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The Use of Technology to Enhance Individualized Learning in Postsecondary Educational Students with Multiple Intelligences in an Anatomy and Physiology Classroom

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THE USE OF TECHNOLOGY TO ENHANCE INDIVIDUALIZED LEARNING IN POSTSECONDARY EDUCATIONAL STUDENTS WITH MULTIPLE INTELLIGENCES IN AN ANATOMY AND PHYSIOLOGY CLASSROOM

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Abstract

This purpose of this dissertation was to determine whether or not the use of computer enhanced supplemental material in a postsecondary anatomy and physiology classroom would be perceived to positively affect students' opinions regarding their acquisition of classroom instruction. There were a total of 15 students who participated in this qualitative case study. They participated in a Multiple Intelligences Classification Survey upon the beginning of class and took part in a lecture on the cardiovascular system from an educator employed with the institution where the study took place. Students then viewed a supplemental video provided by the researcher which contained information very similar to that day's lecture material. Directly afterwards, they participated in a Teaching Methods Survey. This survey contained 18 structured and four semi-structured questions for students to rate their comprehension of the day's learning materials, both before and after the supplemental information was provided. It also offered an opportunity for students to comment on how they best felt they learned new information and how they perceived the information presented in the supplemental video. Results were most often neutral to positive in answer to the structured questions and students were positive and succinct with their comments on the semi-structured portion of the survey.

Dedication

To my best friend and partner in all things. Christopher Stanley, this accomplishment is as much yours as it is mine. I love you.

Acknowledgements

Lao Tzu once said, “The journey of a thousand miles begins with a single step.” I could not agree more in this instance. The journey which led to the completion of this dissertation has been filled with challenges and successes, both of which were met with perseverance and tenacity. There have been many who travelled alongside the path and offered guidance, insight, and support during the times when it was most needed. I am forever grateful for each person who played a key role in the culmination of this journey, for without them, this study would not have been completed.

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To my children -- Brayden, Lauren, Carly, and Connor -- my wish is that you never listen to the prejudices of society, that you choose a career in life which invokes passion, and that you pass on the knowledge and skills God has blessed each of you with to others as you grow in both age and maturity. I love you all more than you will ever know.

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Chapter I: Introduction

Today's learning experience is immeasurably different from that of previous decades. The speed at which our world is progressing demands that students are competent in many areas of everyday life. This presents a difficult challenge for the modern educator, although not impossible. All students bring with them a unique style of learning which matches every student's individual personality. This is the accumulation of a student's innate learning ability and the unique skills and techniques this student has acquired over the course of his or her time in the educational system and throughout life, in general. It is important that educators understand all students are not going to learn the same way; however, there are core similarities between different learning styles and a thorough understanding of these similarities may help in the fulfillment of the immense duties of an educator. These core similarities and educator duties are concepts to be discussed throughout this study.

Indeed, it requires all types of learning to match the various attributes deemed necessary to ensure the continuity of our society in terms of advances in technology, ingenuity, healthcare, political science, literature, and other areas (Connerr, 2008). Each style is valuable and each educator must understand every student will not possess the educator's unique style of learning. However, it is imperative every

educator has the capability and willingness to adjust his or her classroom curriculum in such a way that every student is offered the same opportunities to acquire the information presented so each student may use this information to the student's utmost potential (McKeachie, 1995).

It has been said that if a student's learning style is properly recognized and nurtured sooner rather than later, learning may become a lifelong journey instead of something which must be completed to earn a diploma or degree (Fuller, 2004). This new learning can potentially spark an interest in an area previously unknown to the student. If the student learns a new concept and can relate this concept to something of interest, there could be thirst to learn even more about a completely new subject. Conversely, if a student's proper learning style is never addressed, many students feel incompetent and subpar to their peers (Fuller, 2004). They would rather do anything else but coursework and simply complete the necessary material to finish the tasks required, thus leaving a mountain of potential untapped. One problem facing current postsecondary classrooms and educators today is the method by which students are taught. Educational organizations, in general, have fallen into a routine where the information is didactically presented to a student and the student is expected to learn this information with the ultimate goal of having the ability to recall the information when asked, albeit in a slightly varied form, on an assessment. The term "didactic" in this paper refers to "involving lecture and textbook instruction rather than demonstration and laboratory study" (Encyclopedia Brittanica, 2014). Howard Gardner called this the "correct answer compromise" (Brandt, 1993, p. 5) and

believed schools and current educators equate this level of rote memory as to understanding when, in fact, it is not an understanding of the material (Brandt, 1993). Gardner further explained that cognitive research over the course of the past two to three decades has shown students do not have the capabilities to understand the information presented in one class setting and utilize that same information if presented differently in an altered setting unless the information has been presented to them in various forms or unless it appeals to their own personal multiple intelligence strengths (MI) therein (Brandt, 1993).

Background of the Study

One of the myths which has emerged from Gardner's Theory of Multiple Intelligences is the thought that learning styles and multiple intelligences are one and the same (Gardner, 2011). He explained that learning styles are actually ways in which individuals approach the things they do. Students may approach learning a new concept with auditory, visual, kinesthetic, tactile, or a combination of methods. In essence, auditory learning styles are going to be best utilized through hearing a concept while visual learning styles will require actually seeing the material. Kinesthetic and tactile learning styles will normally need hands-on methods to efficiently understand the concepts presented and students with a combination of these learning styles have found that various methods will help them understand the information much more quickly depending on the actual way it is presented (Checkley, 1997). Multiple intelligences, on the other hand, are the innate abilities by

which we can interpret and respond to different content. While a learning style is a useful tool to help in the learning process when a new task or subject is introduced, ultimately it is the multiple intelligence of the individual that is used to learn the task or subject. The learning style is simply the way the student approaches the situation (Checkley, 1997).

Today's postsecondary educational classroom can prepare students using their unique styles of multiple intelligences by teaching students in different manners. The educators of today can attempt to classify students based on their respective multiple intelligence (MI) and subsequently adapt the curricular approach to meet the needs of their particular classroom and its atmosphere. These needs may be met by incorporating technological tools, supplemental videos or audios, supplemental readings, or any combination thereof, which could possibly reach all students in a single classroom. This would ensure each student receives information designed for his or her strengths and has the potential to cognitively meet course objectives.

With this being said, it is understandable that educators could misinterpret this additional supplemental acquisition to be a cumbersome task expected of a teacher already working overtime to meet the requirements set forth by his or her respective institution. However, within postsecondary educational institutions (career colleges) training students to work in the field of healthcare, it is the job of educators to actually understand students' capabilities and assist them in learning every subject presented in as much detail, and as efficiently as possible. This is vital for all

students. Once these students graduate, they will be entering the work force and treating and/or educating patients on a daily basis about some of the very topics they learned in the classroom.

Each subject required in a career college, as in any educational institution, may be adapted to meet the needs of the MI of a student with a little creative thinking and a short amount of actual time commitment on the part of the teacher due to ever expanding advances in today's technological world. If we, as educators, are capable of demonstrating a bridge between the subject matter and the benefits/life implications of learning that subject matter, our students may be more avid learners and more attentive in class because they would be more interested in the material due to its presentation and the outcomes.

This may actually help answer the age-old questions, "Why do I need to learn this?" and "When will I ever use it in my lifetime?". These questions are likely asked on a daily basis everywhere in the nation, no matter if it is at the elementary school level or the postsecondary school level. Students will always question the importance of a subject if they do not understand its relevance.

One potential method to help with the creative learning process is to have an educator vary the curriculum in a portion of the lesson that students may have historically found confusing and utilize technological resources or supplemental materials to help individualize learning in this portion of the lesson. If done effectively, this will engage more students in the lesson because they can visualize the

importance; likewise, there is a greater chance these students will retain the pertinent material for a longer period of time.

One must not under-appreciate the value of commonly found tools often available to educators in their institutions: computers, projectors, Microsoft PowerPoint, the Internet and email. These tools, which are considered common to virtually all people today, have only been prominent in the most recent few decades and yet have revolutionized the educational system. Nearly all school and university systems are connected online, from simple email to entirely basing their educational process online. One study has shown that students prefer PowerPoint and will respond on a positive level when used (Apperson, 2008). PowerPoint, in particular, has allowed educators to display their ideas and information through vivid content with graphics and images designed to illustrate the lesson objectives. Utilizing the prepared slide-by-slide content saves the educator the physical time it would take to draw out often complicated illustrations.

Another advantage of PowerPoint, and computer projector use in general, is the ability of the instructor to capitalize on modern day media advances as well. Utilizing a computer projector allows the instructor to display previously prepared content to the students often at a high production quality. By displaying high quality production in the education of students, the modern day education system has shifted to a high quality system of education. One study illustrates the relationship between overhead lectures versus PowerPoints and finds that PowerPoint students scored

higher on certain exams with a significant factor being the difficulty of the lecture material (Szabo, 2000). Previously, board content needed to be handwritten along with other classroom materials such as examinations. Papers were another major portion of the academic process expected to be written by hand. Modern technology has made it so virtually anyone in the country can access a computer with Internet and word processing technologies even at a local library. This has revolutionized, modernized and substantially increased the quality of education itself.

Among all of the resources available to enhance the process of education, there are several that are among the most notable. First, is Microsoft, which provides computer software and office software like Word and PowerPoint. These products have substantially impacted the conveyance of information between the student and instructor. While it should be noted that other teaching supplements must be used alongside technology in order to fully relate to all students in the classroom, PowerPoint has been shown to cause a difference in the ability of a student to understand a more complex topic as it may be presented on an assessment (Nouri & Shahid, 2005). Another tool that has substantially enhanced the process of education is the Internet, and from that can be accessed a variety of outside resources designed to differentiate the delivery process and supplement the achievement of various course objectives.

One example of an outside resource to differentiate the delivery process and be useful in the supplementation of an educator's didactic delivery approach to

learning the curriculum course objectives can be found through a website known as Education-Portal.com. This particular website is owned by Remilon, LLC. The founding company is comprised of 50 employees and over 200 subject matter experts as well as video/text editors who contribute on a wide variety of academic subjects to meet the everyday needs of students at both upper level secondary education as well as college level courses (Remilon, 2015).

The overall goal of Remilon and Education-Portal is to offer students a way to obtain college credit by providing an online method of engaging, visually stimulating, and collaborative multi-media lessons presented in short segments. These lessons are designed for even the most inattentive students to gather their curiosity and intrigue, thus hoping they will find a correlation between the lessons presented to some real life concept and return for even more learning experiences (Remilon, 2015). So far the data suggests over two million students have had learning experiences through Education Portal in 2012 and the numbers continually climb (Remilon, 2015).

The original objective of this website was to provide an alternative to the rising costs associated with obtaining a college education; however, the company has come to realize its video lessons are being used in various formats and much of this appeal has to do with the fact that the lessons appeal to diverse learners, not specifically one particular genre (Remilon, 2015). Educators have begun to use the short multi-media lessons as a supplemental tool in their classrooms to reinforce concepts that some students may have trouble understanding. The lessons consist of

cartoon animated graphics combined with human voice instruction as the lesson is presented in the hopes of relating the course material to real-life concepts and real world analogies that students can grasp more easily than they often incur in the classroom setting alone.

Also, each lesson contains a transcript of the exact lecture for those students who prefer to read along with the instructor as the lesson is presented and there is a short quiz at the end of each lesson to help reinforce the objectives covered within the lesson (Remilon, 2015). Students have the ability to access the information from literally anywhere with a web connection and can do so at their leisure; therefore, they may use these lessons to reinforce concepts that are vague to them during individual study time. Also, by using these tools as a supplemental piece inside of the classroom, educators could potentially reach all MI styles of learners due to the differences with presentation combined with the didactic teaching methods educators have been using thus far.

In general, technology is not likely to disappear as long as we have a need for acquiring new information. This concept is meant only to be used as a tool or catalyst to help educate and generate ideas from students by allowing them to use their own intelligence strengths so they may explore subjects for themselves by way of these technological tools in a classroom setting (Weiss, 2000). Merriam-Webster defines technology as "the capability given by the practical application of knowledge" (Merriam-Webster, 2013). Technology is not meant to be the crux of the educational

process. It is simply meant to assist the student as he or she works through the scope of course objectives, such as a calculator or pen would assist them with the completion of an assignment. This process should, therefore, help the student delve further into his or her mind to generate new ideas, explore ideas which have already been planted, and find feasible solutions to certain hypothetical problems which have been created by the educator as part of the complete classroom experience (Weiss, 2000).

As for technology in the classroom, many students do not excel in the use of computerized equipment. However, more often than not, we encounter educators who lack this level of intelligence because of a generation gap due to computer technology being a more recent event in relation to the ages of educators and students (Garcia & Qin, 2006). It is important for students and educators to understand that simply placing a piece of technological equipment in a classroom is not enough to help students who need multiple approaches to learning. They must be adequately trained on the proper way to manipulate various supplemental devices used and gain insightful information which may then be utilized elsewhere as various situations deem appropriate.

Statement of the Problem

The problem in today's postsecondary educational classroom is that educators do not necessarily utilize available resources to address all types of multiple intelligences, and thus all students, in the day to day activities pertaining to the

acquisition of new course content. These students may not understand the scope of the material the way it is delivered and are therefore not achieving as high on assessments as they might be capable of if there was a more varied pedagogical approach which could incorporate their individual needs as based on a student's respective multiple intelligence strengths.

Purpose of the Study

The purpose of this study will be to examine whether or not the use of computer enhanced supplemental material in a postsecondary anatomy and physiology classroom is perceived to positively affect students' opinions regarding their acquisition of classroom instruction before and after use of the additional material.

Rationale

Despite the technological advances in society today, countless students are falling through gaps in the educational process due to a variety of reasons. The student may not fully grasp a particular concept in a subject due to a communication problem based on learning acquisition (MI) and is thereby incapable of building upon that structure. Yet, that student may understand the concepts if they were presented in a different instructional approach or classroom setting (Gardner, 2011). However, this student may not have the cognitive ability to relate these concepts outside of the classroom when needed in another setting such as a physician's office or patient care center. The student may have the potential to learn the information presented and

retain this information, but he or she will have to utilize his or her multiple intelligences and unique learning style to grasp the concepts the way they will remember them.

No matter the reason, we cannot expect to simply place a computer inside each classroom or provide teachers with an interactive whiteboard for classroom use if there will not be instructional improvements as a result of these actions. It is imperative that educational organizations function not only to the best of their ability in terms of delivering content, but they should also be continuously reassessing and readapting teaching styles to supplement their curriculum. Teachers in all educational organizations should assess and adapt their pedagogical styles in order for students to learn efficiently. This could help decrease the risk of a student falling behind due to a technical matter which could have been avoided by simply adding a small amount of effort and attempting to relate to that student's MI strength.

Of significant importance is the understanding that using a technological tool to supplement the delivery of lecture material is an attempt to expand upon the variety of multiple intelligences inside any one classroom at any particular school during the course of a day. The technological tool used to supplement delivery of lecture material would not necessarily change the overall material delivered; rather, it would expand pedagogical approaches to reach a wider range of multiple intelligences and appeal to more students in a classroom.

Research Questions

There are two questions this study will attempt to answer:

Research Question 1: How effective do students with differing main multiple intelligence (MI) classifications perceive classroom instruction to be before and after the supplementation with computer enhanced technology as a delivery mechanism?

Research Question 2: Is there a difference between the perceptions of students with linguistic, logical/mathematical, spatial, naturalist, musical, bodily kinesthetic, or inter-intrapersonal main multiple intelligences?

Significance of the Study

The issue of individualized learning has become a top priority in postsecondary educational institutions such as career colleges because of the wide variety of educational needs. It has been found that many of the students who enroll in career colleges actually were enrolled in community colleges or universities and did not succeed due to larger class size, an increased number of students in the general campus population, and incompatibilities in the instructional methodologies educators used at the students' former institutions versus the career colleges (Corrado, 2014). This does not mean all community colleges and universities are too large, have an overabundance of students in the classroom, and have a limited amount of educators willing to adapt teaching methods. The statement is simply being made that some students need smaller classroom sizes and a smaller campus size to feel they can be successful on a daily basis.

There are limited studies on career colleges and the use of computer enhanced technology as a supplemental tool for teaching. Likewise, there are limited studies on career colleges and multiple intelligences. One study, *An assessment of student preferences for PowerPoint presentation structure in undergraduate courses*, showed a positive relationship between classroom experiences and the use of technology as a supplemental tool for teaching (Apperson, 2014).

This study intends to examine the multiple intelligence profile of every student enrolled in one anatomy and physiology classroom in a career college in Mississippi, which would equate to approximately 15 students and one teacher total. It also will examine, via a qualitative survey of the same students, whether or not the students perceive the incorporation of supplemental technology material to help with the inquisition and retention of course objectives in a single lesson.

Definitions of Terms

The following terms are taken from Brualdi (1996):

Learning Styles- the overall characteristics of cognitive, affective, and physiological factors that serve as indicators of how a learner will perceive, interact with, and respond to his or her learning environment.

Multiple Intelligences- the theory that an individual possesses strengths in multiple areas of intelligence and can therefore use these strengths to enhance his/her ability to learn new information by altering the style in which it is presented.

Intrapersonal Intelligence- the ability of an individual to understand his own feelings, thoughts, beliefs, and reasoning.

Interpersonal Intelligence- the ability of an individual to discern the beliefs and reasoning of others.

Logical/Mathematical Intelligence-the ability of an individual to use deductive reasoning, detect patterns, and think logically.

Linguistic Intelligence- the ability of an individual to use language as a means to clearly express himself or as a means of remembering concepts and information.

Musical Intelligence-the ability of an individual to recognize pitches, tones, and rhythm.

Bodily-Kinesthetic Intelligence- the ability of an individual to use his or her mental ability to control his physical movements.

Spatial Intelligence- the ability of an individual to form and manipulate mental images to solve problems.

Assumptions and Limitations

One assumption of this study is the fact students will consent to participating fully and to the best of their ability regarding the inclusion of a multiple intelligence profile as well as an anonymous survey based on the acquisition of material presented in an anatomy and physiology class. Another assumption is that the material presented in the classroom will meet the same course objectives as that of the

supplemental materials, thereby providing students with more than one way to effectively learn the material. The third assumption is that a second experience with the original approach would have provided a similar outcome. This is an unknown factor, however, and also serves as a limitation in the study. The fourth assumption is that the teacher will carry out her classroom instruction as if this research study was taking place on a normal day and not attempt to change her instruction due to this study.

One important limitation on this study was the geographic location of possible research sites. It was difficult to find an educational organization where the administration was willing to participate in a study based on curriculum and instruction in the classroom. An educational entity was found and this research study began to take form. Due to the qualitative nature of this study, there will be a much stronger focus of student perception as to their acquisition of learning the material. A qualitative study will also allow a more open avenue to discuss variances in student responses and possibly provide insight a student may have on his or her respective intelligence. It should also be noted that any research into the implementation of supplemental technology to assist with traditional didactic professional teaching implies absolutely no negativity towards the educational approaches involved. Finally, it should be noted as the literature suggests, the MI categories of students and educators should be considered equivalent and no category of intelligence should be considered superior to another.

Nature of the Study

This qualitative study will be conducted using exploratory case study methodology from information provided by anatomy and physiology students via a structured and semi-structured questionnaire to be completed at the end of the learning process. The students (approximately 15 in total) will first take a multiple intelligence classification questionnaire, which will be analyzed after all data has been obtained and the research analysis phase begins. One instructor will also take the MI questionnaire to determine his or her classification for analysis purposes only. Only one class will be tested for purposes of this process. The students will then participate in a lecture provided didactically by their anatomy and physiology teacher. After the didactic lecture, students will participate in a short lecture where supplemental videos are shown in the classroom which closely relate to the material presented immediately prior. Students will then participate in a qualitative survey comprised of structured and semi-structured questions to determine if utilization of the video helped with acquisition of the lesson and/or retention of the topic.

Organization of the Remainder of the Study

Chapter Two is a review of the literature that examines research which has been conducted on multiple intelligences, adaptation of general learning styles as an individual ages, varying one's pedagogy to include a variety of teaching methods, the use of technology as it applies to today's classroom and how it can benefit students as

well as educators, and the importance of accepting a variety of intelligences so students are not misclassified as being disabled or having a learning problem.

Chapter Three includes the philosophy and justification of the study, reiterates the research questions, and examines the methodical approach. This chapter also addresses the research design strategy and examines measures used in the study. Participant selection as well as data collection procedures are included. There is also an explanation of the chosen mechanism for data analysis. This chapter concludes with methodology limitations and ethical considerations of the study. In Chapter Four, the results of the study are presented. Chapter Five includes a summary of the research comprised of a final analysis, review of the results, findings in the context of the existing literature, implications for educational practice, and suggestions for future research.

Chapter II: Literature Review

The terms "learning styles" and "multiple intelligences" refer to different concepts. Nevertheless, they are often used interchangeably by many educators and even experts in the field of educational research (Gardner, 2011). The relationship between the two terms is exemplified in the study *Multiple Intelligences and Learning Styles: Two Complementary Dimensions* (Denig, 2004). It is sufficient to say just as learning styles are generally defined as a broad spectrum of cognitive, environmental, and physiological factors which indicate how an individual will perceive, interact and respond to the immediate environment, multiple intelligences essentially serves the same purpose even if approached from a slightly different angle.

Students will adapt their multiple intelligence styles from a young age as well as their learning styles. A study conducted by Johnson (2008) showed that adult learners, at an early age, would begin adapting the concepts needed to acquire information presented to them even if they did not comprehend the exact material being presented. This is common in many schools today and has been the status quo throughout history due to the fact educators will usually deliver the material based on how they best acquired the information and not necessarily on how they believe the diverse students in the classroom will benefit from the acquisition of information (Stitt-Gohdes, 2003). One significant problem with this approach is that in the world of healthcare, simply attaining information to master a course is useless if a student

cannot understand the implications of using the material to educate patients or assist with treatment delivery.

Even the most exceptional academic students have been known to find themselves weak at times when it comes to the ability to use one set of concepts gathered in a setting, such as a classroom, and apply them to a different type of setting, like the workplace or another type of subject area (Brandt & Gardner, 1993). Furthermore, no matter the vocational discipline, students will essentially revert to the ideas and concepts they learned from an early age when exposed to new material if this material is difficult to grasp or the concepts are too vague for their cognitive recognition (Brandt & Gardner, 1993). The ideas expressed by Gardner came from his original work, *The Unschooled Mind* (1991) and have been cited in many articles on related subjects since (Armstrong, 2009;Wiggins, 2005). Many adults never fully understood foundational concepts in elementary school and this causes an obstacle in their postsecondary learning if they are unaware of their unique multiple intelligence classification and/or learning style in an educational setting.

As for the learning techniques of an individual student, Gardner believes there are multiple ways each individual accepts new material. As new information begins to be acquired by a student, the student's brain starts to categorize the various environmental stimuli it receives as a result of this acquisition through each of the senses (auditory, visual, kinesthetic, etc.). The student's brain then further assesses these categories so more knowledge may be gained from whichever stimulus is the

least understood. This is basically how we, as humans, question and examine various processes and learn on a daily basis (Weiss, 2000).

It is often because of this categorization that some students are wrongly classified as having a "learning disability" when, in fact, they simply have a different type of multiple intelligence than that of their various instructors and the instructors are either not capable or not willing to understand how best to deliver the pertinent information in a way for the student to better comprehend on a daily basis. As Hannah and Shore (1995) indicated, this will often happen in the case of gifted children who have a particular style of multiple intelligence and are bored with the instructor's teaching style because it does not correlate with their style of acquisition. This article is supplemented by a work titled *Smart and Bored: Are We Failing Our High Achievers?,* in which the issues of multiple intelligences in a classroom are exemplified (Cleaver, 2008). In such cases, a more diverse teaching style could greatly impact these students and possibly decrease the number of "learning disabled" students in our schools today (Hannah & Shore, 1995).

Shore (2004) found that if educators were willing to connect with students and understand their multiple intelligence needs, thus teaching the curriculum with that instructional aspect in mind, it would greatly help further the student in regard to grades and lead to more efficient learning as well as more successful overall assessments. Cranton (1996) also found that educators have the ability to successfully develop their individual classroom curriculum over the course of the

short term by increasing student participatory methods rather than simply teaching by didactic methods and only appealing to one set of learners. Other studies have cited and related to the same idea in studies since, including an updated study by Cranton (2002). Also, more learning centered decision making as well as more focus on problem solving skills and critical thinking skills help advance educators in a positive direction with regard to incorporating multiple intelligences into their classrooms from the first day of instruction (Cranton, 1996).

As for the traditional "pen and paper" testing method, studies have shown these assessments are inconsistent with all levels of multiple intelligences and the students who do not perform satisfactorily could require a more in-depth approach in relation to various other intelligence modalities if they are to be accurately assessed (Gardner & Hatch, 1989). For example, a student who has a high MI style in interpersonal skills will not perform as well as one who is naturally inclined in the linguistics and mathematics reasoning styles of intelligence. One such study conducted in 2008 focused on the effects of a multiple intelligence teaching strategy on student performance and greatly exemplifies this (Douglas, 2008). Unfortunately, however, the linguistics and mathematics reasoning styles are used in assessments today and many other areas of intelligence are not assessed at all, thus rendering those students as weak when this is not necessarily the case (Gardner & Hatch, 1989).

It is vital for all students to learn as early as possible how to correctly interpret the knowledge they have acquired if they are to be successful in their future

endeavors. Gale (2012) conducted a study to determine to what extent individuals were mentally capable in leading various levels of business as it related to different multiple intelligence categories. These categories were interpersonal, intrapersonal, and logical/mathematical (Gale, 2012).

It was determined by researchers that the employers sought these categories of individuals more in the area of business, especially in terms of leading a department or organization. The study also suggests that earlier MI testing in an individual's career would be beneficial to assist with the placement of that individual into a job which would enhance the quality attributes and skills to help the respective organizations as well as the individual and his character (Gale, 2012). It is vital for career college instructors to understand the various multiple intelligence classifications of their students and adapt to their needs to ensure a positive work experience upon graduation (Gale, 2012).

According to Alaie, Teller, and Qiu (2012), teaching tools in the classroom are in need of a major overhaul. Hunter College developed a module which could assist with the analysis of biological data and also be used to help teach students the basic skills required for quantitative statistics as it relates to the biological sciences. This module actually prepares the students for more advanced studies in the sciences and gives them the extra knowledge needed in addition to the basic requirements they would normally have upon entering an upper level science classroom at a college level setting (Alaie, Teller, & Qiu, 2012). Brown (2007) also conducted a study

inclusive of psychology, education and computer science. This study was to determine whether adaptive educational hypermedia could be used to help students with various learning styles on any academic level. Unfortunately, this particular study did not find conclusive results indicating the hypermedia to be helpful in any academic setting with all individuals. This led me to hypothesize that the earlier a student is exposed to an integrated curriculum, the more the student can be prepared for what lies ahead in terms of academic instruction and how best to interpret curriculum delivery.

Online Instruction in Education

As individuals, we have undergone changes in our daily lives. This has crossed over from personal aspects to business aspects; similarly, the educational needs of students have also changed with the trending population. Modern technology has moved into the classroom through the use of interactive whiteboards, advanced computer software, educational teaching platforms to assist with curriculum delivery, and social media, to name a few. Online education at the postsecondary level has become increasingly more popular within the higher education industry as it provides an option for students seeking higher education who do not want to be limited by time or physical location (Tyler, 2011). The popularity of online education has not come without challenges as many critics have questioned the rigor and quality of its instructional practices (Tyler, 2011).

Even with the challenges, many online program options are doing an exceptional job with regard to creativity and innovation (Cooper, 2008). As online instruction has been developed, there has been a driving force to help students with the discovery, integration, and application processes of curriculum delivery within the confines of an online portal. Ensuring the multiple intelligence needs of enrolled students are met has made the use of an online option in education a viable and rich alternative experience (Cooper, 2008). One educational institution currently benefiting from the use of an online instruction model is National University. The online option in higher education has almost replaced the on-ground option in their School of Education. Of the 1,200 students enrolled in the Education Administration program, 900 have chosen the online format. Each class in the program, with limited exceptions, has the reputation for providing a rigorous delivery method quite competitive to the on-ground/traditional option (Tyler, 2011). A review and analysis of learning style assessments along with aligned professional development training(s) are the key ingredients for the effective integration of multiple intelligences into the online learning community (Cooper, 2008).

Multiple Intelligences in Higher Education

When teachers are faced with a wide range of intelligences, they should modify and/or augment their curriculum to meet the many and varied learning profiles and abilities of students (Anderson, 2007). According to Servilio (2009), there is a level of academic diversity in the classroom today that was unheard of a

decade ago. Adapting instructional practices to meet the needs of all students in a classroom is not only critical at the elementary, middle, and high school level, but learning styles must be respected in higher education as well (Cash, 2011). If differences in learning styles are not respected, learners will become frustrated, confused and unwilling to participate in the learning process (Cash, 2011).

As stated previously, Gardner (2006) believed every person possesses a certain degree of all multiple intelligences, albeit favoring one or more intelligences over the others. He later went on to say the need to differ instruction based on MI differences is not a new phenomenon due to the fact many of our schools began as nothing more than one room school houses (Gardner, 2009). Carol Tomlinson (2001) felt the differentiation of instruction is nothing more than adapting an educator's instructional methods to accommodate various differences in their particular group of students. She felt student readiness, interest, and learning style must all be made a factor to achieve the maximum level of cognitive acquisition at all levels of learning. Within the higher education classroom, teachers can utilize a variety of methods on any given topic. The physical environment of a classroom may also be manipulated to set the conditions for teaching and learning (Anderson, 2007). Finding content which directly relates to students' interests is also a way to accommodate students as they are more likely to be genuinely interested in certain subjects more than others (Anderson, 2007).

Schmoker (2010), a critic of those educators who favor the individualized approach to teaching, insisted that a more standardized pedagogical approach to teaching is necessary for student success and believed acclimating to a student's unique learning ability is not necessary. While Gardner (2006) did indeed agree multiple intelligences are a pluralistic view of the mind and they account for a majority of the way individuals act, he countered that intelligence is a synthesis of both the biological and psychological. He also believed its learning potential is enhanced by experiential, motivational, and cultural factors (Gardner, 2006 & Gardner, 2009).

The original intention of Gardner's (2006) work was to be used in the world of psychology; however, learning theorists found increased uses and value in its level of connectivity and relevance to the world of education. Being attentive to the multiple intentions in higher education as educators work throughout a daily basis assists the educators to reach a deeper level of content and/or skills acquisition (Anderson, 2007). Gardner (2006) suggests the use of "multiple entry points" in postsecondary education. He believes for the purpose of some standard or form, MI should be used at every phase of the instructional process in any variety of ways: planning, implementation, and assessment. Multiple Intelligences is a superior framework to facilitate creativity within the confines of the classroom. Educators who have used MI from elementary to postsecondary education have found that when students are given the choice of how they will demonstrate mastery, they gravitate

toward their respective stronger intelligences rather than those weaker in comparison. Multiple Intelligences allows a teacher a new perspective with which to focus on her students (Gardner, 2006).

Multiple Intelligences as a Tool for Learning

The backlash against the Student Scholastic Assessment Test (SAT) and standardized testing in general gave momentum and offered an extra push to the world of higher education in regard to new ways in which colleges and universities could judge a student's creativity and knowledge. They also provided an open door for using multiple intelligences as a tool for teaching and learning. This and many other trends are an offspring of the higher intelligences (Anderson, 2007). The publication, *The Frame of Mind: The Theory of Multiple Intelligences* was the publication which gave fair credit to MI at all levels of education (Gardner, 2009). Multiple Intelligences crystalized the view that there is no single measure of intelligence such as the traditional intelligence quotient used to establish an individual's I.Q. In accordance to Howard Gardner's classic theory, the notion that intelligence is inherited has been challenged. Intelligence can be nurtured; hence, the process of intelligence is evolving rather than remaining latent. These implications are especially crucial within the world of higher education (Jones, 2007). Howard Gardner (2009) asserts the implications of his work must go above and beyond theory or classic methods of teaching and learning. His work has even changed the structure of his own teaching practice as the traditional lecture was condensed to about 20% of

his presentation of academic content for collegiate audiences and professional practitioners (Gardner, 2009).

Linda-Darling Hammond, a professor of education at Stanford University called Gardner her "personal hero" as she believes what many educators in the world of higher education have believed for years. She believes there is and should be more than one "entry point" for access to higher education (Jaschik, 2008). Standardized testing is worth value as it measures concrete skill sets and acquisition, but it leaves out the variable plasticity for growth and development that we as humans all possess (Anderson, 2007). This would account for the capacity that we have to grow intellectually and academically as humans (Gardner, 2009). In terms of large and notable breakthroughs, one is the understanding that intelligence is not fixed and is not a single measure of intellectual capacity. This conceptual breakthrough has revolutionized classrooms internationally, even in the field of higher education (Gardner, 2006).

Multiple Intelligence Alternative Ways of Thinking

As evidenced by the review of literature, there is a level of criticism as well as a positive acknowledgment of Multiple Intelligence Theory. Willingham (2004) stated the writing on said topic highlights the theory, but does not offer negations to the argument. Additionally, Willingham (2004) asserted that few practitioners in the field of education could cite a solid critique on multiple intelligences and the conversations in large are euphoric in nature and perhaps one sided. Gottfredson and

Dreary (2004) insisted that the literature in psychometrics does not support the idea of eight separate intelligences. Instead, they believe there is evidence to support the idea of a single intelligence. This intelligence is known as the G (general ability). Gottfredson (2004) put together a battery of 16 tests which assessed Gardner's classification of multiple intelligences (two assessments for each intelligence). She then conducted research using these tests alongside a G (general ability) test. Students who scored higher on the G test would normally score high on the MI assessments she conducted as well. Conversely, students who did not score as well on the G test would not score as well on the MI assessments. These researchers argued that what Gardner referred to as multiple intelligences are actually secondary capacities to the "G" factor.

Results of Gottfredson's (2004) study were difficult to interpret. Standardized test scores were shown to increase in 78% of the 41 schools tested, albeit failing to show a statistically significant increase in each school. Also, there was no control group tested for this study and this method of study should have had a comparison base with which to draw valid conclusive information. Being that implementation of the project and the data collection was more consistent with a quasi-research design there is no way of knowing the true impact of MI with validity as the positive change could have been attributed to the excitement associated with the implementation of multiple intelligences. Lack of empirical rigor continues to be one of the indicators which is continuously making the argument against multiple intelligences lose its

momentum. In the review and analysis of the research on multiple intelligences, some critics have accused educators of using superficial applications in the implementation process. This criticism is also prevalent in modern studies on the subject such as Smith (2007) in his work titled *Howard Gardner and Multiple Intelligences*, which is a broad criticism of the multiple intelligence ideas expressed by Gardner in his works.

Chapter III: Methodology

Philosophy and Justification

One of the best ways to obtain information is through first hand direct observation. For this reason, this exploratory qualitative case study approach, as recommended by Robert Yin (1981, 2011), is taken to gather information from the student's perspective and examine the effects that adapted supplemental instruction may have on students with various multiple intelligences which may not coincide with those of the teacher, but could possibly benefit the student if alternative instructional methods were integrated into the daily course curriculum.

Procedures and Research Design

This research design will be explored from a qualitative approach. First, the multiple intelligence classification of each student and their teacher in the sample group will be determined. This will be determined by a Multiple Intelligences Questionnaire provided via Literacy Works (Multiple Intelligences for Adult Literacy and Education, 2015). There will also be qualitative data in the form of a survey instrument designed with open and closed- ended questions revolving around multiple intelligences that will be administered immediately after didactic instruction has been given and a supplemental video has been shown. These questions will examine the effects of the supplemental computer instruction in conjunction with didactic teaching

and how this is perceived to affect multiple intelligences in the group of anatomy and physiology students.

Research Questions

There are two questions this study will attempt to answer:

Research Question 1: How effective do students with differing main multiple intelligence classifications perceive classroom instruction to be before and after the supplementation with computer enhanced technology as a delivery mechanism?

Research Question 2: Is there a difference between the perceptions of students with linguistic, logical/mathematical, spatial, naturalist, musical, bodily kinesthetic, or inter-intrapersonal main multiple intelligences?

This study will attempt to collect data from the subjects and use this information for one of the following three outcomes. Either the supplemental material will be found to be of value and benefit to the subjects, regardless of multiple intelligences, the supplemental material will be found to be of no value or benefit to the subjects, regardless of multiple intelligences, or the effectiveness of the supplemental material will be found to be of value depending on the multiple intelligence characteristics of the individuals. Data will be collected through the use of an online survey administrative system to ensure anonymity and validity.

Theoretical Framework

The objectives and theoretical framework of this study represent a personalized approach to determine whether or not the addition of computer enhanced

supplemental material in a postsecondary educational anatomy and physiology classroom is perceived to positively affect students' opinions regarding their acquisition of classroom instruction before and after use of the additional material. There is a wide breadth in the design of qualitative case studies due to the fact these studies are designed to focus on each respective case study and its research question(s).

Two popular approaches, social constructivist and post-positivist, are widely used by researchers such as Stake, Merriam, and Yin (Hyett, Kenny, & Dickson-Swift, 2014). Merriam states the methodology of case studies to be "particularistic, descriptive and heuristic" (Merriam, 2009, p. 46). It is performed due to an interest in individuals or individual cases and a need to explore the reasoning behind these individual cases. There is a need to impart an understanding of perceptions, phenomenons, interactions, and real-life experiences (Stake, 1995). Stake sums the qualitative case study approach best when he states that the approach "explores a real-life, contemporary bounded system (a case) or multiple bounded systems (cases) over time, through detailed, in-depth data collection involving multiple sources of information… and reports a case description and case themes" (Stake, 1995, p. 97).

The social constructivist approach towards qualitative case study research will most often utilize a personal interaction between the researcher and components of the case. It is presented to engage the reader and serves as a more interactive method

of inquiry (Stake, 1995). The postpositivist approach will develop a clear protocol to guide the case study research to both ensure validity and decrease bias. This approach normally includes some form of pilot phase to ensure all pieces of the case to be analyzed are done with an objective view whenever possible (Yin, 2011).

Variables

There are several variables to take into account when preparing for this study. The first variable would be the students. Each student is going to have differences in through processes, perceptions, levels of everyday cognitive thinking, and a multitude of other characteristics that will set them apart from one another. This study will be conducted via convenience sampling. Convenience sampling is one of many ways to collect data for research studies and Merriam (2009) believes it may be utilized effectively if the variable of convenience, by which the sampling method was so named, is taken into account. Another variable involves the importance of correctly classifying students according to their intelligence profile. The multiple intelligence classification tool used in this research was positively reviewed by Howard Gardner as well as other experts in the fields of psychology and education (Multiple Intelligences for Adult Literacy and Education, 2015). During the administration of this tool, it is also critical to have students understand the importance of answering questions as truthfully as possible while reassuring them that their anonymity will be protected under the laws of IRB.

A third variable in this study is the question of whether completing the study or not will have an adverse effect on students' grades in the anatomy and physiology class to be researched. It is vital to explain the importance of voluntary participation in this study. Also, it is important to explain the need for study completion and that no matter what the outcome of the study, a student's grade will not be affected either positively or negatively.

Research Design Strategy - Robert Yin's Concepts of Qualitative Research

Robert Yin (1981) is well known for his expertise in qualitative analysis as presented in *Case Study Methods*, *Qualitative Research from Start to Finish*, and *Case Study Research: Design and Methods*. His focus on qualitative research and, more notably, case study research demonstrates competence in the field. Case studies are a preferable means by which to conduct qualitative analysis, especially when researching on the nature or reason for a phenomenon (Yin, 1981).

While considering Yin's (1981) work, among other professionals such as Robert E. Stake and Helen Simons, Susan K. Soy (2006) deduces six steps while performing a case study. These procedures may count as some of those that Yin talks about as solutions to Miles' problems in his article about the crisis in qualitative research (Yin, 1981). The steps, as outlined by Soy (2006), may appear familiar to any professional researcher. The first step of the six is defining the research question. After the research question is defined, the researcher may then select a case and move to step two, which is to determine data collection techniques. Step three, data

collection preparation, is critical for the researcher because adequate preparation will likely achieve a more accurate and less biased outcome. During the data preparation stage, Soy, just like Yin, advocates for a pilot study to help identify any imminent obstacles that a researcher may encounter. Data collection, step four, is to be done in an organized way because the researcher will rely on this information for use in analysis of findings with the current study as well as possible use for subsequent studies.

In step five of Soy's (2006) article, she outlines a number of pointers to help in analyzing the data from the case study. The overview of Soy's fifth step is to be organized and systematic while wading through the data collected which largely coincides with Yin's (1981) ideas on handling data in his book, *Case Study Research: Design and Methods*. The sixth and final step in Soy's (2006) articles is to prepare the study's report for publication and presentation (Soy, 2006).

Yin (1981) believes that following three principles on case studies ensures that the research process is not biased. Nienhueser (2005), in his review of Yin's publications, also believes Yin's principles to hold truth. In his review, Nienhueser extracts from Yin's publication that multiple sources, creation of a sound research database and maintaining a solid chain of evidence ensures a non-biased study.

A review of qualitative case study reports classifies Yin's (1981) work as one that uses a post-positivist approach on case study research (Hyett, Kenny & Dickson-Swift, 2014). Yin (1981) advocates following a clear protocol through the case study

that ensures validity and avoids bias. The post-positivist approach ensures that the researcher objectively measures all the aspects of the case and sufficiently describes them. Hyett, Kenny and Dickson-Swift (2014), however, point out that professionals in research may have undervalued case studies. Yin (1981), in particular, as shown in the review, claims that case studies are weaker and are not as rigorous as other research approaches. According to Hyett, Kenny, and Dickson-Swift (2014), some researchers tend to deviate from the methodology that they had initially cited, especially when they referred to Yin's work.

Rademaker (2011), in a review of *Qualitative Research from Start to Finish*, states that Yin (1981) viewed qualitative research as a model worldview. According to Rademaker (2011), Yin was trying to show how qualitative research is a means of arriving at the answers to questions about the world. Rademaker (2011) also points out how Yin's approaches are adaptive. Any researcher reading Yin's book can easily find elements that can suit their particular research process. Rademaker (2011) recognizes Yin's perspective on the old-fashioned notion of literature reviews. He explains that Yin believed literature reviews may limit a researcher's results while in the field. The author, however, does not entirely rule out the importance of literature reviews; however, he put emphasizes the notion of digging deep in prevalent literature while being cautious of falling into trap such as faulty resources. Robert K. Yin has clearly left an indelible mark in the history of qualitative research methods.

Through the ideas presented in his publications, it is possible to conduct a sound and widely accepted qualitative case study.

An exploratory qualitative case study approach was chosen in order to gather information from the student's perspective and examine the effects that adapted supplemental instruction may have on students with various multiple intelligences which may not coincide with those of the teacher, but could possibly benefit the student if alternative instructional methods were integrated into the daily course curriculum (Merriam, 2009).

The purpose of this study is to examine whether or not the use of computer enhanced supplemental material in an anatomy and physiology classroom is perceived to positively affect students' opinions regarding their acquisition of classroom instruction before and after use of the additional material. In using this case study approach, all students and teachers in a single anatomy and physiology classroom will be first assessed with a multiple intelligences profile to categorize their individual style. They will then be asked to participate in a didactic lecture conducted by their anatomy and physiology teacher. They will then participate in a short computer video which closely corresponds to the course objectives previously taught. Students will immediately be asked to fill out a survey questionnaire upon completion of their taking part in the video supplement. The survey questionnaire will consist of structured and semi-structured questions to help examine the student's understanding of the subject matter during the didactic portion and then also with the

addition of the supplemental video. Students will have the ability to comment about the experience during the semi-structured piece of the survey. The information collected during this complete procedure will only be used to explain future implications and recommendations, if there are any.

Measures

This exploratory case study approach will be used to examine the participants' experiences after the completed procedure. Data for this study will be collected through a multiple intelligences classification tool and also a teaching methods survey tool with structured and semi-structured questions for every student. All data will be entered into the software of choice and key words will be coded to help with data analysis. Also, participant comments will be utilized to give further analysis into the case studies so a more thorough examination may take place (Merriam, 2009).

The teaching methods survey tool for this study has been prepared electronically. There are 18 structured questions and four semi-structured questions. Structured questions are for more objective questions with discrete responses while semi-structured questions are for more personalized responses. The software intended to be utilized is known as "Qualtrics" and this is done due to its ease of accessibility and use. Questions will consist of general academic related information of the subjects as well as relevant questions to the study at hand.

The semi-structured survey will be developed as open-ended questions and closed-ended questions that will examine the students' perceptions of the classroom

experience. A crucial piece to this study is the assurance of reliability and validity pertaining to the survey instruments. To ensure reliability and validity, the instruments will be assessed for face and construct validity. The multiple intelligences instrument has been well established in regards to validity and reliability already (Multiple Intelligences for Adult Literacy and Education, 2015). The final teaching methods survey instrument will be reviewed by an expert to determine that all questions are clear and concise while completely covering the material. The final teaching methods survey instrument will also be pilot tested in order for reliability to be checked in regard to consistency patterns for accuracy of data. The pilot tests will be performed on educators and students who are not participating in the actual study. The final teaching methods survey will then be edited as needed and reviewed by an expert in the field once more before data collection begins.

Sampling Design

Every student is going to have a multiple intelligence classification just as every teacher and each individual will have a MI classification which helps him or her in everyday life to learn new skills and put other skills to new uses. Because the aforementioned research type is qualitative in nature and the general population is small, convenience sampling will be used. According to Merriam (2009), this form of sampling is described as sifting through any potential subjects by the researcher in advance with the purpose to only study those subjects from who the researcher feels the most useful information can be acquired.

Also, by using a small convenience sample, this study will attempt to understand the concept of how multiple intelligences can enhance student learning and the how these effects are influential on individual students. The study will be accomplished more in depth due to a smaller sample size and will be more descriptive in its findings due to its qualitative nature. The sample size to be collected for this research study will be approximately 15 participants total. This will be comprised of approximately 14 students and one instructor. The participants of this study are predominantly African American, with a minority of participants identifying with a Caucasian ethnicity. Participants range in age from 20 years old to 53 years old and the majority of participants are female.

Data Collection Procedures

Through the use of an online survey software program, data from each subject of the study will be captured anonymously to help ensure the validity of the responses and study in general. The questions will be designed to assess each respective multiple intelligence classification and be more probative of the effectiveness of the supplemental material at the end of the study.

As for data collection procedures for MI; first, there will be a multiple intelligence classification profile to assess each student's respective strength category. This will be helpful as data is interpreted during the end process of the research study. Also, a teaching methods survey questionnaire will be employed. The questionnaire will consist of structured and semi-structured questions to be administered after

didactic teaching as well as the use of computer enhanced supplemental material. Both the MI classification profile and the teaching methods survey questionnaire will be conducted via an online modality compatible with NVivo software to ensure online data capture is successful and bias is not a factor. Students will take the survey through online software to ensure anonymity and validity.

Data Analysis

After all data has been obtained, any comments on the questionnaire will be transcribed verbatim and checked for accuracy by a person who is not participating in the research study. This should help with data quality (Patten, 2012). The analysis will consist of coding answers and key phrases into categories. This will be done with the use of a software program called NVivo. This software is well known for assisting in the identification of data codes, organization of data, and node identification. Various codes and categories will be derived from the survey and these will be presented via narratives to explain findings of the study. This should provide in depth answers to all research questions.

Limitations of Methodology

Upon making the decision to perform any study, it is natural to expect a set of limitations concerning the methodology. In general, the multiple intelligence profile as well as the questionnaire are completed from the perspective of the study participants and this has the potential to bring bias into the study. This potential for bias will be taken into consideration when interpreting results.

Also, it must be realized that due to this being a qualitative study versus a quantitative one, generalization of findings will be very limited. A larger population sample, a younger population sample, or population samples from other geographic and socioeconomic regions will likely generate different results than the results found in this study. It is important to understand the information found through analysis of data is pertinent for this particular population size, geographical area, and student demographics.

Ethical Considerations

The research study participants will be students and teachers who are affiliated with the school in which the study is to take place. Therefore, careful thought must be given to use gender-neutral words and phrases when at all possible to ensure anonymity as well as use non-descriptive phrases to avoid calling attention to an ethnic group, a gender, or a socioeconomic group. During the entire research process, the presence of the researcher will be minimal so there will be little chance of influence with MI profiles and/or survey questionnaires (Creswell, 2009).

This proposed research study will follow guidelines and specifications set forth by the Institutional Review Board with regard to participants' informed consent. These informed consent guidelines will be included in all initial correspondence with the sample population and school administration. All participants and legal guardians will be informed about the purpose of the study, the topics to be addressed,

participant confidentiality, and their right to exit the study during any time before or during this study process without violating obligations set forth (CITI, 2013).

Also, the importance of "risk of harm" is one to consistently be aware of when performing any type of study. While this research study will not use medications or tools to subject participants to potential harm, there will be survey questions presented to the participants. These should be worded carefully to avoid any miscommunication or unintended researcher bias. Likewise, the participants have the right to leave any survey questions unanswered and have the right to not participate in any or all parts of the research study if this is their choice (CITI, 2013).

Chapter IV: Results

The purpose of this study was to examine whether or not the use of computer enhanced supplemental material in a postsecondary anatomy and physiology classroom is perceived to positively affect students' opinions regarding their acquisition of classroom instruction before and after use of the additional material.

There were 15 students and one teacher participating in this study. Each student and the teacher took part in a Multiple Intelligence Classification Survey that consisted of 59 Likert style questions. The results of this survey provided each participant with their top 3 multiple intelligences as defined by Howard Gardner (Gardner, 2011). Each MI strength was also assigned a score varying between 1-5, with 1 signifying that the question did not apply to the individual at all and 5 signifying that the question strongly applied to the individual. The remaining multiple intelligences were also classified in this survey and scores were assigned to those as well. Upon completion of this MI Classification survey, students participated in a didactic lecture on the cardiovascular system provided by their instructor just as they would on a routine day. Afterward, students were shown a short supplemental video about the cardiovascular system with various pictures and interactive illustrations. Students then participated in completion of a Teaching Methods Survey. This survey consisted of 10 Likert style questions, eight closed-ended questions, and four open-ended questions.

Data Analysis

Information collected from both structured and semi-structured online questionnaires was read multiple times to closely understand and interpret student responses. Responses were coded to identify common themes and these themes were analyzed, relating them to the research questions and the main objective of the study. The process of data analysis has been described by Merriam (2009) as an action requiring the ability to consistently move between data and the concepts exposed, between descriptions formed by participants and the interpretations of those words through objective assessment. Thematic content analysis was used in identifying the common themes and any discourses from the transcription in order to capture representative and multiple individual perceptions. The actual definition of a theme has been defined as "an abstract entity that brings meaning and identity to a recurrent experience and its variant manifestations" (DeSantis & Ugarriza, 2000, p. 362). The information from open-ended questions was not as detailed as I would have preferred. Participants did not provide as in-depth detail with responses as was the expectation prior to this study. Because of anonymity being a factor, these students could not be approached for follow up questioning. Due to this, the use of NVivo was not required. Instead, information from the survey was transferred verbatim into an Excel spreadsheet so that themes could emerge for coding purposes. The spreadsheet also

provided me the capability to filter results, thus proving to be a useful tool in my study.

Description of Study Participants

A total of 15 students participated in this study. The majority of these students had four or more terms remaining before completion of their program. Three participants were taking the course for the second time, with two students reporting they had taken it prior to their enrollment in this particular course. The study participants were asked what they believed their grade currently was in the course being taken. Nine of the students believed they currently held an A, while four of the students believed they held a B in the course. However, two students believed they currently held a C and D, respectively. At this institution, the minimum grade acceptable for satisfactory completion of a course is a C. Students earning a D or F are required to take the course over if they want to progress in the program and ultimately graduate. The fact that a student held a D this early in the course suggests the student may not be acquiring the information as quickly as the others and this student's learning styles could be further explored to ensure the student obtains the needed information in a way they may understand. There are obviously other variables to consider when speaking of grades and academic performance, so one's MI classification cannot be held completely responsible.

During their time thus far in the course, 12 of the 15 students reported not to have been absent at all from the course. Two students reported having one absence in

the course. Active participation is one of the key elements of expressing satisfaction with the mode of teaching. It is also a key element to gauge student acquisition of classroom content. Active participation, as indicated on the survey, included asking questions, providing answers, and being actively involved in class discussions. Almost all of the students (12 of the 14 who participated in this question) agreed that they actively participated in the course discussions and activities. Only two students could not confirm whether they actively participated in class. Additionally, more than half of the students (10 of the 13 who participated in this question) felt they had a solid understanding of the lesson before any supplemental information was provided. However, one student disagreed and felt low understanding. Meanwhile, two students did not state whether they understood or not.

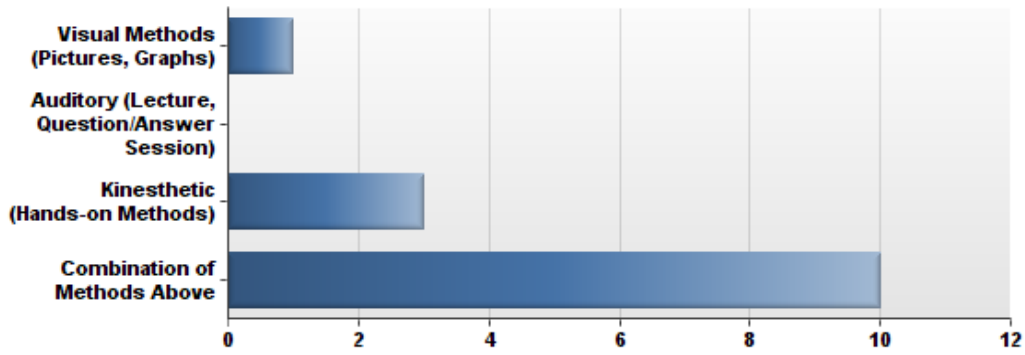
Research Question One

Research Question 1: How effective do students with differing main multiple intelligence (MI) classifications perceive classroom instruction to be before and after the supplementation with computer enhanced technology as a delivery mechanism? This section contains information regarding student perception in regard to how they perceived classroom instruction during the research study, both before and after the use of computer enhanced technology as a supplemental delivery mechanism. The information is based on themes which emerged upon analysis of the Teaching Methods Survey.

Most Effective Teaching Method

Students interviewed were asked what teaching method they felt helped them understand and retain the course information most effectively. Ten of the students preferred a combination of delivery methods which would encompass visual, auditory, and kinesthetic styles of teaching. These students did not prefer one style, rather perceived multiple teaching methods were most effective for them to retain the information presented in class. One student exclusively preferred the use of pictures and graphs and three students preferred kinesthetic methods exclusively. This is indicated in the figure below.

Figure 4.1: *Preferred Learning Method of Students*



Students had varying perceptions of how they best learned inside the classroom. When asked what method of learning they felt best helped them to retain the information, there were a variety of responses. Question 14 on the Teaching Methods Survey was adapted to ascertain what methods students felt they best learned. Comments made by students are listed below:

Q14. Please give a brief explanation…as to how you feel you best learn lecture materials…

Table 4.1: *Most Effective Teaching Methods- Student Comments*

I learn best by visual aids and hands on application. The more ways I can analyze the info, the better I can retain it.
Hands on training while listening Question/answer sessions
Listening and hands on training because I get it better.
I learn best with a combination of all the learning material. Seeing helps with reading.
The best way for me is repetition. I go over or hand write things over and over and over till it sticks.
Hands on training is the way I can learn without a problem
I learn best by practice and repeated flashcards (hands on training).
Hands on training
Flashcards or repeatedly writing information until it sticks with me.
Listening and hands on training. Also with a few questions and answers.
Personally I learn better by hands on training and visual listening methods.
Combination of all above, but flashcards most commonly.
Hands on training
I'm better one on one with a teacher learning hands on.
A combination of it all being that I am a very versatile individual

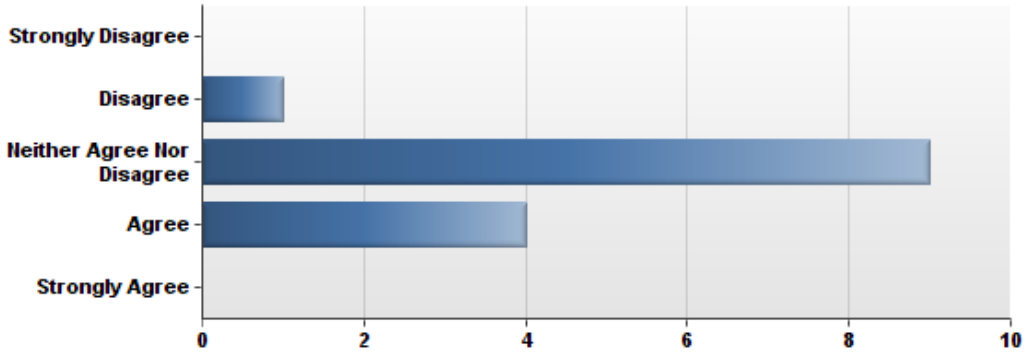
These comments lead one to believe that a combination of teaching methods are needed for many students to attain the information presented due to their varying multiple intelligence strengths. While the majority of students feel they learn best with a combination of methods, the most common method preferred was hands-on. Perhaps this could be due to the fact many hands-on methods require individual attention or working with small groups to accomplish a common objective. While the students may not be aware of their specific strengths, they have spent their academic

lives adapting to the way they best learn by changing methods until "something" worked. The comments above can attest to this.

Students had mixed feelings on the use of computer enhanced supplemental information added after the didactic lesson. More than half could not state whether the supplemental information provided helped them understand the lesson better than the way it was normally taught. Only four students agreed that the supplemented teaching material helped; meanwhile, one disagreed and stated that he/she felt the addition of the supplemental material did not help at all. The following graph represents data from Teaching Methods Survey Question 8.

Q8. You feel the addition of today's supplemental information helped you understand this lesson better than the way this course is normally taught.

Figure 4.2: *Lecture Material Retention (Day of Study)- Student Perception*



Knowledge and Understanding of Subject Material

Before the introduction of supplemental teaching material, students were asked about their knowledge of the course in general. They were asked specifically how much they knew about anatomy and physiology prior to taking the course. Other than the three students who had taken this course before, all students who participated in the interview reported having little to basic knowledge of the course. Many students responded as knowing "nothing" or "very little" regarding their basic knowledge of anatomy and physiology. Meanwhile, those who had taken the course before were either familiar due to the previous course or had "about 80%" knowledge of information already. This suggests that, like a person taking the course for the first time, most students knew "little to nothing" about the topic of anatomy and physiology prior to taking the course. Student comments to this question are presented below.

Q11. Before taking this course, how much did you know about anatomy and physiology in general?

Table 4.2: *Knowledge of Anatomy & Physiology Prior to Study- Student Comments*

Not much. Only what I learned from TV or movies and what I explored on my own.
I have taken API and APIII prior, so I knew a nice amount
Not that much
A little
I had more then a basic understanding.
Nothing. Well, in high school you learn the body function part of the body. Also about blood cells as well.
The basics
Not too much
I am familiar with because I have taken part I and III prior to this.

Around 80%
Basic
A decent amount of general information but not much of the in depth things I have learned in class regarding body systems, etc.
Not much
I had a simple understanding.
Very little

Perceptions About Classroom Instruction with Computer Enhanced Technology

Responses from the survey indicated the students understood better when the supplemental material was presented in class. Students explicitly reported that the visuals provided information in a different way and that made it easier to understand. A majority of the responses clearly indicated that classroom instruction with computer technology improved on the ability to grasp and understand the concepts presented.

It must also be noted that the use of extra teaching materials in class can only be more useful to teaching provided the instructor is efficient in their explanation of the materials. For example, one student felt that the extra materials used in class did not help them understand more because it was just a repetition of what was taught, while another student felt the same and argued that their previous instructor explained the material very well. Yet another student felt that they understood the material very well prior to the addition of computer enhanced material, but attributed this understanding to the teacher having explained it "perfectly" prior to the introduction of supplemental materials. The following question and student responses may attest to this.

Q12. Do you feel like the material shown in class helped you understand today's class better?

Table 4.3: *Perception of Supplemental Material- Student Comments*

Yes, it presented information in a different way which helped me to process and retain the info in another format. I tend to analyze info in different ways and go with what works best.
Yes, because my previous teacher broke everything down and explained the material well.
Yes, because the teacher explains it well
Yes. The more information you have the better you can understand what it is you are learning.
It was a repeat of what we were going over.
Yes, it is almost what was in the book.
Yes, I learn best with repeated visuals
No
Yes. It was explained in detail.
Yes, it was very easy to follow along with and grasp the concept of what was being taught.
No
Didn't personally help me, but I can see how it could help people just by having the topic covered multiple ways
Yes, it has pictures showing exactly what things look like
It didn't help me more or confuse me.
Yes, it was very informative and illustrating

Feelings About How Learning Materials Changed Classroom Teaching

Responses from students showed mixed feelings about how the extra learning materials changed the way the class was taught. Seven of the students interviewed reported no changes in their perception. Meanwhile, the other students felt that it changed the way classroom content was taught. Students felt that the extra materials presented information differently. Additionally, respondents indicated that this

supplemental material used was more enlightening and added new learning capabilities. The computer enhanced materials gave a more broad aspect to the subject material presented that day and helped with other questions, thus providing students with the opportunity to think a bit differently. The following comments express the feelings of all study participants.

Q13. How do you feel the extra material changed the way class was taught today?

Table 4.4: *Perception of Class Modification- Student Comments*

It simply presented the same information in another way for better understanding.
It's more challenging
Okay
It was more informative.
No
No
Just a different way the material was presented.
It didn't
It didn't change but added on to learning experience
No changes
None
Not much changed
It didn't
Slightly if any
It helped break down barriers in our minds and we were able to see things from a more broad aspect.

Information Gathered for Multiple Intelligences and Student Perception

During this study, as stated, students participated in a Multiple Intelligences Classification Survey and this provided them with a numerical score for each

respective intelligence as defined by Howard Gardner (2009). The eight intelligence strengths were classified in order of highest to lowest and the MI Classification Survey focused on the top three intelligences. Those top three MI strengths will also be the focus of the data analysis. The instructor for the research study participated in the MI classification survey as well. According to this survey, her top three Multiple Intelligences were Naturalist, Interpersonal, and Linguistic. The study revealed a diversity of intelligences in regard to students within the classroom. The following summary details the top three MI strengths of students in the anatomy and physiology classroom during the time of the data collection. They are listed in sequential order from most frequent to least frequent and are a strong indication of the vast diversity in learning needs of a single classroom of adult students. This prompts the necessity for creativity by an educator and the ability to foster engagement of each student by accessing at least one of their top three strengths during the learning acquisition process.

Eight students contained Interpersonal as one of the top three MI strengths in their classification profile. Eight students also had a strength of Intrapersonal as one of their top three, while six students were classified as showing a top strength in Musical. The MI classification of Spatial was also applicable to six students in regard to their top three strengths, while Kinesthetic represented a strength held by five students. Five students were classified as being Linguistic amongst their top three strengths, while four classified as being strong in the Math/Logic category and three

students rounded out the Naturalist category. This information is important to an educator because it assists that person in further understanding the dynamics of the classroom atmosphere.

One can quickly view the top strengths from the Teaching Methods Survey and determine that this classroom is filled with students who possess a variety of multiple intelligences across the spectrum of Gardner's classification system. The information gathered can be informative when we consider teaching styles, delivery mechanisms, and supplemental methods to reach all students possible with the goal of every student understanding and possessing the ability to apply the material to situations outside of the classroom. This is even more important for students in a career college environment because these students will take the knowledge they have obtained and immerse themselves directly into the workforce upon graduation. It is vital that they have both the skills and knowledge to perform their job at the level required for superior patient care. They must also understand the information presented in school so that they may educate future patients on these matters in a different environmental setting and context.

Research Question Two

Research Question 2: Is there a difference between the perceptions of students with linguistic, logical/mathematical, spatial, naturalist, musical, bodily-kinesthetic, or inter-intra personal main multiple intelligences? This research question intended to explore differences in the students' perceptions regarding the classroom and course

content provided to them during the research study. Student perceptions of effective teaching methods and general understanding of subject material were also explored. To properly explore the results of data collection for this research question, students' information from their top three strengths on the Multiple Intelligences Classification Survey was entered into an Excel worksheet along with questions from the Teaching Methods Survey which were designed to question the student's perception of how they felt before and after the use of supplemental material in the classroom. These responses were entered as S1, S2, and so forth. The information was transcribed verbatim and filters were used inside of the software to focus on particular top strengths when explaining that MI strength in detail.

The results are presented below.

Table 4.5: *Teacher/Students' Top Three MI Strengths*

Teacher	**MI Strength 1**	**MI Strength 2**	**MI Strength 3**
T1	Naturalist	Interpersonal	Linguistic
Student	**MI Strength 1**	**MI Strength 2**	**MI Strength 3**
S1	Intrapersonal	Musical	Logic/Mathematical
S2	Spatial	Intrapersonal	Bodily-Kinesthetic
S3	Naturalist	Bodily-Kinesthetic	Interpersonal
S4	Interpersonal	Linguistic	Naturalist
S5	Spatial	Logic/Mathematical	Linguistic
S6	Bodily-Kinesthetic	Spatial	Musical
S7	Musical	Interpersonal	Intrapersonal

S8	Intrapersonal	Interpersonal	Linguistic
S9	Interpersonal	Intrapersonal	Musical
S10	Interpersonal	Intrapersonal	Musical
S11	Intrapersonal	Interpersonal	Bodily-Kinesthetic
S12	Linguistic	Logic/Mathematical	Spatial
S13	Bodily-Kinesthetic	Interpersonal	Linguistic
S14	Naturalist	Interpersonal	Spatial
S15	Spatial	Musical	Logic

Most Effective Teaching Method

The following two questions on the Teaching Methods Survey were adapted specifically to gain insight as to what style of teaching students perceive to be the most effective in regards to their level of acquisition and engagement.

Question 7. What teaching method do you feel helps you understand and retain the course information most effectively? Ten of the participants felt that a combination of visual methods, auditory methods, and kinesthetic methods helped them understand and retain the information most effectively. Three of the participants felt a completely kinesthetic method helped them understand and retain the course information most effectively, while only one student found visual means such as pictures and graphs to be the most useful tool by which to learn effectively. This was interesting due to the breakdown of top strengths in the classroom based on the MI classification profile. While there was one person who felt that kinesthetic

methods were the most effective in learning and retaining the information, two students classified with Kinesthetic being their top strength.

Question 14. Please give a brief description…as to how you feel you best learn lecture material (listening, flashcards, hands-on training, question/answer sessions, etc.) One student had this to say when asked the question: "I am better one on one with a teacher and learning hands on." Another student, who possessed a top strength in Kinesthetic from the MI classification profile, had this to say in response to the same question: "I learn with a combination of all methods, but flashcards most commonly." The first student with Kinesthetic as a top strength is not surprising in the fact this student feels they learn better with individual attention and a hands-on method rather than visualization or listening to didactic lecture. The second student, however, felt like a combination of all methods helped them retain the information better. The use of flashcards could lead one to believe that the actual act of making flashcards and tangibly holding these in one's hands could provide the sufficient kinesthetic needs for the student to feel as if this was the best way to attain the information initially. As for the other ten students who felt a combination of methods was the best to learn, this is not surprising either due to the fact a combination of methods would meet all of the criteria encompassing each MI strength as needed dependent on the subject at hand.

Student responses to the question are listed below:

Q14. Please give a brief explanation in the box below as to how you feel you best learn lecture material:

Table 4.6: *How Students Perceive to Best Learn- Student Comments*

I learn best by visual aids and hands on application. The more ways I can analyze the info, the better I can retain it.
Hands on training while listening question/answer sessions
Listening and hands on training because I get it better.
I learn best with a combination of all the learning material. Seeing helps with reading.
The best way for me is repetition. I go over or hand write things over and over and over till it sticks.
Hands on training is the way I can learn without a problem
I learn best by practice and repeated flashcards (hands on training).
Hands on training
Flashcards or repeatedly writing information until it sticks with me.
Listening and hands on training. Also with a few questions and answers.
Personally I learn better by hands on training and visual listening methods.
Combination of all above, but flashcards most commonly.
Hands on training
I'm better one on one with a teacher learning hands on.
A combination of it all being that I am a very versatile individual

Knowledge and Understanding of Subject Material

While it was important to understand the general methods by which students learn new concepts and acquire information presented, it was of equal importance that I explored whether or not the students believed they had a clear understanding of the subject material at hand. The material in question was information related to the

cardiovascular system in the human body. Concepts related to the general function of the cardiovascular system had been covered throughout high school biology and also in Anatomy and Physiology I, which was a requirement students must meet to enroll in this particular course.

Question 6. You feel that you had a solid understanding of this lesson before any supplemental information was provided. This particular question was intended to determine each student's perception as to their understanding of the material presented from the cardiovascular system during the day of the study before any computer enhanced supplemental information was presented. The student responses were intended to indicate whether or not they clearly understood the concept of how the cardiovascular system worked to oxygenate and deoxygenate the body. Nine of the 13 participants agreed that they had a solid understanding of the lesson before they were provided with any supplemental information. This could be due to teaching delivery by the instructor. It could also be due to the fact this course was rather new in the term and students had not become engrossed in the material as much as if they were in the end stages of the course. Participants who agreed on this question commented on their understanding of the lesson by providing such feedback as "[The supplemental material] …was a repeat of what we were going over" and "it is almost what was in the book." Also, one participant who believed the lesson reiterated the information they were already learning in the course stated, "yes, I learn best with repeated visuals." Another participant felt that "yes…it was explained in

detail." These comments led me to believe participants in the study had an overall positive perception of the addition of supplemental materials to the lesson because, while repetitive in a sense, the material provided a different way for students to learn and this had the potential to reach students who may otherwise not have the information yet on concrete and abstract levels of cognition.

For this question, filters were applied to the Excel spreadsheet to focus on the top MI strength of each student for the purpose of exploring whether different students who possessed the same top MI strength had the same or variable perceptions to the question. Two of the three students who classified top in the Intrapersonal classification agreed that they had a solid understanding of the lesson before any supplemental information was provided. One student in this category did not respond to the question. Both students who classified as Naturalist in their top MI strengths agreed that they had a solid understanding as well. As for students who classified as Bodily-Kinesthetic in the top MI strength, Student 6 agreed to this question and Student 13 felt neutral. Student 12, who possessed a top MI strength of Linguistic, agreed that they had a solid understanding of the lesson before implementation of any supplemental information. The student who classified top in the MI strength of Musical agreed to this question as well. The three students who classified as Spatial being their top MI strength were in agreement with the question also. As for students who classified top in Interpersonal, each participant had varying responses to the question. Student 4 felt neutral, whereas Student 9 disagreed with

the question and Student 10 strongly agreed. The information presented shows a diversity of students across categories of Multiple Intelligences. The majority of students will utilize all MI strengths to grasp new concepts and most of these students did not need the addition of supplemental information to fully understand the information presented the day of the study. This could be due to the instructor using a variety of means to instill course objectives with or without the use of computer enhanced technology.

Perceptions About Classroom Instruction with Computer Enhanced Technology

There were several questions presented on the survey concerning classroom instruction with computer enhanced technology and how students perceived this instruction, both in general and on the day of the research study. The questions and their results are presented as follows.

Question 8. You feel the addition of today's supplemental information helped you understand this lesson better than the way this course is normally taught. Question 8 was presented to students because I desired to understand more about whether each student believed participating in a regular classroom lecture was more effective towards the acquisition of the classroom learning material or if the addition of extra material to enhance various multiple intelligences clarified the learning process. Nine of the 14 students who responded to this question neither agreed nor disagreed to the question as it was presented. There were four participants who agreed with the question and one participant disagreed. While there were common

MI strengths in these students, no two students had the same top MI strength or even same set of strengths. This led me to believe students could have been in agreement due to the fact there was repetitiveness to the lecture and this, in itself, caused them to understand the lesson with the addition of supplemental material rather than the way class is normally taught.

Question 12. Do you feel like the material shown in class helped you understand today's class better? There were a total of 15 responses to this question. Only two students felt that the material shown in class during the day the study was conducted did not help them learn any better than they normally would learn during a regular class session and three students appeared to be neutral to the question. All other students appeared to believe the material was helpful. The student classifying as Musical in the top MI strength felt that the extra information presented was a repeat of what had already been presented in the same class during the day of the research study. However, Student 12 classified as being Linguistic in regard to the top MI strength. This student felt the material taught in class during the study helped because it was very similar to the content from the required course text. Three participants fell into the top MI classification of Interpersonal. All three felt the material taught in class helped them understand the course better. Student 4 commented, "yes, it was very informative and illustrating" and Student 9 felt, "it has pictures showing what everything looks like." The third student gave perhaps the

best answer to this question of all by stating, “yes, the more information you have the better you can understand what it is you are learning.”

Three students also fell into the top MI classification of Intrapersonal. Student 1 felt the information helped because “the teacher explains it well.” Student 8 also felt an understanding due to the information being “explained in detail.” Student 11 did not feel the information presented helped with a more solid understand and simply responded to this question with a “no”. As for students classifying with a top strength in the Spatial category, Student 2 did not feel that the material in class helped with a better understanding. The other two students had more positive perceptions and Student 5 felt, “it presented information in a different way which helped me to process and retain the info in another format. I tend to analyze info in different ways and go with what works best.” Student 15 replied having a firm understanding of the material because “my previous teacher broke everything down and explained the material well.” Of the two students who classified as having a top MI strength of Bodily-Kinesthetic, neither felt like the material helped them understand the class better; however, Student 6 commented that they could see how it would benefit others even though it was not personally beneficial to that individual. Students 3 and 14 fell into the Naturalist classification as their top MI strength and Student 3 believed visuals made things easier to learn, while Student 14 felt it was easier to follow along with the material so there was a better grasp on the concepts.

Question 13. How do you feel the extra material changed the way class was taught today? This question was also presented as an attempt to understand the perceptions of students in regard to the use of supplemental materials in the classroom during the research study. It, however, was presented to give participants an opportunity to provide more thorough responses if needed. Fifteen students responded to this question and there were several who believed the material did not change the way class was actually taught. One student felt the material "added on to the learning experience" and another believed the extra material made the course "more challenging." Some students simply replied "no", which led me to believe they either did not fully read the question or they misunderstood the context in which it was asked. The results of Question 13 are listed below:

Q13: How do you feel the extra material changed the way class was taught today?

Table 4.7: *How Material Changed Class- Student Comments*

It simply presented the information in another way for better understanding.
It's more challenging.
Okay
It was more informative
No
No
Just a different way the material was presented
It didn't
It didn't change but added on to learning experience
No changes
None
Not much change

It didn't
Slightly if any
It helped break down barriers in our minds and we were able to see things from a more broad aspect.

Due to the number of students who felt the extra material did not change the way class was taught the day of the research study, the focus will be on those students who did feel that class was somewhat changed due to the extra presentation. One student who classified with the top MI strength of Interpersonal believed the extra material, "helped break down barriers in our minds and we were able to see things from a more broad aspect." Due to the inner reflective nature of those with strong Interpersonal MI strengths, this comment was not surprising. Student 8, who classified first in the MI strength of Intrapersonal did not believe class actually changed, but that the material "added on to the learning experience." Students who classified in Spatial as their top strength believed there was a positive overall change in the way class was taught during the day of the study. Student 15 believed the material made things "more challenging" and Student 5 felt the information was the same, but presented "in a different way for better understanding."

Feelings About How Learning Materials Changed Classroom Teaching

Two questions on the Teaching Methods Survey were presented to participants to gauge their perception of how well they understand the concepts of anatomy and physiology in regard to the information presented during the day of the research study. This would encompass the cardiovascular system. These questions

were presented to explore whether or not students felt like they understood the material well enough to apply the theoretical information in various contexts, dependent upon whatever the situation deemed appropriate. It was important for me to understand if the students felt like they understood the material better because of the computer enhanced supplemental information or if they would have had a solid understanding of the material nonetheless.

Question 9. The instructor taught this lesson (before any supplemental information was given) so well that you have a solid understanding of how to use these concepts in the workplace. Out of the entire class, there were eight students who agreed with this question, two students who were in strong agreement, and four students who felt neutral. Upon looking at the top MI strengths for each of these students, there is no clear cut reason as to why there was an agreement with the majority of the class other than the fact the instructor of the class shared strengths in her top three MI categories with each of the students who were in agreement with the question. This led me back to the assumption that there is a connection between the way a class is taught dependent upon the multiple intelligence strengths of the instructor and the strengths of each learner in the classroom. It can also be assumed that this instructor is in tune with the needs of her students and has an understanding that they require more than one teaching style in order to fully understand course content. The fact so many students were in agreement with this question is a positive

indication there is indeed an atmosphere conducive to learning which is shared amongst all who are present inside her classroom.

Question 10. You feel that you have a solid understanding of the lesson taught today only because the instructor used supplemental information to help you relate these concepts in the workplace. There were a total of 15 responses for this question and nine students felt neutral, while four students agreed and two students were in strong agreement. This was an interesting finding due to the fact there were so many students who had a neutral opinion on the issue. Many of the students who felt neutral to this particular question agreed with the question immediately prior. Basically, the majority of students felt like the instructor taught the lesson with clarity and, as a result, the majority of the class felt a solid understanding even before any extra material was added to supplement the course objectives during the study. It is important to note here that the students who did not feel a solid understanding prior to introduction of computer enhanced supplemental materials should be attended to in regard to why they may need extra material to learn the course concepts. Obviously, a student's Multiple Intelligence strengths will play a role in student acquisition of material; however, there is more to be considered than simply MI strengths. It is vital for the students who do not understand to be monitored and assisted with the intention of further helping them with classroom acquisition. This is the only way all students will be helped. It is dependent on the student informing the teacher of a problem and

also the teacher making adjustments to connect with the level of cognition for that student as needed.

Combination Methods as a Way of Learning

One theme evident in the semi-structured piece of the Teaching Methods Survey was that multiple students felt they learned by a combination of ways, not specifically by visual methods, auditory methods, or kinesthetic methods alone. This was made clear in Question 14 when students were asked to give a brief description of how they felt they learned best. Eleven of the participants responded to this question with a comment attesting to the fact they learned by more than one method. Students had comments such as "I learn best by visual aids and hands on application. The more ways I can analyze the info, the better I can retain it" and a "combination of all above, but flashcards most commonly." Also, one student summed up their learning preference by stating, "a combination of it all being that I am a versatile individual." These comments indicate students have amended their study and learning acquisition techniques until they found something to work for them. It signifies the importance of using many teaching methods for classroom delivery with the intention of reaching learners of all learning styles, even if those styles may not be a known to the teacher or student. One of the delivery methods teachers can choose to use in the classroom to deliver supplemental material is the computer because the opportunity to reach students through this medium is immense. Software, videos, streaming media, and live coverage of subject material can be used as additional

sources of educational information which could bridge together the information an educator is already attempting to deliver to the classroom with an alternate form of delivery to foster engagement with students who could benefit from this particular method as a tool.

Overall Emerging Patterns

During the course of this research study, the data collected was sufficient to grant me a closer view from within the classroom. Despite a lack of explicit detail in student responses, there were patterns which emerged from the data collection process. The vast majority of students perceived to understand the information presented to them by the instructor and most of these participants had positive attitudes towards their general learning and knowledge of the concepts presented. Many participants felt repetition was crucial to ensure a more successful learning process. Although the instructor in this classroom was not to be judged on her teaching skills, it is evident that there were multiple ways of presentation to ensure the information is acquired and understood by as many students as possible. This is refreshing due to the fact these students will enter the work force upon completion of their degree and the thorough understanding as well as application of all information attained throughout the course will be crucial for them in the months and years ahead.

Chapter V: Discussion, Implications, Recommendations

Overview of the Study

The purpose of this study was to examine whether or not the use of computer enhanced supplemental material in a postsecondary anatomy and physiology classroom was perceived to positively affect students' opinions regarding their acquisition of classroom instruction before and after use of the additional material.

Students participated in a didactic lecture given by their instructor on the topic of the cardiovascular system during their anatomy and physiology course. They were then shown a supplemental video also on the topic of the cardiovascular system provided by education-portal.com.

After this, they completed a Multiple Intelligences Classification profile to classify them according to the top three strengths as defined by Howard Gardner's Theory of Multiple Intelligences (Gardner, 2011). They then completed a Teaching Methods Survey consisting of structured and semi-structured questions to provide feedback on several topics relating to classroom learning acquisition, instructor delivery style, general grade in the course, knowledge of anatomy and physiology before taking the course, general perception of how they best learned new materials, and how the day's activities helped or did not help them with the ability to attain the new knowledge about the cardiovascular system. Students were given the option to

not participate during any part of the study and were assured all information would remain anonymous.

Fifteen students and one instructor participated in this research study. The information was categorized through Qualtrics and qualitative data was entered into an Excel spreadsheet to assign common themes so more information could be gained as to why students may perceive things a certain way depending on their respective MI strengths as well as other possible factors listed on the survey instrument. The remainder of this chapter analyzes this information and provides implications for the future of education as it continues to evolve. It also presents recommendations for educators who wish to engage their entire classroom for an enriched learning experience. This chapter concludes with my own comments concerning students, learning styles, multiple intelligences, and the subject of education in general.

Research Questions

The two research questions this research study attempted to answer were:

1. How effective do students with differing main multiple intelligence classifications perceive classroom instruction to be before and after supplementation with computer enhanced technology as a delivery mechanism?
2. Is there a difference between the perceptions of students with linguistic, logical/mathematical, spatial, naturalist, musical, bodily kinesthetic, or inter-intra personal main multiple intelligences?

Conclusions

Students with varying multiple intelligences will have different styles of learning the material presented in a classroom. As stated in the beginning of this paper, they will adapt their methods over the course of many years to help them learn subjects they may not normally understand as easily as they would if the presentation of material directly related with their own respective multiple intelligence strengths (Johnson, 2008). This section will focus on the conclusions drawn as data was analyzed form the research study.

Effective Teaching Methods

The majority of students who participated in this research study believed they had an A or B in the course as of the day the study was conducted. This leads to the assumption that one's method of delivery in reference to teaching style will be reflective on students' grades within a course. Due to the fact most of the students were achieving grades of satisfactory and above, it appeared that the teaching delivery style was successful. Although the instructor's teaching style was not deeply researched during the study, her method of delivery was such that the majority of her students understood the concepts she was attempting to deliver even before the use of computer enhanced supplemental material was introduced. This is a positive outcome from the view that this particular instructor understands her class and what is required to engage the vast majority of students.

The instructor in this anatomy and physiology classroom was perceived as having a positive relationship with the majority of students in the classroom. This particular instructor had a top MI strength of Interpersonal, which most likely helped her relate to students effectively and thus foster their interest in the subject matter. Also, to be noted is the fact that the results of this study found the instructor to share many of the top MI strengths as the students in her classroom. While this dynamic will obviously change depending on each new classroom of students and their particular MI strengths, it served as a successful factor in this particular study and the hope is all students in that classroom will be successful throughout the course.

Use of Computer Enhanced Supplemental Materials

While the complete use of computer enhanced material is not indicated for a course such as anatomy and physiology in my professional opinion, there are indeed times that modern technology will prove very useful in assisting a student with the understanding of a particular concept. In this particular case, it was useful in the explanation of how blood is transported through the cardiovascular system. Students felt the inclusion of supplemental material helped, maybe not for them, but from an overall perspective because of the compassionate nature of this particular classroom. While it is also true that educators will normally deliver content based on how they best acquired the information and their own personal MI strengths (Stitt-Ghodes, 2003), it was evident throughout this study that the instructor was successful in her delivery methods.

In rare instances where students felt they did not understand the material as well until the use of the supplemental material was added, this addition of material provided those students the opportunity to grasp the concepts a second time. Perhaps this addition was the small piece needed to bridge all ideas together in their minds for solidarity of acquisition. As an end result, there were no students who gave completely negative comments on the information conveyed. There were also no students who perceived to be uncertain of the information after supplemental materials were provided to them. It is important to note that the exact results from this particular study would most likely not be repeated if a similar study was conducted in a different environment or with a different set of subject matter. The results obtained were exclusive to this particular postsecondary institution, this particular classroom, and this group of adult learners.

Multiple Intelligences and the Classroom

This study also uncovered an interesting piece in regard to the MI classification range for the students. There were no students who classified as Logic/Mathematical as their top MI strength and there were very few students who classified as Linguistic for their top MI strength. This, again, applies only to the classroom that was studied. The interesting fact is that the majority of the class scored highest in Intrapersonal and Interpersonal as their top MI strengths. This leads me to believe the adult students in question have compassion for their fellow man, which is vital to the field of allied health. Also, with a strength of Intrapersonal, they

have a stronger innate ability to reflect on events and various situations to learn from these and take the important concepts gained into the future as they grow professionally.

Gale (2012) highlights the importance of educators to understand various MI classifications of students to ensure a positive work experience post graduation. The only way to ensure this is to routinely assess what methods are working best for students and what methods could be altered to increase student engagement throughout the course. Educators should do this with every group of students because each group will have a different set of MI strengths. This will cause a difference in teaching delivery style depending on the majority of strengths represented inside of each classroom and with every course.

Implications

The results of this research study have implications for educational delivery in the 21st century postsecondary classroom. Each classroom will contain a different group of students with variable multiple intelligence strengths and relating to these strengths will be vital to engage all students if an educator wishes to effectively deliver teaching materials. One implication of this study is the importance of using multiple teaching modalities to ensure all students understand presentation of the subject matter.

In this study, it was found that the majority of students believed a combination of teaching delivery methods was most effective in helping them learn the subject

matter rather than simply one method alone such as visual, auditory, or kinesthetic. This was a surprising finding in the research due to the fact only three students listed their preferred teaching delivery method as kinesthetic, yet 11 students commented that a hands-on method was helpful for them in learning the material. The findings from this research study indicated no significant difference in the perceptions of students with varying main multiple intelligences in regard to their acquisition of new concepts as presented, before and after the use of computer enhanced technology as a supplemental tool. As detailed in Chapter 4, the majority of students in this class understood the concepts presented before use of the supplemental material no matter what their top MI strengths happened to be. For the small group of students who did not have a solid grasp of the original material presented by the instructor, the content became clear to them upon use of the supplemental material. This, again, had no relation to their top MI strengths. While this research applies to a single classroom, the implication is that a combination of teaching delivery styles will likely engage more students and this will, in turn, offer them a greater opportunity to acquire and retain the information presented.

The study found that, prior to this course, the majority of students had a basic to subpar knowledge of general anatomy and physiology. This implies that students who are enrolled in a course for the first time could have little to no knowledge of the subject material, which makes the effective delivery of information an even more important task of the educator. It has also been said that overall student participation

in class will be a direct indication of whether or not a teaching delivery method is proving effective (Cranton, 2002). Students who actively participate by asking questions, participating in discussions, and completing lab activities associated with classroom material most often will understand the information presented due to the repetitive nature of the subject matter and also due to multiple opportunities for further explanations when needed. While repetition was found in this study to be helpful in solidifying student acquisition of the materials, it is of equal value that this subject matter is presented effectively the first time so there is a sense of student engagement from the beginning. The students in this study overwhelmingly perceived the information presented to be detailed and reported having a solid understanding of the subject matter. While there were students in this study who understood the information presented prior to delivery of the computer enhanced supplemental information, other students felt this piece was needed to enhance the learning experience. As an educator, the implication here is that multiple methods of delivery are indeed vital to incorporate all students in the learning process.

Recommendations for Practice

In order to fully understand a class of students, there are a few key pieces in which every educator and educational institution should be made aware. While it is important for an administration to understand multiple intelligences and learning styles, it is even more vital for educators to have a basic knowledge of the information so they may apply this inside their classrooms. Mandatory professional

development courses should be held for faculty so they are made aware of the differences between MI strengths. They should be made aware of the fact their own top MI strengths could play a role in the style of delivery they use on a daily basis. It has been said that many educators deliver course materials based on how they best learned the information and not necessarily on the best way students can acquire the information (Stitt-Ghodes, 2003). These professional development courses should also serve to make educators aware of how students' MI strengths could affect their acquisition of course materials depending on teaching delivery methods, how to use their own MI strengths to modify course content for richer delivery of subject matter, and to increase the potential for student engagement during daily activities.

Also, the inclusion of multiple teaching modalities is needed to reach all students, especially those who may learn best by a combination of methods as found in this research study. If multiple modalities are used to deliver course content and the teacher is attuned to the MI strengths of students in the classroom, there should be a positive atmosphere of learning and active class participation taking place the majority of the time. It is through the use of these multiple modalities that educators can integrate concepts directed towards certain MI strengths into their curriculum if they find the material to be lacking in a particular area. These modifications are not difficult, but merely take a bit of creativity and/or research on the part of the educator. For those students who classify as Bodily-Kinesthetic, a hands-on activity will significantly help solidify material which has been presented during class. For those

students who classify as Intrapersonal, reflection and ethical dilemmas are wonderful supplements to add to an already rich curriculum for more thorough reflection. Students who are Interpersonal most likely would succeed best if group activities or presentation were incorporated into the classroom alongside the material. Linguistic learners most likely would find discussion questions appealing as part of their learning process, whereas numerical based activities could be used to enhance learning in students with strengths in Spatial or Logic/Mathematical. A combination of these methods could greatly enhance delivery style and increase the level of student engagement to improve the learning process.

Future Recommendations

The literature review exposed a need for more information in the general area of multiple intelligences as well as information on how multiple intelligences are being used in educational settings to enhance learning on a daily basis. The results from this study reiterate that focus in the aspect that many students may classify more closely with a certain strength, yet have a need for a combination of teaching delivery methods to completely understand a new concept and retain the information successfully for applicable use outside of the classroom environment. Due to the geographical limitation in this study, future qualitative and quantitative researchers may find that replication of this study with a larger student population could yield more detailed results. This would be of great benefit to the education community because the amount of data collected from participants could be more thoroughly

analyzed for reoccurring themes and patterns which may not have surfaced during the time of this study. Also, a larger participant population would also most likely include more courses or an entire college. This could prove beneficial if teacher-student relationships pertinent to MI strengths are analyzed. A broader study base, inclusive of students and teachers, could significantly affect the outcome of future results.

Another limitation to this study was the inability to follow up on questionable responses. Future researchers may find that focus groups or interviews could allow for a deeper discussion and provide insight into why various teaching methods are accepted by students. These interviews or focus groups could also provide more detailed information as to which method of delivery contains the most clarity and which should be introduced into the class lesson first. Also, for those students who find that a combination of learning styles best suites them, focus groups or interviews would likely provide the opportunity to explore in detail which styles most resonate with each student.

In regard to delivery methods, future researchers could explore whether a computer enhanced approach should be used as the primary delivery methodology. With this research study, students were perceived to learn more effectively with computer enhanced material used as a supplemental tool rather than as the primary method of instruction. Researchers could explore whether a well-crafted computer

enhanced approach aimed at targeting all multiple intelligences could prove more effective than the strategy used in this study.

Also, there is a question as to whether individuals with different MI classifications would be more apt to pursue different career paths. Future studies may find that students who share MI strengths are more likely to be attracted to certain careers depending on what options are provided to them. Gale (2012) has researched this in some form already when studying which intelligences are sought after by employers in certain occupations. The research conducted by Gale could further be enhanced if explored on a traditional college campus or inside of a postsecondary educational institution.

Concluding Comments

As an educator and an adult learner, I feel students deserve the opportunity to acquire information and be entrusted with the gift of knowledge so they may one day choose to fulfill their utmost dreams and perform at their highest potential. This study was evidence that there are other educators and adult learners who hold the same beliefs although in varying circumstances.

The participants in this study were provided an excellent opportunity to learn from a highly skilled professional and the majority of these students did just that. While the responses were much more succinct than I would have preferred, future researchers could possibly modify their survey instruments to reflect on this aspect. It was perceived during this study that students felt the information was being conveyed

in ways they could understand and, thus, they had more desire to participate in classroom activities. This correlation in student class participation and increased scores cannot be a simple coincidence. It appeared to be the result of a group of adult learners who adapted information until it resonated with them via their various multiple intelligences. Cranton (2002) and Douglas (2008) both agree on the positive effect of focusing on students' multiple intelligences as a teaching strategy to increase their desire to participate and retain more information as a result.

A science classroom is not the only place one will come into contact with multiple students who have very different strengths in regard to how they learn. Any classroom contains these students and, because of this, any classroom should have the ability to modify parts of a curriculum so it can meet the needs of every student enrolled. This can be applicable to courses related to business, humanities, sciences, and others. There are only two requirements for this MI focused learning to occur: a willing teacher and a willing learner.

References

Alaie, A., Teller, V., & Qiu, W. (2012). A bioinformatics module for use in an introductory biology laboratory. *The American Biology Teacher, 74*(5), 318-322.

Anderson, K. (2007). Tips for teaching: Differentiating instruction to include all students. *Preventing School Failure,* (51) 3,49-54. DOI:*10.1017/S0033291710000371.*

Apperson, J., Laws, E., & Scepansky, J. (2014). An assessment of student preferences for PowerPoint presentation structure in undergraduate courses. *Computers & Education,* 148-153. Retrieved from http://www.sciencedirect.com/science/article/pii/S.

Armstrong, T. (2009). *Multiple intelligences in the classroom* (3rd ed.). Alexandria, VA: ASCD.

Brandt, R., & Gardner, H. (1993, April). On teaching for understanding: A conversation with Howard Gardner. *Educational Leadership*, 4-7.

Brown, E. (2007). The use of learning styles in adaptive hypermedia. University of Nottingham.

Brualdi, A. (1996, Sept). *Multiple Intelligences: Gardner's Theory*. Retrieved from http://ericae.net/digests/tm9601.htm

Cash, R. (2011). *Advancing differentiation: Thinking and learning for the 21st century.* Minneapolis, MN: Free Spirit Publishing.

Checkley, K. (1997, September). The first seven...and the eighth: A conversation with Howard Gardner. *Educational Leadership*, 8-13.

Cleaver, S. (2008). Smart and bored: Are we failing our high achievers. *Instructor, 117*(5), 28-32.

Collaborative Institutional Training Initiative, (2013). Retrieved from Bethel University Moodle.

Connerr, H. (2008). *Learning without tears.* London: Watkins Publishing.

Cooper, F. (2008). An examination of the impact of multiple intelligences and metacognition on the achievement of mathematics students. Minneapolis, MN: Capella University.

Corrado, D. (2014, April 22). Differences between career colleges and traditional postsecondary institutions. (K. C. Stanley, Interviewer) Jackson, MS.

Cranton, P. (1996). *Professional development as transformative learning: New perspectives of educators of adults.* San Francisco, CA: Jossey-Bass.

Cranton, P. (2002). Teaching for transformation. *New Directions for Adult and Continuing Education,* 63-72.

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, CA: Sage Publications.

Creswell, J. W. (2013) *Qualitative inquiry and research design: Choosing among five approaches.* 3rd ed. Thousand Oaks, CA: Sage.

Denig, S. (2004). Multiple intelligences and learning styles: Two complementary dimensions. *Teachers College Record,* 96-111.

DeSantis, L., & Ugarriza, D. N. (2000). The concept of theme as used in qualitative nursing research. *Western Journal of Nursing Research*, 22, 351-372.

Douglas, O., Burton, K. S., & Reese-Durham, N. (2008). The effects of the multiple intelligence teaching strategy on the academic achievement of eighth grade math students. *Journal of Instructional Psychology*, *35*(2), 182.

Encyclopedia Brittanica. (2014). *Merriam-Webster*. Retrieved from http://www.merriam-webster.com/dictionary/didactic.

Fuller, C. (2004). *Talkers, watchers, and doers: Unlocking your child's unique learning style*. Retrieved from School Savvy Kid.

Gale, L. (2012). *An examination of Gardner's Multiple Intelligences of leadership in organizations*. Minneapolis, MN: Capella University.

Garcia, P., & Qin, J. (2006). Identifying the idendification gap in higher education: Where do the differences really lie? *Learning & Technology Meeting of the AAC&U.* Seattle, WA.

Gardner, H. (2006). *Multiple intelligences: New horizons.* New York, NY. Basic Books.

Gardner, H. (2009). *Frequently asked questions-- multiple intelligences and related educational topics.* Retrieved from

http://howardgardner.com/FAQ/FREQUENTLY%20ASKED%20QUESTIONS%20Updated%20March%2009.pdf.

Gardner, H. (2011). *Frames of Mind: The Theory of Multiple Intelligences.* New York: Basic Book Inc.

Gardner, H., & Hatch, T. (1989, Nov). Multiple intelligences go to school: Educational implications of the theory of multiple intelligences. *Educational Researcher, 18*(8), 4-10.

Gottfredson, L. (2004). Intelligence: Is it the epidemiologists' elusive "fundamental cause" of social class inequalities in health? *Journal of Personality and Social Psychology , 86* (1), 174-199.

Gottfredson, L., & Dreary, I. (2004). Intelligence predicts health and longevity, but why? *Current Directions in Psychological Science , 13* (1), 1-4.

Hannah, C. L., & Shore, B. M. (1995). Metacognition and high intellectual ability: Insights from the study of learning-disabled gifted students. *Gifted Child Quarterly, 39*, 95-109.

Hyett, N., Kenny, A., & Dickson-Swift, V. (2014). International Journal of Qualitative Studies: Methodology or method? *A critical review of qualitative case study reports,* 1-3.

Jaschik, S. (2008, March 25). *"Multiple Intelligences" at 25*. Retrieved from Inside Higher Ed: https://www.insidehighered.com/news/2008/03/25/mi.

Johnson, G. D. (2008). Learning style and emotional intelligence of the adult learner. Auburn University.

Jones, N. B. & Provost, D. (2007). "Developing a University Research Web- Based Knowledge Portal".

McKeachie, W. (1995). Learning styles can become learning strategies. *4* (6).

Merriam, S. (2009). *Qualitative research: A guide to design and implementation.* San Francisco, CA: Josey-Bass.

Merriam-Webster. (2013). Retrieved from m-w.com: http://www.merriam-webster.com/dictionary/technology.

Multiple Intelligences for Adult Literacy and Education. (2015). *Assessment: Find your strengths*. Retrieved from LiteracyWorks: http://literacynet.org/mi/assessment/findyourstrengths.html.

Nienhueser, W. (2005). Special issue: Flexible work - atypical work - precarious work?. Mering: Hampp.

Patten, M. L. (2012). *Understanding research methods: An overview of the essentials*. Glendale, CA: Pyrczak Publishing.

Rademaker, L. L. (2011). *Qualitative Research from Start to Finish: A Book Review*. Chicago, IL, USA: National Louis University.

Remilon. (2015). Retrieved from Remilon: http://remilon.com/about.

Schmoker, M. (2010). *When pedagogic fads trump priorities.* Retrieved from http://www.edweek.org/ew/articles/2010109/29/05schmoker.h30.html.

Servilio, K. (2009). You get to choose! Motivating students to read through differentiated instruction. [Electronic version]. *Teaching Exceptional Children Plus,* 5(5), 2-11.

Shore, J. (2004). Teacher education and multiple intelligences: A case study of multiple intelligences and teacher efficacy in two teacher preparation courses. *Teacher's College Record, 106*(1), 112-139.

Smith, M. (2007). Howard Gardner and Multiple Intelligences. *Encyclopedia of Informal Education*. Retrieved from http://sts.schools.smcdsb.on.ca/UserFiles/Servers/Server_6/File/Secondary Schools/STS - St. Thomas Aquinas/PLajoie/Gardners MI by Smith.pdf.

Soy, S. K. (2006, December 2). The case study as a research method. Retrieved from https://www.ischool.utexas.edu/~ssoy/usesusers/l391d1b.htm.

Stake, R. E. (1995). *The art of case study research.* Thousand Oaks, CA: Sage. Press.

Stitt-Gohdes, W. (2003, April). Student educators and their students: Do their instructional and learning preferences match? *Business Education Forum, 57*(4).

Szabo, A., & Hastings, N. (2000). Using IT in the undergraduate classroom: Should we replace the blackboard with PowerPoint? *Computers & Education,* 175-187. Retrieved from http://www.sciencedirect.com/science/article/pii/.

Tomlinson, C. (2001). *How to differentiate instruction in mixed-ability classrooms.* Alexandria, V A.: Association for Supervision and Curriculum Development.

Tyler, C. (2011). *Can multiple intelligences enhance learning for higher education online instruction?* National University, Department of Educational Administration. San Jose: National University.

Weiss, R. (2000, September). Howard Gardner talks about technology. *Training and Development*, 52-56.

Wiggins, G., & McTighe, J. (2005). *Understanding by design* (Expanded 2nd ed.). Alexandria, VA: Association for Supervision and Curriculum Development.

Willingham, D. T. (2004, Summer). Check the facts: Reframing the mind. *Education Next* .

Yin, R. K. (1981). The Case Study Crisis: Some Answers. *Administrative Science Quarterly*, pp. 58-65.

Yin, R. K. (2011). *Qualitative research from start to finish.* New York, NY: The Guilford.

Appendix A

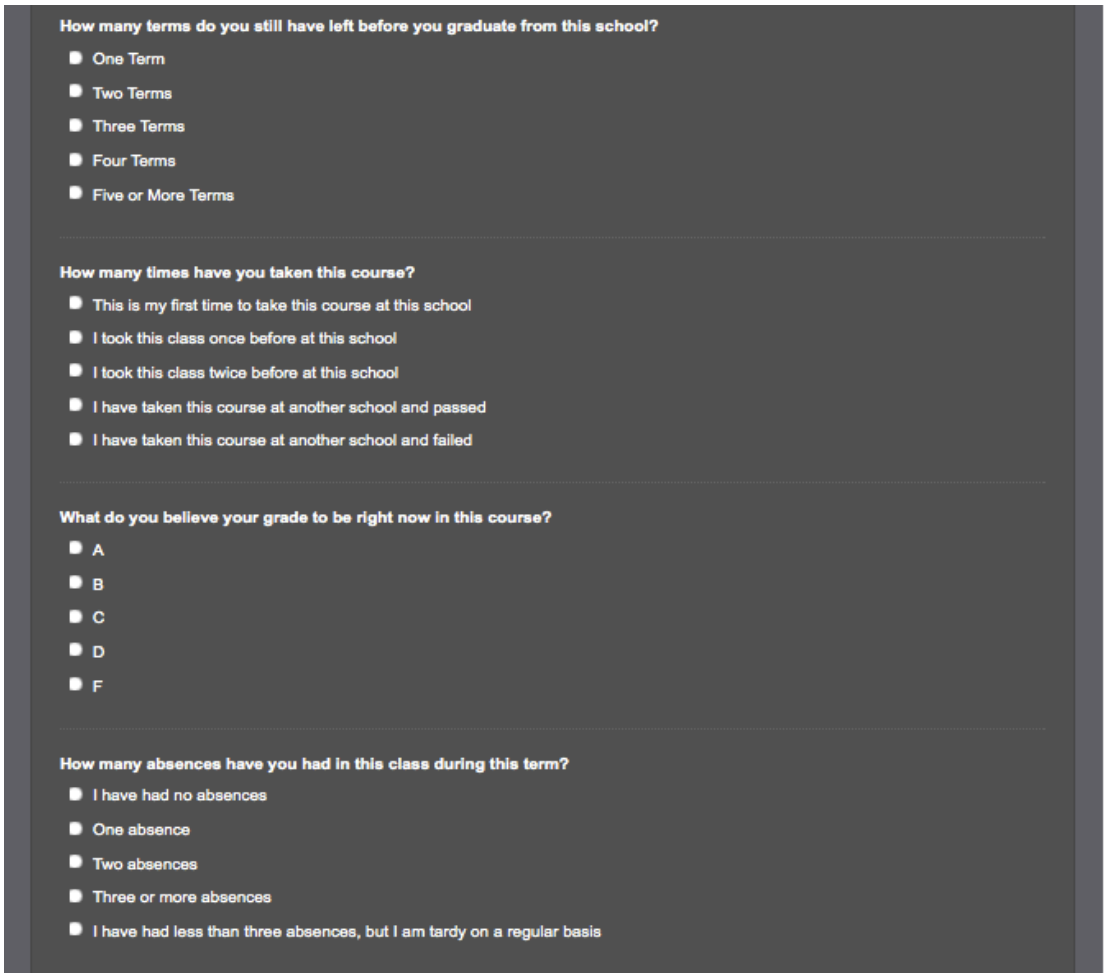
Multiple Intelligences Classification Tool

The Multiple Intelligences Classification Tool may be found at the following URL: http://www.literacynet.org/mi/assessment/findyourstrengths.html. This tool was used in the data collection process to assess the MI classification of each research participant.

Appendix B

Teaching Methods Survey Tool

The following survey tool was created using software provided by Qualtrics and was completed online by research participants as part two of the data collection procedure.



You feel that you have regularly participated in this course (such as asking questions, providing answers, being actively involved in class discussions).

- Strongly Disagree
- Disagree
- Neither Agree Nor Disagree
- Agree
- Strongly Agree

You feel that you had a solid understanding of this lesson before any supplemental information was provided.

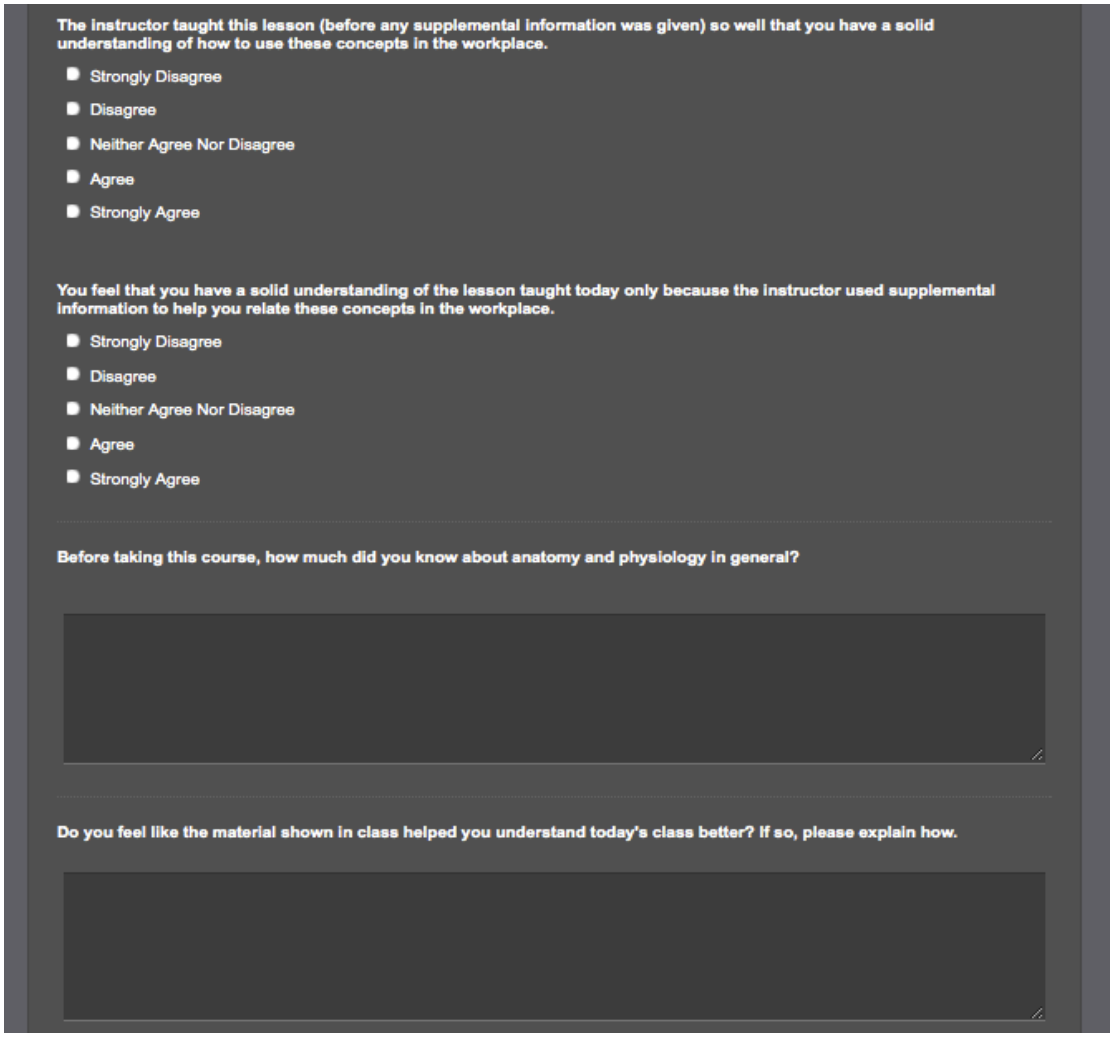
- Strongly Disagree
- Disagree
- Neither Agree Nor Disagree
- Agree
- Strongly Agree

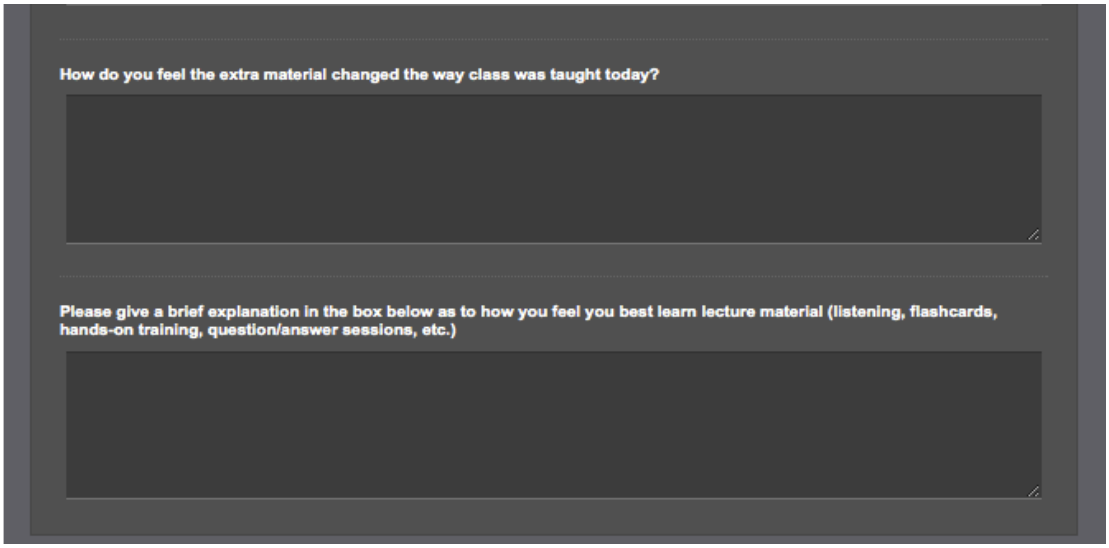
What teaching method do you feel helps you understand and retain the course information most effectively?

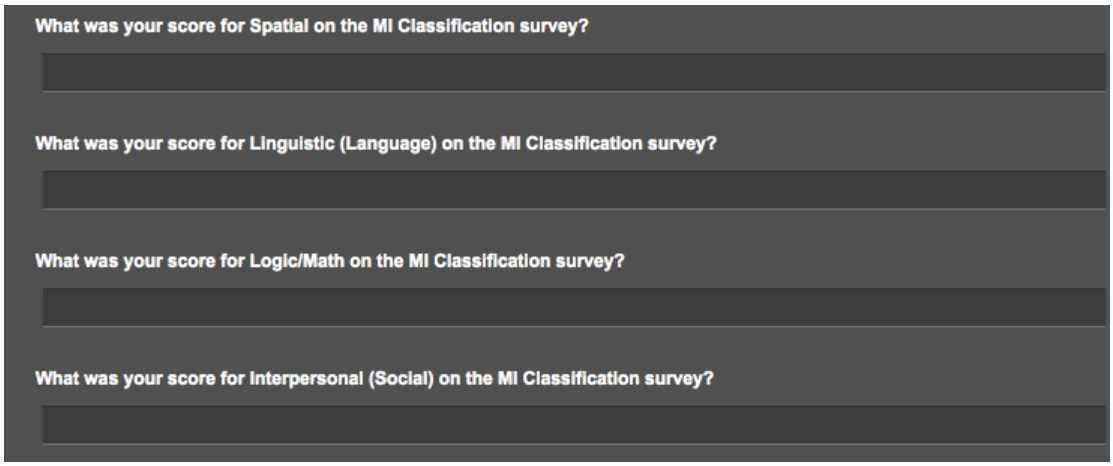
- Visual Methods (Pictures, Graphs)
- Auditory (Lecture, Question/Answer Session)
- Kinesthetic (Hands-on Methods)
- Combination of Methods Above

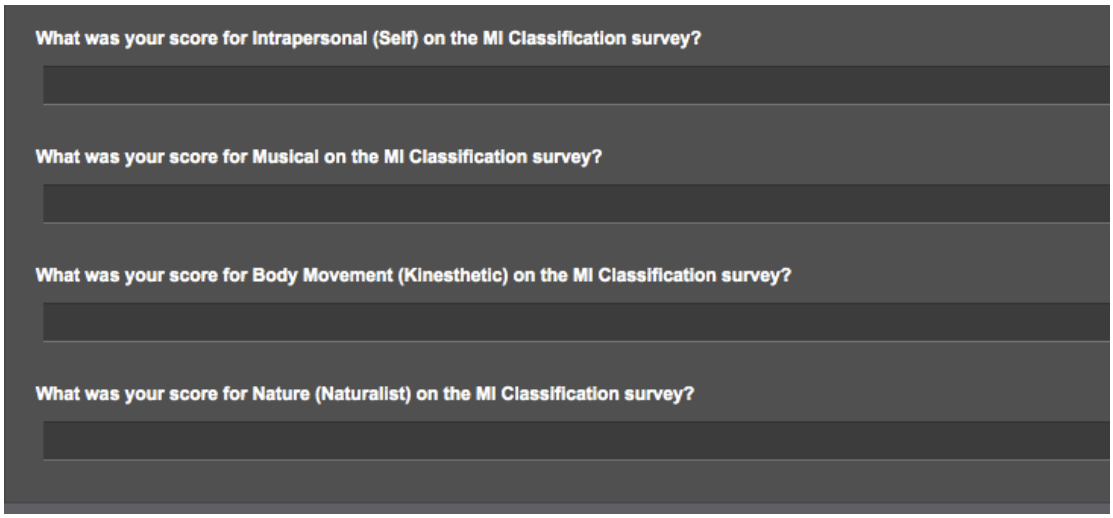
You feel the addition of today's supplemental information helped you understand this lesson better than the way this course is normally taught.

- Strongly Disagree
- Disagree
- Neither Agree Nor Disagree
- Agree
- Strongly Agree


The instructor taught this lesson (before any supplemental information was given) so well that you have a solid understanding of how to use these concepts in the workplace.
Strongly Disagree
Disagree
Neither Agree Nor Disagree
Agree
Strongly Agree
You feel that you have a solid understanding of the lesson taught today only because the instructor used supplemental information to help you relate these concepts in the workplace.
Strongly Disagree
Disagree
Neither Agree Nor Disagree
Agree
Strongly Agree
Before taking this course, how much did you know about anatomy and physiology in general?
Do you feel like the material shown in class helped you understand today's class better? If so, please explain how.


How do you feel the extra material changed the way class was taught today?
Please give a brief explanation in the box below as to how you feel you best learn lecture material (listening, flashcards, hands-on training, question/answer sessions, etc.)


What was your score for Spatial on the MI Classification survey?
What was your score for Linguistic (Language) on the MI Classification survey?
What was your score for Logic/Math on the MI Classification survey?
What was your score for Interpersonal (Social) on the MI Classification survey?


What was your score for Intrapersonal (Self) on the MI Classification survey?
What was your score for Musical on the MI Classification survey?
What was your score for Body Movement (Kinesthetic) on the MI Classification survey?
What was your score for Nature (Naturalist) on the MI Classification survey?

Appendix C

Student Participation Notification Letter

Multiple Intelligences Participant Notification Letter

Dear Student:

I am a doctoral candidate in Education at Bethel University in St. Paul, Minnesota. I am conducting dissertation research on how the use of technology may enhance a student's individual learning in the postsecondary educational environment. The objectives of this study are to:

- Investigate students' perceptions of classroom instruction before and after the use of supplemental technology to assist with the delivery of classroom material
- Investigate the differences between the perceptions of students with varying main multiple intelligences

Your honest reflection about the following questions is an important element in the success of my research. It should be easy to complete and will be incorporated as part of today's lecture. Please be advised that your participation is completely voluntary, but again ***I need your help*** to accomplish this effort. If at anytime *during* your participation you change your mind, you have every right to opt out and will not be obligated to continue. Your decision to participate or not will have no impact on your coursework or grade. If you have any questions about your rights as a research participant, please contact the researcher and the requested information will be made available to you.

Also, be assured that your responses will be held strictly confidential. Under no circumstances will any personalized information, submitted during your participation, be available to any individual or other organization, beyond the researcher. If you have any questions about this survey, please feel free to contact Kimberly Stanley by email at kcp99442@bethel.edu or by phone at 601-954-3319 and/or Mike Lindstrom at m-lindstrom@bethel.edu or by phone at 612-209-1739. Thank you in advance for your participation.

Sincerely,

Kimberly Stanley, Doctoral Candidate

Dr. Mike Lindstrom, Dissertation Advisor

Bethel University