# COGNITIVE RETENTION OF GENERATION Y STUDENTS THROUGH THE USE OF GAMES AND SIMULATIONS

A Dissertation

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## Abstract

A new generation of students has begun to proliferate colleges and universities. Unlike previous generations, Generation Y students have been exposed to a variety of technological advancements, have different behaviors towards learning, and have been raised in a different environment. These differences may be causing conflict with traditional pedagogy in educational institutions, thereby creating, while it may be unintentional, an inability for Generation Y students to learn under the standard educational method of lecture presented to previous generations. The literature supports the position that additional teaching methods are needed in order to effectively educate Generation Y students (Prensky, 2001; Brozik & Zapalska, 1999; Albrecht, 1995). Consequently, the primary goal of this dissertation is to examine the ability of Generation Y students to achieve greater cognitive retention when the instructional material is conveyed with the assistance of or through the use of games and/or simulations.

## ACKNOWLEDGEMENTS

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Finally, I give all thanks, glory, honor, and praise to my Lord and Savior, Jesus Christ. Without Him, I am nothing, and it is because of His provision that I have soared on the wings of eagles, and completed what was initially an impossible task.

# LIST OF TABLES

# LIST OF FIGURES

# TABLE OF CONTENTS

Page

# Chapter 1: Introduction

## *Overview*

Instructors of post-secondary schools have the sometimes daunting task of educating those students who have expressed a desire for gaining knowledge and wisdom in a particular area by matriculating to an institution and enrolling in a class, thereby indicating to the instructor their need for training in a specific subject that will enable the student to prepare for life after their collegiate career is complete. With the predominate student of a four year institution of higher learning being those within Generation Y (Haytko, 2006), the task of the instructor then becomes how to best meet the specific learning needs of this generation and therefore the most effective means of instruction in an age when technology has exploded (Rollin, 1999).

## *Problem Background*

Each generation throughout American history is often remembered for either specific events that have occurred during one's formative years, famous people and/or products of that time period, or for character traits common among members of that particular generation (Fishman, 2004).

Generation Y students are of particular interest as they are the newest and the largest segment within the current postsecondary school system (Haytko, 2006), and are often considered to have been born from 1979 through 1990 (Johnson, 2007; Salzberg, 2007; Stubbs, 2007; Turetsky, 2006). As this generation is different from previous generations (Denham & Gadbow, 2002), there is a need to determine the most effective method for teaching Generation Y students that both enhances and promotes a student's ability to learn and retain knowledge. According to Oblinger and Oblinger (2006), there

is a strong correlation between Generation Y students' ability for cognitive retention and the utilization of games and simulations.

As each generation has its own social characteristics and behaviors, generations also have unique learning traits. Therefore, educators are finding that to be effective in the classroom, one cannot teach using the same instructional tools for Generation Y students as was used for teaching previous generations (Prensky, 1998; Prensky, 2001; Prensky, 2005/2006). Since Generation Y students appear to be tactile oriented (Oblinger, 2004; Oblinger & Oblinger, 2006), it appears that instructors should be utilizing activities within the classroom that encourage learning through this method. As a result of the differences in learning styles, one could therefore correlate that if a student is instructed in the learning modality most closely related to the student's learning style, then retention of material presented may be enhanced, prolonged, and/or possibly improved. Accordingly, since Generation Y appears to be kinesthetic learners (i.e. tactile) (Marriott, 2004), active learning through the use of games and simulations needs to be evaluated more extensively to determine the significance, if any, the games and simulations play on a student's ability to retain information and whether the combining of learning modalities has a statistically significant role in a student's cognitive retention, particularly when studies such as Helm (1991), Sredl (2006), and Eison and Bonwell (1991) indicate either that there is no statistical difference that today's students (i.e. Generation Y) cannot learn effectively from the more traditional methods of lecturing or visual means of instruction (Bischof, 2004; Arhin & Johnson-Mallard, 2003) such as PowerPoint., or that a paradigm shift is needed within the educational world in order to effectively and efficiently instruct our students (Allery, 2004).

*Purpose of the Study*

The role of an instructor is to impart knowledge, while the role of the student is to learn and retain as much as the student is able. When the instructor fails to impart knowledge or does not convey the information in a way that a student understands, then the student may either have difficulty or be unable to effectively learn the material. As a result, it appears that there may be a separation between the instructor's teaching and a student's learning. Using the terms Digital Natives, to represent those within Generation Y, and Digital Immigrants, to distinguish persons, particularly instructors, who are older than Generation Y, Prensky (2001) summed up this apparent separation as

> Its just dumb (and lazy) of educators – not to mention ineffective – to presume that (despite their traditions) the Digital Immigrant way is the *only* way to teach, and that the Digital Natives' 'language' is not as capable as their own of encompassing any and every idea. (p. 6)

As a result, more research is needed to determine the most effective and efficient method of instruction rather than continuing on a path that is shown to be ineffective.

*Bloom's Taxonomy*, commonly thought of as a progression of learning (Atherton, 2005a; Atherton, 2005b), specifically defines cognition (Clark, 2007) and various cognitive abilities (Forehand, 2005) that may be achieved during the learning process. Often shown in a diagram as a pyramid (Huitt, 2004), *Bloom's Taxonomy,* has been utilized to align teaching pedagogy with that of student learning (Forehand).

Similar to *Bloom's Taxonomy* is the Dale's Cone of Experience (Dale's Cone). Dale's Cone not only examines how one may learn, but also attempts to understand the degree of retention based on the method of instruction (Thalheimer, 2006; Alabama

Department of Education, 2001-2003). While not an exact science, Dale's Cone is significant in that the Accounting Education Change Commission declared a need for change within accounting education as students were not learning the practical elements of accounting that practitioners felt should be known once an accounting student graduates from college (American Accounting Association, 2007). Consequently, a decree was issued by the American Accounting Association signifying the need for pedagogical change within accounting higher education.

Wilbert McKeachie (1987, 1995, & 2001) examined the learning styles of students, as well as the various teaching pedagogies employed by instructors, and then developed strategies which could assist instructors in effectively reaching their students. Actively engaging students in the classroom (e.g. games and simulations) began to evolve, particularly as studies involving retention and effective teaching began to surface in light of the Accounting Education Change Commission charge.

Previous studies such as Gombeski, Effron, Ramirez, and Moore (1982), Matzo, Sherman, Lo, Egan, Grant, and Rhome (2003), and Azriel, Erthal, and Starr (2005), have researched the significance of cognitive retention as well as possible means to achieving success in this area. Unfortunately, despite the increased use of games and simulations within the accounting discipline (Busta & Kimmel, 1993; Pillsbury, 1993; Burns & Mills, 1997; Tanner & Lindquist, 1998; Helliar, Michaelson, Power, & Sinclair, 2000; Hoffijan, 2005; Murphy, 2005; Johnson, 2007; Salzberg, 2007; Stubbs, 2007; Turetsky, 2006;), such as Monopoly™, little empirical research has actually been conducted to determine the cognitive retention of Generation Y students within the field of accounting. Thus, a study which examines the affects of games and simulations on the cognitive retention

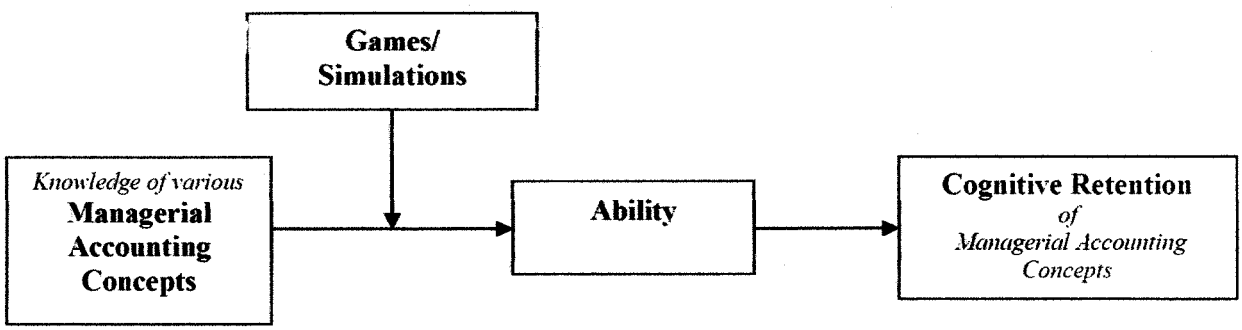
rates of Generation Y students is necessary. Once these affects are known, accounting professors may not only realize the benefits of such tools, but the increased usage of games and simulations may better equip a generation that has proliferated current college campuses thereby allowing the potential for integrated learning by those students within the field of accounting.

The purpose of this study was to therefore examine the ability of Generation Y students to achieve greater cognitive retention when the instructional material being covered in the classroom, specifically in an introductory accounting class, is conveyed with the assistance of or through the use of games and/or simulations.

*Variables and Relationships*

There are several variables that were examined within this study, including dependent (i.e. cognitive retention of Generation Y students), independent (i.e. lecture and group work), modifying (i.e. game to be utilized), and mediating (i.e. the cognitive ability of students). Each variable and the relationship between the variables were examined in an effort to determine the effectiveness of games and simulations in relation to cognitive retention of Generation Y students. Following is the cognitive model that utilized within the study to evaluate the effectiveness of games and simulations.

Figure 1.1: Cognitive Model



*Research Questions*

The primary research question for this study focused upon the pedagogy of instructors in entry level accounting classes and the relationship of the pedagogy to that of the cognitive retention of Generation Y students. The resulting null hypothesis then became:

$H_{o1}$ = there is not a statistically significant difference in accounting students' cognitive retention as a result of instructional intervention in the form of games.

In addition, the students participating in the study came from a varied background and had various degrees of cognitive ability. Consequently, the researcher also examined the impact of ability, as determined by student grade point average (GPA), on cognitive retention. The second null hypothesis was therefore:

$H_{o2}$ = there is not a statistically significant difference in accounting students' cognitive retention based on their level of ability.

Both research questions were important to consider as the cognitive retention of students within Generation Y is a concern for current educators as a result of the differing attitudes towards education that may be found when researching Generation Y (Brownstein, 2000).

The results of the studied were analyzed using the statistical software package Statistical Package for the Social Sciences (SPSS), and specifically through the use of t-tests and mixed ANOVAs. A t-test allows the researcher to determine whether there is a difference between the methods employed in this study (i.e. a difference between the experimental and control groups) (N. Anderson, personal communication, June 22, 2007). Further, according to Anderson (personal communication, June 22, 2007), the

mixed ANOVAs will allow a better determination of the statistical significance between the post-test, retention test, and any difference between the two tests. In addition, according to Cook and Campbell (1979), when using a post-test and retention test design, as conducted in this study, the "...ANOVA is perhaps the simplest model of the structure of the data" (p. 150).

*Games and Simulations*

The game which students were actively engaged in had been created specifically for this study through the use of PowerPoint slides. Students self-selected into three groups, with one individual from each group being asked a question. The number of questions asked to any individual was random as students were asked to periodically change in order for each group member to experience the asking of questions. Questions that were asked varied, and included true/false questions, multiple choice, and problem solving questions. The students were not privy to the types of questions to be asked and were limited in their ability to consult with their group for the correct answer.

*Limitations and Delimitations*

This study was conducted at one medium sized, private, evangelical institution of higher learning with the subjects enrolled in the second introductory level class of accounting principles. The students all fell within the age range of Generation Y, as defined previously and below. All students were taught by the same instructor to provide validity to the research and eliminate any discrepancies of teaching style. A student's cognitive ability during a particular time of day was not a central focus of this study as cognitive retention based on the time of instruction has been extensively researched and determined that that there is a difference in students' ability to retain information based

on the time of day (Folkard, Monk, Bradbury, & Rosenthall, 1977; Muyskens & Ysseldyke, 1998; Oakhill, 1988). The students however pre-selected the time of day to enroll in the accounting course, therefore the researcher assumed, for the purpose of this study that the students enrolled in the class of their choosing, based on the students' own perception of the best time of day for them to learn. Research conducted by Folkard et al., Muyskens & Ysseldyke, and Oakhill indicated that morning classes typically do best on pre-tests (i.e. those tests given immediately after the information has been presented), however afternoon classes often are better able to recall the information on post-tests (i.e. those tests given after time has passed). Therefore, the researcher utilized the game for those students who were instructed in the morning, to further test the hypothesis of whether games and simulations have a statistically significant effect on the cognitive retention of Generation Y students.

Another limitation in the study was the potential for students to recall the correct answer from the pretest without truly understanding and comprehending the material. As such, the post-test was slightly different. In an effort to eliminate disparities in difficulty, the same questions were utilized in a random order. In addition, some of the questions involving computations had the numbers changed in an effort to further validate the comprehension of the material and not simply a student's ability to recall answers. Consequently, students were tested on the same general information however the questions themselves either slightly changed or were placed in a different order in an effort to determine the cognitive retention of the material presented rather than simple recall of the answers.

Finally, the instrumentation of the game involved in this study may be viewed as having the potential for inconsistency among students who are absent on the days the game was played, or for those students who did not take both the pre-test and the post-test. This limitation is nullified however as those students who either did not fully participate in the game (i.e. those students who did not attend all of the classes when the game was played) will not be taken into consideration of this study. Further, those students who did not take both the pre-test and the post-test were also excluded from analysis.

*Definitions*

Active learning is also defined as experiential learning and involves those activities that allow students a hands-on approach to learning (Greenawalt & Foster-Stinnett, 1992).

Cognitive retention was defined as the ability of a student to retain information.

Digital Immigrants are those persons who were born before Generation Y and who are either not as familiar with the current technology or who have not grown up with the technology as a part of every day life (Prensky, 2001).

Digital Natives are those persons who are also considered to be Generation Y (Prensky, 2001).

Games and simulations include board games, verbal games, cards, as well as computer applications. In relation to this study, the game involved a series of questions that were asked verbally by the instructor to the students immediately involved in the answering of the question. The question was also presented on the projection screen for students to read.

Generation Y students were defined as those students born after 1979 and before 1990 (Arhin & Johnson-Mallard, 2003; Johnson, 2007; Salzberg, 2007; Stubbs, 2007; Turetsky, 2006). The students in this study were typically sophomores, but could have been freshmen, juniors, or seniors in college. Generation Y is also known as the Net Generation, Gen Y, and Millenials.

Instructors, or professors, were those who had earned at least a Master's degree and 18 hours within the subject being taught, and were considered full time professors at an accredited institution of higher learning.

Learning style is best defined as the way a person, particularly a student, "...concentrates on, processes, internalizes, and remembers new and difficult academic information or skills" (Shaughnessy, 1998, ¶ 1). Through the utilization of a particular learning style, a student should be able to recall information at some point in the future (Lee, McCool, & Napieralski, 2000).

Undergraduate students were considered those students who had matriculated to a four year institution of higher learning and are pursuing their first degree.

*Importance of the Study*

Every student is entitled to a quality education. While a student may attempt their best at learning the material, some of the responsibility appears to lie in the hands of the instructor. Just as each student will have unique characteristics, each instructor also has certain teaching characteristics. For instance, some instructors may prefer to lecture only, while others may involve the students in group activities.

Not all students have the same learning modality. Consequently, if an instructor's style of teaching does not fit a student's learning modality there may be a hindrance to

the student's ability to learn and therefore impact the student's ability for cognitive retention. As Generation Y has been exposed to various technological advances from their birth, Generation Y students tend to be more tactile. Therefore, it becomes essential for students to be actively engaged in the learning process. "Student involvement is crucial to learning..." (Brozik & Zapalska, 1999, p. 278). Accordingly, it has become essential for instructors to know the best method for instructing Generation Y and providing the opportunity for cognitive retention in the area of accounting.

# Chapter 2: Literature Review

## *Generation Y*

### *Overview*

"Prior to beginning a study of cognitive ability, one must first understand the definition of a generation as well as the varying characteristics of the generation being studied" (Hicks, 2007b, p. 1). The study of a generation, in particular Generation Y, provides guidance and a better understanding of the unique characteristics associated with this generation, and more specifically how these characteristics may influence a generation's or one's ability to cognitively preserve, maintain, and develop knowledge. Descriptions utilized in defining a specific generation can be different depending on who is defining the generation, as definitions may change frequently as time passes (Fishman, 2004; Guardo, 1982). "Previously, generations were defined by centuries, such as the current generation, one's father as the previous generation, and the grandfather as the previous generation to the father's generation" (Guardo as referenced in Hicks, p. 1).

In past years, generations were typically defined in 20 year increments of time (Guardo, 1982). Today, generations are often defined by either the time period in which one was born, or via certain characteristics which are common among groups of people (Hicks, 2007b). "From a psychological perspective, a generation may be understood to refer to the collective expression and reflection of the stages of change that occur in the personality development of individuals clustered together in peer groups" (Guardo, p. 501).

Yet, even when characteristics are utilized as a primary definition to distinguish the different generations, invariably researchers will also use the year of birth as a

> classification to assist in the definition of a particular generation. For this study, both aspects will be utilized in order to better capture the essence of Generation Y. (Hicks, p. 2)

The use of years to define generations may cause discrepancies as an individual born around the end or the beginning of a generation may be classified as one generation, but have characteristics and tendencies of the other generation. Consequently, Generation Y will be defined in this study as an approximation of years, 1979 through approximately 1990 (Johnson, 2007; Salzberg, 2007; Stubbs, 2007; Turetsky, 2006) as well as through various characteristics that assist in better defining Generation Y.

*Generational Characteristics*

Generation Y, also known as either the Net Generation or the Millennial Generation, has both similarities and differences with previous generations. For instance, those within Generation Y often tend to believe that those in authority are looking out for their best interest and as a result do not seem to question norms and standards that have been placed over them as Generation Xers, the generation immediately preceding Generation Y, did before them (Denham & Gadbow, 2002). As a result, Generation Y appears to be much more willing to abide by the rules rather than constantly questioning or challenging those rules.

> Much like the previous generation, Millennials have witnessed significant technological growth within the world. During the mid to late 1990's, the dot com explosion opened up new avenues for exploration and expression (Rollin, 1999). "For Millennials, the academic emphasis has been on standards, the fiscal tilt has

> been towards kids, and child nurturing has been tightening" (Denham & Gadbow, p. 10). (Hicks, 2007b, p. 7).

In addition, typical features of Generation Y relate to the technological advancements made during their lifetime such as the internet, cellular telephones, and other mass communication devices "because many of them have grown up with computers..." (Arhin & Johnson-Mallard, 2003, p. 121).

Since those within Generation Y were raised with many of the technological advancements created prior to their coming of age, these technological advancements are more of an extension of their person rather than technology (Arhin & Johnson-Mallard, 2003).

> Because many of them have grown up with computers, a majority of youth in this generation are technologically literate. In fact, intrinsic to the proliferation of technology, modern tools of communication such as the internet, beepers and cell phones are social lifelines for these generations. (Arhin & Johnson-Mallard, p.121)

"As a result of increased technology that has become prolific within society, Generation Y may require more up to date learning techniques in the classroom in order to hold their interest thereby attempting to increase the students' cognitive retention" (Hicks, 2007b, p. 8).

While Generation Y has many characteristics that are similar to the previous two generations (i.e. Baby Boomers and Generation X), Generation Y is often viewed as being more closely similar to the Baby Boomer generation as opposed to Generation X as both groups have many of the same values (Brownstein, 2000; Denham & Gadbow,

2002). Generation X however also grew up with a greater understanding of technology than the Baby Boomer generation and can therefore relate more easily to Generation Y with regards to technology (Arhin & Johnson-Mallard, 2003). Generation Y is often viewed as having a focus of assisting others that need assistance (Brownstein) much like the Baby Boomer generation who are often considered the Greatest Generation due to their many sacrifices in assisting others. By focusing on others, one's behavior and temperament may change. In the case of Generation Y, this differing focus could also be translated as a different educational view thereby causing a difference in Generation Y student's ability for cognitive retention.

> In fact, some researchers predict that the higher standards which may now be found "...in elementary and secondary schools will be transferred to college. There will be increased calls for pregraduation competency testing and the elimination of remedial classes" (Brownstein, 2000, ¶ 39). Hence, the overall behavior toward education will also change as one may see a dwindling of men enrolled in colleges, choosing to enter the workplace instead (Brownstein). This trend could have significant effects for the educational system as a whole, particularly as the parents of Generation Y are increasingly involved in the admission process (Brownstein). (Hicks, 2007b, p. 7)

Consequently, in order to properly evaluate the significance of game utilization in the classroom, one must first understand the learning style of those within Generation Y, as Generation Y appears, on the surface, to be vastly different from previous generations.

## *Learning Styles and Instructional Techniques*

### *Learning Styles*

*Overview.* Each person has a different learning style. "In the most basic sense there are many learning styles…" (Lee, McCool, & Napieralski, 2000 as referenced in Sredl, 2006, p. 85), that may be of assistance to an individual and often one may find that a combination of learning style techniques works best for an individual when attempting to recall information. Shaughnessy (1998) found that "Styles often vary with age, achievement level, culture, global versus analytic processing preference, and gender" (¶ 1). Thus, Generation Y students almost certainly have a different learning style from those who are instructing them.

While there is a distinction between learning styles and learning preferences (Lee et al., 2000), this study is focused on the three main learning style categories that have been established to provide one with guidance on the various learning modalities typically defined: auditory, visual, and kinesthetic. Additional techniques to assist learners will also be analyzed.

*Auditory.* The first learning style is that of auditory, typically accomplished through various techniques, but primarily lecturing (Hicks, 2007b). "Auditory learners hear information via lecture, discussion, or debate and prefer discourse" (Sredl, 2006, p. 85). Students who are best able to comprehend material being presented by listening to someone speak will tend to have the auditory learning style. Many of those who are now professors at institutions of higher learning, and who often fall within the Baby Boomer generation, were subject to this form of interaction between the instructor and the student as the currently available technology of the twenty-first century was not yet available

during the instructor's educational years thereby forcing students to learn through lectures (Eison & Bonwell, 1991).

*Visual.* "Visual learning is concerned with creating systems that learn to analyze and interpret images, both static images and images that change over time" (Bischof, 2004, p. 151). "As a result, those who are visual learners must take information that is seen and process it into useful information. Unfortunately, visual learners may not properly synthesize the information at all times (Bischof)" (Hicks, 2007b, p. 9) or may incorrectly remember information. Regrettably, information is not always learned correctly, which may cause problems in either the classroom or later in one's place of employment if the information is expected to be remembered correctly. Visuals such as PowerPoint presentations, handouts, and other materials assist in the instruction of the visual learner and provide another form of learning to those with other learning styles.

*Kinesthetic.* "Those with the need to learn by doing are often considered kinesthetic learners" (Hicks, 2007b, p. 10). "Kinesthetic learners 'feel' the information through concrete, hands on experiences" (Sredl, 2006, p. 85). "As a result, practice sets, group and individual activities, as well as games and simulations may work best for this group of learners" (Hicks, p. 10).

*Instructional Techniques*

*Lectures.* The lecture is one of the most common methods of instruction utilized in the classroom (Eison & Bonwell, 1991) and may benefit those with the auditory modality. Instructors with classes that contain a large number of students, may find this is the easiest method for them to present the material however depending on the student this method may not always be effective due to the learning styles of those within the class.

Prensky (2001) however believes Generation Y students will not receive the full benefits of the lecturing technique as so many of the Generation Y students are highly tactile in their learning methodology. Consequently, if only given lectures, Generation Y students may not be fully engaged in the lecture, thus causing a lost opportunity for learning (Prensky).

*Visual aids.* Visual techniques such as PowerPoint presentations may be able to assist students as visual pictures of the slides may provide an opportunity for better recall. Students who employ visual techniques may learn through the use of mentally creating pictures of the information being presented (Arhin & Johnson-Mallard, 2003). Further, videos showing life examples of the information being taught, or handouts containing the material being presented may further enable the visual learner to grasp the concepts.

*Active learning.* Also known as experiential learning, active learning allows students a hands-on (i.e. kinesthetic) experience to concepts and information (Greenawalt & Foster-Stinnett, 1992). The idea behind active learning is to engage the students in the material being presented and by doing so create a "...learning experience that may be more memorable, may bring about a deeper understanding, and may have a more lasting benefit to college students" ( Greenawalt & Foster-Stinnett, p. 8-9). According to Brozik & Zapalski (1999), "student involvement is crucial to learning..." (p. 278). These learning experiences may be accomplished through the use of group work, and more specifically, through the utilization of games and simulations.

*Application Overview.* While everyone learns differently, instructors who can incorporate all three learning styles into their teaching methodology will be able to meet the needs of a majority of students. Unfortunately, studies, Helm (1991) for example,

have been done that show one learning method may not have as high a success rate as others. Helm's study consisted of both men and women aged 18 to 45 years old over a two year time period, and found that auditory learners were actually the slowest learners while kinesthetic learners, or kinesthetic learners who combined other learning styles, performed better in school.

When instructional devices that combine learning styles are utilized, a greater number of students may be reached and effectively taught (Azriel et al., 2005). For instance, the combining of a lecture and a PowerPoint presentation will be able to reach those students who learn by auditory means as well as those who learn through visual means. Similarly, when other activities are combined with these two methods (i.e. the utilization of all three learning styles), the potential for even more students to learn therefore appears to increase.

Helm (1991) however noted that "though there was a slight gain in grade average by combining modalities, it does not tend to be significant and may seem to indicate confusion and a lack of instructional expertise in the teaching through the varied use of modalities (¶ 9). One primary and significant flaw in Helm's study however is that when using grade point averages as a tool to measure the ability for cognitive retention, those within the study who were kinesthetic or who were a combination of kinesthetic and another learning modality were the ones who actually performed better and had a higher grade point average. As a result, it is unclear from the Helm study as to which was the greater influence on cognitive ability, the actual learning modality or the innate cognitive ability. Thus while Arhin and Johnson-Mallard (2003) agreed with Helm's conclusions that not all students will benefit by the combination of instructional techniques (i.e. some

students may still not be effectively learning if their learning modality is not being utilized), professors at the institution being studied in this research proposal often utilize a combination of instructional methods in an effort to reach students that learn through each learning modality. Since Generation Y appears to be highly tactile (Prensky, 2001), it would seem logical that games and simulations would be of benefit.

Further, Generation Y students are vastly different from previous generations and should be treated as such in regards to the educational techniques and tools which are employed (Prensky, 2001). "Our students have changed radically. Today's students are no longer the people our educational system was designed to teach" (Prensky, p.1). Consequently, auditory instruction alone, while it may have worked with previous generations, will not necessarily be the greatest benefit to many Generation Y students. Visual aid instruction also appears to not benefit every student within Generation Y.

Rather, Generation Y students appear to be highly tactile and hands on in their approach to learning (Prensky, 2001). One may surmise that the high use of video games and other technological gadgets used by Generation Y students has aided in the preference to the kinesthetic style of learning, yet also able to teach those with the visual learning modality as those playing the game may be able to retrieve a mental image of what is going on in the game.

Therefore, instructors must find a way that benefits each style of learner, but do so in a manner that is not hindering the learning of one specific modality as limiting one modality may also be hindering students with that specific modality. Thus, instructors should alter their teaching pedagogy to incorporate the Generation Y student into the learning process through various techniques that must be employed to facilitate learning

by all students (Prensky, 2001), further refuting the claims made in the Helm's (1991) case study.

By engaging students in the learning process, rather than simply allowing students to become passive participants, more effective learning may take place. The utilization of games within the classroom setting provides the student with an opportunity.

> Learning from doing provides an important paradigm shift away from the tutor as knowledge disseminator, expert and authority figure towards the role of the participant as an active processor of information. Using gaming ensures that all participants are winners in that all have the opportunity for involvement and to engage with experiential learning. (Allery, 2004, p. 504)

Allery briefly examined four studies involving games and simulations which showed that both games and simulations could be adapted to fit the needs of the instructor and the corresponding students. While the effects of the games and simulations in relation to cognitive retention were not researched, it did become apparent to Allery that both games and simulations were of benefit within the classroom. Game and simulations therefore appear to assist Generation Y students in the learning process, rather than hinder the learning process.

## *Cognitive Retention*

### *Definitions and Overview*

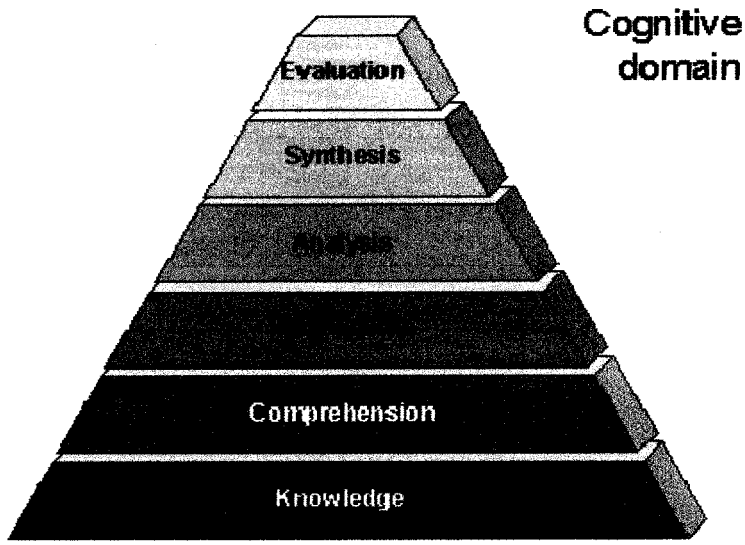
*Cognition.* In 1780 Abigail Adams, wife of former President John Adams, stated, "learning is not attained by chance, it must be sought for with ardour and attended to with diligence" (The Quotations Page, 2007, ¶ 1). A student's ability to learn is often essential for academic success, yet there are different levels of learning based upon the different

forms of activities employed within an educational setting. Consequently, the different levels of cognition need to be examined and understood in order to promote the highest level of cognitive ability among students of all generations, and particularly those students within Generation Y.

According to research conducted by Benjamin Bloom, there are three areas of educational activities including cognitive, affective, and psychomotor (Clark, 2007). The results of Bloom's study are typically described in a pyramid known as *Bloom's Taxonomy of the Cognitive Domain* (Bloom, 1956 as referenced in Huitt, 2004). Since the primary purpose of this study relates to the cognitive aspect of educational activities, cognition is more specifically defined as "mental knowledge" (Clark, ¶ 1). The mental knowledge a student has in reference to a particular subject may indicate the ability for the student to not only learn concepts, but also to truly understand the information presented, and therefore progress to a higher degree of learning (Clark).

Consequently, the various levels of cognition must also be known in order to determine the actual level of understanding. Based on Bloom's taxonomy, Figure 2.1 shows the gradual progression of learning based on cognitive activities, with each progression up the pyramid as a higher level of cognitive skills acquired by an individual (Atherton, 2005a).

Figure 2.1 – Bloom's Taxonomy: Cognitive Domain



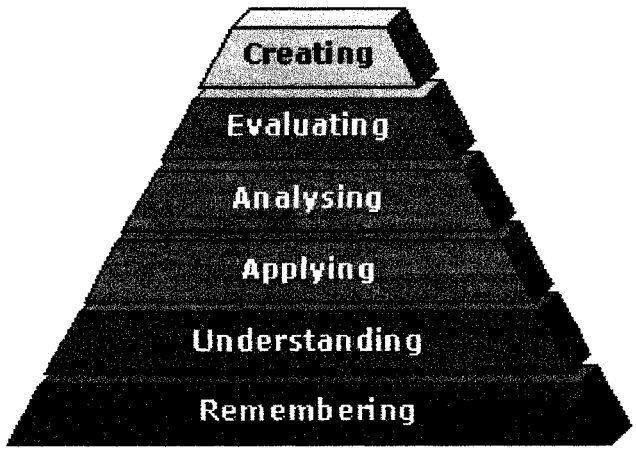

**Source: (Atherton, 2005a)**

Each level within the pyramid represents a type of cognitive ability that may be attained, with each level dependent on the preceding level. Teachers at all levels of academics have desired for their students to excel and continually reach the next level of cognitive ability (Forehand, 2005).

Despite the overwhelming popularity and consistent use of Bloom's taxonomy, numerous researchers have attempted to make changes to Bloom's conceptual pyramid (Forehand, 2005). One of the more significant modifications was done by a former student of Bloom and one of Bloom's co-editors, in an effort to provide, "...relevance for 21st century students and teachers" (Forehand, ¶11).

Basing their research on Bloom's original taxonomy, Anderson and Krathwohl (2001 as referenced in Atherton, 2005) made changes to the pyramid (Figure 2.2). Their efforts were an attempt to make the process of learning more active as opposed to the more traditional passive role found within Bloom's (Forehand, 2005).

Figure 2.2 – Revised Bloom's Taxonomy: Cognitive Domain




**Source: Atherton (2005a)**

Both pyramids are similar in that as an individual's cognitive ability increases, there appears to be a higher level of comprehension. It is important to note that the primary purpose of both models was to develop a tool that instructors could use to measure a student's ability (Forehand, 2005). "With the dramatic changes in society over the last five decades, the Revised Bloom's Taxonomy provides an even more powerful tool to fit today's teachers' needs" (Forehand, ¶ 18). As previously mentioned, Generation Y students are different, and therefore the tool to measure their cognitive ability should also be different from Bloom's original version in an effort to align current learning objectives with current practices (Forehand).

*Retention.* Retention is the act of remembering or knowledge attained (Atherton, 2005b). In both the original Bloom's taxonomy and the revised taxonomy, knowledge and the remembering of knowledge attained is the lowest level of learning. Consequently, instructors who strive for their students to reach a higher level of cognitive ability need to

gain an understanding of how students learn in order to assist the students in achieving a higher level of learning.

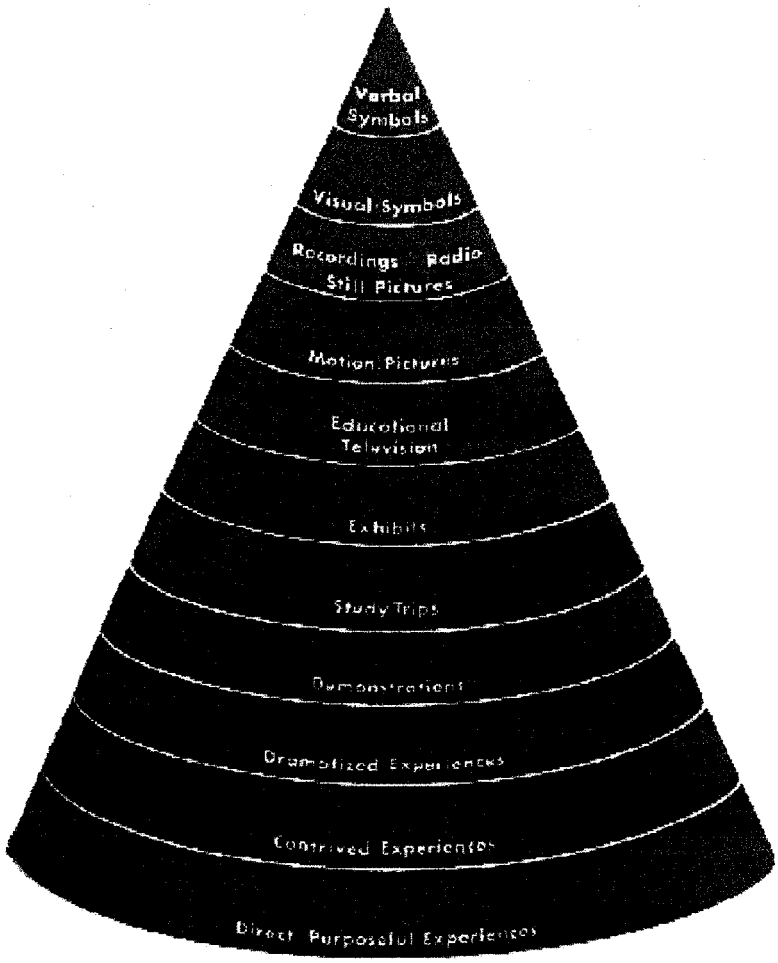
One tool that is widely used throughout the educational world is the Dale's Cone of Experience (Dale's Cone) originally created around 1954 (Thalheimer, 2006). Figure 2.3 (next page) represents the third revision of Dale's Cone done in 1969 (Thalheimer). Edgar Dale, who utilized his experience in both the business world and within teaching, developed the relationships between the various levels of retention and the activities that are employed to attain the varying levels of retention (Alabama Department of Education, 2001-2003).

Dale created the cone in an effort to better understand how individuals learn and the relationship between learning and various activities and teaching methods. The cone however was not intended to be utilized as fact. "In fact, Dale warned his readers not to take the model too literally" (Thalheimer, 2006, ¶ 6).

At some point after the original publication, Dale's Cone was changed to include percentages of likelihood associated with the actual learning of an individual based on various teaching methods and activities utilized (Atherton, 2005b; Thalheimer, 2006). The NTL Institute for Applied Behavioral Science (NTL Institute) eventually has taken credit for what they termed the Learning Pyramid. While researchers such, as Atherton and Thalheimer, agree that the percentages found on the Learning Pyramid make sense on the surface, the researchers also stress that there is a lack of statistical and actual research to validate the percentages found on the Learning Pyramid (Figure 2.4, see below) and contribute the original concept to Dale not the NTL Institute. Further, upon closer examination, Thalheimer discredits the percentages as misleading as there are

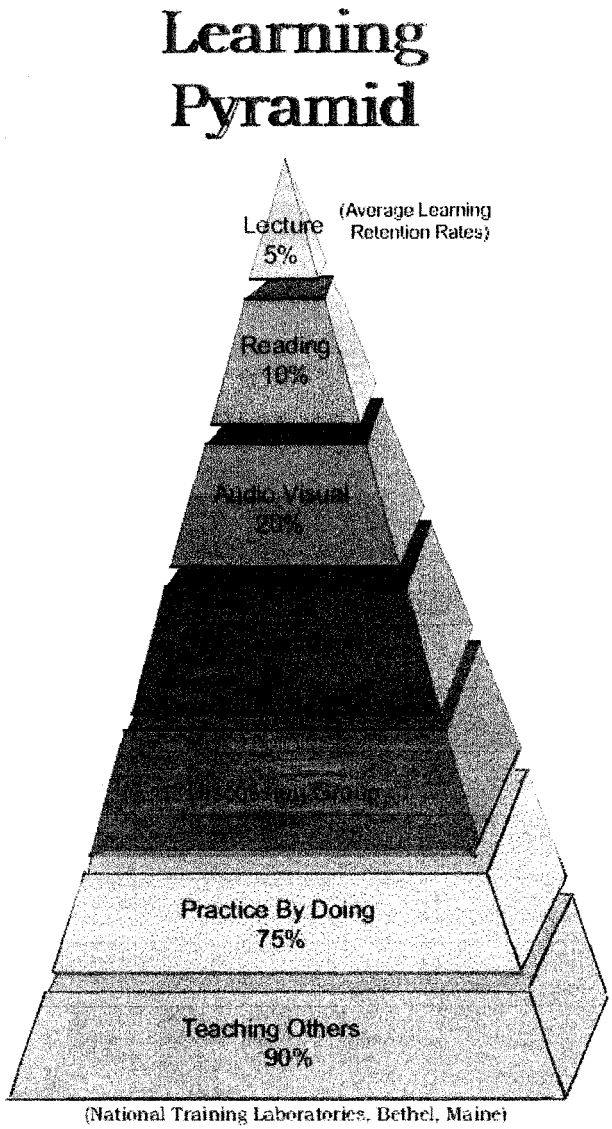
validation issues among the activities. For example, a majority of individuals see to read. The NTL Institute percentages do not distinguish as to whether it is the reading of information or the seeing of the words that allows an individual to retain knowledge (Thalheimer).

Figure 2.3 – Dale's Cone of Experience (Original)




**Source: Thalheimer (2006) as referenced in** Dale's Cone of Experience (Dale, 1969, p. 107)

Figure 2.4 – NTL Institute Learning Pyramid




Despite the apparent lack of statistical data to validate the percentages shown on the Learning Pyramid, educators have often found the percentages to be somewhat realistic to the actual learning and retention that takes place in the classroom in so far as the percentages relate to isolated activities that may easily be distinguished between the auditory, visual, and kinesthetic modalities (Atherton, 2005b; Thalheimer, 2006). As a result, it becomes apparent that if the Learning Pyramid is fairly similar to what educators have found in the classroom as to the actual learning retention of students, then the belief

that games and simulations increase cognitive retention among Generation Y students would have a greater likelihood of impacting those same students, particularly as the games and simulations would generally fall somewhere between the discussion group and the teaching others category depending on the type of game or simulation being conducted. As such, the research will utilize the Dale's Cone to infer the same information presented by the NTL Institute, without the actual percentages.

*Cognitive retention.* Cognitive retention therefore may best be defined through the use of Bloom's taxonomy and Dale's Cone as the ability for an individual (i.e. student) to retain information (i.e. knowledge). As a result, one could reason that if a Generation Y student was to teach another student the information being presented, then the likelihood of the Generation Y student having greater cognitive retention of the material is greater when compared with the Generation Y student simply listening to a lecture. One has to remember that Generation Y students crave stimulation (Arhin & Johnson-Mallard, 2003), and tend to have primarily kinesthetic learning tendencies (Marriott, 2004). Consequently, the instructor must find a way to actively engage the students, thereby meeting the stimulation cravings, as well as allowing the students to become active participants within the learning environment.

*Teaching Pedagogy*

*Overview.* Change in accounting education has been discussed as early as 1967 and continued throughout the 1970s and 1980s (American Accounting Association, 2007). During this time, several committees were formed to evaluate the progress of accounting education and the applicability to actual life experiences and knowledge required for young accountants graduating from post-secondary schools. The most

notable committee reporting the need for change was the Bedford Committee (American Accounting Association). As a result of the Bedford Committee and other committee findings, the Accounting Education Change Commission (AECC) was formed in 1989 (American Accounting Association).

The American Accounting Association sought to determine the best results for preparing college accounting graduates with the ability to succeed in the professional realm while still being able to properly provide accounting students with the vast amount of foundational accounting knowledge needed to fully understand the many rules and regulations (American Accounting Association, 2007). To compensate for the lack of time available to properly educate accounting students, many universities had to decide whether a five year program was needed in an effort to provide accounting students with the necessary skills and knowledge or whether some of the information needed to be combined and curriculums adjusted (American Accounting Association).

> In the 1980s, the consensus on the common body of knowledge began to erode. Accountants began to realize that no matter how many courses students took, they were not going to be able to know the complete body of accounting rules, regulations, and techniques. A new approach to accounting education was needed. (American Accounting Association, Chapter 1, p. 2)

As a result for the need of change, the AECC was further sponsored by the then Big 8 accounting firms and commissioned to begin to formulate the requirements for the widespread need for accounting education reform. Important to accounting education reform was the need for change in the delivery of the information from the normal lecture style of teaching to one that more actively engaged the student (Murphy, 2005). Thus, the

door was opened for instructors to begin implementing other tools within the classroom such as games and simulations.

*McKeachie.* Wilbert McKeachie is often known within academic circles for writing a book, *McKeachie's Teaching Tips: Strategies, Research, and Theory for College and University Teachers.* While his ideas were written over fifty years ago, many techniques presented in the book are still utilized and have relevance today (McKeachie, 1987). In fact, the book is now in its eleventh edition. The primary strategy in getting students to learn and remember what they learned, according to McKeachie, is to understand the student and understand what the instructor is attempting to accomplish. If one does not comprehend these two concepts, the effectiveness of both may be diminished.

Further, McKeachie (1995) also examined the difference in learning styles of students with different teaching styles and found that when an instructor modifies the delivery of information to accommodate the students' learning styles, more students will have the opportunity to learn. McKeachie quickly noted however that learning styles, as well as teaching styles, change. As a result, teaching methodologies should not be fixed but rather should change to fit the needs of the students thereby increasing the potential of success for the students.

> An effective teacher needs to vary techniques and to have an armamentarium of teaching methods and learning activities that can be drawn upon from moment to moment or from week to week to facilitate maximum learning for as many students as possible. (McKeachie, p. 1)

Consequently, students and teachers both must learn to adapt to various teaching and learning styles (McKeachie). McKeachie's techniques and suggestions were later validated when the AECC expressed the need for changes within the accounting education system (Murphy, 2005).

Additionally, not only are students different, but instructors are as well. To be truly effective within the classroom, both the student and instructor differences must be recognized by the instructor thereby creating an atmosphere for learning (McKeachie, 2001).

> Although there are many norms and folkways that characterize an entire campus; you need to recognize that there are many subcultures. Some of them are subcultures of faculty in different disciplines, but it is important to recognize that there are student subcultures that have their own norms and expectations. And within the student subcultures there are important individual differences among students. Taking account of the diversity of students is so important in teaching... (McKeachie, p. 4)

As a result, McKeachie (2001) believed that most students learn various materials better outside of the classroom due in part to all of the outside influences that students encounter. In addition, McKeachie felt learning should continue outside of the classroom as experience is a great. "There are many important goals of college and university teaching not the least of these is that of increasing the student's motivation and ability to *continue* learning after leaving college" (McKeachie, p. 6). As a result, it becomes incumbent on the instructor to find methods that will better enable students to effectively learn both in and out of the classroom.

*American education commission change.* McKeachie's belief of continuous learning complemented the goals and objectives of the AECC. Since learning should be an on-going activity and not an activity that stops once one leaves the classroom, the instructional goals of McKeachie may be considered similar to that of the AECC.

> The overall objective of the Accounting Education Change Commission is to foster changes in the academic preparation of accountants consistent with the goal of improving their capabilities for successful professional careers in practice. These capabilities are described in the sponsoring firms' White Paper, *Perspectives on Education: Capabilities for Success in the Accounting Profession,* and in the American Accounting Association report of the Committee on the Future Structure, Content and Scope of Accounting Education (Bedford Committee report). Providing such capabilities will require both curriculum reengineering and supportive institutional changes by educational, professional, licensing, and accreditation bodies, *inter alia,* all with the ultimate goal of serving the public interest through the improved education of accountants. The Accounting Education Change Commission has been formed to pursue the realization of these objectives. (American Accounting Association, 2007, Chapter 2, p. 2)

Wide-sweeping change was needed within accounting curricula to properly prepare students for future success in the accounting profession (American Accounting Association, 2007). While various methods were being utilized in some classrooms, these tools were largely limited and not generally accepted by many of the current instructors who felt their way of instruction (i.e. primarily lecture) was a better pedagogy that

worked for them and should work for the current student (Prensky, 2001), particularly as many instructors may not have the experience needed to conduct games and simulations within a classroom setting (Prensky, 1998).

*Research*

*Measurements.* Cognitive retention in students is not a new concept, nor is it a new area of study. Various studies on cognitive retention date as far back as the early twentieth century (Folkard et al., 1977). Therefore in order to examine and understand the significance of studies done specifically in accounting, which do appear to be fairly new in comparison with other areas of academia, it becomes essential to examine how cognitive retention is measured.

Cognitive retention is primarily measured with an immediate test following the presentation of information and a recall or retention test to evaluate the long-term memory of the subjects (Folkard et al., 1977; Oakhill, 1988; Ornstein, Merritt, Baker-Ward, Furtado, Gordon, & Principe, 1998). The immediate test is often considered a short-term memory or cognition test, while long-term retention has been measured and considered to be as long as a few hours after the initial test to several months or even years later (Folkard et al.; Ornstein et al.; Yen, 1978; Beenties and van der Voort, 1993; Muyskens and Ysseldyke, 1998).

Therefore, in relation to the actual definition of short-term and long-term retention, it becomes apparent that there are no set guidelines as to what should be classified as long-term retention. Clearly, cognitive retention does need to be monitored in that one test alone is not sufficient to statistically prove the understanding and comprehension of knowledge. Further, repeated tests of cognition allow for further

validation as to the statistical significance of a particular teaching tool or teaching pedagogy. "It is obvious and helpful for instructional practice that research results are reviewed from time to time" (Astleitner, 2005, p. 3). Therefore, it appears that continued research enables instructors to frequently assess the best instructional methods for their students thereby allowing a potentially greater opportunity for students to learn. In addition, testing the long-term cognitive retention of students provides guidance to the instructor as to the effectiveness of the various instructional methods as skillfully teaching is less time consuming and more beneficial to students than teaching badly (McKeachie, 2001).

> What is most important is the manner in which the curriculum is implemented. Thus, more emphasis is needed on pedagogy and the delivery system. The implication for accounting educators is to be careful not to change merely the content of the course but to evaluate how that content is being delivered. (Hite, 1996, ¶3)

*Studies.* Literature is replete of examples on the cognitive retention effects of games and simulations within the classroom as well as studies involving the cognitive ability of subjects based on the amount of time material was presented. One study involving two cardiopulmonary resuscitation (CPR) classes conducted by Gombeski et al., (1982) examined the effects on retention when material being presented was done so in two different time frames.

> Two groups were formed that covered the same material over different time periods: three sessions of instructions that lasted eight hours total and four sessions of instruction that also lasted a total of eight hours (Gombeski, et al.).

> Researchers found that those students who were able to learn the material over a greater time frame did better than those taught in the shorter time frame, yet still below national standards, when they were tested one year later over the same material (Gombeski et al.). (Hicks, 2007b, p. 11)

Consequently, according to Gombeski et al. the longer students are presented with the material, the greater the cognitive ability to recall the same information in the long-term.

Matzo et al. (2003) conducted a study on retention involving the ability of students and professionals to rely upon previous tactile experiences. In particular, Matzo et al. determined that those who were able to draw upon past experiences were more likely to retain information that was presented through a tactile experience. As a result, those with tactile experiences, such as games and simulations, may be given an advantage, particularly if the primary learning modality for a student is kinesthetic. Additionally, "the results of the study could lead one to believe that kinesthetic learners have a greater advantage..." (Hicks, 2007b, p. 12) if students do in fact draw upon their past experiences in an effort to retain information that has been presented.

Kurt Squire tested one game, *Civilization III,* as to students' ability to relate history with various regions and people groups as well as how all aspects of history relate to one another (Squire & Jenkins, 2003). Squire determined from the research that those students who were given the opportunity to play the game were in a better position to understand and relate the various aspects of history as opposed to those who had not played the game (Squire & Jenkins). Conclusive statistical analysis however was not conducted. Rather, the conclusions were the opinion of the authors.

In another study, a technique known as the Triangle Technique was utilized to alleviate math anxiety in nursing students, particularly those who are dealing with young patients (Sredl, 2006). Both pretests and posttests were utilized to determine the cognitive retention of information for safe dosages to young patients. The results of the experiment showed an increase in retention by those students who were exposed to the Triangle Technique, thus indicating the need for interaction between the material being presented and the actual kinesthetic activity of solving the problems (Sredl).

Games and simulations have also been utilized in marketing classes. Haytko (2006) reports on a marketing variation of the popular game show "The Price is Right" where it becomes the students' goal to correctly match a product with its price. According to Haytko, "the students also felt the Price is Right game and subsequent discussion helped them learn the concepts more easily..." (p. 3). Unfortunately, Haytko did not have a control group for this experiment. Therefore there was an overwhelming reliance on the students' interpretation of whether the game was actually a benefit to the overall cognitive learning of the class.

Becker and Watts (2001) further conducted a study in the area of economics relating to the actual amount of teaching that was being conducted. Unfortunately, their findings found that within the area of economics, many classrooms were still utilizing chalk boards and lectures as the primary means of communicating information rather than attempting to instruct with games and simulations (Becker & Watts).

In constrast, Brozik and Zapalska (1998) conducted a study using a game for economics. "The Market Game is a voyage of discovery in which players learn the meaning of such concepts as supply, demand, and price. Players explore market and

economic structures as they seek other traders and deals" (Brozik & Zapalska, p. 279). As with the Haytko study, the actual cognitive retention of students was not examined. Rather, positive student perceptions as to the amount of learning conducted and the resemblance of actual business transactions were expressed (Brozik & Zapalska).

Games may also be applied to those within the engineering field. A study conducted by Sugar (1990) was designed to assess the participant's level of knowledge and provide a new means for interactive and fun learning. Those involved in the study consisted of participants at a seminar. Actual cognitive retention was not examined; only the participants' enthusiasm and the ability to adapt the game to any area of study (Sugar).

Sugar (1987) also promotes the use of games in training employees. According to Sugar, creating a game to train employees in a variety of topics is an easy way to get the employees involved and to understand the information that is being presented. Unfortunately, as in his other case study, Sugar did not conduct a retention test to indicate the actual benefits of the game.

Monopoly™ is one game that appears to be utilized frequently, particularly in accounting courses. Tanner and Lindquist (1997) examined the effects of Monopoly™ based on a team approach to the student's learning. Students were broken into teams with one member from each team playing against one member from each of other teams. Thirty-six students in total were monitored as the games progressed. Similar to the other studies however the students were asked about their perceived benefits and support from group members, rather than a post-test or retention test being given. In addition to the student's perceived value, the students were also asked their grade point averages. The

grade point averages did allow students with the same cognitive ability to compete against each other (Tanner & Lindquist).

Finesse, developed in the United Kingdom, is a game created to assist in the learning of finance, specifically in the area of security portfolios and risk (Helliar et al., 2000). Students were given the opportunity to invest in the stock market over the academic year, thereby allowing the students the opportunity to see changes in the market and the possible effects of not managing one's portfolio well (Helliar et al.). Within this study, Helliar et al. provided the students with a survey in an attempt to understand the students' perceptions. Again, a cognitive retention test to determine the actual effectiveness of the game as it relates to cognition was not completed.

Hoffjan (2005) employed the use of Calvados, a business game, within a cost accounting course. Students progressed through three rounds of simulations where decisions concerning relevant costs, objectives, pricing, and other managerial accounting decision were evaluated. At the conclusion of the simulation however students were only asked via questionnaire as to their learning (Hoffjan). While students did go through a debriefing with the instructor and moderator of the simulation to assess learning, no actual retention tests or assessments were given.

Another managerial accounting game involving LEGO® sought to determine whether students engaged in the simulation could see the potential benefits and detriments of not properly evaluating costs, quality, and other inventory needs (Burns & Mills, 1997). Burns and Mills further utilized the LEGO® in both the undergraduate and graduate classrooms. Discussions of problems the students encountered were discussed with the class to allow for further explanation and understanding of the process (Burns &

Mills). Unfortunately, while their simulation has been nationally recognized by the American Accounting Association for innovation in accounting (Burns & Mills) there were no cognitive tests taken by the students in order to assess the degree of learning.

A game consisting of four rounds where students bid on various companies was conducted by Busta and Kimmel (1993). The primary objective was for students to gain a better understanding of the stock market by bidding on the companies and attempting to purchase companies through the use of forecasting, auctioning, evaluating and re-evaluating stock prices, as well as interim financial data (Busta & Kimmel). While Busta and Kimmel felt the experience provided to the students allowed the students to gain experience and a better understanding of the material, cognition was not evaluated or monitored.

Monopoly™ may be utilized in accounting courses to demonstrate a myriad of accounting techniques and concepts. Albrecht (1995) had "students first assume the roles of business manager and accountant as they play the game of Monopoly™ and prepare financial statements summarizing the results of their actions" (p. 128). Further, both undergraduate and graduate students participating in the game were required to make investments that would be beneficial to them while playing the game. A Likert-type scale was utilized to determine the students' attitude toward the use of the game however retention tests were not conducted on the participating students to determine the benefits and correlation between the game and a student's cognitive retention (Albrecht).

Auditing is a field within accounting that may work well with simulations. To test the effects of simulations and internal control, Pillsbury (1993) conducted a softball simulation where students were divided into teams. Each team was given a case study

and then asked by the instructor, who was considered the pitcher in the simulation, to name an internal weakness (Pillsbury). Each team would continue either providing an internal weakness or naming a solution to a previously mentioned weakness (Pillsbury). Students were then given an exam essay question where internal control weakness had to be determined (Pillsbury). Pillsbury found the students who were involved in the simulation had an average score of 2.1 points higher on the internal control essay question as compared to those students who were not involved in the game. While initial retention was measured through the use of the post-test, the actual retention test was not administered to the students.

Murphy (2005) employed the use of the game *Jeopardy!* within a governmental accounting course, as many of the initial concepts in governmental accounting deal primarily with definitions of various terms. *Jeopardy!* has been utilized in a variety of courses, particularly those unrelated to accounting (Murphy). *Jeopardy!* was found to be a useful tool for instructing students on the various terminology and in keeping the interest of the students (Murphy). Students were then given a survey to determine their feelings on the benefits of *Jeopardy!*, which Murphy found to be positive. As with other studies, the actual use of a post-test and a retention test were not conducted.

Taxation may also be utilized within the area of games and simulations. Frischmann (1996) developed an exercise whereby students were engaged in a market economy where stocks must be purchased through bids. Sales of purchases as well as dividends are then examined based on a group's tax bracket, with the intent of each group to earn a certain return on any investment that is made (Frischmann). Results of the

exercise were conducted through questionnaires with the student participants rather than cognitive tests (Frischmann).

Pate and Mateja (1979) examined sixteen studies utilizing games and simulations and the impact on retention. A study by Garvey and Seiler (1968 as referenced in Pate and Mateja) showed those students who were exposed to simulations performed better on a retention test eight weeks after the initial post-test thus leading to the presumption that the simulation students had a greater cognitive retention. The information being covered during this study related to different teaching methods (Pate and Mateja) rather than an accounting course.

Pierfy (1972 as referenced in Pate and Mateja, 1979) utilized games and simulations within the study of geography with those students in the fifth grade. Retention tests were given two weeks after the initial post-test, and found those students who participated in the simulation scored significantly better in comparison to those who were not exposed to the simulation.

Pate and Mateja (1979) further referenced Wylle's (1974) study on retention that also utilized geography. Again, those exposed to the simulation scored significantly higher on the retention test as compared to the post-test. Unfortunately, the students were also of elementary age, as opposed to post-secondary students that would fall within the Generation Y category.

Bagley (1973) and Dickerson (1975), discovered significant differences between post-tests and retention tests, when simulations involving reading vocabulary were utilized in an elementary school setting (as referenced in Pate and Mateja, 1979). In both

cases, those students exposed to simulations performed better, thus indicating the need for simulations.

Experimental treatments (Riegel, 1969), history classes (Baker, 1968; Lucas, Postma, & Thompson, 1975), science (Hazen, 1974), life career assessment (Curry and Brooks, 1971; Johnson and Euler, 1972; Conte, 1968) behavioral management (Brand, 1976), self-actualization measures (Smith 1975), mathematics (Karlin, 1971), and map reading skills (Cohen and Bradley, 1978) were additional studies examined by Pate and Mateja (1979) that all showed a significant difference between those students who were able to participate in a simulation and those who were instructed through traditional methods. In each instance, those students exposed to the simulation showed higher scores that were statistically significant (Pate and Mateja). As before, the students involved in the study were not from Generation Y. Consequently, generational differences may play a factor in the results if the tests were to be replicated with current students.

Azriel et al. (2005) utilized *Jeopardy!* in an effort to determine the cognitive learning benefits with games and simulations. At the completion of the game, students were given a questionnaire in which they answered questions using a five point Likert scale as to the effectiveness of the game. A retention test was not given after the post-test, thus leaving the results open for interpretation by the owner (Azriel et al).

In a study by Vogel, Vogel, Cannon-Bowers, Bowers, Muse, and Wright (2006), simulations were examined as to their effectiveness on persons of all ages. Grouping their subjects into various age categories, Vogel et al., determined that there was a statistically significant difference in the preference for games among all age groups. "Not surprisingly, the overall results yielded significantly higher cognitive gains and better

attitudes toward learning for subjects utilizing interactive games or simulations compared to those using traditional teaching methods of instruction" (Vogel et al., p. 235). Despite these apparently positive results, the authors do note that more research is needed in this area in order to properly deem the results to be reliable (Vogel et al.)

*Application and significance.* The results of the previous studies may have a significant impact on the study of games and simulations within the field of cognitive retention. "As stated by Gombeski et al. (1982) instructors must find a way in which to effectively reach students with all three different modality learning styles. The use of games and simulations is one such method" (Hicks, 2007b, p. 12).

> Generation Y students, the primary focus for this proposal, is a generation that has grown up with high tactile skills and a generation that does not necessarily fit the current educational mold. Prensky, (2001, as referenced by Skiba, & Barton, 2006, ¶ 6) stated, "Our students have changed radically. Today's students are no longer the people our educational system was designed to teach." Consequently, Generation Y, referenced below as the Net Generation, students need more than just PowerPoint slides and lecturing. Further,
>
> ... a student in a lecture realizes that he does not understand the teacher's lecture, and even the PowerPoint (text) slides provide no new insights. This student, using his wireless laptop, canvasses other students in the class via text messaging and IM (instant messaging) and discovers they too do not understand the lecture. To solve this problem, the student googles the concept, finds a URL with simulations that better explain the concept, and immediately transits this URL to others in the class. It is important to remember that the Net ***Generation*** seeks immediate

> information and knowledge not by finding it in a textbook, but by connecting to the Internet. (Oblinger, 2005 as referenced by Skiba & Barton, 2006, p.5)
>
> The use of games and simulations will provide the students with the tactile experience believed to be an essential component of their education as referenced in Matzo et al. (2003). Further, the use of games and simulations will also enable students who learn primarily through the audio and visual modalities to experience learning through these methods as instructions and experiences will be both heard and seen respectively. (Hicks, 2007b, pp. 12-13)

Games and simulations are not a new invention, nor are they new within the educational arena (Oblinger, 2004; Keys & Wolfe, 1990). The use of technology with games and simulations however is a relatively newer concept. "It is only recently that technology has been added to games, giving them a different character" (Oblinger, p. 8). In fact, as Figure 2.5 shows on page 46, there are numerous applications for the adoption of games and simulations within the educational arena, and accounting in particular could benefit from the use of games.

The use of games and simulations within the classroom actively engages the students, which is essential for Generation Y students (Astleitner, 2005; Oblinger, 2004; Oblinger & Oblinger, 2006; Prensky, 2001). Further, games and simulations are not limited to one specific field as shown through the variety of studies previously covered.

In particular, accounting is extremely open to a variety of games and simulations such as *Jeopardy!*, Monopoly™, and Calvados to name a few. Unfortunately, there has not been a substantial amount of research done on the cognitive effects of games and simulations. Rather, most of the research has focused on students' perceptions or an

initial post-test without a follow-up retention test (Azriel et al., 2005; Becker & Watts, 2001; Brozik & Zapalska, 1998; Burns & Mills, 1997; Busta & Kimmel, 1993; Frischmann, 1996; Haytko, 2006; Helliar et al., 2000; Hoffjan, 2005; Pillsbury, 1993; Sugar, 1987; Sugar 1990; Tanner & Lindquist, 1997). Consequently, there is an apparent need for research to be done as to the cognitive retention when games and simulations are utilized, and specifically in accounting.

## Summary

> Further research is required to truly examine the effects of games and simulations on cognitive retention for Generation Y students. "Games are a good supplement to course lectures because they provide students with another learning modality that goes beyond the typical classroom experience" (Sugar, 1994 as referenced in Azriel et al., 2005, p. 10). "Games provide students with a creative environment that encourages them to work within a team, to communicate, and to problem solve" (Barclay & York, 1996; Warburton & Madge, 1994; Whiteley & Faria, 1989 as referenced in Azriel et al., p. 10). Consequently, the capacity to use games and simulations provide Generation Y students with another tool to proactively engage in learning. This proposal will further the advancement into the study of and the possible benefits of providing Generation Y students greater success in enhancing their cognitive retention. (Hicks, 2007b, p. 13)

Figure 2.5 – Game Applications

| Principle | Description | Application in Games |
|---|---|---|
| Individualization | Learning is tailored to the needs of the individual | Games adapt to the level of the individual |
| Feedback | Immediate and contextual feedback improves learning and reduces uncertainty | Games provide immediate and contextualized feedback |
| Active learning | Learning should engage the learner in active discovery and construction of new knowledge | Games provide an active environment which leads to discovery |
| Motivation | Students are motivated when presented with meaningful and rewarding activities | Games engage users for hours of engagement in pursuit of a goal |
| Social | Learning is a social and participatory process | Games can be played with others (e.g., multiplayer games) or involve communities of users interested in the same game |
| Scaffolding | Learners are gradually challenged with greater levels of difficulty in a progression that allows them to be successful in incremental steps | Games are built with multiple levels, players cannot move to a higher level until competence is displayed at the current level |
| Transfer | Learners develop the ability to transfer learning from one situation to another | Games allow users to transfer information from an existing context to a novel one |
| Assessment | Individuals have the opportunity to assess their own learning and/or compare it to that of others | Games allow users to evaluate their skill and compare themselves to others |

*Table 2: Some principles of good pedagogy and parallels in a game environment*

**(Oblinger, 2004, p. 14)**

## Chapter 3: Methodology

This study had as its primary focus Generation Y students who were currently enrolled in the second introductory level accounting course, and the effect games and simulations have on students' cognitive retention in comparison with the cognitive retention of those students who do not participate in games and simulations. Many of those within Generation Y appear to have the kinesthetic learning style (Oblinger & Oblinger, 2006; Prensky, 2001), which would appear to indicate that tactile functions, such as games and simulations, would therefore increase the cognitive retention of the information that has been presented.

An examination of the literature further confirmed the need for additional research as to the impact games and simulations have on cognitive retention within the accounting discipline. Much of the literature discussed the students' perception on cognitive retention, but very few studies had actually conducted retention tests.

### Research Design

A principles of accounting course is often one of the first business courses that students must complete in their quest to earn an undergraduate business degree. As such, it is important for students to grasp the information presented and apply the information to their respective field of study. This study was designed to quantitatively examine Generation Y students' ability to retain accounting knowledge based on posttest scores as well as retention test scores. Students from one class were engaged in a game designed around the material being presented, thus encouraging active participation, which researchers deem an important component in Generation Y students' learning ability (Prensky, 2005/2006; Allery, 2004). Consequently, conducting research to determine the

benefits of games and simulations within an accounting course is relevant for the advancement of accounting education and possible other disciplines as instructors teaching those within Generation Y may adapt the game to suit their field of study.

Cognitive retention is often analyzed based on student performance on tests (Folkard et al., 1977; Muyskens & Ysseldyke, 1998; Oakhill, 1988). Consequently, test scores were also analyzed in this study on both an individual student basis as well as each class as an aggregate. In addition, one student's ability to retain knowledge may be greater than another. Therefore, grade point averages for each student, and the class as a whole, were analyzed to evaluate the overall cognitive ability.

Further, many of the studies that did examine cognitive retention (Gombeski et al., 1982; Matzo et al., 2003; Sredl, 2006) not only were in fields other than accounting, but also examined retention after only a few hours. This study examined the students' retention after two and one-half weeks, which based on studies such as Folkard et al. (1977), Muyskens and Ysseldyke (1998), and Oakhill (1988) would be considered long-term in nature.

*Selection of Subjects*

The students chosen for this study were all taught by the same professor in order to eliminate differences in teaching styles between instructors and provide greater integrity to the study. Each class had approximately 16 to 22 students depending on student enrollment. Student enrollment was based on the students' pre-selection to the class rather than on the researcher, thus allowing the sample to be more randomized. Students were unaware at the time of enrollment that a study would be conducted. To further validate the integrity of the study, students were provided a random number which

was utilized to ensure that all aspects of the study have been completed by each individual student. Those students not attending each class during the experimentation phase, those who did not complete the post-test, retention test, and the survey were excluded from the analysis.

*Variables*

*Dependent.* The primary dependent variable in the study is that of the cognitive retention of Generation Y students. The cognitive retention was measured via the resulting increase or decrease on the post-test as compared to the pre-test results for the same student.

*Independent.* The independent variables to be examined in this study included the lecture and group work as each student was given the same information and assignments. Traditional pedagogy consists of lecturing (Eison & Bonwell, 1991). Unfortunately, lecturing is not always effective with Generation Y students. "Our students have changed radically. Today's students are no longer the people our educational system was designed to teach" (Prensky, 2001, p.1). Thus, there is a strong need for developing new methods and/or tools for instruction.

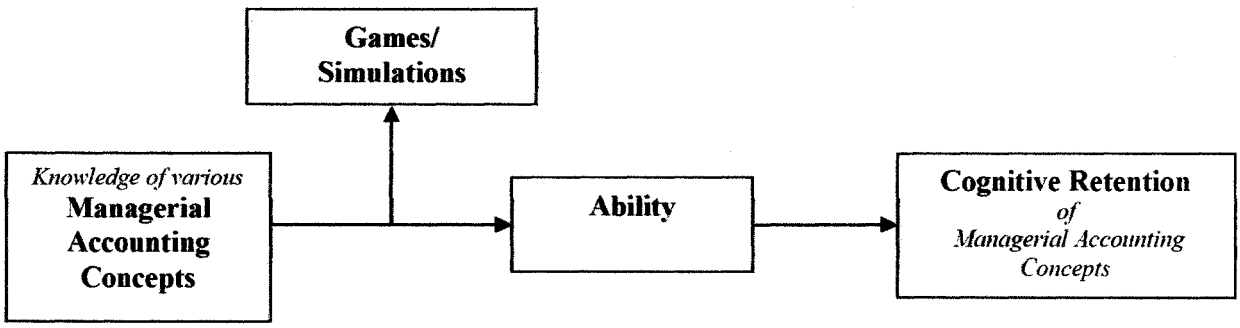
*Modifying variable.* Those in the experimental group were additionally exposed to a game, thereby further emphasizing and re-enforcing the material presented during class. The modifying variable was developed to hopefully introduce a new pedagogy that will allow instructors to be more effective while actively engaging Generation Y students in the learning process of accounting.

*Mediating variable.* Some students will have a higher cognitive ability than other students. To account for this variable, each student's GPA was attained. It was further

examined whether those with a higher cognitive ability showed a greater retention of the accounting knowledge as compared with those students who may have a lower cognitive ability.

Figure 3.1, shown below, illustrates the relationship between cognitive retention and the instructional methods that was employed during this study. Those students taught with only lectures and group work were expected to have a lower level of cognitive retention, while those who receive increased instruction through the use of a game were expected to have a higher level of cognitive retention.

Figure 3.1 – Cognitive Model




## Instrumentation

The game which was utilized is one that consisted of a variety of questions from which the students needed to answer, and had been created specifically for this study. Questions were derived from each chapter that were to be covered on both the post-test and retention test.

Students were given a survey at the time of the retention test which indicated whether the student is a male or female, the age group (i.e. to ensure the student belonged to Generation Y), and their grade point average range in an effort to determine the

student's ability for cognitive retention. Students were then grouped based on the various grade point average classifications. There was approximately the same number of students for each class in each category, so no further consolidation was needed. Grade point averages have been utilized as a measure of cognitive ability (Tanner & Lindquist, 1997), and were therefore utilized in this study.

## Procedures

Since this study involved human subjects, all procedures were first sought and pre-approved by the Institutional Review Board of both Argosy University – Sarasota, and the school where the study was conducted before the experiment began.

The study was conducted through the use of a game involving PowerPoint and designed around the material covered in the principles of accounting course. Students self-selected into groups containing approximately the same number of students in each group. Those students who were engaged in the game selected one group member to go to the front of the classroom and represent their respective teams. A question relating to material that had been covered was then displayed on the PowerPoint slide. Those students at the front of the classroom were then required to answer the question presented. Options available to the students included asking their group for assistance, asking another team for assistance, or choosing to answer the question without assistance. The options of asking their group or asking another team for assistance was limited so as to encourage students to study prior to coming to class. When a student got the answer correct, their respective group earned a point; there were no deductions for incorrect answers. Points accumulated as play continued each class period until the class period before the post-test.

On the day of the post-test, students were given a random number generated from the random feature found in Excel. Students were then instructed to take the post-test using the randomly generated number so as to ensure the confidentiality of the student. Both classes took the exam after having completed the same number of class periods and following the same procedures of lectures with PowerPoint slides, the assigning of homework, and in-class group work. One class however was exposed to the game while the other class was not.

After the post-test had been completed, the instructor began teaching the next chapters. Typically, the instructor would go over the test during the next class period however in this case, the instructor did not go over the test to ensure the integrity of the post-test and the retention test as well as to ensure that students had not memorized the correct answers from the review.

The retention test was based off of the post-test. Both tests contained true/false and multiple choice questions. The retention test had the true/false questions grouped together whereas the post-test had both types of questions intermingled. In addition, the answers to the multiple choice questions involving definitional or application oriented problems were shifted. Some of the multiple choice questions involving calculations were given new figures, while keeping the question the same in all other aspects, in an effort to further preserve the integrity of both the post-test and the retention test.

## Data Processing and Analysis

Individual scores from the post-test and the retention test were then compared as well as the class aggregate scores for the post-test and the retention test. Scores were then entered into the Statistical Package for the Social Science (SPSS). The data was analyzed

using both the t-test and the ANOVA techniques with the confidence level of 95% and the significance level set at $p < .05$. T-tests are often utilized when comparing two different methods (N. Anderson, personal communication, June 21, 2007). In this study the two different methods that were examined for purposes of the t-test included the experimental group where the game was employed as part of the instructional pedagogy, and the control group that was not influenced by the introduction of the game to the instructional pedagogy. The ANOVA technique was then utilized to determine the statistical significance between the post-test and retention test scores of students. Further, Cook and Campbell (1979) believed that the ANOVA technique was one of the most simplistic methods for determining difference between the post-test and retention model found within this study. Two ANOVAs were therefore created using the data collected in an effort to determine whether the results were statistically significant in validating the following hypotheses.

$H_{o1}$ = there is not statistically significant difference in accounting students' cognitive retention as a result of instructional intervention in the form of games.

$H_{o2}$ = there is not a statistically significant difference in accounting students' cognitive retention based on their level of ability.

## Assumptions

There were several assumptions made on the part of the researcher.

One of the main assumptions and limitations to this study was that the students would actively participate in the game. While this is a novel assumption, it may also be naïve. Students may choose to discuss other items during the process of the game, thus eliminating the opportunity for additional learning by the students,

> find the game boring or difficult to play, or students may not be motivated to play the game. In an effort to promote participation and enthusiasm by the students, the group with the highest score was deemed the winner and therefore eligible for extra credit. (Hicks, 2007c, p. 2)

Another assumption made was that the students would answer the questionnaire honestly, specifically in regards to their grade point average, and that each class would have the same overall cognitive ability. While assurance was given to the students that their responses would be kept confidential, there was still the possibility of a student incorrectly selecting their grade point average. In each of the studies that were listed previously in chapter two, it was assumed that students answered the questionnaires honestly. Consequently, this assumption is not something that is unique to this study. Grade point averages were compared between the two classes to evaluate each class' cognitive ability in comparison with the other class.

While much of the information in the later sections of the principles of accounting textbook built on previous chapters, it was further assumed that students would not continuously review the information from previous chapters, but rather began studying the new information being covered. By waiting to inform the students that they were participants in the study until right before the retention test, it was the researcher's hope that the results of the retention test would be truly reflective of what the students learned previously in regards to the material being covered, rather than allowing the students time to study the material and skewing the results of the retention test.

Finally, it was assumed that when the students read a question on the retention test, they did not attempt to remember how they answered on the post-test, but rather tried to reason through the answers and recall the information.

# Chapter 4: Findings

## Introduction

The results of testing the two hypotheses, as stated in chapter three, through the utilization techniques of a post-test and retention test are presented in this chapter. The first part of the chapter restates the purpose of the study, describes the data collection procedures, and general information concerning the field study, while the specific results and analysis are discussed in the later part of the chapter.

## Restatement of Purpose

There is a great deal of literature on Generation Y, and specifically, many authors such as Brozik and Zapalska (1999), Greenawalt & Foster-Stinnett (1992), Oblinger (2004), Oblinger and Oblinger (2006), and Prensky (1998, 2001, 2005/2006), have all discussed in their articles that the best way to instruct Generation Y students is through the use of games and simulations in an active learning environment, as this generation appears to thrive on active learning, and is the predominant generation within our post-secondary educational system (Haytko, 1006). Very little research however has actually sought to validate these claims, and no studies could be found that validated the claims within the field of accounting. Therefore, based on the research of available literature, the purpose of this study was to determine if the use of games and simulations has a significant statistical difference in the cognitive retention of Generation Y students within the field of accounting, and in particular, a principles of accounting course.

## Demographic Data

*Data Collection*

Before the study could begin, the Institutional Review Boards, at both the University where the fieldwork was conducted as well as Argosy University, were contacted for permission to conduct this study, both of whom gave their consent. The professor chosen had two classes of approximate equal size in population as well as an equal distribution of males and females between the two classes. Students were not told that they were going to be a part of a study as that knowledge could have influenced the students' study habits.

Each student was given a random number to be used on both the post-test and the retention test to ensure the confidentiality of the students. In addition, the random numbers were also used on the informational survey given to the students on the day of the retention test. Only those students who completed all three assignments (36 out of 37) were used in analyzing the results of this study. All students involved within the study fit the age requirements for Generation Y as defined by Johnson (2007), Salzberg (2007), Stubbs (2007), and Turetsky (2006).

*Characteristics.* The control group contained 21 students, of which, five (23%) were female. The experimental group was similar in composition. There were originally 16 students, of which, four (25%) were female. Students self-selected into each of these classes, and self-selected into their various groups. Each group contained approximately the same number of students. Students ranged from freshmen to seniors, and all were either business or accounting majors.

In addition, students, both male and female, had various degrees of cognitive ability as defined by their grade point average (GPA). GPAs were broken down in increments of 0.50. Those deemed with the highest cognitive ability were those students who fell in the 3.5 – 4.0 GPA range. Those with the lowest cognitive ability were considered to be those students that had GPAs between 2.0 – 2.49 as there were zero students that fell below this GPA range. Table 1 (see next page) shows the breakdown male versus female students according to the relative cognitive ability. In addition, Table 2 (see next page) shows the comparative breakdown of GPAs between the experimental and the control group, which indicates that roughly the same number of students within each GPA classification were enrolled in the experimental group as compared with the control group. Thus, an equal number of students, with the exception of the 3.0 to 3.49 range, were studied within each GPA range. So while the number of overall cases in both the experimental group and the control group were small, they were statistically equivalent with each other, and provided a good comparison for purposes of this study.

*Data collection procedure.* Both the experimental class and the control class were given the same lecture and group work, as well as the same final review before the post-test. In addition, the experimental class played the PowerPoint game during the last part of each class leading up to the post-test. Each student within the experimental class was given the opportunity to represent their respective teams at the front of the classroom. Students did know how many questions would be posed to them, nor the exact format of the question. Questions ranged from multiple choice, true/false, and problem solving, and covered material that had been presented either in previous classes or in class that day.

Table 1 - Gender and Cognitive Retention

GPA & Gender Cross-tabulation

| | Gender | | |
|---|---|---|---|
| GPA Range | Female | Male | Total |
| 3.5 – 4.0 | 3 | 5 | 8 |
| 3.0 – 3.49 | 2 | 16 | 18 |
| 2.5 – 2.99 | 3 | 4 | 7 |
| 2.0 – 2.49 | 1 | 2 | 3 |
| Totals | 9 | 27 | 36 |

Table 2 – Cognitive Retention & Class

GPA & Class Cross-tabulation

| | Class | | |
|---|---|---|---|
| GPA Range | Experimental | Control | Total |
| 3.5 – 4.0 | 4 | 4 | 8 |
| 3.0 – 3.49 | 5 | 13 | 18 |
| 2.5 – 2.99 | 4 | 3 | 7 |
| 2.0 – 2.49 | 2 | 1 | 3 |
| Totals | 15 | 21 | 36 |

Initial reactions to the game appeared to be mixed as students were unsure of the level of difficulty the questions would be, as well as how many questions they would be required to answer. While several students commented during the course of play that they felt intimidated by the questions, those same students stated that the game was pushing and encouraging them to study the material before each class period, rather than waiting until the night before the exam to begin studying. In addition, students who began working on their homework stated that the questions that were found in the game appeared to be easier if they had previously worked on their homework. As with the majority of studies researched in chapter two, students stated they felt the game assisted in the learning process of the material that had been presented.

After all of the material had been presented and reviewed, the students were required to take the 40 question post-test (see Appendix A) as part of their normal class assignments. Students were not aware their test scores would be utilized in the study. They were however given random numbers to use as identifiers rather than placing their names on the tests. When questioned as to what the numbers meant, the professor informed the students that they would be told at a later time. Both the experimental class and the control class were given the post-test after the same number of class periods.

Typically after a test is given, the professor would go over the answers to the test during the next class period. In an effort to provide greater integrity to the study however, the professor notified the students that the test would be reviewed at a later date so as to provide enough time to cover the remaining chapters before their final exam. In the meantime, the class proceeded as usual by covering the next several chapters in the textbook. While the material was similar to that of the post-test, much of the information

being covered was new and did not directly relate to the old material. It was observed by the professor that in both the experimental class as well as in the control class, students did not seem bothered with the change in procedures (i.e. not going over the test in the class period following the test).

After two weeks of new information being covered, the professor then informed and briefly explained to the students they were a part of the study, and what the study entailed. It was observed that a majority of the students appeared pleased that they were selected for the study. Some students asked if their grades on the post-test would negatively affect the results of the study. After explaining the purpose of the study and that the post-test scores and the retention test scores for each individual student would be compared first with themselves on an individual level, and then with those who were in the same grade point range, those students who first appeared to be concerned, then appeared to relax. The students were also informed that the random numbers that were assigned and utilized on both tests and the questionnaire were to provide anonymity should the results be studied by those other than the professor.

The students were then instructed to complete the questionnaire honestly (see Appendix B), and then begin the 40 question retention test (see Appendix C) using their previously assigned random number. Additional instructions to the students included that they were to read each question carefully as words or numbers within each question may have changed in comparison with the post-test. Extra credit for each question answered correctly was given as a further incentive for students to do well and take the retention test as seriously as the post-test. Only the raw scores for both the post-test and the retention test were utilized in the analysis of this study.

## Research Question One Results

Again, 97% (36 out of 37) of the students took the retention test, thus there was a high success rate for students completing all three requirements for this study. After the raw scores from the post-test and the retention test were calculated, the information was entered into the Statistical Package for the Social Sciences (SPSS) software system in order to conduct both a t-test and a mixed analysis of variance (ANOVA). The first hypothesis was stated as

$H_{o1}$ = there is not a statistically significant difference in accounting students' cognitive retention as a result of instructional intervention in the form of games.

In order to perform an analysis on the raw data, a t-test was first conducted in an effort to determine whether there was equality between the post-test and retention test. A t-test is a measure of how different the means will be (Kerlinger, 1986). "We know that if sets of random numbers are drawn, the means of the sets will not be equal. They should, however, not be too different, that is, they should differ only within the bounds of chance fluctuations" (Kerlinger, p. 207). Consequently, a t-test was utilized to determine whether the differences in the post-test and retention test were statistically equal.

Table 3 (see page 64) shows the statistical significance of the post-test scores and the retention test scores. The significance levels for the post-test and retention tests are both above 0.05. Since a 95% confidence level is utilized, this indicates that there is not a significant difference between the two tests. Therefore, since the post-test and the retention tests are similar in nature, further analysis may be done.

With the equality established, it becomes necessary to examine the results of the data through a mixed ANOVA. Using the ANOVA will allow a comparison between the

various methods (i.e. the experimental group versus the control group), and the post-test and the retention tests. The different methods are considered the between factors and the post-test and retention tests are considered the within factors. As shown in Table 4 (see next page), when the post-test and the retention test are compared to the type of class, the significance is 0.358. Based on the same 95% confidence level as in the t-test, the significance level in Table 4 indicates that there is not a significant statistical difference between the use of games and simulations as they relate to the post-test and the retention test given to both the experimental class and the control class. In addition, there appears to be very little difference between the two classes.

To further examine the significance of the games and simulations, one must also examine the between factors as shown in Table 5 (see next page). The between factor shows the variability between the experimental and control class. Again, the significance level for the class is above the 0.05 limit indicating that the variance is not significant.

Consequently, when the raw data has been analyzed using the ANOVA, the null hypothesis has been supported as the performed significance level, 0.358, is greater than the confidence level value of 0.05. As a result, it would appear that within the context of this study, the use of games and simulations did not make a statistically significant difference in the cognitive retention of Generation Y students within the area of a principles of accounting course.

Table 3 - Significance of Scores

**Independent Samples Test**

| | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | 95% Confidence Interval of the Difference | |
| | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Posttest | 1.632 | 34 | .112 | 2.543 | 1.558 | -.623 | 5.709 |
| Retention | .979 | 34 | .334 | 1.410 | 1.439 | -1.515 | 4.334 |
| Difference between Pos | .931 | 34 | .358 | 1.13333 | 1.21669 | -1.33928 | 3.60595 |

Table 4 – Test of Within Factor

**Tests of Within-Subjects Effects**

Measure: MEASURE_1

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| factor1 | 63.175 | 1 | 63.175 | 9.755 | .004 |
| factor1 * Class | 5.619 | 1 | 5.619 | .868 | .358 |
| Error(factor1) | 220.200 | 34 | 6.476 | | |

Table 5 – Test of Between Factor

**Tests of Between-Subjects Effects**

Measure: MEASURE_1

Transformed Variable: Average

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Intercept | 47972.232 | 1 | 47972.232 | 1458.719 | .000 |
| Class | 68.343 | 1 | 68.343 | 2.078 | .159 |
| Error | 1118.143 | 34 | 32.887 | | |

## Research Question Two Results

A second null hypothesis considered the difference in the post-test and retention test raw scores in comparison to the various students' cognitive ability. Specifically, the second hypothesis was stated as:

$H_{o2}$ = there is not a statistically significant difference in accounting students' cognitive retention based on their level of ability.

To test the second hypothesis, another mixed ANOVA was conducted. In this analysis the post-test and the retention test were again considered to be the within factors. In contrast however GPAs were utilized as the between variable. Since the first hypothesis established that within this study there was not a significant statistical difference between the methods of instruction, the second hypothesis examines the raw data based on an individual basis. Table 6 (see next page) shows the significance of GPAs in comparison with the post-test and the retention test.

The Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root are four statistical criteria that examine various statistical elements such as the effects of the sample size, and the size of the treatment on the variables (Hair, Black, Babin, Anderson, & Tatham, 2006). The important figure to examine in Table 6 is the Wilks' Lambda. Specifically, the Wilks' Lambda figure determines the effects on the variables as well as the independent ability of those variables to discriminate (Hair et al.). The Wilks' Lambda significances score is also above the 0.05 level which again indicates that there is not a statistical significance between a student's cognitive ability, based upon GPAs, and the use of games and simulations. Consequently, the second hypothesis that the level

of cognitive ability does not have a statistically significant influence on cognitive retention is also upheld.

Information was gathered concerning the participants gender. While it was not a formal hypothesis, Table 7 (see next page) shows the significance of gender and the use of games and simulations. Again, when using the Wilks' Lambda significance scores, there was not a statistical difference in the cognitive retention of Generation Y students when based on the gender of the student. One will notice however that the significance level did decrease from 0.427 in Table 6 to 0.255 in Table 7. While the significance is still above the 0.05 significance level, the significance factor is much closer. There were only nine female students involved in this study, of which only four were in the experimental group. Consequently, the sample size is not large enough to provide valid statistical analysis by gender. Ignoring this fact however, the results would appear to indicate that while there is not a statistically significant difference in this particular study, there may be a difference between cognitive retention and gender in other studies with a larger sample size of female students. Further discussion of the potential for this topic is discussed in chapter five.

Table 6 - Multivariate Test with GPAs

**Multivariate Tests[b]**

| Effect | | Value | F | Hypothesis df | Error df | Sig. |
|---|---|---|---|---|---|---|
| factor1 | Pillai's Trace | .192 | 7.618[a] | 1.000 | 32.000 | .009 |
| | Wilks' Lambda | .808 | 7.618[a] | 1.000 | 32.000 | .009 |
| | Hotelling's Trace | .238 | 7.618[a] | 1.000 | 32.000 | .009 |
| | Roy's Largest Root | .238 | 7.618[a] | 1.000 | 32.000 | .009 |
| factor1 * GPA | Pillai's Trace | .082 | .952[a] | 3.000 | 32.000 | .427 |
| | Wilks' Lambda | .918 | .952[a] | 3.000 | 32.000 | .427 |
| | Hotelling's Trace | .089 | .952[a] | 3.000 | 32.000 | .427 |
| | Roy's Largest Root | .089 | .952[a] | 3.000 | 32.000 | .427 |

a. Exact statistic

b.
Design: Intercept+GPA
Within Subjects Design: factor1

Table 7 – Multivariate Test with Gender

**Multivariate Tests[b]**

| Effect | | Value | F | Hypothesis df | Error df | Sig. |
|---|---|---|---|---|---|---|
| factor1 | Pillai's Trace | .232 | 10.260[a] | 1.000 | 34.000 | .003 |
| | Wilks' Lambda | .768 | 10.260[a] | 1.000 | 34.000 | .003 |
| | Hotelling's Trace | .302 | 10.260[a] | 1.000 | 34.000 | .003 |
| | Roy's Largest Root | .302 | 10.260[a] | 1.000 | 34.000 | .003 |
| factor1 * Gender | Pillai's Trace | .038 | 1.340[a] | 1.000 | 34.000 | .255 |
| | Wilks' Lambda | .962 | 1.340[a] | 1.000 | 34.000 | .255 |
| | Hotelling's Trace | .039 | 1.340[a] | 1.000 | 34.000 | .255 |
| | Roy's Largest Root | .039 | 1.340[a] | 1.000 | 34.000 | .255 |

a. Exact statistic

b.
Design: Intercept+Gender
Within Subjects Design: factor1

## Summary

While the majority of students within Generation Y have various degrees of similarity to previous generations, they are the first generation that has been able to actively engage in and encouraged to utilize technology for the purposes of learning (Prensky, 2001). As diagramed in the cognitive domain component of *Bloom's Taxonomy*, as referenced in chapter two, in order for students to properly evaluate the information that is being taught, the student must first have the knowledge and comprehension of the material (Atherton, 2005a). If these important first two steps are not completed, it would then appear to be extremely difficult, if not impossible, for students to grasp the material being presented, not matter what method of pedagogy has been utilized to present the information. As noted in Forehand (2005), teachers want their students to be able to learn. Consequently, a shift in the current teaching pedagogy may become necessary to achieve academic success if those within Generation Y are demanding such a change and that change proves beneficial to the learning.

This chapter presented two hypotheses that dealt with the cognitive retention of Generation Y students. The first hypothesis questioned the ability of games and simulations to impact the learning of students. The results showed a statistical value greater than the 0.05 with a 95% confidence level, thus indicating that there was not a statistically significant difference between the post-test and retention test scores between the experimental and control classes.

The second hypothesis questioned the ability of games and simulations to impact the cognitive retention of Generation Y students with varying degrees of cognitive ability as measured by the GPAs of the students. Again, the results of the testing showed a

statistical value that was greater than the 95% confidence level of 0.05. The results from the analysis indicate that the cognitive ability of students and the ability of those students to perform on the retention test are not statistically significant.

In addition, an analysis was also conducted based on gender. Again, there was not a statistically significant difference in the results.

The ending result of this study implies that the game and simulation conducted in the experimental course did not have a statistically significant effect on the retention test in comparison to the post-test. While several factors could have affected the results of this study, this study indicates that there is not a statistical significance in retention test scores when games are employed within the games and simulations teaching pedagogy. Further, there is also not a statistical significance between various levels of cognitive ability (i.e. GPAs), nor is there a statistical significance based upon gender.

This is just one study however and may vary when a larger sample size, different subject matter, greater time between the post-test and the retention test, and other considerations are taken into account. The following chapter provides additional conclusions as to how this study could be improved upon and possible future areas of research.

# Chapter Five: Summary, Conclusions, & Recommendations

## Summary

### *Restatement of the Problem*

The purpose of this study was to determine if there was a significant statistical difference in the raw scores of Generation Y students between the post-test and the retention test when games were utilized as part of the teaching pedagogy. Further, the question was raised as to whether a student's cognitive ability also plays a significant role in the cognitive retention of Generation Y students.

Researchers such as Brozik and Zapalaski (1999) emphasize the importance of actively engaging students. The use of games and simulations is one method that attempts to actively engage students with the material that is being covered. Arhin and Johnson-Mallard (2003) further validate Brozik and Zapalaski's ideas as Generation Y students have been exposed to a multitude of technological advances. Their learning styles are highly related to tactile functions (Prensky, 2001), thus the apparent successful application of games and simulations within a classroom setting.

Allery (2004) further emphasized the need for actively engaging students in the learning process. It was noted by Allery however that the use of games would be a paradigm shift from traditional teaching pedagogy. This change in paradigm appears to be what the Accounting Education Change Commission requested during the 1980s to actively engage accounting students as well as better prepare them for life in the professional world.

After much research, there was little evidence to support the claims made by Brozik and Zapalska (1999), Greenawalt & Foster-Stinnett (1992), Oblinger (2004),

Oblinger and Oblinger (2006), and Prensky (1998, 2001, 2005/2006) as to the substantiation that games and simulations increase the cognitive retention of students. Consequently, this study attempted to validate or refute the claims made by these researchers.

## Conclusions

The research lends itself to the practical application of games and simulations within the classroom. Since the majority of students in colleges and universities are currently within the Generation Y classification (Haytko, 2006), teaching to them (i.e. in a manner that actively engages them) has become essential. While traditional pedagogy may work for some students, researchers such as Brozik and Zapalska (1999), Greenawalt & Foster-Stinnett (1992), Oblinger (2004), Oblinger and Oblinger (2006), and Prensky (1998, 2001, 2005/2006) seem to indicate that games and simulations are a more effective means of communication. The utilization of games and simulations is however a change from the more traditional teaching pedagogy of the lecture only atmosphere that is often found in a majority of post-secondary classrooms today (Eison & Bonwell, 1991).

While the research strongly suggests the use of games and simulations in an effort to actively engage Generation Y students in the learning process, the results of this study do not directly support that assumption. Even when looking at the various cognitive abilities of students, there is not a direct statistically significant correlation between the learning by the students and the use of games and simulations.

In examining both hypotheses, an analysis of variance was conducted on the post-test and retention test results. The results of which indicated that there was not a

statistical significance in the cognitive retention between those who utilized the game and those who did not. Further, there was not a statistical significance among those with various levels of cognitive ability as defined by the students' grade point average. Consequently, both null hypotheses were validated.

It is interesting to note however that according to Folkard, Monk, Bradbury, and Rosenthall (1977), Muyskens and Ysseldyke (1998), and Oakhill (1988), morning students tend to perform better on short-term retention tests, whereas afternoon students tend to perform better on long-term tests. When comparing the differences between the two tests (i.e. post-test and retention test), the morning class still performed better overall than the afternoon test. While there was not a statistically significant difference in the scores, there was still a difference.

## Implications for Practice

There are several implications for the practice of utilizing new instructional tools within post-secondary education. Based on the results of this study, the primary implication is that for a majority of instructors, there is no apparent need to change their teaching pedagogy simply because their students consist predominantly of Generation Y.

Despite the preponderance of material on Generation Y and their apparent need for being actively engaged in the classroom in order to learn, the use of games and simulations to effectively instruct Generation Y students and for Generation Y students to effectively learn did not appear to be true in this study. Rather, as with previous studies discussed in chapter two, the students preferred the games and simulations simply as a result of the tools being another way to learn the material and possibly enhance the joy of learning. The actual knowledge attained however appears to still rely on the student

rather than the instructional pedagogy. The actual results of this study may be an anomaly and therefore requires further research.

In addition, the results of the study may be different depending on the subject matter being taught. An accounting principles class, for example, which utilizes games and simulations, may not have the same cognitive effects as a more advanced accounting course, or even a different subject matter. Therefore, the instructor must examine each course objectively as well as examine the students within each course.

## Implications for Research

As a result of the plethora of research on Generation Y, this study should be conducted again. To better determine the long-term effects of cognitive retention through the use of games and simulations, the time span between the two tests could be lengthened significantly. A typical residential college course is often roughly sixteen weeks. So, a study could be conducted where there is at least ten weeks between the post-test and the retention test.

In addition, a different level of accounting course could also become part of the study. For example, students could be tested in intermediate or advanced type level courses as opposed to the introductory course, as the material may have built too much upon itself within this study.

The experiment was conducted at a medium sized private evangelical institution of higher learning. The results may have differed had the experiment been conducted in a public university setting. Research could therefore attempt to determine whether the type of institution (i.e. private or public, evangelical or non-denominational) played a significant role in the results of this study. Further, depending on the university chosen,

the cognitive ability of the students being tested may also play a significant role. Consequently, an examination at a public university could also be studied.

The time of day may also have been a factor. Consequently, it would be best to conduct a future research study on classes of approximate size that met during the same time of day. Additionally, while keeping the same instructor for both classes under study, using another instructor may yield different results.

Additionally, the type of game that was utilized may need to be modified. Allowing students to create the questions may increase the learning opportunity as students will need to understand the material in order to create the questions.

In the experimental class, the students were not only exposed to the game, but also all of the other activities that the control group participants were actively engaged in. Allowing the experimental group more time to participate in the game would increase the amount of active learning time. Consequently, the increased exposure to the game may cause different results from those of this study, particularly as the literature suggests that the active involvement of Generation Y students is a necessary component to their learning.

A study examining the effects of gender is also possible. While the results were evaluated in this study, the sample size of females was not large enough to truly be reflective of all Generation Y females.

There could also be a difference in the results based on race. As different cultures may treat education differently, research may be conducted to determine if games and simulations positively affect the learning of those within the culture.

Finally, a larger sample size should be utilized to better determine the importance of games and simulations and the effect on the Generation Y culture. By replicating the study with a larger group of students, further validation of the significance of games and simulations could be determined and verified.

## Recommendations

The most significant recommendation is to replicate the study with a new set of Generation Y students. In addition, using different material and a greater time length between the post-test and the retention test would also provide an increased benefit to the new study. Overall, the purpose of the study is to determine the relative importance and significance of game utilization within the classroom.

While the study could be replicated in other fields of study, research in accounting is relatively slim with regards to the actual testing of cognitive retention. As a result, not only should the study be repeated at the same institution of higher learning, but additional research and testing should be conducted at other institutions to ensure that Generation Y students enrolled in a private evangelical institution are similar to Generation Y students enrolled at public institutions.

Despite the literature suggesting that the use of games and simulations increases the cognitive retention of Generation Y students, the results of this study imply that the games and simulations to not make a statistically significant difference in test scores. Additional research should be conducted to further validate or disprove these claims. At the very least, the students appeared to enjoy learning in this manner.

When students are actively engaged in a subject, the common belief among Generation Y researchers is that those students will therefore learn. While this may inherently be true, the study could not support and validate this claim.

The results of this study are significant to the field of accounting. As students are exposed to greater amounts of technology, it has become inerrant upon post-secondary professors to actively engage the students in the learning process and find better and more effective means of instruction. If the utilization of games and simulations can assist students in not only basic knowledge of a particular subject matter, but also the practical application of basic accounting principles, not only will accounting students become more prepared for the world outside of the classroom, but business students enrolled in the principle courses could also benefit.

In a world where accounting is constantly changing to adapt to the environment (Previts & Merino, 1988), changes within the realm of accounting education are increasingly necessary. The researcher believes that despite the results of this study, there is at least a difference in the attitudes of the students within the experimental group in comparison to those within the control group. Consequently, the researcher will continue to study this area as the implications are significant both to the world of accounting as well as to post-secondary education in general.

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# Appendix Cover Sheet

*Appendix A: Post Test*

# ACCT 212 Test Three Chaps 20-22

*Student:*

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1. Which of the following is the best explanation for why it is necessary to calculate equivalent units of production in a process costing environment?

A. In most manufacturing environments, it is not possible to conduct a physical count of units.
B. Companies often use a combination of a process costing and job order costing systems.
C. In most process costing systems, direct materials are added at the beginning of the process while conversion costs are added evenly throughout the manufacturing process.
D. All of the work to make a unit 100% complete and ready to move to the next stage of production or to finished goods inventory may not have been completed in a single time period.
E. In most cases, there is no difference between physical units and equivalent units of production.

2. Which of the following characteristics applies to process cost accounting and not to job order cost accounting?

A. Use of a predetermined overhead rate.
B. Identifiable lots of production.
C. Equivalent units of production.
D. Labor time ticket for each employee.
E. Use of a single Goods in Process account.

3. When raw materials are purchased on account for use in a process costing system, the corresponding journal entry that should be recorded will include:

A. A debit to Goods in Process Inventory.
B. A debit to Accounts Payable.
C. A credit to Cash.
D. A debit to Raw Materials Inventory.
E. A credit to Raw Materials Inventory.

4. A company uses a process cost accounting system. Its Assembly Department's beginning inventory consisted of 50,000 units, 3/4 complete with respect to direct labor and overhead. The department started and finished 127,500 units this period. The ending inventory consists of 40,000 units that are 1/4 complete with respect to direct labor and overhead. All direct materials are added at the beginning of the process. The department incurred direct labor costs of $24,000 and overhead costs of $32,000 for the period. The direct labor cost per equivalent unit is:

A. $0.126.
B. $0.160.
C. $0.178.
D. $0.295.
E. $0.373.

5. In a process costing system, when manufacturing overhead costs are applied to the cost of production, they are debited to:

A. the Finished Goods Inventory account.
B. the Cost of Goods Sold account.
C. the Goods in Process Inventory account.
D. the Manufacturing Overhead account.
E. the Raw Materials Inventory account.

6. At the beginning of the recent period, there were 900 units of product in a department, one-third completed. These units were finished and an additional 5,000 units were started and completed during the period. 800 units were still in process at the end of the period, one-fourth completed. The equivalent units produced by the department were:

A. 6,700 units.
B. 5,900 units.
C. 5,800 units.
D. 5,500 units.
E. 8,500 units.

7. Which of the following characteristics does not usually apply to process manufacturing systems?

A. Each unit of product is separately identifiable.
B. Partially completed products are transferred between processes.
C. Different managers are responsible for different processes.
D. The output of all processes except the final process is an input to the next process.
E. All of the above are characteristics of process manufacturing systems.

8. Which of the following five types of products is least likely to be produced in a process manufacturing system?

A. Compact disks.
B. Slacks for casual wear.
C. Baseball hats.
D. Calculators.
E. Oil paintings.

9. A measure of the productivity of a process with respect to its use of direct materials, direct labor, or overhead, and an expression of the activity of a process as the number of units that would have been processed during a period if all effort had been applied to units that were started and finished during the period, is called:

A. Manufacturing overhead.
B. Units in process.
C. A job cost sheet.
D. Equivalent units of production.
E. Process cost summary.

10. Which of the following statements is most accurate?

A. In process costing, estimating the degree of completion of units is usually more accurate for conversion costs than for direct materials.
B. The weighted average method uses the stage of completion of the current period's beginning goods in process inventory account in calculating equivalent units.
C. The weighted average method focuses on the total costs and total equivalent units completed to date; this is the major difference between the weighted average method and the FIFO method of calculating equivalent units of production.
D. The FIFO method of calculating equivalent units of production merges the work and the costs of the beginning inventory with the work and the costs done during the current period.
E. It is not possible for there to be a significant difference between the cost of completed units between the weighted average and the FIFO methods.

11. Direct costs in process cost accounting include only those costs that can be readily identified with particular product units.

True False

12. In some circumstances, a process cost accounting system can classify wages paid to maintenance workers as direct labor costs instead of factory overhead.

True False

13. If a department that applies process costing starts the reporting period with 50,000 physical units that were 25% complete with respect to direct materials and 40% complete with respect to direct labor, it must add 12,500 equivalent units of direct materials and 20,000 equivalent units of direct labor to complete them.

True False

14. In process cost accounting, all labor that is applied exclusively in a single production department is considered to be direct labor.

True False

15. The number of equivalent units of production assigned to ending goods in process inventory should usually be equal to or less than the number of physical units in ending goods in process inventory.

True False

16. A difficult problem in calculating the total costs and expenses of a department is:

A. Determining the gross profit ratio.
B. Assigning direct costs to the department.
C. Assigning indirect expenses to the department.
D. Determining the amount of sales of the department.
E. Determining the direct expenses of the department.

A firm produces and sells two products, Mica and Plax. The following information is available relating to setup costs (a part of factory overhead):

| | Mica | Plax |
|---|---|---|
| Units produced | 200 | 16,000 |
| Batch size (units) | 10 | 400 |
| Number of setups | 20 | 40 |
| Direct labor hours per unit | 5 | 5 |
| Total direct labor hours | 1,000 | 80,000 |
| | | |
| Cost per setup | $ 1,080 | |
| Total setup cost | $64,800 | |

17. Use of activity-based costing would result in allocating the following amounts of setup cost to each unit:

| | Mica | Plax |
|---|---|---|
| (A) | $21.60 | $ 0.54 |
| (B) | $54.00 | $27.00 |
| (C) | $60.00 | $60.00 |
| (D) | $108.00 | $ 2.70 |
| (E) | $200.00 | $16,000.00 |

A. A Above.
B. B Above.
C. C Above.
D. D Above.
E. E Above.

18. With traditional twostage allocation of overhead costs, using direct labor hours as the allocation base, the setup cost portion of overhead that is allocated to each unit of product is:

| | Mica | Plax |
|---|---|---|
| (A) | $0.80 | $0.80 |
| (B) | $3.20 | $3.20 |
| (C) | $4.00 | $4.00 |
| (D) | $160.00 | $12,800.00 |
| (E) | $200.00 | $16,000.00 |

A. A Above.
B. B Above.
C. C Above.
D. D Above.
E. E Above.

19. Dresden, Inc., has four departments. Information about these departments follows:

| | Maintenance | Cutting | Assembly | Packaging |
|---|---|---|---|---|
| Direct costs | $18,000 | $30,000 | $70,000 | $45,000 |
| Sq. ft. of space | 500 | 1,000 | 2,000 | 3,000 |
| No. of employees | 2 | 3 | 16 | 4 |

If maintenance costs are allocated to the other departments based on floor space occupied by each, the amount of maintenance cost allocated to the Cutting Department is:

A. $ 2,769.
B. $ 3,000.
C. $ 3,724.
D. $ 6,000.
E. $18,000.

20. The amount by which a department's revenues exceed its direct costs and expenses is the:

A. Net sales.
B. Gross profit.
C. Departmental profit.
D. Contribution margin.
E. Departmental contribution to overhead.

21. General Chemical produced 10,000 gallons of Breon and 20,000 gallons of Baron. Joint costs incurred in producing the two products totaled $7,500. At the split-off point, Breon has a market value of $6.00 per gallon and Baron $2.00 per gallon. What portion of the joint costs should be allocated to Breon if the basis is market value at point of separation?

A. $2,500.
B. $3,000.
C. $4,500.
D. $5,625.
E. $1,500.

22. An expense that does not require allocation between departments is a(n):

A. Common expense.
B. Indirect expense.
C. Direct expense.
D. Administrative expense.
E. All of the above.

23. Departmental wage expenses are direct expenses of that department.

True False

24. Activity-based costing attempts to better allocate costs to the proper users of overhead by focusing on activities.

True False

25. A service department is usually evaluated as a profit center.

True False

26. In producing oat bran, the joint cost of milling the oats into bran, oatmeal, and animal feed is considered a direct cost to the oat bran, because the oat bran cannot be produced without incurring the joint cost.

True False

27. Traditional two-stage cost allocation means that indirect costs are first allocated to both operating and service departments, then operating department costs are allocated to service departments.

True False

28. A cost that remains the same in total even when volume of activity varies is a:

A. Fixed cost.
B. Curvilinear cost.
C. Variable cost.
D. Step-wise variable cost.
E. Standard cost.

29. A method that estimates cost behavior by connecting the costs linked to the highest and lowest volume levels on a scatter diagram with a straight line is called the:

A. Scatter method.
B. High-low method.
C. Least-squares method.
D. Break-even method.
E. Step-wise method.

30. During its most recent fiscal year, Simon Enterprises sold 200,000 electric screwdrivers at a price of $15 each. Fixed costs amounted to $400,000 and pretax income was $600,000. What amount should have been reported as variable costs in the company's contribution margin income statement for the year in question?

A. $2,400,000.
B. $1,600,000.
C. $3,000,000.
D. $2,000,000.
E. $1,000,000.

31. When graphing cost-volume-profit data on a CVP chart:

A. Units are plotted on the horizontal axis; costs on the vertical axis.
B. Units are plotted on the vertical axis; costs on the horizontal axis.
C. Both units and costs are plotted on the horizontal axis.
D. Both units and cost are plotted on the vertical axis.
E. Data points always represent expected future points.

32. A cost that changes in proportion to changes in volume of activity is a(n):

A. Differential cost.
B. Fixed cost.
C. Incremental cost.
D. Variable cost.
E. Product cost.

33. The margin of safety is the excess of:

A. Break-even sales over expected sales.
B. Expected sales over variable costs.
C. Expected sales over fixed costs.
D. Fixed costs over expected sales.
E. Expected sales over breakeven sales.

34. Cost-volume-profit analysis is based on three basic assumptions. Which of the following is not one of these assumptions?

A. Total fixed costs remain constant over changes in volume.
B. Curvilinear costs change proportionately with changes in volume throughout the relevant range.
C. Variable costs per unit of output remain constant as volume changes.
D. Sales price per unit remains constant as volume changes.
E. All of the above are basic assumptions.

35. A company has fixed costs of $90,000. Its contribution margin ratio is 30% and the product sells for $75 per unit. What is the company's break-even point in dollar sales?

A. $ 60,000.
B. $128,571.
C. $180,000.
D. $210,000.
E. $300,000.

36. Cost-volume-profit analysis provides approximate, but not precise, answers to questions about the relations among costs, volume, and profits.

True False

37. A step-wise variable cost can be separated into a fixed component and a variable component.

True False

38. The margin of safety is the amount that sales can drop before the company incurs a loss.

True False

39. Unit contribution margin is the amount a product's selling price exceeds its total variable costs.

True False

40. Curvilinear costs are also known as nonlinear costs.

True False

*Appendix B: Questionnaire*

# Accounting 212 – Informational Survey

Random Number:_____ Date:_____

Instructions: Please circle the appropriate answer.

1. What is your gender?

   A.) Male

   B.) Female

2. What age category are you?

   A.) Under 17

   B.) 17 – 28

   C.) Over 28

3. Which range represents your grade point average?

   A.) 3.50 – 4.0

   B.) 3.0 – 3.49

   C.) 2.5 – 2.99

   D.) 2.0 – 2.49

   E.) Below 2.0

All information obtained will be kept confidential.

*Appendix C: Retention Test*

# ACCT 212 Test Three Chaps 20-22

*Student:*

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1. Direct costs in process cost accounting include only those costs that can be readily identified with particular product units.

True False

2. In some circumstances, a process cost accounting system can classify wages paid to maintenance workers as direct labor costs instead of factory overhead.

True False

3. If a department that applies process costing starts the reporting period with 50,000 physical units that were 25% complete with respect to direct materials and 40% complete with respect to direct labor, it must add 12,500 equivalent units of direct materials and 20,000 equivalent units of direct labor to complete them.

True False

4. In process cost accounting, all labor that is applied exclusively in a single production department is considered to be direct labor.

True False

5. The number of equivalent units of production assigned to ending goods in process inventory should usually be equal to or less than the number of physical units in ending goods in process inventory.

True False

6. Departmental wage expenses are direct expenses of that department.

True False

7. Activity-based costing attempts to better allocate costs to the proper users of overhead by focusing on activities.

True False

8. A service department is usually evaluated as a profit center.

True False

9. In producing oat bran, the joint cost of milling the oats into bran, oatmeal, and animal feed is considered a direct cost to the oat bran, because the oat bran cannot be produced without incurring the joint cost.

True False

10. Traditional two-stage cost allocation means that indirect costs are first allocated to both operating and service departments, then operating department costs are allocated to service departments.

True False

11. Cost-volume-profit analysis provides approximate, but not precise, answers to questions about the relations among costs, volume, and profits.

True False

12. A step-wise variable cost can be separated into a fixed component and a variable component.

True False

13. The margin of safety is the amount that sales can drop before the company incurs a loss.

True False

14. Unit contribution margin is the amount a product's selling price exceeds its total variable costs.

True False

15. Curvilinear costs are also known as nonlinear costs.

True False

16. Which of the following is the best explanation for why it is necessary to calculate equivalent units of production in a process costing environment?
A. In most cases, there is no difference between physical units and equivalent units of production. B. In most manufacturing environments, it is not possible to conduct a physical count of units.
C. Companies often use a combination of a process costing and job order costing systems. D. In most process costing systems, direct materials are added at the beginning of the process while conversion costs are added evenly throughout the manufacturing process.
E. All of the work to make a unit 100% complete and ready to move to the next stage of production or to finished goods inventory may not have been completed in a single time period.

17. Which of the following characteristics applies to process cost accounting and not to job order cost accounting?

A. Use of a single Goods in Process account.
B. Use of a predetermined overhead rate.
C. Identifiable lots of production.
D. Equivalent units of production.
E. Labor time ticket for each employee.

18. When raw materials are purchased on account for use in a process costing system, the corresponding journal entry that should be recorded will include:

A. A credit to Raw Materials Inventory.
B. A debit to Goods in Process Inventory.
C. A debit to Accounts Payable.
D. A credit to Cash.
E. A debit to Raw Materials Inventory.

19. A company uses a process cost accounting system. Its Assembly Department's beginning inventory consisted of 50,000 units, 3/4 complete with respect to direct labor and overhead. The department started and finished 127,500 units this period. The ending inventory consists of 40,000 units that are 1/4 complete with respect to direct labor and overhead. All direct materials are added at the beginning of the process. The department incurred direct labor costs of $32,000 and overhead costs of $24,000 for the period. The direct labor cost per equivalent unit is:

A. $0.213.
B. $0.126.
C. $0.160.
D. $0.178.
E. $0.295.

20. In a process costing system, when manufacturing overhead costs are applied to the cost of production, they are debited to:

A. the Raw Materials Inventory account.
B. the Finished Goods Inventory account.
C. the Cost of Goods Sold account.
D. the Goods in Process Inventory account.
E. the Manufacturing Overhead account.

21. At the beginning of the recent period, there were 800 units of product in a department, one-fourth completed. These units were finished and an additional 5,000 units were started and completed during the period. 900 units were still in process at the end of the period, one-third completed. The equivalent units produced by the department were:

A. 6,700 units.
B. 5,900 units.
C. 5,800 units.
D. 5,500 units.
E. 8,500 units.

22. Which of the following characteristics does not usually apply to process manufacturing systems?

A. The output of all processes except the final process is an input to the next process.
B. Each unit of product is separately identifiable.
C. Partially completed products are transferred between processes.
D. Different managers are responsible for different processes.
E. All of the above are characteristics of process manufacturing systems.

23. Which of the following five types of products is least likely to be produced in a process manufacturing system?

A. Oil paintings.
B. Compact disks.
C. Slacks for casual wear.
D. Baseball hats.
E. Calculators.

24. A measure of the productivity of a process with respect to its use of direct materials, direct labor, or overhead, and an expression of the activity of a process as the number of units that would have been processed during a period if all effort had been applied to units that were started and finished during the period, is called:

A. Process cost summary.
B. Manufacturing overhead.
C. Units in process.
D. A job cost sheet.
E. Equivalent units of production.

25. Which of the following statements is most accurate?

A. It is not possible for there to be a significant difference between the cost of completed units between the weighted average and the FIFO methods.
B. In process costing, estimating the degree of completion of units is usually more accurate for conversion costs than for direct materials.
C. The weighted average method uses the stage of completion of the current period's beginning goods in process inventory account in calculating equivalent units.
D. The weighted average method focuses on the total costs and total equivalent units completed to date; this is the major difference between the weighted average method and the FIFO method of calculating equivalent units of production.
E. The FIFO method of calculating equivalent units of production merges the work and the costs of the beginning inventory with the work and the costs done during the current period.

26. A difficult problem in calculating the total costs and expenses of a department is:

A. Determining the direct expenses of the department.
B. Determining the gross profit ratio.
C. Assigning direct costs to the department.
D. Assigning indirect expenses to the department.
E. Determining the amount of sales of the department.

A firm produces and sells two products, Mica and Plax. The following information is available relating to setup costs (a part of factory overhead):

| | Mica | Plax |
|---|---|---|
| Units produced | 200 | 16,000 |
| Batch size (units) | 10 | 400 |
| Number of setups | 20 | 40 |
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| Total direct labor hours | 1,000 | 80,000 |
| | | |
| Cost per setup | $ 1,080 | |
| Total setup cost | $64,800 | |

27. Use of activity-based costing would result in allocating the following amounts of setup cost to each unit:

| | Mica | Plax |
|---|---|---|
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| (B) | $54.00 | $27.00 |
| (C) | $60.00 | $60.00 |
| (D) | $108.00 | $ 2.70 |
| (E) | $200.00 | $16,000.00 |

A. A Above.
B. B Above.
C. C Above.
D. D Above.
E. E Above.

28. With traditional twostage allocation of overhead costs, using direct labor hours as the allocation base, the setup cost portion of overhead that is allocated to each unit of product is:

| | Mica | Plax |
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| (B) | $3.20 | $3.20 |
| (C) | $4.00 | $4.00 |
| (D) | $160.00 | $12,800.00 |
| (E) | $200.00 | $16,000.00 |

A. A Above.
B. B Above.
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29. Dresden, Inc., has four departments. Information about these departments follows:

| | Maintenance | Cutting | Assembly | Packaging |
|---|---|---|---|---|
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| Sq. ft. of space | 500 | 1,000 | 2,000 | 3,000 |
| No. of employees | 2 | 3 | 16 | 4 |

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B. $ 2,769.
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A. $5,625.
B. $1,500.
C. $2,500.
D. $3,000.
E. $4,500.

32. An expense that does not require allocation between departments is a(n):

A. Administrative expense.
B. Common expense.
C. Indirect expense.
D. Direct expense.
E. All of the above.

33. A cost that remains the same in total even when volume of activity varies is a:

A. Standard cost.
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E. Break-even method.

35. During its most recent fiscal year, Simon Enterprises sold 200,000 electric screwdrivers at a price of $15 each. Fixed costs amounted to $400,000 and pretax income was $600,000. What amount should have been reported as variable costs in the company's contribution margin income statement for the year in question?

A. $1,000,000.
B. $2,400,000.
C. $1,600,000.
D. $3,000,000.
E. $2,000,000.

36. When graphing cost-volume-profit data on a CVP chart:

A. Data points always represent expected future points.
B. Units are plotted on the horizontal axis; costs on the vertical axis.
C. Units are plotted on the vertical axis; costs on the horizontal axis.
D. Both units and costs are plotted on the horizontal axis.
E. Both units and cost are plotted on the vertical axis.

37. A cost that changes in proportion to changes in volume of activity is a(n):

A. Product cost.
B. Differential cost.
C. Fixed cost.
D. Incremental cost.
E. Variable cost.

38. The margin of safety is the excess of:

A. Expected sales over breakeven sales.
B. Break-even sales over expected sales.
C. Expected sales over variable costs.
D. Expected sales over fixed costs.
E. Fixed costs over expected sales.

39. Cost-volume-profit analysis is based on three basic assumptions. Which of the following is not one of these assumptions?

A. Sales price per unit remains constant as volume changes.
B. Total fixed costs remain constant over changes in volume.
C. Curvilinear costs change proportionately with changes in volume throughout the relevant range.
D. Variable costs per unit of output remain constant as volume changes.
E. All of the above are basic assumptions.

40. A company has fixed costs of $90,000. Its contribution margin ratio is 30% and the product sells for $75 per unit. What is the company's break-even point in dollar sales?

A. $300,000.
B. $ 60,000.
C. $128,571.
D. $180,000.
E. $210,000.