall mean of the *ES* for the 52 studies was 0.552, showing that CAI performance increased test results by ½ standard deviation compared to TI.

A validating study measuring simulations was done in 2010 to determine the information retention of students (Chang & Yang, 2010). A study was conducted with 105 11th graders from a Taiwanese high school. Over the course of four weeks, a game on global warming that utilized multimedia curriculum was completed. A 9-point Likert scale was used to determine mental effort on the learning tasks and an online test was used to determine information retention. The survey was given to 105 students of the same educational level. Global warming was chosen, as it was a topic that had not been covered in any curriculum up to this point in their education. The alpha consistency of the Likert scale was 0.73. There was a pre-test and a post-test to measure the improvement before and after the online curriculum. Post-curriculum, the measured improvement of the paired *t*-test was ($t = -4.42$, $p < 0.001$), or a statistically significant improvement. One interesting finding of the study was that the female participants had higher scores on the Likert scale than that of the males in the study, but scored similarly on the post-curriculum test. In conclusion, this study showed that there is measurable improvement on test scores when students play a simulation game.

A similar 2007 study (Boulter, 2007) showed where the science of multimedia design and learner-oriented theory is relevant. The study looked at inner-city junior/senior high students with a propensity for both teenage pregnancy and alcohol consumption during pregnancy leading to fetal alcohol syndrome (FAS/FAE) and used multimedia presentations and a simulation to educate the students of the potential harm to the fetus. This study took 642 students (267 male, 375 female) from 5 different schools in a southeastern city in the United States, without a FAS/FAE program. The goals of the study were to educate the population and check information retention rates. The student's knowledge was measured by a pretest and a posttest following the presentation. One key element of the presentation was that it was designed by upper-classmen in the same school district as the study and it simulated the effects of alcohol and teen pregnancy. This allowed for lack of a language gap in the material and proved to allow the researchers to have less influence on the data sets, showing uninfluenced results (Boulter, 2007). The approach showed improved knowledge ($f = 31.08$, $p < .001$). Reasoning for inclusion of such a study is to show that interactive student involvement can improve information retention and learning.

Social Impacts of Gaming

Children, for example, use games that prepare them for the events that life will bring them (Vygotsky, 1978). Children play house, ride a broom as a horse, play dress-up or simply mimic their parents as a way to prepare for these adult activities. In an effort to keep the attention of children they are often given games to play to pass the time and, occasionally, learn. The ability to learn in almost a stealth mode (Michael and Chen, 2006) has an added benefit in the sense that people may be learning without an

understanding they are in fact learning. Excitement and engagement of the end-user remains the primary focus of many of the games designed for children (Klopfer, 2009). Holding the attention of children or any end user may ensure that the proper amount of time is spent on the game at hand and the skill-set or subject matter is being absorbed.

Adults play games for many of the same reasons children play games, such as a release from daily pressures, for simple pleasure (Bergeron, 2006). As SGs and video games develop with regard to technology and as the generations get older, more adults play video games and SGs because they have been playing them since their childhood. For many of the same reasons that children play games, fun, excitement, challenge, social interaction, and as an outlet for the daily mundane activities adults may be able to continue those habits learned in childhood. As the millennial children grow up, they have spent their entire lives surrounded by technology, digital media and gaming. It would stand to reason that this trend would continue in their lives as they matriculate to college, as they develop relationships and as they enter the workforce.

The relationship between male and female gamers may be one of the most fascinating areas of study. The facts are that, on average, the average serious gamer is 37 years old and that 42% of all gamers are women (Grabstats, 2012). While females make up a large percentage of the overall gamer population, males tend to spend more time playing games than females (Connolly, Boyle, & Hainey, 2007; Lucas and Cherry, 2004). Connolly et al., (2007) explored these significant differences in the amount of time playing games between the genders, as well as their overall perception of the games. The study involved an online survey and there were 551 respondents (328 female and 220 male). Females played games for more pleasure, relaxation and leisure purposes and

only one quarter of the female respondents played on an average of 5-10 hours per week. Conversely, males played for significantly longer, with more than 75% of the respondents playing for 5-10 hours per week. Males played games for pleasure and leisure purposes as well, but also played for an emotional release as their justification.

A previous study by Lucas and Cherry (2004) showed similar results. In this particular study there were 544 participants with an average age of just under 20. These respondents were broken down by gender (female n = 313, male n = 231). The individuals were given a uses and gratification questionnaire which asked questions pertaining to game preferences, hours played per week and format of games played. The results showed that females played for fewer hours, 4 hours per week, than their male counterparts of 11 hours per week. The male participants in the survey also gave higher marks for reasoning behind playing games than that of the females in the study, including competition, challenge, social interaction and diversion. Both the male and female participants chose the challenge of games as the key motivating factor in playing the game. Jansz (2010) studied the social interaction of gaming across the sexes. The study found that males rated social interaction of playing games second behind the challenge of the game itself. On the same scale, females rated the social interaction aspect of gaming last, showing that males take the opportunity of gaming to be a social event much more than females do. LaRose (2009) ran a study with similar findings. This study found that males play games for fun and for the challenge of the game, but mainly for the competition that the game provides. This study also found that males tended to play the games for longer periods of time than females and that the males in the study played the games as an outlet for anger. This study showed that both males and females played

games for a variety of reasons, and not just positive ones. The study was conducted by observing the gaming habits of 388 college students over the course of a semester. The study weighted the variables that caused excessive gaming and found that the majority of the participants began playing video games to alleviate stress, anxiety or to relieve boredom and provide an escape from reality. This study is an interesting take on why both sexes play games and what may lead them to play games for extended periods of time Chou & Tsai (2007) found that males also tend to enjoy gaming more than their female counterparts, leading to more extended play. The study also found that the motives behind gaming were different between the two sexes, potentially leading to a more addictive nature. Males generally played games for the challenge of the game itself, the social interaction of the game, or for emotional release while females generally played the games purely for the entertainment value of the game.

Chapter Summary

This chapter showed some research regarding several key aspects of gaming, simulations and technology as it relates to education, medicine, the military and the history of gaming itself and the benefits of serious games. An important gap found in the research is that there is a lack of research on the impacts SGs have on college students, especially community college students, regarding their study habits and class attendance.

Chapter 3: Research Design Methodology

Review of Statement of Problem

Community colleges face the task in the first half of the 21st century of setting a standard of education that many graduating high-school seniors, non-traditional students and those looking to further their education by taking a specific class are looking for. The White House has been closely following the evolution of the community college dating back to the Truman administration and the Truman Commission (1947) through the Obama administration and the Health Care and Education Affordability Act (2010). Higher education has also been monitoring itself closely and in 2010 the top six community college organizations signed an agreement (AACC, 2010) to match the goals of the Obama administration to have the highest percentage of college graduates in the world.

This task is not without its challenges. Ensuring that the students are able to continue their education and that they have the necessary resources to do so are just some of the challenges that community colleges face. Specific traits of CC students, including class attendance, specifically related to a student's exposure to serious games, is one area of research that may help gain an understanding of the high dropout rates of CC's in an effort to keep the student engaged. In an effort to better understand some of the reasons that students do not finish their degrees or miss class on a regular basis, and if there is an impact from exposure to serious games, the following questions need to be asked.

Research Questions

1. *Do traditional students engage in serious games at a higher rate than non-traditional students?*
2. *Do students that engage in serious game play miss more classes than those students that do not play serious games?*
3. *Are there differences in study habits between serious gamers and non-serious gamers?*

Rationale for Study Methodology

Given the many possibilities of student background, student major and possible technological or serious game exposure, a quantitative analysis of the data will be used. A quantitative study provided a useful preliminary analysis of the impacts of serious gaming and be a foundation for future research on the subject. This survey was short, concise and followed a simple instruction set to ensure that the student remained engaged and completed the survey in a timely manner.

Research Context

The research took place at a community college (CC) located in the northeast, with a main campus and several satellite campuses. The CC is a regional community college that focuses on meeting the needs of the communities that it serves by formulation of curriculum and degree programs that fill potential gaps in business and industry within the local geographical area. Founded in 1950, focusing mainly on the humanities and liberal arts, the CC has gone from 169 students that first year to more than 4,000 enrolled students in 2012. The average incoming freshman class across all campuses is typically 1,500 students that include matriculating students, recent high-

school graduates, non-traditional students and strictly online students. Of those categories, about 60% are considered recent high-school graduates, with the remainder being non-traditional students.

Research Participants

The survey was sent out to all available students enrolled at the CC, or about 4,000 students. This fits many and an extensive list of possible combinations, that is, those that are going for a certificate, those that are taking just one or two classes, or those that are auditing classes to get a better understanding of subject matter. For purposes of this study, only those students that were considered full time or those that were taking 12 credit hours or more were considered for the study. Using only full-time students for this study eliminated the students that may be just taking one class for work-related studies or those students that are not exposed to the campus as frequently. These students are also the ones that are likely to have to juggle the most classwork as well as those that have to do the most with regard to time management relating to their school work. These students should provide the necessary answers to the research questions.

An exclusion for this study was students that are below the age of 18. In the case of the students that were below the age of 18, many were still in high-school and therefore did not have the same experiences, living arrangements, or academic responsibilities that those above 18 have. The final exclusion was students that served in the military. These students have been historically exposed to more strategy based gaming and simulations, as noted in Chapter 2, than many of the other students and are also likely to have a different academic philosophy than those students that have not.

Instruments to be used in Data Collection

The survey was comprised of five sections of questions (Appendix A) for this study that gave an accurate portrayal of how the student views the academic structure and the goals of academic success. The first section of the survey consisted of nine questions determining how many classes the student is currently enrolled in, how many classes the student has taken to date, how they have done in those classes, whether they have Internet access or a computer, and their current work status. The purpose of these questions was to determine the status of the student and whether they were a full-time or part-time student and whether or not they were employed. Full time students were the key focus of this study. For purposes of this study, GPA was not collected, but may prove to be a useful tool for future studies. This first section of questions was intended to determine the background of the student with regard to their academic history and access to technology outside the classroom. Answers to these questions proved to have a bearing on the amount of time the student spends with technology and games, versus the time spent studying.

The second section of the survey (Appendix A) consisted of three questions that provided insight as to the study and academic habits of the student. These three questions will compliment section 5 in determining the study habits of the student. Each of these questions were asked for a specific purpose, which was to determine how the participant views themselves as a student and whether or not they recognize the importance of proper study habits to academic achievement.

The third section of questions (Appendix A) related to the specific gaming experiences and attitudes of the students. The first part of this section addressed gaming

from a serious game standpoint, or for games that have an educational component to them. Games that don't have a recognized or desired learning outcome did not fall into this category. Each of the questions regarding serious games were used to determine if that student would be considered a heavy gamer for purposes of this study, or simply a gamer that does so on occasion that has little or no likely impact on their academic success. These habits proved to provide some significant insight into the study habits and how they correlate to the gaming habits of the students.

The questions in section 4 consisted of six questions pertaining to the demographics of the participant, such as male or female, their age and their living arrangements. Each of these can be important factors in this particular study as they may directly relate to game play, studying, and academic achievement. For example, as about 60% of all college students are female (CCSSE, 2009), it may prove interesting to see the relationship between those male students that game versus those female students that game. Furthermore, it may prove important to see the relationship between the male and female students and see how their living arrangements are. One additional question toward the end of this section was whether or not the student served in the military. Military students have likely been exposed to simulation games in their military environments, so seeing any relationship between their opinion as to the relevance of serious or simulation game play in the classroom was not part of the overall design of the study. The final question in the survey asks the student what the student's major is. The questions in section 5 (Appendix A) asked the potential participants further questions regarding study habits begun in section 2 of the survey, such as if they routinely are able to hand in their assignments on time, if they have extracurricular activities that may

interfere with their studies, etc. These questions were answered using a 5-Likert scale from always/almost always to never/almost never. A point value was given to the answers and higher points would then dictate better study habits. The purpose of this information is to determine the student's study habits. Community college students, which consist of more than 50% of all college students (NCES, 2007), are comprised of such a mix of traditional versus non-traditional students, that the results should show a wide variety of answers to these questions. The questions in this section also asked two very specific questions regarding health. One question was if the student exercises regularly. This question was posed to see if there is a correlation between health and gaming. Along with the exercise question, there was a question regarding eating a balanced diet. Like the question regarding the exercise, this question was asked to determine the relationship between those that game and those that do not with regard to their health. Finally, two questions regarding time management were asked. Time management is critical in the success of all college students, but community college students in particular. These students are the most susceptible to dropout based on the low cost of tuition and a lesser stake in the college commitment (Goldrick & Pfeffer, 2009). Each of these questions provided insight into the underlying belief each student has toward their studies, their health and their experience with gaming. These, along with the responses collected in section 2, gave a clearer picture of how the student views academics and their specific study habits.

Confidentiality

The information provided was treated as confidential. The study was approved by the SJFC Institutional Review Board and the department of academic affairs for the CC.

Procedures Used

The measure was designed using Qualtrics, a survey tool that is freely available to students at St. John Fisher College. It is a web-based survey tool designed to incorporate an easy email delivery method to ensure a wide number of potential respondents. In an effort to ensure that the students responded, question location was important. Putting sensitive information toward the end of the survey can ensure that the survey isn't abandoned in the early stages (Iarossi, 2004). Furthermore, easier questions toward the beginning of the survey and asking those questions in the shortest way possible also can also ensure that the survey isn't abandoned (Iarossi, 2004).

The first email was sent with a hyperlink to the survey. Each student had one opportunity to take the survey based on their IP address and each IP address was only able to access the survey one time. Even within the same computer classroom or computer lab, each machine has a unique IP address, making it easier to track. The IP addresses were not kept following the completion of the survey's timeframe. Only completed surveys were considered for this study. After a period of two weeks, a second email with the hyperlink to the survey went to the student body that reminded those who hadn't taken the survey and thank those who had. Following the two week window, the survey was locked and no further responses were accepted.

Data Analysis

Upon gathering the results of the survey, the information was analyzed quantitatively using the Statistical Package for Social Science (SPSS) version 19. The data obtained was in computer generated form from Qualtrics, based on the instrument (Appendix A) designed specifically for this study and exported into both Excel and SPSS.

As Creswell (2005, 2007) noted, quantitative study of information was a solid manner to test theories and relationships given a wide variety of variables. This study has many such variables that may have an impact on a student missing classes or not being able to continue their studies. The demographics questions, such as age and sex, were given a numerical value and their frequencies were reviewed and noted to see what type of respondents comprise the survey. The CC student body itself is about 60% female, therefore the survey results should reflect this population.

More specifically, certain variables and information obtained was correlated and analyzed using different methods including Chi-Square, Cohen's *d* effect size, Mann-Whitney testing, Fisher's Exact testing and a factor analysis. All of the numbered questions in the survey (Appendix A) can fit into this category. The first research question, *Do traditional students engage in serious games at a higher rate than non-traditional students* was analyzed this way. Survey questions 2 through 7 (Appendix A) were the foundation for this research question. Survey question 2 asked how many classes the student was enrolled in. As full-time students are those that are enrolled in 12 or more credit hours, those students that answered 12 or more were considered full-time students. If a student is full time and answered yes to question 3, they were considered a full-time traditional student. If the student is full time but answered no to question 3, they were a full-time non-traditional student. Each of these two groups are the independent variable, while the answer to question 5 is the dependent variable in this comparison. Survey question 5 asked if the student plays serious games and the rate in which they play them. The percentage of students that are full time, play serious games, and are traditional students was compared to the percentage of students that play serious

games, are full time, and are non-traditional students. Questions 6 and 7 further defined serious gamers as those that play serious electronic games on a regular basis. Comparing and contrasting those different populations of the survey showed whether or not traditional students are playing serious games due to their familiarity with technology verses non-traditional students that may have had greater life experiences that bring wisdom into the mix. A Fisher's Exact Test was completed to further analyze the relationship between traditional and non-traditional students with regard to their serious gaming habits.

The second research question, *Do students that engage in serious game play miss more classes than those students that do not play serious games* was analyzed in a similar manner to research question 1, with frequency tables representing the breakdown of missing classes . Those students that answered yes to question 5, whether or not they play serious games, and answered that they were full-time students were compared to those students that answered no to question 5. The dependent variable in this case was the answer to question 5, and whether or not they are serious gamers. The independent variables in this analysis were the answers to question 13, whether or not they miss class and to what rate they miss class. A basic comparison of the number of classes the students reported that they miss for those that play serious games versus the number of classes that students reported they miss for students that don't play serious games was the analysis. Further analysis was done using both a Chi-Square test as well as a Fisher's Exact Test. The Chi-Square test analyzed the impact of serious gaming status on missing classes. The Fisher's Exact Test confirmed the Chi-Square Test by further analysis of the relationship between serious gamers and non-serious gamers.

Research question 3, *Are there differences in study habits between serious gamers and non-serious gamers,* was analyzed somewhat differently. Each of the questions in section 2 and section 5 of the survey gave a snapshot of what types of study habits the student has. Each of the answers in section 5 were given a point value based on the answers using a 5-Likert scale. Point values were given to each of the 20 questions in section 5 and added to the point value for certain questions posed in section 2 of the survey. The higher the point value, the better the study habits were for purposes of this study. The students that are engaged in serious games or those that answer yes to question 5 will be compared to those students that answered no to question 5 regarding their scores on the measure, question 14 as well as survey questions 8, 11, and 13.

Further analysis of the collected data was done using a variety of different statistical methods. Specifically, measuring Cohen's *d* effect size ensured that the relationship can be properly analyzed regardless of sample size. Further analysis of the relationship between the study habit related questions was done using a factor analysis using eigenvalue = 1 criterion. Using the dependent variable of those that play serious games and analyzing what types of students play serious games gave a better idea of what students may require from the CC to better aid in their studies.

Chapter Summary

An understanding of the reasons that a student may leave their community college without degree completion or without the ability to continue classes or transfer to another institution of higher learning is an area that is under considerable attention. The AACC (2010) is ensuring that continuity of enrollment is a priority, the White House under the Obama administration (2009) has referenced the importance of education at the

community college level, and there is current research in the area (Adelman 2005; Berkner 2002; Boggs 2010). This study considered the effects of exposure to serious games and the potential consequences of missing class related to continuity of enrollment.

Chapter 4: Results of the Study

Introduction and Data Analysis

The study "An analysis of the impacts of serious game play on the study habits of the community college student" was conducted via an online Qualtrics based survey (Appendix A) for the purposes of gaining insight into the gaming and study habits of the community college student. The study link was sent via email to the student's email account from the IT department's offices in December, 2013 and the study was active for several weeks, concluding prior to January 1, 2014. The information presented in this chapter provide answers to potential differences in study habits between several groups of students, specifically the differences between gamers and non-gamers as well as certain differences between the study habits and class attendance of traditional and non-traditional students. The study was online via a hyperlink to the survey, completely anonymous, and is a preliminary study for research purposes as was described in Chapters 1- 3.

The frequency and demographic information gathered in the survey was analyzed using Statistical Package for Social Sciences (SPSS) v. 19.

Demographics

The survey resulted in 36 workable results for purposes of this study. Table 4.1 shows the breakdown of the demographics:

Table 4.1

Demographic Characteristics of Participants

Characteristic	n	%
Gender		
Male	14	39
Female	22	61
Age at time of survey		
18-30	32	89
Above 30	4	11
Student		
Traditional	9	25
Non-traditional	27	75
Employment		
Not-employed	16	44
Employed	20	56
Living arrangements		
Alone	2	6
With family	23	64
With roommates(not family)	11	30

The demographics of the study are on par with the typical breakdown of the community college makeup. About 60% of all community college students are female, and in this survey the number of female respondents was 61% (CCSSE, 2009). Further analysis of the demographics showed that there was a similar makeup for those students that were employed versus those students that are not employed, 56% and 44% respectively. The vast majority (89%) of the students in the survey were between the ages of 18-30, with a small number of responses (11%) being students above the age of 30. The living arrangements of the respondent were also collected to review any

potential patterns, but proved to be similar to the overall population of community college students, with about twice the number of respondents (64%) living with family members or more specifically with their parents or guardians, than those students that live in a more conventional college setting with roommates (30%). Therefore, despite its small sample size this sample appears to be representative of the community college population (NCES, 2007; NCES, 2011).

Research Questions

There were three main research questions this study evaluated:

1. Do traditional students engage in serious games at a higher rate than non-traditional students?
2. Do students that are considered serious gamers miss more classes than those students that are non-gamers?
3. Are there differences in study habits between serious gamers and non-gamers?

Survey Results - Research Question 1

Question one, *Do traditional students engage in serious games at a higher rate than non-traditional students,* was analyzed using both frequency tables as well as a cross-tabulation with the frequency table being represented in Table 4.2.

Table 4.2

Research Question 1 – Frequency Table

	Traditional (N = 9)		Non-traditional (N = 27)		Totals
	n	%	n	%	
Gamer	2	15	11	85	13
Non-gamer	7	30	16	70	23

Table 4.2 shows the breakdown of serious gamers (traditional and non-traditional) and non-gamers (traditional and non-traditional). Of the 36 participants, two were in the category of traditional student serious gamer, or just over 5% of the total respondents. On the contrary, there were 11 non-traditional gamers, or just over 30% of the respondents, a higher percentage than that of the traditional serious gamers.

There was no significant association between the variables, ($p < .05$).

Survey Results - Research Question 2

Question two, *Do students that are considered gamers miss more classes than students that are non-gamers,* was evaluated in a similar manner to question 1. This question is measured by survey question 13 (Appendix A), which asked the frequency of the respondent missing classes. This is a self-reported answer to ensure the anonymity of the respondent, with the results presented in Table 4.3. In addition to the frequency table, a Chi-Square test was run along with a Fisher's Exact test to confirm the results and to account for the small sample sizes.

Table 4.3

Research Question 2 – Frequency Table

	Does not miss class (N =19)		Misses classes regularly (N = 17)		Totals
	n	%	n	%	
Gamer	6	46	7	54	13
Non-gamer	13	57	10	43	23

Table 4.3 shows that there was a relatively small percentage difference between gamers and non-gamers with regard to their class attendance reporting, 54% and 43% respectively. This small percentage was carried through to those who did not miss class with any regularity as well as 46% of gamers did not miss classes while 57% of non-gamers did not miss class. The differences are more notable when looking at the differences within their respective groups. Gamers missed class at a rate that is similar to those that did not miss class, 54% and 46%. On the other hand, non-gamers missed class at a rate of 43% while they did not miss class at a rate of 57%, a wider margin.

There was no association between serious gaming status and missing class (X^2 = .358, Fisher's Exact test = .73, $p > .05$)

Survey Results - Research Question 3

Research question 3, *What, if any, differences are there in the study habits between gamers and non-gamers,* was a far more involved question to answer and evaluate than research questions 1 and 2. There were 20 questions in the measure that were specifically related to the study habits of the student. A factor analysis was completed to determine which questions were correlated to one another to reduce the

number of dimensions. Once the factor analysis was completed, the summed groups of questions for each factor were analyzed. I report the Cohen's *d* effect size.

In addition to the 20 questions related to the measure of study habits for this survey, several other questions also pertained to study habits. Specifically question 8, *How often have you stayed up all night playing electronic games during the semester*, was evaluated. Similarly question 11, *How often have you studied or done homework so far this semester*, and question 13, *How often have you missed class so far this semester*, were studied. These questions were evaluated to understand if there were differences for serious gamer status.

Table 4.4 shows the results of the viramax rotation of a principal component factor analysis using eigenvalue = 1 criterion. For purposes of this study a factor loadings of .5 were reported.

Using Table 4.4 to determine the grouping of variables and a .5 minimum factor load, there were 7 groups of questions. A scree plot (Figure 4.1) confirmed the number of factors to be seven. Each of the seven groups was given a name corresponding to the highest load item in the group. Group 7, which consisted of only one variable, was evaluated in the same manner as the others.

Table 4.4

Factor Analysis

	Factor Loadings						
Item	1	2	3	4	5	6	7
Study Habit Q1	.503						
Study Habit Q2						.665	
Study Habit Q3	.712						
Study Habit Q4							.895
Study Habit Q5					.601		
Study Habit Q6			.844				
Study Habit Q7		.782					
Study Habit Q8		.873					
Study Habit Q9		.604					
Study Habit Q10	.697						
Study Habit Q11			.675				
Study Habit Q12						.647	
Study Habit Q13						.772	
Study Habit Q14				.832			
Study Habit Q15				.898			
Study Habit Q16	.689						
Study Habit Q17	.887						
Study Habit Q18					.702		
Study Habit Q19					.904		
Study Habit Q20			.774				

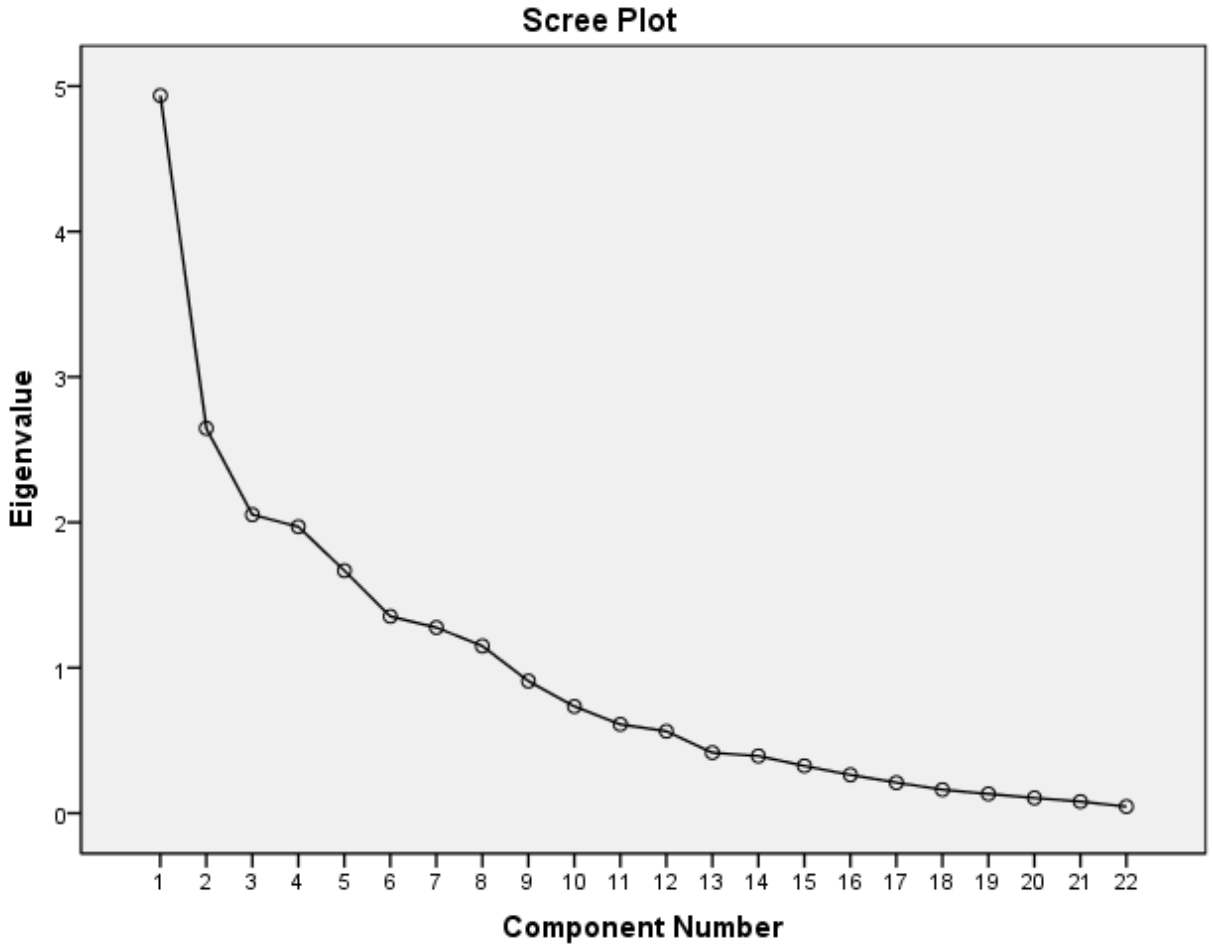

Figure 4.1. Scree plot showing factor analysis.

Study habits factor one. Factor one, the *Time Management* factor, consists of 5 questions within the measure (Appendix A);

- I take notes during class
- I review my notes regularly
- I avoid cramming for quizzes and exams
- I manage my time well
- I keep a calendar for class assignments and extracurricular activities

Each of the questions in this factor related to using time wisely, either through the use of calendars for time management or using time during class to take notes. For that reason, naming the group time management heled define this group of questions. These questions were summed. Their mean (M) and standard deviation (SD) were used to calculate the Cohen's *d* effect size. Cohen's d effect sizes are ranged from small effect size (.2) to medium (.5) to large (.8)(Cohen, 1988). In this factor (Table 4.5) gamers had a (M = 3.02) with a (SD = .69) while non-gamers had a (M = 3.34) and a (SD = .48). This resulted in a Cohen's *d* effect size of 0.55, or a medium sized effect on the respondents' time management. A Mann-Whitney nonparametric test (Table 4.06) was also run on the factor which resulted in, indicating that there was not a significant association between gaming status and time management (U = 110.5, p = .193).

Table 4.5

Time Management Summary

	M	SD
Gamers	3.02	.69
Non-gamers	3.34	.48

Table 4.6

Time Management Mann-Whitney

	Totals
Mann-Whitney U	110.5
Asymp. Sig. (2-tailed)	.193

Study habits factor two. Factor two, the *Study Techniques* factor, consisted of 3 questions out of the measure (Appendix A):

- I like to study alone
- I like to study with others
- I study in the same place

The questions that were represented in this factor share studying as the main component. The technique in which the respondent studied dictated the factor being called the Study Techniques factor. This factor was also summed and a mean and standard deviation was calculated (Table 4.7). The resulting numbers for gamers consisted of (M = 3.28) and (SD = .72) with that of non-gamers having (M = 3.10) and (SD = .47). This resulted in a Cohen's *d* effect size of 0.30, considered a small effect on the respondents' class preparation. A Mann-Whitney test (Table 4.8) was run on the factor which resulted in an indication that there was not a significant association between gaming status and study techniques (U = 109.0, p = .174).

Table 4.7

Study Techniques Summary

	M	SD
Gamers	3.28	.72
Non-gamers	3.10	.47

Table 4.8

Study Techniques Mann-Whitney

	Totals
Mann-Whitney U	109.0
Asymp. Sig. (2-tailed)	.174

Study habits factor three. The third factor, labeled the *Focus on School* factor, due to the inability to focus on school or school work, consists of three questions out of the measure (Appendix A);

- I find it difficult to pay attention during class
- I wait until the day the assignment is due to start it
- Work or other extracurricular activities interferes with my studying

Table 4.9 displays the mean and standard deviation of this factor by gaming status. The results for the gamers were (M = 2.38) and (SD = 0.65), while the results for the non-gamers were (M = 2.58) with (SD = 0.64). Using this information a Cohen's *d* effect size was calculated resulting in an effect size of .31, or a small effect on the group depending on the respondent being a gamer or a non-gamer. A Mann-Whitney test was also run to confirm the results (Table 4.10). There was not a significant association between gaming status and focus on school (U = 122.5, p = .368)

Table 4.9

Focus on School Summary

	M	SD
Gamers	2.38	.65
Non-gamers	2.58	.64

Table 4.10

Focus on School Mann-Whitney

	Totals
Mann-Whitney U	122.5
Asymp. Sig. (2-tailed)	.368

Study habits factor four. The fourth factor consists of two questions relating to *Health Management* out of the measure (Appendix A);

- I exercise regularly
- I eat a well-balanced diet

Further evaluation of this *Health Management* factor was done using the mean and standard deviation as seen in table 4.11. This resulted in (M = 2.08) and (SD = 0.64) for those that were gamers and numbers of (M = 2.98) and (SD = 0.61) for those respondents that were non-gamers. Using this information, a Cohen's *d* effect size was determined to be 1.44, which showed a large effect size. This result means that there was a strong association between health management and gaming status. Based on the numbers, gamers had a significantly poorer result in score on the health management portion of the measure than those that were non-gamers There was a strong and statistically significant association between health management and gaming status (U = 47.5, p = .001).

Table 4.11

Health Management Summary

	M	SD
Gamers	2.08	.64
Non-gamers	2.98	.61

Table 4.12

Health Management Mann-Whitney

	Totals
Mann-Whitney U	47.5
Asymp. Sig. (2-tailed)	.001

Study habits factor five. The fifth factor consists of questions related to potential interferences with studying, either with a lack of organization of notes, which is an indirect interference or more direct interferences such as television. This factor, called the *Potential Interferences* factor, consisted of three parts of the measure (Appendix A) related to potential distractions;

- I keep my notes and study materials well organized
- Playing electronic games interferes with my studying
- Television interferes with my studying

As with the previous factors, this information was summed and table 4.13 displays the mean and standard deviation of this factor by gaming status, with gamers having (M = 2.87) and (SD = 0.57) while non-gamers had (M = 3.05) and (SD = 0.73). Using this information to calculate the Cohen's *d* effect size, the number .27 was found. A Mann-Whitney test (Table 4.14) was run to confirm resulting in (U = 122.5, p = .365),

which did not detect a significant association between gaming status and potential interferences.

Table 4.13

Potential Interferences Summary

	M	SD
Gamers	2.87	.57
Non-gamers	3.05	.73

Table 4.14

Potential Interferences Mann-Whitney

	Totals
Mann-Whitney U	122.5
Asymp. Sig. (2-tailed)	.365

Study habits factor six. The sixth factor, *Class Participation*, was made up of three parts of the measure (Appendix A), all of which related to the either the completion of assignments, or involvement in group work, each relating to participation in class;

- I compare my notes with other students in class
- I complete all of my assignments
- I turn in all of my assignments on time

The mean and standard deviation were calculated in table 4.15 resulting in (M = 3.56) and (SD = 0.48) for gamers and (M = 3.49) and (SD = 0.39) for non-gamers. This information was used to calculate the Cohen's *d* effect size, resulting in .16, or a small effect on class participation regardless of gaming status. To validate these findings, a Mann-Whitney test was run (Table 4.16) resulting in (U = 130.5, p = .519) which

indicated that there was not a significant association between gaming status and class participation.

Table 4.15

Class Participation Summary

	M	SD
Gamers	3.56	.48
Non-gamers	3.49	.39

Table 4.16

Class Participation Mann-Whitney

	Totals
Mann-Whitney U	130.5
Asymp. Sig. (2-tailed)	.519

Study habits factor seven. Factor seven consisted of only one of the study habit questions, so this will be analyzed individually. The question:

- I only review my notes prior to exams or quizzes

The mean and standard deviation (Table 4.17), resulted in (M = 3.54) and (SD = 0.66) for gamers and (M = 3.26) and (SD = 0.81) for non-gamers. The effect size for Cohen's *d* was calculated to be .38, which shows a small to medium effect regarding gaming status as related to reviewing notes. Further analysis consisted of a Mann-Whitney test (Table 4.18) resulting in (U = 121.0, p = .299), indicating that there was not a significant association between gaming status and reviewing notes prior to exams.

Table 4.17

Review Notes Summary

	M	SD
Gamers	3.54	.66
Non-gamers	3.26	.81

Table 4.18

Review Notes Mann-Whitney

	Totals
Mann-Whitney U	121.0
Asymp. Sig. (2-tailed)	.299

Question 8 – How often have you stayed up all night playing electronic games this semester? Question 8 of the survey (Appendix A) poses the question the frequency of the respondent staying up all night during the semester playing electronic games. This question was analyzed in a similar manner as the grouping of questions in the previous section by running a mean and standard deviation table (Table 4.19) followed by a Mann-Whitney test and calculating the Cohen's *d* effect size.

The resulting information for question 8, (M = 3.39) and (SD = 0.77) for gamers and (M = 3.70) and (SD = 0.47) for non-gamers gives us a Cohen's *d* effect size of .47. This shows that there's a medium effect on the answer to question 8 depending on the respondent being a gamer or a non-gamer. Further analysis was accomplished using a Mann-Whitney test (Table 4.20). This resulted in (U = 119.0, p = .234), indicating that there was not a significant association between gaming status and staying up all night gaming.

Table 4.19

Question 8 Summary

	M	SD
Gamers	3.39	.77
Non-gamers	3.70	.47

Table 4.20

Question 8 Mann-Whitney

	Totals
Mann-Whitney U	119.0
Asymp. Sig. (2-tailed)	.234

Question 11 - How often have you studied or done homework during the semester? Survey question 11 can also be closely related to the question of the impacts of gaming on the study habits of the respondent. For this question the same methodology was used as in question 8 to determine mean and standard deviation to calculate Cohen's *d* effect size (Table 4.21) and a Mann-Whitney test (Table 4.22). This resulted in (M = 3.31, SD = 0.75) for gamers and (M = 3.48,SD = .73) for non-gamers calculating a Cohen's *d* effect size of .23, or a small effect. A Mann-Whitney non-parametric test was run resulting in (U = 129.0, p = .450), indicating that there was not a significant association between gaming status and the amount of studying or homework done during the semester.

Table 4.21

Question 11 Summary

	M	SD
Gamers	3.31	.75
Non-gamers	3.48	.73

Table 4.22

Question 11 Mann-Whitney

	Totals
Mann-Whitney U	129.0
Asymp. Sig. (2-tailed)	.450

Question 13 – How often have you missed class so far this semester? Question 13 was reviewed in answering research question two, but it also has bearing when considering the study habits of gamers and non-gamers as well. This question shows the involvement of the respondents to their workload and class participation, both of which impact their success or failure. For this question the mean and standard deviation was calculated (Table 4.23) as well as a Mann-Whitney test (Table 4.24) to calculate the Cohen's *d* effect size to consider the potential significance of gamers versus non-gamers on class attendance.

The resulting data (M = 3.39,SD = 0.75) for gamers and (M = 3.48,SD = 0.67) for non-gamers calculates to a Cohen's *d* effect size of .14, or a small effect. Further analysis was accomplished using a Mann-Whitney test which resulted in (U = 136.0, p = .618), indicating that there was not a significant association between gaming status and class attendance.

Table 4.23

Question 13 Summary

	M	SD
Gamers	3.39	.75
Non-gamers	3.48	.67

Table 4.24

Question 13 Mann-Whitney

	Totals
Mann-Whitney U	136.0
Asymp. Sig. (2-tailed)	.618

Comparison of Cohen's d effect sizes. Table 4.25 shows the differences between Cohen's *d* effect sizes of the study.

Table 4.25

Cohen's d effect size summary

Construct	Cohen's *d*	p-value
Factor 4 – *Health Mgmt*.	1.44	.001
Factor 1 - *Time Mgmt*.	0.55	ns
Question 8 - *Staying up all night gaming*	0.47	ns
Factor 7 - *Reviewing notes before exams*	0.38	ns
Factor 3 - *Focus on School*	0.31	ns
Factor 2 - *Study Techniques*	0.30	ns
Factor 5 - *Potential Interferences*	0.27	ns
Question 11 – *Frequency of homework or studying*	0.23	ns
Factor 6 -*Class Participation*	0.16	ns
Question 13 - *Missing Class*	0.14	ns

ns = not significant

Table 4.25 shows the Cohen's *d* and associated statistical significance per question and per factor of the factor analysis, in rank order. Health and time management are at the top of the list with class participation and class attendance being at the bottom

of the list. Based on this table, gamers tend to have less of an ability to well manage their time or health and may study more prior to their exams than that of non-gamers. There were negligible associations between gaming status, class participation or missing class.

Chapter Summary

The results of research questions 1 and 2 were similar in that there was little difference as to whether the respondent was a gamer or a non-gamer or a traditional student or a non-traditional student when answering the questions. Interestingly, the smallest number in the cross-tabulation was for the respondent to be a traditional student and a gamer, with only 6% of the respondents fitting that category. Technology driven student populations, which is much more prevalent than it has been in the past, would dictate that the younger students would be more likely to be involved in electronic gaming than the older or non-traditional students. This will be explored in greater detail in chapter 5.

Research question 3, which is the foundation for the research, shows little variety in the outcomes. Of the grouping of variables and the three additional questions the respondents answered, only one group, the *Health Management* group, showed that there was a significant difference between the respondent being a gamer ($M = 2.08$, $SD = 0.64$) or non-gamer ($M = 2.98$, $SD = 0.61$). Of note with these numbers are the similarities of the standard deviation, while there was a large difference in the mean. Non-gamers showed a statistically significant difference over their gaming counterparts in answering the factor related to good health management. This factor had nearly a one point difference in scoring between the two groups, with the gamers scoring significantly more poorly than the non-gamers. This will also be explored in greater detail in chapter 5.

Chapter 5: Discussion

Discussion and Summary

The results of this exploratory study showed that, overall, it made no difference whether the person was a serious gamer or a non-gamer in the study habits based on the individual. That is the underlying theme based on the three research questions in general, though there were several instances that serious gaming status was associated with the outcome. Only one area of the measure showed a strong association between serious gaming status and non-gamer status, and that was health management. The focus of the study was to compare first, traditional students or those that attended college full-time having graduated from high school within the past year, with non-traditional students, or those who didn't enroll in college immediately following high school graduation, and their frequency of serious gaming. Further focus was to explore the differences in serious gamer status on class attendance and overall study habits.

For example, as research question 1 explored, traditional students were less likely to be serious gamers than non-traditional students, an interesting result given that traditional students have a more recent exposure to educational technology (Graaflad et al., 2012; Prensky, 2001 & 2005). Exposure to technology and the availability of many electronic gaming systems may lend itself to playing such games, but it wasn't the case with these respondents. Because traditional students have had more access more recently to educational technology, based upon the recent infusion of technology in the classroom, (NCLB, 2001), they likely have not had the life experiences that non-traditional students

have likely had. The impact that this may have is that, while they have had less direct involvement to technology as recently as the past year in the classroom, they may recognize the benefits of engaging in serious games to pass the time. Of the 13 serious gamers in the study, only 15% of them were classified as traditional students, or students that have graduated high-school within the past year and entered college within that timeframe. These students are the typical incoming freshman student that has had access to technology in school (Lei & Zhao, 2007) and likely used this technology on a daily basis. For this group of students to have a small representation as serious gamers versus the non-traditional students, of which 85% were serious gamers, was surprising.

An instance where the differences in gamer status may have been less of a surprise was in regard to research question 2 and class attendance. On the surface one may hypothesize that serious gamers would miss more classes than non-gamers, given that more of their time was spent serious gaming rather than attending classes. The data in fact does show that serious gamers tended to miss more classes than non-gamers, 54% versus 43% of their respective groups. As missing class tends to have an adverse effect on academic success (Adelman, 2005) one could infer that serious gamers may be at higher academic risk than non-gamers. Exploring students' GPA by serious gaming status was not part of this study and may be an area of future research. However, in my study, Cohen's *d* was small and the result was not statistically significant, thus the gaming effect on class participation or class attendance is likely very small. My research showed that there were no statistical differences in study habits between serious gamers and non-gamers.

The third research question dealt specifically with the study habits of the CC student. According to the results across all parts of the measure, except one regarding health management, serious gaming status had little or nothing to do with study habits. The students were given a twenty question study habit measure that would, very specifically, show the trends of each groups' study habits. There was no statistical significance between serious gamers and non-gamers for the following factors and questions:

- Time Management
- Study Techniques
- Focus on School
- Potential Interferences
- Class Participation
- Review of Notes
- How often they have stayed up all night playing electronic games during the semester
- How often they have studied or done homework during the semester
- How often they have missed class during the semester

The fact that serious gamer status had no association with study habits is surprising given that many would view the gamer as the one that would spend more time doing things related to serious gaming than working on their studies (Berkner et al., 2002; Chen et al., 2007).

The one area that there was a significant difference was in the health management factor. This factor returned a Cohen's *d* of 1.44, or a strong association between serious

gaming status and health. The non-gamers had significantly better scores in this area than serious gamers. This is the one area that stereotypes may actually fit in that serious gamers may have a more sedentary lifestyle than non-gamers.

Findings in Relation to the Literature

The literature has shown both the need and the importance of studying the community college student. More and more students are entering the college ranks and both the AACC (2010) and Obama administration (2009) have pledged time and money to ensure the future success of the CC student. Both governing bodies, the AACC and the Obama administration, have recognized the nature of the CC campus as a true melting pot, be it by age, race, gender or educational background. Very few places could you potentially find an 18 year old high-school Valedictorian in a study group with a grandparent, a veteran and a person that recently received their GED. For this and many purposes, the studying of the CC student and their potential study habits proved to be an interesting area of study.

Another area of measure that impacts the success or failure of the CC student is in class attendance. Research question 2, do serious gamers miss more classes than non-gamers, aligned with research done by Adelman (2005) which recognized the importance of class attendance with regard to academic success. The research showed that there is a direct correlation between missing class and doing poorly on exams and overall grades, which are the direct measures of this academic success (Berkner et al., 2002; Chen et al., 2007). This study showed no statistically significant association between missing class and gaming status. The results of this having an impact on the academic success of the students, was more theoretical as the GPA of the student was not collected. Further

analysis of serious gamers that miss classes regularly and the specific impact that missing classes has on their grades may be an area of continued research.

Studies such as those done by Tinto (1993) and Bradburn's (2002) have highlighted the need for continuity of enrollment and class attendance being a key factor in ensuring that CC students have success. Further research (Pusser & Levin, 2008) expanded on this importance of attendance and enrollment and explored their specific relationship to time management. All of these authors share in the understanding that the CC is an area of importance not only from a research standpoint, but to understanding the path of the CC student as they move through their studies. This understanding of the need to attend class to be successful, both on this campus and campuses across the country is and should be an area of concern. While it has been shown that individuals learn and process information differently (Mayer & Moreno, 2002; Sweller, 1999), the lack of exposure to these teachings and activities that occur during class can have lasting effects (Pusser & Levin, 2008). Continued research, focus on attendance and associated research can improve upon the success of the student and in turn the CC.

The third research question expanded on the attendance of the student and explored the study habits and potential impacts gamer status had on them. Younger people or people in the millennial generation specifically, are predisposed to learn differently than their predecessors based on their exposure to technology (Chandler & Sweller, 1999). This is far from a new concept. Researchers have studied the impact of technology, imagery and images enhancing the learning process going back at least as far as early 20th century (Dewey, 1913). The methods and delivery may have changed but the concept has not. Reviewing notes, ensuring that assignments are completed and

classes are attended are all parts of this greater picture. It's the mode in which it is achieved that is the only difference. This understanding of the potential impacts gaming has on study habits was the primary basis of the research question.

In general the research showed that serious gamer status didn't matter to the respondent's study habits. Whether they were a serious gamer or a non-gamer they basically studied the same, spent a majority of their down time in the same way and had similar demographics. What was not the same was their basic health management as defined by factor 4 of the factor analysis. Serious gamers ate a poorer diet and exercised less. What could this mean? It may mean that there should be continued research and understanding on these potential physical risks associated with serious gaming. There is and has been continued focus on mental health as it relates to serious gaming, and this focus on the mental health may be overlooking the general physical health. The Wii Fit has sold more than 25 million units (Entertainment Software Association, 2011), which is technology that may change the physical impacts of all gaming. The fact that it is a recognized trend to involve the body with gaming as much as the mind, it is still troubling that a study done at the end of 2013 can show that there is such a significant lack of emphasis put on a college student's own health. Simply repeating the means of the two groups again emphasizes the importance. Serious gamers scored nearly one point less on average, in answering the health related questions, than their non-gamer counterparts. Couple that with the Cohen's *d* of 1.44 and the association between poor health and extensive serious gaming shows. It may have been my expectation to see a difference in serious gamers and non-gamers with regard to some of these variables, this

trend of poor eating habits and inactivity by serious gamers is an area that certainly needs attention.

As 2014 progresses there is certainly an emphasis on health and healthy activity in NY and around the country. Crossfit, for example, has become an emerging trend for an exercise regimen for people of all ages, and schools have begun to remove high sugar drinks and unhealthy snacks from vending machines and lunchrooms. Perhaps this renewed interest on health will continue into the CC environment. What's interesting though is that the majority of the serious gamers are non-traditional students and therefore older than your typical 18-19 year old. This aligns with national data that shows the average age of any gamer is 37 (Grabstats, 2012). This means that they are likely to have delayed the habit of lack of exercise and poor eating habits and therefore it isn't really a product of their CC environment rather a product of their lifestyle. What is of further interest is that there is often a bias toward on-campus students rather than to commuters with regard to student involvement (AACC, 2010). If there is little or no campus provided initiative for a healthy lifestyle for commuters and non-traditional students, then the challenge of changing their habits becomes increasingly difficult.

Limitations of the Study

The main limitation of the study was the small sample size. Because this study was underpowered, I reported Cohen's *d* effect sizes that are not dependent upon sample size.

Recommendations for Future Research

This was intended to be an exploratory study on the study habits and gaming habits of community college students as they relate to their experiences with serious

electronic games, and to that degree it was a successful study. Further studies may consider drilling down and more specifically defining which specific serious games the community college student is using. The video game industry, and more specifically, the games that are serious in nature are constantly changing and evolving, particularly with the recent influx of tablets, iPads, iPhablets, etc. that have begun to saturate the market. As it becomes more common to be using these devices both inside and outside the classroom, it stands to reason that the relationship between these devices and studying will also become more homogenous. As specific games continue to be developed and become more readily available and transportable, the effects that they may have on study habits and the learning process may be worth exploring again.

My recommendation for future research and future researchers is to remain focused on the community college student, which from a research standpoint, is often overlooked. The majority of research studies focus on the 4-year institution, even though at least half of all college students are community college students (NCES, 2007 & 2011). With half of all students being made up of CC students, it would stand to reason that about half of the research would occur within those ranks. This simply is not the case. Perhaps access to CC campuses and students is lacking or perhaps researchers don't see the validity in studying those students in the same manner as 4-year students. Much of the research for doctoral and masters programs comes from 4-year institutions and their students, and many student researchers write about what they have ready access to. As President Obama (2009) urged "every citizen, youth and adult, to be enabled and encouraged to pursue higher learning". This higher learning, if only for a class or a year, will not occur for the most part at an Ivy League school but at the local community

college that attends to the needs of the community and to the needs of their local businesses. This is where the research should focus.

Chapter Summary and Conclusion

This study proved to show some interesting, if not surprising, results. While it stands to reason that those students that spend their time playing electronic games would likely have less time doing the necessary things required for the college student like studying, the lack of a strong association was surprising. What was also surprising was that there was such a significant difference between gamers and non-gamers relating to the *Health Management* factor. For gamers to have that significantly poorer results relating to their eating and exercising habits, it is certainly an area for both future research and concern for campus administrators. While certain gaming systems have been positioned in the marketplace to improve upon the gamer stereotype, this snapshot shows that the stereotype may have some merit. Certain foci by the Obama administration, as well as the governing bodies of community colleges (AACC), may choose to ensure that the campuses are not only advancing financially and physically, but that their students are maintaining healthy lifestyles.

More than half of students are taking classes or getting their first experience of higher education at the community college level and that trend, based on commitments made by the AACC and the Obama administration is only going to continue its upward climb. It is truly the melting pot of college life, much more so than your technical schools or many of the public and private 4-year schools prevalent in the U.S. There are gamers and non-gamers, traditional students and many non-traditional students, old and young and students of any and all colors. These gamers and non-gamers may have the

same study habits, miss classes at a different rate and have varying beliefs when it comes to taking care of their health, but they need to be studied and researched.

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Appendix A

Community College Study Habits

BY SELECTING THE I CONSENT SELECTION BELOW, YOU HEREBY AGREE TO PARTICIPATE IN THE ABOVE NAMED SURVEY

- ❍ I CONSENT (1)
- ❍ I DO NOT CONSENT (2)

If I DO NOT CONSENT Is Selected, Then Skip To End of Survey

Q1 Which of the following best represents your current age?

- 17 or younger (1)
- 18-30 (2)
- Above 30 (3)

If 17 or younger Is Selected, Then Skip To End of Survey

Q2 How many classes are you currently enrolled in?

- 1 (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)

If 1 Is Selected, Then Skip To End of SurveyIf 3 Is Selected, Then Skip To End of SurveyIf 2 Is Selected, Then Skip To End of Survey

Q3 Did you graduate high school within the past year?

- Yes (1)
- No (2)

Q4 Have you ever served in the military?

- Yes (1)
- No (2)

If Yes Is Selected, Then Skip To End of Survey

Q5 This study is considering the use of electronic media and game play of various kinds. Researchers define serious electronic games as games that have an educational intent, or a defined learning outcome. Some common examples of serious electronic games are SimCity, Civilization, iCivics, Electronic Chess, etc. Researchers further define recreational electronic games as games that are not intended to have an educational intent, or designed for recreational purposes. Some examples of recreational electronic games are Grand Theft Auto, Call of Duty, Halo, World of Warcraft, sporting games, etc. Given these definitions, how often do you play serious games?

- ❍ Daily (1)
- ❍ A few times a week (2)
- ❍ A few times a month (3)
- ❍ Never (4)

Q6 On the days that you may play electronic games, how many hours do you typically play?

- ❍ 1 or less (1)
- ❍ 2 to 4 (2)
- ❍ 5 or more (3)

Q7 Of the electronic games that you play, are the majority of those....

- ❍ Serious Games? (1)
- ❍ Recreational Games? (2)

Q8 How often have you stayed up all night playing electronic games during the semester?

- ❍ Never (1)
- ❍ Once or twice a month (2)
- ❍ Once or twice a week (3)

Q9 Do you believe that electronic games can enhance learning?

- ❍ Never (1)
- ❍ Sometimes (2)
- ❍ Always (3)

Q10 How many courses have you taken that have incorporated the use of electronic games?

- None (1)
- 1-3 (2)
- 4 or more (3)

Q11 How often have you studied or done homework so far this semester?

- Daily (1)
- Once or twice a week (2)
- Once or twice a month (3)
- As needed (4)

Q12 How often have you stayed up all night so far this semester?

- Never (1)
- Once or twice a week (2)
- Once or twice a month (3)

Q13 How often have you missed class so far this semester?

- Never (1)
- Daily (2)
- Once or twice a week (3)
- Once or twice a month (4)

Q14 Please answer the following questions regarding your study and school related habits.

Choose the answer that best represents how you view yourself as a learner.

	Always/Almost Always (1)	Sometimes (2)	Rarely (3)	Never (4)
I take notes during class (1)	❍	❍	❍	❍
I compare notes with other students in my classes (2)	❍	❍	❍	❍
I review my notes regularly (3)	❍	❍	❍	❍
I only review my notes prior to quizzes or exams (4)	❍	❍	❍	❍
I keep my notes and study material well organized (5)	❍	❍	❍	❍
I find it difficult to pay attention during class (6)	❍	❍	❍	❍
I like to study with others (7)	❍	❍	❍	❍
I like to study alone (8)	❍	❍	❍	❍
I study in the same place (9)	❍	❍	❍	❍
I avoid cramming for quizzes or exams (10)	❍	❍	❍	❍
I wait until the day the assignment is due to start it (11)	❍	❍	❍	❍

I complete all my assignments (12)	❍	❍	❍	❍
I turn in all my assignments on time (13)	❍	❍	❍	❍
I exercise regularly (14)	❍	❍	❍	❍
I eat a well balanced diet (15)	❍	❍	❍	❍
I manage my time well (16)	❍	❍	❍	❍
I keep a calendar for class assignments and extracurricular activities (17)	❍	❍	❍	❍
Playing electronic games interferes with my studying (18)	❍	❍	❍	❍
Television interferes with my studying (19)	❍	❍	❍	❍
Work or other extracurricular activities interferes with my studying (20)	❍	❍	❍	❍

Q15 Are you currently employed?

- ❍ No (1)
- ❍ Yes-Part time (less than 35 hours per week) (2)
- ❍ Yes-Full time (35 hours or more per week) (3)

Q16 Of the options listed below, which best describes your household composition during the academic year?

- ❍ Live alone (1)
- ❍ Live with a spouse or partner (2)
- ❍ Live with children (3)
- ❍ Live with parents (4)
- ❍ Live with extended family members (5)
- ❍ Live with others/roommates/not family (6)

Q17 What is your major?

- Biotechnology (1)
- Business: Accounting (2)
- Business: Business Administration (3)
- Communication (4)
- Computer Information Systems (5)
- Computer Science (6)
- Criminal Justice (7)
- Criminal Justice: Police (8)
- Engineering Science (9)
- Fine Arts: Music (10)
- Fine Arts: Studio Arts (11)
- Human Services (12)
- Individual Studies (13)
- Information Technology (14)
- Liberal Arts and Sciences: Adolescence Education (15)
- Liberal Arts and Sciences: Childhood Education (16)
- Liberal Arts and Sciences: Early Childhood Education (17)
- Liberal Arts and Sciences: Humanities (18)
- Liberal Arts and Sciences: Math and Science (19)
- Liberal Arts and Sciences: Social Science (20)
- Mechanical Technology (21)
- Media Arts (22)
- Medical Office Technology (23)
- Nursing (24)
- Occupational Therapy Assistant (25)
- Office Technology (26)
- Physical Education Studies (27)
- Professional Piloting (28)
- Public Safety Technology: Fire Science (29)
- Welding Technology (30)
- I am currently going for a certificate (31)
- I am currently undecided (32)
- Environmental Science (33)

Q18 What is your sex?

- ❍ Male (1)
- ❍ Female (2)