

MOVEMENT AND LEARNING  
IN LECTURE CLASSROOMS

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by  
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# MOVEMENT AND LEARNING IN LECTURE CLASSROOMS

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## ABSTRACT

This mixed methods research utilized Action Based Learning Theory on a population of undergraduate college-aged students to determine if movement breaks in a predominately lecture-style college class affected a student's ability to demonstrate learning. Four professors from various disciplines, each teaching two sections of the same predominantly lecture-style classes, participated in this 16-week study. Each professor had one section considered a control group and one section considered a treatment group. Quantitative data were collected by comparing final grade percentages between the control and treatment groups. Control groups received periodic *review* breaks and treatment groups participated in circulation inducing *activity* breaks. Two sets of the four professors' classes were statistically significant ( $t(19) = -2.358, p = .029$ ;  $t(25) = -2.488, p = .020$ ). Qualitative data were collected from interviews with participating professors. Three themes were noted as indicative of creating a more conducive learning environment: (a) incorporating the movement breaks in the classroom, (b) student gains or losses via creation of community and camaraderie, and (c) student gains or losses via reduction of anxiety.

## CHAPTER ONE

### INTRODUCTION TO THE STUDY

The human body is biomechanically designed for movement; it is engineered to perform physically. The technology base of modern life has recreated how humans move, adding sedentary characteristics to the daily repertoire which disrupts a human's natural instincts, posing one of the biggest threats to continued survival. Therefore asking someone to stay in one position for an extended period of time can be considered a painful process in numerous ways. Sitting stationary for rest is vastly different than sitting stationary based on traditional demands from a superior, because the human relationship with food, physical activity, and learning is inherently built into the brain's circuitry (Ratey, 2008).

According to Action Based Learning theory, movement is the catalyst for the brain to acquire knowledge (Madigan, 2004). When humans allow themselves to engage the body in physical activities, physiological responses include not only those associated with structure, configuration, and health/wellness; the brain is made more receptive to the attainment of knowledge. This study compared the number of high achieving students in classes that encourage movement through semi-structured physical activities to those without movement to test the theory that the brain can acquire knowledge more readily when the body is more active. The intention of the study was to use the Action Based Learning theory on an adult population who are undergraduate college-aged students to determine if movement breaks in a predominately lecture-style college class affected a student's ability to demonstrate learning. The ability to demonstrate learning was

measured by comparing the number of high achieving students of one class to another by using final grade percentages.

### Background

Action Based Learning theory is based on brain research. The Action Based Learning theory (Madigan, 2004) and Medina (2008) agree movement is the spark that increases the human brain's ability to grasp information for processing and storage. Findings support the connection of early motor development, intentional movement, increased physical activity, and exercise for improved cognition (Madigan). The theory intimates that physical movement is the link to learning in the cognitive domain since 85% of students are predominantly kinesthetic learners (Medina). Movement elevates the heart rate which increases oxygen consumption, thus feeding the body and brain with essential nutrients of oxygen and glucose. The movement actions then prepare the brain for learning by refueling and revitalizing. Madigan used Ratey's (2008) pronouncement of "our culture treats the mind and body as if they are separate entities" (p. 4) as a cue to find ways for teachers to reconnect the cognitive and psychomotor domains, thus convincing educators that they, too, can utilize simple techniques in their classrooms. These researchers found a relationship between physical activity and student achievement in elementary and secondary schools where teacher creativity is encouraged.

During the upper grade levels of secondary schools, inventiveness and originality of teaching techniques begin to decline at the same time movement requirements are reduced to state mandated minimums and limited to the school gymnasium (Carlson et al., 2008). Even though teachers may still aspire toward gaining the maximum effect from each lesson plan, research shows that as students advance in grade level, they are required

to remain stationary for longer periods of time (Coe, Pivarnik, Womack, Reeves, & Malina, 2006). According to the Action Based Learning theory, students in the upper grades of secondary schools who are not given the opportunity to move are not maximizing their learning potential (Madigan, 2004; Medina, 2008). Some teachers may recognize that students need to move on a regular basis, and in the public school setting, innovative teaching methods are held in high regard if achievement results are noticed (Ouston, 1999).

Upon high school graduation, the next step in a student's educational career is higher education where students will move abruptly from the once creative learning environment to a predominately lecture based setting (Lea & Callaghan, 2005). Lecture classes, the primary delivery method for teaching situations in higher education, have a long held tradition, yet the typical 50 or 75 minutes of stationary knowledge acquirement does not adequately allow students the opportunity to stay focused, retain information, or utilize applicable material (Dyson, 2008). Knowing the average student has an attention span of only around 20 minutes, sometimes the majority of lecture material is lost to students (Beeks, 2006; Caldwell, 2007).

Certain college courses tend to have a reputation for containing information that is difficult to grasp, such as most natural science content classes (Lindblom-Ylanne, Trigwell, Nevgi, & Ashwin, 2006). These classes, and other similar ones, are barbed with heavy content loads and an exorbitant amount of information needing to be covered in a relatively small amount of time. The student must be well prepared to soak up and create knowledge during a short time frame. A problem thus ensues and provokes the scholar to try new methods of teaching.

Different techniques have been tested over the past several decades leaving many professors to feel overwhelmed or to believe too much time is wasted when trying something other than a straight lecture (Lea & Callaghan, 2005). Changing how a lecturer teaches can cause anxiety since higher education instructors are seen as experts or authorities on a subject and asking them to change their format may cause a certain degree of personal sensitivity (Martin & Lueckenhausen, 2005). Issues with teaching and academic workload exist in higher education, in so much as many professors have additional pressure to do research and compete for funding. Therefore, they do not necessarily have much time to focus and prepare for classes, especially new methods to use during precious class time (Lea & Callaghan).

#### Problem Statement

The long-held tradition of remaining seated during educational lectures has placed today's student at a disadvantage. The walls and towers of higher education bring forth voices with orations carrying an astounding amount of information in which students are to absorb, ponder, and apply (Horgan, 2003). All of this is to occur in the midst of a fog, creating denseness within the brain because of a loss of attention and lack of blood circulation (Leppo, Davis, & Crim, 2000). This takes place because the human body and its design for movement is forced into a fixed position while asking the brain to become stimulated enough to bring about a heightened awareness to a new set of knowledge. Professors are hoping to create new knowledge in their students but unfortunately, the brain is incapable of responding with maximum effort (Nonaka, 1991; Ratey, 2008).

Research has indicated a relationship between physical movement and brain activity (Colcombe et al., 2006; Madigan, 2004; Medina, 2008; Tremarche, Robinson, &

Graham, 2007; VanPraag, Kempermann, & Gage, 1999; Vayman & Gomez-Pinilla, 2006). Therefore, physical activity and circulation-encouraging movement activities occurring intermittently during a predominantly lecture style college course, which is sedentary by design, can hopefully affect the overall grade or learning of students. “Nobody has yet directly tested the relative effectiveness of just breaking the lecture up against interspersing it with activities” (Young, Robertson, & Alberts, 2009, p. 43), therefore movement activities and lecture breaks should be compared to look further into Madigan’s Action Based Learning Theory. Her theory includes the idea of the human brain’s ability to better function during and with physical activity. Madigan’s studies focused on how a teacher of elementary school-aged students can create a combined lesson plan with content area topics and movement activities. The movements did not necessarily need to correlate with specific details from the content area information, but Madigan suggested having a degree of content reinforcement of ideas if there is a relevant connection.

In a higher education setting, professors find time and effort become obstacles and a challenging task to undertake when trying to balance conveying a large amount of information, while at the same time ensuring students are absorbing enough information to be able to use the knowledge in their future career (Summers & Sviniki, 2007). What is needed is a procedure that is easy to follow, uses a small amount of time, and is effective in helping students learn. Breaks in the lecture where students perform activities related to class content, known as interactive windows, have been researched as a method for enhancing student learning, yet the preparation time to execute interactive

windows properly is very time consuming (Huxham, 2005; Knight & Wood, 2005; Lake, 2001; Lea & Callaghan, 2005; Machemer & Crawford, 2007; Summers & Sviniki).

Higher education classrooms are not considered to be as creative in their information dissemination process as elementary schools, where Madigan (2004) focused her research, yet the learning of information is still the primary goal of both completely different arenas of education. Research needed to occur in higher education to see if Action Based Learning theory can be further expanded into another genre of student age and learning level. Another reason to look at higher education classrooms was to determine if lecturing professors could employ a somewhat more simple technique to assist students' knowledge acquisition without watering-down content and placing an additional burden on an instructor by increasing their preparation time as interactive windows appeared to do.

#### Purpose of the Study

While interactive windows have been found to be relatively successful in raising achievement levels, much preparation time is required to adequately implement this technique as well as teach students the amount of content professors require for personal or professional reasons (Lea & Callaghan, 2005). A more undemanding method is needed to maintain the students' attention. According to Caldwell (2007), using simple "periodic breaks may help relieve student fatigue and restart the attention clock" (p. 12). The hope was that merely providing breaks could afford a beneficial boost in student learning with much less preparation time than interactive windows. Questions then arose about what type of breaks should occur, specifically whether students would benefit more from being passive and sedentary. If students remain inactive, as they are during lecture



time, they may not be able to jump-start their attention span without moving around and activating their circulatory system. A bonus effect might occur if the circulatory system is engaged which has demonstrated an increase in cognitive abilities (Medina, 2008). Medina has encouraged instructors to rethink the teaching process by understanding the human's primordial functioning.

Research has shown the inability of students to maintain an adequate amount of attention during lecture style classes (Beeks, 2006; Dyson, 2007; Caldwell, 2008). Furthermore, most research on college students has been related to using interactive windows as a means to enhance student learning and length of attention (Huxham, 2005; Knight & Wood, 2005; Lake, 2001; Lea & Callaghan, 2005; Machemer & Crawford, 2007; Summers & Sviniki, 2007). Research on physical activity, fitness, and achievement levels has been conducted with elementary school-aged students (Colcombe et al., 2006; Madigan, 2004; Tremarche et al., 2007; VanPraag et al., 1999; Vayman & Gomez-Pinilla, 2006). The intention of the current study was to use the Action Based Learning theory on a more adult population who are undergraduate college-aged students to determine if movement breaks in a predominately lecture-style college class affected a student's ability to demonstrate learning.

The use of interactive windows was considered to be too burdensome for many professors, even though research demonstrated a positive connection between the interactive windows and student achievement (Huxham, 2005; Knight & Wood, 2005; Lake, 2001; Lea & Callaghan, 2005; Machemer & Crawford, 2007; Summers & Sviniki, 2007). Professors have relied on straight lecture techniques for centuries, and enormous efforts are needed to change a teacher's underlying beliefs (Lindblom-Ylanne et al.,

2006). Therefore, to invoke a change in teaching techniques the professor's perception of a method's ease of use and effectiveness would affect its validity. This means that in order for a method to become widely used, instructors would need to perceive the technique as helping student achievement, eliciting few, if any, challenges, and non-time-consuming.

One purpose of this study was to compare final grade percentages of college students to determine student achievement. These students were enrolled in one of two classes in which there were two course sections taught by the same instructor within the same semester. Of the two classes within each subject area, one class performed a circulation inducing activity periodically during class. The activities were brief and then the class resumed lecture momentarily, hopefully only removing up to a total of four minutes of lecture while participating in the movements. The second class within each different subject area did not have the breaks involving movement. Instead the students and the instructor followed typical protocol used by the instructor and during the time where the other class moved, this class was given a review break. During this time, students had the same break opportunity but they were not given movement activities to perform.

Another purpose of this study was to become aware of how professors perceived the two methods of instruction. Instructors gave insightful information regarding how they believed the movement or review breaks affected students. These perceptions referred to the merit of its use in higher education classrooms and how the methods fit into a teaching routine. Professor attitudes were determined through phone conversations during the semester, as well as an end-of-semester personal interview. Participating

professors were interviewed once the semester had been completed and answered questions about the teaching methods used to gain insight into the technicalities and nuances that arose during the initial stages of the study.

### Research Questions

The overarching goal of this project was to find a means to help students increase their learning capacity in college classes knowing students are faced with many predominately lecture style classes. An increase in the number of high achieving students puts more pressure on professors to determine the most effective and efficient method to deliver information while maintaining course integrity and working within time constraints for class preparation.

The research questions guiding this study were:

1. Do circulatory enhancing movement breaks in a lecture-style college class affect student achievement over the course of a full semester, 16 weeks?
2. Is there a difference in student achievement between the classes used in this research among the various subjects when circulatory enhancing movement breaks are used in lecture-style college classes?
3. What are the professors' perceptions of the use of enhanced movement breaks in lecture-style college classes?

### Limitations

This study may have been limited by the following. First, the students in the classes were enrolled because it was a requirement for their degree program. Typically, students are told when to take which set of classes and they were taking these classes to be able to obtain a degree. Research has shown intrinsic motivation in an educational

setting is related to a student's desire to learn and their interest in a particular subject (Stipek, 2002). Therefore, a limit to this study was that students may or may not have intrinsic motivation to become and remain as alert as necessary to acquire given knowledge.

Second, the students' backgrounds were not taken into consideration. Some may have had a greater ability to perform on tests than other students, depending on their aptitude for test-taking, knowledge acquisition and retention, amount of preparation, level of interest in subject matter, and drive for success. Yet this is typical of any given college course outside of honors or special needs courses. No honors classes or special needs classes were used; therefore, each class should have had close to the same degree of varying amount of student aptitude ability.

Third, the instructors were presumed to have used the same method of teaching in each of the two classes, as well as covering the same amount of material. Since the same instructor was used to teach both course sections of each participating class, the instruction and course material was expected to remain consistent. By comparing the syllabi of both classes per instructor, a cross-match of information was determined. Since teachers remained the same for both sections of the classes, it was assumed that there was not any bias from the instructor in relation to how they approached teaching methods from one class to the next. The researcher did not know if the professors had a predetermined sense as to how well one class may perform than the other, therefore a limitation may have arisen if there was an unbeknownst factoring difference. Professors of academia are assumed to have research integrity, thus they understood the importance of quality and validity to a research project.

Fourth, students in the test group were expected to participate actively during the movement breaks and to return to normal class functioning quickly. As adults, these students were informed of the class format at the beginning of the semester which stipulated the expectations of how students are to self-monitor their ability to move or acknowledge the breaks given as a brief pause and not a lengthy interruption of class procedures. By merely staying enrolled in the class, students were to follow the guidelines set forth by the researcher via the professor. As such, they were agreeing to fulfill researcher expectations of movements.

Fifth, the control group was given the ostensible review breaks at the same time as the treatment group received movement breaks. These review breaks could have been misconstrued as time students could and would use to their advantage by prying the instructor for deeper knowledge and information found to enhance the control groups' grasp of certain subject area concepts. Instead, the time used by the control group was not regimented in a manner whereas the students were asked to look at their notes or ask questions of the instructor; instead professors were directed to signify the beginning of the break time and the end without further discussion. If students had questions they were to wait until the lecture time began again. The students were to either volunteer to participate in the review break or to follow other normal classroom protocol set up by the professor.

Finally, in an effort to control for the Hawthorne effect of having behavior occur that was not characteristic of this group of participants due to their knowledge of the research performed, both groups were aware of their role in the research project. Each class knew they were being studied rather than only one of the two classes having

knowledge of the research and the other not. Even though the students were aware of the class procedures in which the process was out of the ordinary and had some sort of research element involved, the students did not know the full extent of the study.

#### Definition of Key Terms

*Achievement.* The ability to demonstrate learning through pre- and post-testing indicated by grade-point averages, scores on standardized tests, and grades in subject specific courses (Carlson et al., 2008).

*Adequate Attendance.* Student is present in class and able to participate in activities without missing more than 10% of class meeting opportunities.

*Circulatory Enhancing Movements.* Activities that increase heart rate, blood flow, and breathing tempo (Plowman & Smith, 2008).

*Cognitive Domain.* A learning area involving knowledge which includes the recall of facts, procedural patterns, and concepts related to the development of intellectual abilities (Bloom, 1956).

*Final Grade Percentage.* The rate or proportion per hundred based on criteria set by an instructor at the completion of a semester.

*Higher Education.* Education that exceeds a high school baccalaureate degree, sometimes referred to as post-secondary education.

*Interactive Windows.* Breaks in a lecture where students are answering questions based on content area information.

*Intrinsic Motivation.* Stimulus to learn about a topic strictly inherent to the individual and not induced or manipulated by external means (Stipek, 2002).

*Learner-centered Teaching.* A teaching perspective focused on the individual learner's background, experiences, talents, interests, and needs, as well as teaching practices that promote motivation, learning, and achievement (McCombs & Whisler, 1997).

*Lecture-style.* A prepared disquisition, the formal treatment of a subject, delivered to a class that is designed to instruct (Horgan, 2003).

*Locomotor Skills.* Classified by its purpose, a movement that uses a human skill to initiate the body into motion away from a central location, thus moving the body from one place to another (Kluka, 1999).

*Non-locomotor Skills.* Classified by its purpose, a movement of the human body using spinal support to suspend, balance, move external objects, or receive forced objects, thus movements performed in one location without moving through space (Kluka, 1999).

*Psychomotor Domain.* A learning domain that includes physical movement, coordination, and motor skills (Bloom, 1956).

*School-aged Children.* Students who are of the chronological age to participate in elementary, middle, and high schools.

*Teacher- or Content-centered Teaching.* A teaching perspective where instructors focus their attention on classroom performance and the ability to transmit information related to the curriculum thinking it will be sufficient for student learning (Ramsden, Prosser, Trigwell, & Martin, 2007).

*Traditional Class Hours.* The typical length of time used for higher education classes, usually 50 - 75 minutes.

*Vigilance Decrement.* A state of alertness that has undergone a lessening or has been lost during a planned activity (Young et al., 2009).

### Summary

Throughout much of the literature related to lecture style teaching formats, lack of student attention was predominant (Beeks, 2006; Caldwell, 2007; Dyson, 2008; Young et al., 2009). In other related literature, students were exposed to a method of instruction requiring a large amount of preparation time by the instructor and were shown to have higher grade percentages than those who were not exposed to this method (Huxham, 2005; Knight & Wood, 2005; Lake, 2001; Lea & Callaghan, 2005; Machemer & Crawford, 2007; Summers & Sviniki, 2007). According to Action Based Learning theory and other research (Madigan, 2004; Medina, 2008; Ratey, 2008), students can cognitively grasp more subject area concepts when movements are incorporated into the learning process. This theory is the basis for studying if more college students can increase achievement by incorporating brief movement activities into a typical lecture style course.



## CHAPTER TWO

### REVIEW OF LITERATURE

The evolution of education and the role of the teacher have been well documented, especially for the elementary and secondary levels. With each succeeding generation, post-secondary, or higher education, has been left to a series of trial and error methods of teaching (Horgan, 2003). This chapter will focus on literature related to educational roles, higher education lectures, student engagement studies, cognition, and achievement through exercise.

#### Education

According to Merriam and Brockett (2007), “learning can occur both incidentally and in planned educational activities” (p. 6). Today’s educators are thus reminded of the dichotomous thinking between liberal and progressive education in an attempt to lead students away from simply acquiring information and toward gaining knowledge by owning wisdom.

#### *Liberal and Progressive Education*

In liberal education, wisdom is an ultimate goal by which practical, real-world knowledge and pedantic, theoretical intelligence requires a search for truth about the human situation and the world by studying books, listening to orators, and self-reflection (Elias & Merriam, 1995). Knowledge and wisdom are a “result of a life dedicated to learning for the sake of learning” (Elias & Merriam, p. 23). Learning is what the brain strives to do as the body functions through a daily routine (Ratey, 2008). Even though

the human desires to learn, the capacity and level of each person's ability to learn has unique challenges.

Students who follow a liberal education path first need to acquire facts about a variety of topics and then they can utilize an innate or learned ability to deal with these facts by continually searching further for deeper knowledge (Merriam & Caffarella, 1999). This search has its roots in philosophy as one attempts to find more information about a topic by reading books and listening to lectures in order to gain factual knowledge and then using thought processes and discussions to further advance understanding. The foundational concept to liberal education is self-directed learning involving abstract thoughts and ideas (Elias & Merriam, 1995).

Progressive education includes principles from the experimental scientific method using problem solving techniques with an emphasis on the sciences in order to better the human condition (Elias & Merriam, 1995). With this form of educational perspective, schools began to broaden their view of education, finding "schools are just one agency responsible for transmitting culture and information" (Elias & Merriam, p. 55). Instead of focusing their attention on traditional literature and educational materials, schools turned to the scientific community to help describe and explain how humans and the world function.

Yet progressive education is still similar to liberal forms by believing education is more than just preparing students for a mature aspect of the world, but also a continuous expansion of the mind (Merriam & Caffarella, 1999). The differences between the two educational outlooks occur when education becomes useful, functional, and pragmatic (Merriam & Brockett, 2007). Granted, all education should have characteristics of

usefulness, functionality, and pragmatism, but how to teach or emphasize these aspects is where progressive and liberal education divide. Liberal education focuses on finding meaning in the use and function of a topic. Progressive education employs a more data driven viewpoint whereas a subject is treated as if proof is needed before students should believe how and when something has happened or will occur (Merriam & Caffarella).

Within the last century the relationship between teachers and learners changed to accommodate this paradigmatic shift in educational viewpoints. The teachers' role expectations shifted to one where instructors should organize and stimulate students to learn by creating interactive processes that students can use to relate with their environment, thus facilitating learning using problem solving methods (Elias & Merriam, 1995). As with any educational objective and in order for a student to be able to problem solve, first they must have a certain amount of background information about a subject matter. The information, however it is delivered, is internalized by the student and restructured by the brain so knowledge dissemination skills can be created (Daud, Rahim, & Alimun, 2008).

Once knowledge is created from the information provided by the teacher, students can then externalize what they have deciphered from the learning experience in hopes of finding solutions to problems. Unfortunately, much of the knowledge creation process never extends past information accumulation. According to Daud et al. (2008), students who are not provided with innovative learning opportunities academically perform at sub-standard levels of knowledge creation.

### *Surface or Deep Approach to Learning*

Teachers are continually given information about how to best disseminate information to students to encourage understanding which in turn creates knowledge that can be used for problem solving (Ouston, 1999). Problem solving and critical thinking skills are high agenda items in today's educational setting. Principals, presidents, and other administrators have various reasons for this emphasis on problem solving and critical thinking skills, and transformational educational leaders are attempting to change the quality of teaching techniques to meet new legislative and corporate demands (Yukl, 2006). According to Yukl, a transformational leader motivates followers, such as students or teachers, by "making them more aware of the importance of task outcomes" (p. 262). Transformational leaders create a dynamic environment and a learning organization which becomes value-laden for both the instructor and the student (Ramsden et al., 2007). In these circumstances, the leader encourages different communication strategies to align course content with students and professors (Wulff & Wulff, 2004). "Changing the teaching environment or the perceptions teachers have of their environment may trigger changes in teaching" (Ramsden et al., p. 141) and thus change the way students perceive they should approach learning.

According to Ramsden et al. (2007), since students' perception of the context of learning determines how they approach learning; the quality and magnitude of the learning can be adjusted. The context of learning relates to how important or interesting a student perceives information to be. If instructors can motivate students to become more interested in attending class and appreciating the content, a deep approach to learning occurs (Kemper, Leung, & McNaught, 2008). A deep approach to learning

emphasizes thought rather than memory (Bligh, 2000). Bligh stated that when students are utilizing deep learning, the meaning of information is different and personal to each individual who will take sections of newly acquired knowledge and make it contextual to their personal experiences. Students are then looking for an overall structure of the ideas that will relate to something they either find interesting or important. It is as if students mentally embrace the course content because they have a personal attachment to its significance. The deep approach to learning occurs when students thoroughly comprehend material presented by a teacher in a new or different context from which the information was originally associated, such as learning a new way to view material from whence the student had at one point related it (Ramsden et al.).

In contrast to deep learning is the surface approach to learning, which is related to rote memorization (Bligh, 2000). With rote memorization, there is not a heightened awareness to the intrinsic nuisances associated with a particular subject or topic because students have only tried to learn or acquire superficial knowledge based on an immediate need to do so (Kemper et al., 2008). Questions arise about what an educational system is responsible to teach, especially related to how long students should understand facts or have knowledge and the best way to promote deep learning. A deeper understanding is particularly useful when subjects are linked to students' career aspects where they are expected to be more knowledgeable and better equipped to solve problems or create advancements in their area of study. In order for this to happen, information and essential background knowledge must be given to students so they can have a baseline of facts from which to draw conclusions or to act upon (Bligh). Lectures are used in many

settings to deliver this knowledge in hopes of providing as much information as possible in a timely manner.

### Lectures

The primary delivery system for large-scale teaching in higher education institutions is the lecture (Dyson, 2008). In the United States and throughout the world, in spite of technology and innovations in teaching, lecturing is the most common method of teaching (Bligh, 2000). “In politics lectures are called speeches. In churches they are called sermons. Call them what you like; what they are in fact are more or less continuous expositions by a speaker who wants the audience to learn something” (Bligh, p. 4). According to Horgan (2003), instructors lecture because it provides a cost effective means of teaching to a large group of students over a course of many semesters when the information typically remains consistent. Lecturing is considered cost effective because the instructor can provide new information, based on original research and generally not found in textbooks, thus not only is the material up to date, but students do not have to purchase a textbook (Horgan). The alternatives to straight lecture normally include more high-tech gadgets and equipment for showmanship and demonstrations. These additional purchases, above and beyond the classic college classroom arrangement, can raise the cost of education creating a larger overhead than when reliance is predominately on one individual showing up to a classroom and speaking.

Many professors declare lectures are essential for information dissemination, giving background data and ideas, basic concepts, and methods before students can learn on their own and/or become intelligent participants in classroom discussions. Findings have indicated as many as 80 to 90% of higher education classes are devoted to lecture

(Gray & Madson, 2007; Horgan, 2003). Horgan also found instructors stating they can communicate their enthusiasm for a subject matter while dramatizing ideas and share personal insight when using the lecture format. Another reason for lecture was based on the subject matter because lectures allow instructors to quickly organize material and then lecture or speak better based on their set of course objectives derived from the original outline of content.

Historically speaking, as education has become more widespread and more available to the general public, liberal educators believe teaching by a professor is the best method of instruction, even if the delivery system is predominantly lecture, as long as the information is well organized and ability dependent (Elias & Merriam, 1995). As stated earlier, this preference for lecturing professors is due to the ideals of liberal education where oration is held in high esteem. Today's progressive educators also admire lecture because of the professor's ability to share experimental findings and to demonstrate how the conclusions may have occurred. Yet strict lectures may not allow for classroom discussions as a liberal educator may desire, and there may not be time to demonstrate experimental applications, with the amount of facts to cover during a typical class period as progressive education wishes (Lindblom-Ylanne et al., 2006). Learning is to occur with or without ostentatious elements, and lectures are considered the most stringent with time.

Horgan (2003) intimated lecturers can become so bogged down and fixated with covering as much material as possible in a given class period that students "miss the chance to uncover" the deeper meaning associated with a lesson's point (p. 78). Furthermore, a methodical lecture may actually be detrimental to the quality of student

learning, in so much as students may begin to expect learning to be a passive experience, therefore missing the opportunity to engage in deep processing of the subject matter (Bligh, 2000; Horgan). White (2007) stated that as students mature so should their level of understanding; therefore, students' ability to decipher information from a lecture is a reflection on their maturity and preparation for a future career. Analyzing information may be an element of maturity, yet students develop at different rates making general statements about cognitive progression a moot point (Graham, Holt/Hale, & Parker, 2007).

Many college students can more keenly develop their learning approach to focus on reproducing facts for tests and quizzes during their time at college (Ramsden et al., 2007). Instructors in higher education institutions found lecture to be the most efficient for a recitation level of understanding because there are assigned readings and students are expected to be able to repeat the material presented in textbooks (White, 2007). This is not deep learning; instead it is only on the surface, which is contrary to the accolades a higher education degree promulgates. The deep learning approach encourages students to find meaning within information that can enrich knowledge making it more tacit than explicit (Daud et al., 2008). Tacit knowledge is automatic, highly personal, and based on deep-set intuitions accumulated over time and reflection (Nonaka, 2000). Explicit knowledge is formal, can be communicated, and systematic (Nonaka). The specifics of explicit knowledge that is related to a concept can be explained from one person to another, thus leading to tacit knowledge once the student receiving the knowledge has used the deep learning approach that facilitates reflection or practice in using the information (Nonaka). Knowledge creation is therefore reliant on student ability to



disseminate information in as much as instructors can relay key concepts to encourage deeper appreciation.

According to Bligh (2000), the deep approach to learning is not normally achieved in traditional lectures since professors presume students will leave a strict lecture-style class and reflect on or study material soon afterwards to reiterate information. However, excessive material and little time does not allow reflection and reviews to happen. When students leave the classroom, they do not take the extra time to revisit lecture material; instead they are preparing for upcoming classes or participating in other activities (Bligh). As a pedagogical tool, lecturing is relatively ineffective in promoting conceptual understanding, especially due to the assumption that students learn the same and gain meaningful understanding of concepts by passively listening to verbal presentations (Knight & Wood, 2005).

### *Student Attitudes*

According to Huxham (2005), students do not like lecture-style, stating the classes “are unpopular with students who demonstrate their feelings by not attending them” (p. 17). Lectures elicit blank looks, tired expressions, and students who appear bored out of their minds (Grey & Madson, 2007). “The major disadvantage of lectures is believed to be the passive nature of information transmission and the lack of active involvement by students” (Lake, 2001, p. 897). The students’ role is to remain seated and listen attentively while “selecting information from what is said, possibly translating it into their own words or some form of shorthand, and then writing it down” (Bligh, 2000, p. 9). To be completely accurate, this requires students to have forehand knowledge about course content to be able to consider data important.

Horgan (2003) stated that the main purpose of a lecture is to build a bridge between what the student already knows and the structures of the subject matter. Yet lecture information is translated differently depending on the student's current state of understanding. Many students find themselves lost in the discourse, unable to keep a paper trail of vital or key points (Horgan).

As instructors, "we expect students to learn and change as a result of teaching" (Martin & Lueckenhausen, 2005, p. 390). Although used predominately in higher education, lecture is not the most stimulating and engaging to the students. Instructors lodge themselves in front of the classroom and vocally deliver an oration describing facts and information as students sit passively for 50 to 75 minutes in one location (Grey & Madson, 2007). "Students report that the longest they can comfortably endure uninterrupted lecture is 20 to 30 minutes" (Caldwell, 2007, p. 12).

#### *Attention Spans*

The average student has an attention span of approximately 20 minutes (Beeks, 2006), and students stop focusing on content being delivered within 15 to 20 minutes (Young et al., 2009). Knowing typical lecture-style classes last much longer, anywhere from 50 to 75 minutes, it is difficult to believe information is understood by the student or the instructor's data are able to be deciphered well enough to be put into notes for reflection or study at a later time. The passive nature of the lecture aids in students' inability to retain information because traditional lectures do not facilitate the deep approach to learning, and concentration levels drop as a class proceeds through the allotted time (Young et al.).

Young et al. (2009) studied five different lecture formats to determine if the length of student concentration could be improved. They found the traditional lecture format resulted in the greatest lack of concentration. In addition, grades on exams in lecture courses were found to be lower than the other formats except on the essay portion where they were only slightly lower. The differences in achievement and concentration levels were attributed to the amount of student stimulation, both mentally and physically.

As students move from class to class across campus or within an academic building, their alertness is reinvigorated because of the physical movement (Madigan, 2003). Therefore when students arrive to a lecture-style class they should be ready to gear up and prepare to take notes. But even if students are attentive at the beginning of class, “sometimes the later half of the lecture is lost; because the average human attention span is not more than 20 minutes, recall of information drops drastically after 15 to 20 minutes of lecture” (Caldwell, 2007, p. 12). Horgan (2003) reinforced the idea of concentration decline by stating:

Attention levels during a 50 minute lecture reveal that during the first 10 minutes attention levels are high, but as the lecture proceeds, attention levels drop and continue to do so if students are not actively involved in some way. Research studies on memory and retention of material show that students frequently forget, or never learn, much of the material presented to them during a typical 50-minute traditional lecture. (p. 78)

Bligh (2000) pointed out that facts presented during the middle of the lecture are most likely to be disregarded or forgotten because of the passive nature of traditional lectures.

Dyson (2008) found through a self-analysis of engagement by students in a lecture class, “lecture engagement was significantly more variable at the beginning of the lecture relative to all other periods” (p. 276). Students arrived to

class moments before the beginning of lecture and were prepared to listen. Dyson's study asked students to rate their level of attentiveness every five minutes during a lecture. This same study also indicated that the self-analysis itself could have caused the students to be more engaged overall compared to other studies, possibly because they had to pay attention in order to fill out the rating scale given to them to use during class. Making the notations on the paper-and-pencil scale was considered stimulating to a student's attention; therefore it was a form of active or anonymous contribution to the learning process. Dyson stated, "It was also clear that by introducing a variety of small scale interventions the lecturer increased the likelihood of engaging all of the students at least some of the time" (p. 280). This meant more students were alerted to participate and interact in class proceedings.

### *Changing the Lecture*

The most engaging teachers are very effective and "if we rely on only lecture, the odds are against our becoming the most effective teachers" (Gray & Madson, 2007, p. 83). Yet changing how a lecturer teaches causes anxiety since higher education instructors are seen as experts or authorities on a subject and they do not want to appear abnormal or as if they are neglecting their duties of the information giver (Martin & Lueckenhausen, 2005). The giving of information in a lecture format is deemed comfortable due to the perfunctory nature of mechanically portraying facts and not the sense that this delivery method should suffice for all students.

Professors may be intimidated by new approaches to teaching since they are simply trying to hold their students to the same degree of education from which they once

were held themselves. Horgan (2003) suggested new instructors may deem teaching by lecture as an efficient means to transmit knowledge to students “and rarely think of the impact of this approach on students’ learning” (p. 78). The new instructor is initially focused on the quality and accuracy of their presentation as well as classroom management. Once confidence has been raised, new instructors may be able to turn their attention to the needs of the student as a learner and not just a person occupying space in the classroom, thus searching for more innovative teaching techniques.

At one time, new instructors were considered those who predominantly chose to lecture (Horgan, 2003). Other demographics of teachers have now been found to opt for traditional class styles, too. Lammers and Murphy (2002) stated that there are more male professors who lecture than female. This is possibly due to the desire of females to break out of the traditional mold and the female professor is more willing to experiment with new techniques. Overall, lectures are here to stay in the world of higher education; they are not leaving any time soon (Lammers & Murphy). According to Martin and Lueckenhausen (2005), lectures may change in small methodical ways with formatting, but first an instructor should identify what category of teacher they wish to become to be able to change more effectively with a higher degree of efficacy.

The categories of teacher impact styles consist of: (a) the courier who sees the subject matter as a package to be delivered to and received by students; (b) the builder who gives the pieces and parts of the information and students must gather and then pack and unpack the information to put it together to make it fit them or rearrange it for their personal understanding; (c) the navigator who teaches highlighted key ideas and interconnections and then students chart their own way and come to know things by

reflecting on what was presented; (d) the expedition leader who shows the lows, highs, short-cuts, and dead-ends by guiding students toward knowledge; and (e) the pioneer who must clear hazy conceptions and make the uncertain more sensible (Martin & Lueckenhausen, 2005). All of the categories still reflect a lecture-style class, but with a different focus or with a newer understanding to student needs. Once instructors connect with an idea from a category they may be able to make changes to their lecture more easily. Mostly, lectures will remain the predominant format for information delivery even if professors identify the technique with which they are most comfortable.

*Active learning.* According to Young et al. (2009), active learning in higher education can occur any time there is a break in the traditional learning and the student is engaged in discussion, reflection, movement, hands-on activities, or some form of verbal stimulation. Huxham (2005) used interactive windows as a means to engage in active learning breaks in lecture time by having teachers stop their lecture long enough to allow students time to understand a particular bit of information. Interactive windows are gaps within lectures that teachers use to employ learning activities. The teacher would then use an active learning activity related to the subject matter.

The interactive window teaching technique basically caused lecture to be interrupted by a break for the students where a stimulating active learning endeavor would transpire. Active learning occurred when the students initiated or participated in these innovative educational opportunities. Instructors encouraged reflection upon prior knowledge from readings, lectures, or other assignments by directing activity prompts toward subject area content (Huxham, 2005). Active learning does not disagree with

lecturing, instead it provides opportunities for students to reflect, evaluate, analyze, synthesize, and communicate on or about the information presented (Fink, 2003).

Knight and Wood (2005) found the interactive window approach to lectures to significantly improve test and homework grades. Even though this may have increased student achievement, Huxham (2005) believed the interactive windows may cause a loss of teaching time, reduction in the accuracy of transmission, student resistance, poor student perceptions, and a loss of control of the class and its content. Again, depending on the Martin and Lueckenhause (2005) category a teacher espouses, the teacher may need to decide if student achievement is more important than losses described by Huxham. The amount of time spent for preparation compared to the amount of student achievement is discouraging to professors (Knight & Wood). Many professors already have difficulties with distribution of resources, which includes time constraints, and they are not willing to expend the effort necessary to implement interactive windows (Knight & Wood). “Designing and testing active learning events can be time-intensive on already overloaded faculty schedules” (Machemer & Crawford, 2007, p. 11).

Instructors may find student acceptance of the change in lecture style teaching as lacking. Some students claim the time and skill needed to participate in interactive window breaks is harder than memorizing facts, and this is because the information students are learning during the lecture breaks requires a deep approach for processing (Machemer & Crawford, 2007). In a Knight and Wood (2005) study, students at first disliked and distrusted the interactive class and group activities, but after the first few weeks most became comfortable and stated that it helped their learning of difficult material.

Lake (2001) found students believed the active learning classes had academic rigor but thought the teacher taught them less material than in a traditional lecture style class. This attitude changed dramatically once students were explained the rationale for the instructor's change in teaching approach due to the research study's objective. The change in class style caught them off-guard at first. Additionally, as the initial impact subsided, the students began to think of the instructors who changed their style of teaching as more caring professors than others (Lake).

*Community.* As students participated in alternative forms of interaction during class time, a sense of community within the classroom occurred because students claimed to feel a shared emotional connection through collective experiences, creating a feeling of belonging. Summers and Sviniki (2007) reported significantly higher motivation in courses using interactive learning, stating students perceived a sense of community in the classroom. Machemer and Crawford (2007) surveyed students' perceived value of teaching styles, finding students valued lecture and being active equally but they "identified interactions as the most popular feature of the lecture" (p. 12). It appears students have a sense of security with lectures but appreciate activities where the whole class is involved to some extent. According to Dwyer, Sallis, Blizzard, Lazarus, and Dean (2001), physical activities can improve the social development of students, leading to the belief that movement activities could help with the creation of a community thought process.

Interdependence among students occurred when there was a belief that efforts to learn would be successful when those in the class, or other groups, shared a common goal to participate in the interactive windows (Summers & Sviniki, 2007). Students would



then have a common commitment to learning which fosters a community within the classroom. By engaging students in similar activities, students create an environment where they feel a sense of belonging and a sense of responsibility. A mutual liking of each other is then fostered among the students which engender a process of acceptance into the community of learners.

Once connectivity among students occurs, the motivation to achieve can significantly raise grades (Summers & Sviniki, 2007). Summers and Sviniki measured student achievement and perceptions in interactive college classrooms. They found an underlying reliance upon community attributes by students who worked together or shared common goals. Additionally, when college students needed to complete a mastery of a cognitive or performance based assignment, students perceived individual workmanship as more desirable.

*Lecture breaks.* Interactive teaching with lecture breaks requires more preparation time on the part of the instructor (Lea & Callaghan, 2005). Professors of higher education have issues with the amount of time used to teach due to the increased pressure to do research and compete for funds by writing grants or soliciting endorsements (Martin & Lueckenhausen, 2005). In many universities, professors do not have much time to focus on class preparations, resulting in an archaic thought process. Accordingly, professors then believe that what has occurred over many generations will have to be sufficient for today's student, yet higher education funds are disproportionately given to research even though most money comes from student fees and it is the education of the student that is the product and claimed focus point of a university (Bligh, 2000; Lea &

Callaghan). Simply put, professors need an idea to help with student focus and achievement without putting undue burden on preparatory time.

Research has demonstrated an effect of student lack of attention and low achievement levels which may be connected to the misuse of lecture with low stimulation. Young et al. (2009) explained the term vigilance decrement, which is when students do not have constant attention; their levels of concentration have diminished to a point that they are not able to process new information. The decrement has to be reset somehow or the instructor must restore some level of active processing into the human's task. A lack of concentration is only natural when the attention span is not long enough to make it through a typical college class time frame (Horgan, 2003). Identifying this as a material matter and knowing students experience vigilance decrement means we can avoid their loss of concentration by trying to solve it.

Madigan's (2004) Action Based Learning Theory has found mental concentration to increase when students are given movement opportunities to reset their vigilance alertness. The movement is not only a natural human undertaking; it is a stimulant (Medina, 2008). Many active learning methods include movement, but are unstructured and without direction since the in-class assignments are typically content based, which is characteristically cognitive (Knight & Wood, 2005). The unstructured movement may appear chaotic to uninformed onlookers, but the physical movements are causing the student's attention to reset to a more alert state (Madigan; Medina).

There is a parallel between active learning and increased vigilance but there is no research to support if active learning is superior to just resetting the attention clock by another means. Caldwell (2007) stated, "Periodic breaks may help relieve student fatigue

and restart the attention clock” (p. 12). “Studies imply that true interactivity is not necessarily a criterion for deep learning to occur and simply breaking the vigilance decrement could be just as important” (Young et al., 2009, p. 53). To break the vigilance decrement, instructors will then want to begin a different approach to teaching, one that focuses on the student’s needs. According to Lea and Callaghan (2005), there is increasing pressure associated with improving student outcomes; therefore, instructors are searching for a method to meet the ethos and culture of their institution while working within the demands of the modern professor.

#### Learner-centered and Teacher- or Content-centered Approaches

According to Weimer (2002), today’s college students are not empowered to learn, are not confident in their knowledge, and are not self-motivated to learn, which has educators wondering if there is something about the way students are taught making them uncomfortable and tentative. Universities espouse that graduates from their institution are ready for the workforce and mature citizenship. However, some research suggests historic teaching methodologies are producing people who are too reliant on specific directions, therefore unable to think critically because of the overtly structured classroom (McKinney, 2007). The idea of too much structure happens when “students’ motivation, confidence, and enthusiasm for learning are all adversely affected when teachers control the processes through and by which they learn” (Weimer, p. 23).

#### *Teacher- or Content-centered Teaching*

Teacher- or Content-centered teaching is when school curriculums are focused on what the teacher deems important for content outcome goals and then employs the most comfortable and effective method for the instructor without necessarily considering how

the method aligns with student needs (McCombs & Whisler, 1997). The main emphasis is to transmit knowledge and present information related to course content in the simplest way possible (Lindblom-Ylance et al., 2006). This teaching process is under scrutiny because of research implicating the educational environment as too prejudiced toward autocratic control by instructors over both content and pedagogy. Traditionally, teachers give students a list of demands on the first day of class and exude a controlling attitude about who will learn what content (McCombs & Whisler). The demands include all aspects of how, why, and where learning is to occur. This attitude is oppositional to the values this country encourages a citizen to advocate, therefore a correlation between socially unprepared college graduates and Teacher- or Content-centered teaching is contradictory (McCombs & Whisler).

Research has stated that teachers who give instruction in the “hard disciplines such as the physical sciences, engineering and medicine, were most likely to apply a Teacher-centered approach to teaching” (Lindblom-Ylance et al., 2006, p. 286). As with most content laden classes, the instructor’s “focus of student learning is fact retention for structured problems” (Lindblom-Ylance et al., p. 287). When “students adopt approaches to learning aimed at reproduction rather than understanding” (Prosser, Ramsden, Trigwell, & Martin, 2003, p. 37) content, the experience is said to be dissonant. Recitation of information does not imply comprehension of material (White, 2007). In fact, the highest level of education is evaluation, where one can judge the work of others (Bloom, 1956). Recitation level only demonstrates that learners are passive and dependent on the teacher to provide exact examples and solutions (White).

Prosser et al. (2003) studied first year university students concerning the quality of teaching and quality of learning. They found:

students who reported adopting surface approaches and who perceived the teaching to be poorer, the goals and standards to be less clear, the workload to be too high and the assessments to be testing reproduction, were shown to have poorer quality understanding of key concepts and to be performing less well on tests of achievement. (Prosser et al., p. 38)

It appears instruction of classes where the focus was Content-centered and followed a curriculum with strict lecture and memorization of facts; students were not prepared for the problem-solving and thought provocation skills they were asked to consider. Critical thinking to problem solve is not only a delegated assumption of a college graduate but it is also an element corporate America claims is lacking in recent graduates (Bligh, 2000; McKinney, 2007).

#### *Learner-centered Teaching*

Learner-centered teaching is commonly referred to as Student-centered because the teacher's methods of instruction and class content are focused on students and their learning capabilities. McCombs and Whisler (1997) stated Learner-centered teaching is when class content and curriculum meet, or at least attempt to meet, the individual needs of the student/learner. A key concept related to the individual needs of a student is the degree to which understanding of course information is processed. In higher education, learners take certain classes not only to meet degree requirements; they want to comprehend material relevant to their future career. For this to occur, students would need to have a conceptual change, which occurs when the teaching style is centered on student desires (Prosser et al., 2003).

Learning is multifaceted, thus there are many contributing factors to successful learning (Hall, 2007). “As teachers, we have to remember that each student we encounter is a unique individual with unique learning needs” (Hall, p. 124). Furthermore, when creating the curriculum and course goals, the individual learner’s heredity, experiences, perspectives, backgrounds, talents, interests, and capacities are deemed important. Every detail of each student does not need to be critically examined, but the diversity should be acknowledged and considered (Larson, 2001; Shields, 2004). When discussing lack of attention span during lecture classes, a Learner-centered classroom would consider how individual learners may perceive the stationary environment and attempt to address a possible solution. Learner-centered teaching would find the lack of movement and student passivity during lecture style teaching classes an impediment to meeting the individual needs of students (McCombs & Whisler, 1997).

Due to today’s school systems’ spotlight on meeting standards required by the public domain and the production of a quality employee, the educational setting is portrayed and viewed as an environment where educators tend to focus on the results of high stakes tests instead of on the process of learning (Ouston, 1999). This narrow look at how achievement is measured is found in elementary, secondary, and post-secondary education. An indication has been noticed that the system may be breaking the mold where all students should be successful with a new focus, whereas students are, in fact, not achieving because “students focus on their feelings and needs that are not being met” (McCombs & Whisler, 1997, p. 38) instead of achievement.

## Exercise and Cognition

Even though we have unique needs to be able to learn, as humans, one person's brain is constructed similarly to another person's. Even more so, we can look at research performed on both humans and nonhumans to solidify certain data. To understand how we sift through information and retain or apply what we learn, it would be wise to look at the brain's structure to determine how it may work best. Knowing the most effective use of students' brains would help instructors maximize their teaching efforts due to the limited amount of time teachers have with students and the need to make the biggest impact. As students enter universities or other higher education institutions they are on the cusp of their third decade of life which is an important period in the brain's existence. According to Colcombe et al. (2006), this is the era when the structure of the human brain shows functional decline. Therefore, instructors are not only working with limited time and large amounts of information to disseminate, they are also facing students who have brains that are on the verge of a slow decline.

### *The Brain's Structure*

The brain's neurons are the structures that allow information to pass from one area of the brain to another while processing necessary and eliminating unnecessary data (Colcombe et al., 2006). According to Ratey (2008), as a person reads written information, the brain's frontal lobe begins to fire signals trying to determine if the material is new, old, removable, or indispensable. If the information is new, the brain will encode the data for storage which will then allow it to be retrieved when necessary (Medina, 2008). How much information is absorbed and stored in the brain has much to

do with whether there is a proper balance of neurochemicals and growth factors to bind the neurons together long enough to communicate (Ratey).

The brain derived neurotrophic factor (BDNF) helps neurons converse with one another while building and maintaining cell circuitry (Ratey, 2008). Cell circuitry is the interconnectivity system responsible for brain functioning. BDNF is a member of the neurotrophin family of molecules that keep the divisions within the brain working appropriately (Kesslak, So, Choi, Cotman, & Gomez-Pinilla, 1998). The more BDNF our brain has, the greater the amount of exchange of and retention of information. BDNF is elevated with neural activity which then enhances signal capabilities with synaptic transmissions; this causes an increase in protein synthesis promoting structural integrity, all of which is essential for the long-term storage of information (Kesslak et al.). Several factors affecting BDNF levels have been determined and human behavior patterns seem to be the most paramount and tangible. According to Kesslak et al., daily exercise increases BDNF levels in several areas of the brain even after brief bouts of running. The hippocampus was one area showing an increase in BDNF, which was interesting to researchers since the hippocampus is well known to participate in learning and memory (Kesslak et al.).

*Stress and the brain.* When humans are in an environment where their attention and concentration levels must remain highly alert in order to respond mentally to information, such as a classroom, our bodies become stressed (Leamson, 2000). Hydrocortisone, commonly known simply as cortisol, is a hormone secreted by the adrenal glands to help the mind and body cope with stress; thus, stress is the trigger that causes cortisol to be produced. Higher cortisol levels cause the brain to not be able to



plan, judge, problem solve, and complete higher order skills as well as possible, also resulting in the decline in BDNF (Leamnson).

Students may identify with stress levels during strict lecture classes when trying to perform activities which require concentration and a high level of alertness, such as deciphering information to take notes when there is not a high level of background knowledge. Additionally, students who sit longer than 20 minutes experience a decrease in the flow of BDNF (Madigan, 2004). This decrease in BDNF coupled with the release of cortisol may cause students to mentally shut down during classes when long lectures are predominately used to deliver new information. Medina (2008) stated, “If you wanted to create an education environment that was directly opposed to what the brain was good at doing, you probably would design something like a classroom” (p. 5).

### *Movement*

Movement, even stretching, can help stimulate BDNF (Madigan, 2004). As such, exercise increases the base line of new neuron growth because of the increase in brain functioning in those who train aerobically (Colcombe et al., 2006). The more neurons there are in the brain, the more the human’s ability is to learn (VanPragg et al., 1999). This ability to learn was noticed by Marmeleira, Godinho, and Fernandes (2009) when they observed physical activity having a positive effect on perception, cognition, physical abilities, and the enhancement of attention capacity of humans while performing dual-task situations. Automobile driving skills were used to test adult participants who followed an exercise regimen for an extended period of time. The treatment routine included cardio endurance activities, strength training, and stretching exercises.

In a study using a more precise treatment, Colcombe et al. (2006) found specifically cardio exercise to be associated with improved functioning, especially higher order cognitive processes such as working memory, switching between tasks, and inhibiting irrelevant information. The researchers randomly assigned older adults to either an aerobic or non-aerobic program where they participated in moderate physical exercise three times per week over six months. The group who performed the aerobic program had an increase in brain volume especially in areas where early degeneration occurs, which is typically demonstrated by loss of memory (Colcombe et al.).

Medina (2008) found people who exercise “outperform couch potatoes in tests that measure long-term memory, reasoning, attention, problem-solving, even so-called fluid-intelligence tasks. These tasks test the ability to reason quickly and think abstractly, improvising off previously learned material in order to solve a new problem” (p. 14). The former non-mover can demonstrate higher levels of brain functioning on similar tests by adhering to a consistent movement program (Medina). A comparison of achievement scores between students who began to move and then were unable to move for a period of time showed noteworthy results. Young students began a jogging program and then improved their cognitive performance significantly. A subgroup within the same research sample who began the jogging program then had the program withdrawn due to unforeseen financial circumstances, the then non-jogging students’ scores plummeted to pre-experimental levels (Medina). Similarly, “in a 2007 study of humans, German researchers found that people learn vocabulary words 20% faster following exercise than they did before exercise” (Ratey, 2008, p. 45), finding a direct correlation with BDNF.

Knowing the hippocampus is the area of the brain associated with memory processing, Vayman and Gomez-Pinilla (2006) also believed its functioning is dependent on physical activity. "Exercise impacts the molecular systems which is important for synaptic plasticity and learning and memory" (Vayman & Gomez-Pinilla, p. 699). This occurs because exercise and movement provide the brain with more oxygen-rich blood, allowing more neurotransmitters to be engaged, more endorphins to be released, and the overall groups of neural networks to develop, becoming stronger (Tremarche et al., 2007). Medina (2008) found that even small amounts of movement every week can improve memory processing tasks. He found that a non-mover who simply fidgets shows increased benefits over those who do not fidget.

#### *Research on Nonhuman Animals*

"Research examining the impact of exercise on brain structure has overwhelmingly relied upon nonhuman animals, due to the highly invasive methods typically required to assess changes to brain structure" (Colcombe et al., 2006, p. 1166). There are clear limitations to researching human brains, so human responses can only be inferred by indirect examinations (Hillman, Erickson, & Kramer, 2008). Therefore, the nonhuman brain has been used to directly examine cellular responses to exercise. Studies of

nonhuman animals show chronic aerobic exercise can lead to the growth of new capillaries in the brain, increase the length and number of the dendritic interconnections between neurons, and even increase cell production in the hippocampus. The end result of these structural changes is a better interconnected brain that is more plastic and adaptive to change. (Colcombe et al., p. 1166)

Another study found rats that ran on exercise wheels showed an increase in capillary density in the cerebellum, enhanced cortical high affinity choline uptake and

increased dopamine receptor density in older rats, and increased the number of new cells in the hippocampus (Van Praag et al., 1999). Access to an environment with exercise availability “has a positive effect on neuronal growth and on the neural systems that are involved in learning and memory” (Hillman et al., p. 58).

### *Research on Humans*

Research on the human brain can occur by notating and observing activities requiring the brain’s function or upon demise through a medical examination. Colcombe et al. (2006) found the brain of an older adult who was cardio fit before death to be better preserved, especially the frontal lobes where cognitive functioning occurs. A long-term study on aging involving those individuals who had the least amount of cognitive decline found three reoccurring factors: (a) education, (b) self-efficacy, and (c) exercise (Ratey, 2008). This study sparked an interest in exercise, cognition, and aging.

Using live participants allows researchers to observe the results of a treatment. In a study performed on an older adult population using a Positron Emission Tomography (PET) scan and following a six month aerobic exercise program, brain volume, including both gray and white matter, increased. This did not occur after a stretching and flexibility program (Colcombe et al., 2006). “Aerobic exercise seems to be the key” (Medina, 2008, p. 16) to reducing the risk for dementia. Colcombe and Kramer (2003) also performed a study on older adults by testing their executive controls which included coordination, inhibition, scheduling, planning, and working memory. They found that those who participated in an aerobic program and were tested on speed, visuospatial, and controlled processing improved the most in executive controls.

According to Tomporowski, Davis, Miller, and Naglieri (2007), children respond to exercise in a fashion similar to adults. This being said, research on youth and adults related to exercise programs and cognition tests are comparable. When preadolescents were asked to perform goal directed processes for selection, scheduling, and coordination, researchers were studying the students' executive control which is also considered to be perception, memory, and action speed (Hillman, Buck, Themanson, Pontifex, & Castelli, 2009). Executive control assists humans as we mature from adolescence by being able to more readily manage inferences and hold two or more pieces of information while determining a response (Hillman et al.). "Aerobic fitness was related to a better cognitive function in preadolescent children using a task that required variable amounts of interference control, one aspect of executive control" (Hillman et al., p. 124). The higher someone's aerobic fitness level, the more the availability of oxygen-rich blood there is for the brain which improves functionality, as explained by Kesslak et al. (1998).

A thought-provoking statement by Medina (2008) about the human requirements for life, which are food, drink, and fresh air, and their effects on our survival, is:

You can live for 30 days or so without food, and you can go for a week or so without drinking water. Your brain, however, is so active that it cannot go without oxygen for more than 5 minutes without risking serious and permanent damage. Toxic electrons over-accumulate because the blood can't deliver enough oxygen sponges. (p. 21)

These so-called oxygen sponges are what Medina believes are supplied by the freshly oxygenated blood we produce when we are active. The sponges absorb excess toxins in the brain and other tissues which are then expelled through other human processes such as exhaling.

In educational settings, cognition and exercise research has mostly been assessed using “paper-and-pencil and computer based tests” (Hillman et al., 2009, p. 58). Brown (1967) tested IQ scores and found an increase in IQ as well as social skills when children performed tasks requiring exercise where students had to control motor movement (Tomprowski et al., 2007). IQ tests “provide global measures of functioning” therefore they “may not be sensitive enough to detect subtle changes in specific aspects of cognitive functioning brought about by exercise” (Tomprowski et al., p. 117). Additional forms of research have been sought by educators to look for three outcomes for measuring a child’s mental function: (a) cognitive abilities, (b) academic achievement, and (c) intellectual function. According to Tremarche et al. (2007), “brain research is here to stay and educators have a professional responsibility to examine the research and utilize the information for application within the classroom” (p. 58).

### *Cognition*

Cognitive science is characterized by the study of mental processes where researchers typically use an analysis approach that assesses the activities of the mind (Tomprowski et al., 2007). Cognition, the ability to acquire knowledge using reasoning, intuition, or perception, requires active participation by both the student and the teacher through concerted efforts (Vaynman & Gomez-Pinilla, 2006). It is not passive. Sibley and Etnier (2003) studied school-aged children from 4 – 18 years old looking for, among other items, a connection between cognition and movement by assessing cognition with eight categories. The categories were perceptual skills, intelligence quotient, achievement, verbal tests, math tests, memory, developmental level/academic readiness, and a catch-all other category. They found a positive relationship between physical

activity and cognition. Sibley and Etnier suggested the effects of the movement treatments on cognition would be greater for children than on adults, thus stating that movement behaviors should be adopted as early as possible.

“Aerobic fitness has a larger impact on tasks that require controlled and effortful processing than on tasks that are executed using automatic processing” (Marmeleira et al., 2009, p. 91). This leads one to believe that an active, aerobically fit, person has a better ability to perform tasks requiring mental effort. A human’s energy consumption and expenditure through diet and exercise impact cognitive function, as well (Vaynman & Gomez-Pinilla, 2006). These “behaviors concerned with activity and metabolism may have developed simultaneously and interdependently during evolution to determine the influence of exercise and diet on cognition” (Vaynman & Gomez-Pinilla, p. 699) and survival.

#### Achievement and Fitness

“Since the time of the ancient Greeks, there has been an implicit belief that physical activity is linked to intellectual abilities” (Tomprowski et al., 2007, p. 111). Since that time, there have been several studies performed on achievement levels and fitness, especially related to physical education programs in public education. Academic achievement is indicated by grade-point averages, scores on standardized tests, and grades in subject specific courses. “Measures of concentration, memory, and classroom behavior provide indirect estimates” (Carlson et al., 2008, p. 721) of academic achievement. No known research has been performed on adults or those enrolled in higher education institutes (Tomprowski et al.). Since children respond to exercise in a

fashion similar to adults, Action Based Learning follows the precept that movement is essential to learning for everyone (Madigan, 2004).

### *Research with Physical Education*

In a longitudinal study, Carlson et al. (2008) compared the amount of time spent in physical education to grade percentages across almost 10,000 elementary students from 1998 to 2004. The amount of time spent in physical education ranged from 16 to 30 minutes for kindergarten, and from 31 to 60 minutes for first through fifth grade. Overall, the researchers found females with the lowest movement in physical education class and lowest amount of time spent outside of school actively moving scored the lowest in all subjects. Additionally, 5<sup>th</sup> grade students demonstrated the most significant differences in scores related to amount of time moving, which was found with males who showed an increase in overall grades especially in reading skills. The overall findings suggest physical education can positively effect student achievement especially in the areas of mathematics and reading. Those two subjects are key components in the yearly progress schools must make because of the federal No Child Left Behind act (Castelli, Hillman, Buck, & Erwin, 2007).

Castelli et al. (2007) tested 259 public school students in 3<sup>rd</sup> and 5<sup>th</sup> grades from four schools. Two of the schools were considered academically effective based on their overall grade percentages on a state standardized test in reading and mathematics. The other two schools scored significantly lower on the standardized test. Researchers compared field tests of physical fitness to academic achievement. Findings suggested aerobic physical fitness was positively related to academic achievement. As aerobic capacity increased, achievement was positively associated, but body mass index (BMI)



was inversely associated. Although a newer form of fitness testing, BMI is not an accurate measurement of fitness due to the concreate numerical system used and the exclusion of hereditary body composition as well as lean muscle mass. Even so, using BMI as a base line for comparisons is used as a standard in fitness/wellness levels.

Coe et al. (2006) compared 214 middle school students' grades from four core subject classes and a standardized test with enrollment in physical education classes. This study was barbed with failing aspects due to the unfortunate fact that students only spent approximately 19 minutes of the 55 minute class period in physical education moving at a moderate to vigorous pace. The authors recognized this low amount of time moving in physical education skewed the results because they assumed classes would mirror true exercise programs whereas fitness capacities would increase or at least follow national recommendations to have students spend at least 50% of their time in physical education classes performing moderate to vigorous physical activities (MVPA). There were no correlations between core subject achievement and standardized test grades with time spent in physical education classes. The researchers stated students deemed fit were so because of outside activities and their grades were higher than other students (Coe et al.).

Research by Dwyer et al. (2001) found the higher the cardio respiratory endurance capability, muscular force and power, the better the academic achievement of middle school students. They directly tested the participants' physical abilities and discovered higher achievement scores in males than in females. The researchers also found that the older the student, the higher his/her scholastic ability on a standardized test. Students with higher academic ratings "took less time to complete the 50-meter run,

completed more sit-ups, and leapt greater distances in the standing long jump” (Dwyer et al., p. 231). Since the researchers used many different tests for strength and aerobic capacity, it cannot be concluded that only one component of fitness is related to academic performance.

*Concentration and attention span.* Caterino and Polak (1999) studied concentration levels of second, third, and fourth-grade students. Students were divided into two groups per each grade level. One group went to the school gym and participated in physical activity, the other group stayed in their classroom doing normal teacher constructed lessons. As soon as the gym group participated in a structured physical education class or physical activity with a moderate amount of moving, researchers measured levels of concentration using the Woodcock-Johnson Test. They found concentration levels moderately high once students stopped the movement activity. The classroom group’s concentration levels decreased as class progressed, especially compared to the beginning of class. Free-play recess and passive physical activities did not affect concentration with the group, but female students significantly scored higher than males overall.

Martin and Chalmers (2007) performed a similar study but focused on the use of motor skills and then compared the amount of motor skill used to math and reading scores for elementary students. Their research showed that with an increase in the use of motor skills through aerobic activity, the relationship with grades was low, but still quantitatively significant. Any improvement is better than none which makes a case for not removing movement opportunities.

Tremarche et al. (2007) studied the impact of increasing quality physical education on fourth-grade students taking a state standardized test. “Physical education refers to a structured physical activity curriculum that meets state and national standards” as opposed to “physical activity which refers to movements of the body in general, following no specific curriculum” (Hall, 2007, p. 123). A quality physical education program differs from the classes used in Coe et al.’s (2006) research. Quality programming includes class time to meet National Association for Sport and Physical Education (NASPE) standards of small class sizes, developmental curriculum, minimum of 50% MVPA, ample practice opportunities, adequate equipment, and a positive environment (Graham et al., 2007).

Tremarche et al (2007) used two schools with two different total hours of quality physical education. School One provided students with 28 hours of physical education per school year and School Two provided 56 hours. The state mandated standardized test scores from the two schools were compared in two areas. One area was math and the results showed no significant difference between the schools. The other area was English and language arts which showed School Two scoring significantly higher than School One. A key element to understand is the difference between the types of test sections that were compared. The math section was strictly solving age appropriate problems using numerical configurations. The English and language arts section asked students to read and evaluate scenarios which require attention to details and high levels of concentration during test taking. There are not a set of rules or facts to memorize (Tremarche et al.).

## Summary

The review of relevant literature carried the readers from educational philosophies to recent research on achievement. Overall, the main goal of this project was to help professors forge ahead with new classroom formats to aid in student learning by determining if the number of high achieving students can increase in a lecture formatted class. Knowing learning is multi-faceted, we can then understand how teaching must follow the same venue and search for how professors can make learning a by-product of a college degree. The literature suggests that humans are able to do more than sit and absorb because of our natural design. By looking at the information, the researcher has determined there to be a substantial call for further studies on how to increase the number of high achieving students in post-secondary education.

## CHAPTER THREE

### RESEARCH DESIGN AND METHODOLOGY

The purpose of this project was to determine if physical activity and circulation-encouraging movement activities occurring intermittently during a predominantly lecture style college course affected the achievement level of students. Quantitative research allows a trial-and-error of treatments to test upon a sample of a population for effectiveness while hoping the outcome can be used to predict or prescribe possible cause-and-effect relationships. Qualitative research allows researchers to ask probing questions about perceptions and thought patterns. Interviews can help with unearthing the human perspective as to how the quantitative data are relational to the information discovered through qualitative methods as well as finding deeper meaning in past events (Merriam, 1998). As such, this researcher used a mixed method of inquiry by first quantitatively addressing a real world phenomenon of lecturing and lack of student attentiveness then qualitatively asking in what ways professors may view the researcher's suggestion to change their teaching format. The procedures were sequential so the researcher could elaborate and expand on the findings from the quantitative method (Creswell, 2003). A mixed method added to the breadth of knowledge concerning how professors may scrutinize the teaching method prescribed in this research project.

#### Problem Statement

The human body is biomechanically designed for movement; it is engineered to perform physically (Ratey, 2008). The technology base of modern life has recreated how humans move, adding sedentary characteristics to the daily repertoire which disrupts a

human's natural instincts, posing one of the biggest threats to continued survival (Ratey). Therefore, asking someone to stay in one position for an extended period of time can be considered a painful process in numerous ways. Sitting stationary for rest is vastly different than sitting stationary based on traditional demands from a superior, because the human relationship with food, physical activity, and learning is inherently built into the brain's circuitry (Ratey).

Research has indicated a relationship between physical movement and brain activity (Colcombe et al., 2006; Madigan, 2004; Medina, 2008; Tremarche et al., 2007; VanPraag et al., 1999; Vayman & Gomez-Pinilla, 2006). Therefore, physical activity and circulation-encouraging movement activities occurring intermittently during a predominantly lecture style college course, which is sedentary by design, can hopefully affect the overall grade or learning of students. "Nobody has yet directly tested the relative effectiveness of just breaking the lecture up against interspersing it with activities" (Young et al., 2009, p. 43), therefore movement activities and lecture breaks should be compared to look further into Madigan's Action Based Learning Theory. Madigan's theory includes the idea of the human brain's ability to better function during and with physical activity. Her studies focused on how a teacher of elementary school-aged students can create a combined lesson plan with content area topics and movement activities. The movements did not necessarily need to correlate with specific details from the content area information, but Madigan suggested having a degree of content reinforcement of ideas if there is a relevant connection.

In a higher education setting, professors find time and effort become obstacles and a challenging task to undertake when trying to balance conveying a large amount of

information, while at the same time ensuring students are absorbing enough information to be able to use the knowledge in their future career (Summers & Sviniki, 2007). What is needed is a procedure that is easy to follow, uses a small amount of time, and is effective in helping students learn. Breaks in the lecture where students perform activities related to class content, known as interactive windows, have been researched as a method for enhancing student learning, yet the preparation time to execute interactive windows properly is very time consuming (Huxham, 2005; Knight & Wood, 2005; Lake, 2001; Lea & Callaghan, 2005; Machemer & Crawford, 2007; Summers & Sviniki).

Higher education classrooms are not considered to be as creative in their information dissemination process as elementary schools, where Madigan (2004) focused her research, yet the learning of information is still the primary goal of both completely different arenas of education. Research needs to occur in higher education to see if Action Based Learning theory can be further expanded into another genre of student age and learning level. Another reason to look at higher education classrooms was to determine if lecturing professors could employ a somewhat more simple technique to assist students' knowledge acquisition without watering-down content and placing an additional burden on instructors by increasing their preparation time as interactive windows appeared to do.

### Purpose of the Study

While interactive windows have been found to be relatively successful in raising achievement levels, much preparation time is required to adequately implement this technique as well as teach students the amount of content professors require for personal or professional reasons (Lea & Callaghan, 2005). A more undemanding method is

needed to maintain the students' attention. According to Caldwell (2007), using simple "periodic breaks may help relieve student fatigue and restart the attention clock" (p. 12). The hope was that merely providing breaks could afford a beneficial boost in student learning with much less preparation time than interactive windows. Questions then arose about what type of breaks should occur, specifically whether students would benefit more from being passive and sedentary. If students remain inactive, as they are during lecture time, they may not be able to jump-start their attention span without moving around and activating their circulatory system. A bonus effect might occur if the circulatory system is engaged which has demonstrated an increase in cognitive abilities (Medina, 2008). Medina has encouraged instructors to rethink the teaching process by understanding the human's primordial functioning.

Research has shown the inability of students to maintain an adequate amount of attention during lecture style classes (Beeks, 2006; Dyson, 2007; Caldwell, 2008). Furthermore, most research on college students has been related to using interactive windows as a means to enhance student learning and length of attention (Huxham, 2005; Knight & Wood, 2005; Lake, 2001; Lea & Callaghan, 2005; Machemer & Crawford, 2007; Summers & Sviniki, 2007). Research on physical activity, fitness, and achievement levels has been conducted with elementary school-aged students (Colcombe et al., 2006; Madigan, 2004; Tremarche et al., 2007; VanPraag et al., 1999; Vayman & Gomez-Pinilla, 2006). The intention of the study was to use the Action Based Learning theory on a more adult population who are undergraduate college-aged students to determine if movement breaks in a predominately lecture-style college class effected a student's ability to demonstrate learning.



The use of interactive windows was considered to be too burdensome for many professors, even though research demonstrated a positive connection between the interactive windows and student achievement (Huxham, 2005; Knight & Wood, 2005; Lake, 2001; Lea & Callaghan, 2005; Machemer & Crawford, 2007; Summers & Sviniki, 2007). Professors have relied on straight lecture techniques for centuries, and enormous efforts are needed to change a teacher's underlying beliefs (Lindblom-Ylance et al., 2006). Therefore, to invoke a change in teaching techniques the professor's perception of a method's ease of use and effectiveness would affect its validity. This means that in order for a method to become widely used, instructors would need to perceive the technique as helping student achievement, eliciting few, if any, challenges, and non-time-consuming.

One purpose of this study was to compare final grade percentages of college students to determine student achievement. These students were enrolled in one of two classes in which there were two course sections taught by the same instructor within the same semester. Of the two classes within each subject area, one class performed a circulation inducing activity periodically during class. The activities were brief and then the class resumed lecture momentarily, hopefully only removing up to a total of 4 minutes of lecture while participating in the movements. The second class within each different subject area did not have the breaks involving movement. Instead the students and the instructor followed typical protocol used by the instructor and during the time where the other class moved, this class was given a review break. During this time, students had the same break opportunity but they were not given movement activities to perform.

Another purpose of this study was to become aware of how professors perceived the two methods of instruction. Instructors gave insightful information regarding how they believed the movement or review breaks affected students. These perceptions referred to the merit of its use in higher education classrooms and how the methods fit into a teaching routine. Professor attitudes were determined with phone conversations during the semester, as well as an end-of-semester personal interview. Participating professors were interviewed once the semester had been completed and answered questions about the teaching methods used in hopes of acquiring insight into the technicalities and nuances that arose during the initial stages of the study.

### Research Questions

The overarching goal of this project was to find a means to help students increase their learning capacity in college classes knowing students are faced with many predominately lecture style classes. An increase in the number of high achieving students puts more pressure on professors to determine the most effective and efficient method to deliver information while maintaining course integrity and working within time constraints for class preparation.

The research questions guiding this study were:

1. Do circulatory enhancing movement breaks in a lecture-style college class affect student achievement over the course of a full semester, 16 weeks?
2. Is there a difference in student achievement between the classes used in this research among the various subjects when circulatory enhancing movement breaks are used in lecture-style college classes?

3. What are the professors' perceptions of the use of enhanced movement breaks in lecture-style college classes?

#### Population and Sample

The sample was drawn from students in higher education in an effort to make a conclusion about the effectiveness of the treatment in other higher education arenas. This study used a maximum variation sample of students and instructors at a mid-size state comprehensive university with a population of approximately 8,900 undergraduate students. To maintain comparable status for participants and treatment, students must have met the admission requirements of the university, such as ACT scores, high school grades, and mandatory preparatory college curriculum. Instructors from diverse departments across campus were examined to determine if they met the criterion-based selective process (Merriam, 1998).

The first phase of this mixed method study following sequential procedures was quantitative. To find courses to use in the study, the researcher reviewed the university's listing of all available classes for the given semester and made a database of all teachers who were listed as the professor for two identical class titles or prefix and class number. The same professor for both classes was necessary for continuity of content delivery. There were many undergraduate classes with a minimum of two course sections using the same instructor for each subject matter in which students voluntarily enrolled due to their program of study.

Of these classes with two of the same sections, a criterion-based selection occurred by excluding the following instructors who: (a) had one or both of their classes meet during non-traditional class hours, (b) had a laboratory associated with the class, (c)

had one class designated as honors, (d) are based on internship opportunities or teaching field experiences, (e) were predominately used for graduate program of studies, (f) were only offered for a portion of a semester, and (g) were considered an activity class. Six instructors met the criteria for inclusion. The classes were held within the same semester as each other, spring 2010. Each class had between 20 and 90 students.

A list of the instructors whose classes met the above criteria was initially contacted via email using the format seen in Appendix A. Once instructors responded, the researcher answered questions they had or sent a note of appreciation for replying. An electronic worksheet was designed to list the name and department of each instructor contacted. There were three columns to designate each professor as willing to participate, declining to participate, or undecided. Two weeks before the end of the semester prior to the semester involving research, a time was set for instructors who could attend to meet and ask questions of the researcher. If an instructor could not make the informational gathering, an appointment to meet with the researcher was made on an individual basis. If a phone conference was needed due to professor locality or non-availability, notes were taken and a follow-up email was sent to recap the discussion. Two professors met at one time at the informational meeting and four set up individual meetings with the researcher.

### *Assumptions*

This researcher followed the perspective that knowledge is socially constructed, thereby believing individuals seek understanding in the world where they live and work (Creswell, 2003). Specific contexts about the classroom format, use of lectures, and student attentiveness were addressed in this study. Professors followed the quantitative research format and then used their background knowledge to acknowledge the method's

viability during follow-up interviews. The assumptions the researcher used to conduct the interview followed tantamount claims by constructivists where meanings are created by humans as they engage with the world they are interpreting (Creswell). It was assumed the professors could create meaning about the research intervention used in their classrooms by simply participating in its application.

For the quantitative portion of the research, an assumption about the continuity between samples meant that the students used in the study had met the same requirements for acceptance to the university; therefore, it was assumed they were homogenous to the degree that all classrooms will have some degree of variance among intelligence, efficacy, and academic propensity which is typical of any educational environment. The testing environment for all the classes used the standard classroom found at the university; none of the classes used laboratories or had other hands-on apparatuses available.

Assumptions about the stability of those administering the treatment were that they were accomplished in their respected fields in so much as the position they hold as professor. The profession of scholar in higher education carries with it a respectful level of academic honesty which carries forward to research in which they are involved or conducting.

#### *Procedure for Informed Consent*

At the beginning of the semester, students were informed of research being performed using their class to the extent that the instructor read a letter to the students (Appendix B & C). Since the researcher had no contact with the students, the letter briefly explained to students that their class was involved with a research project over the course of the semester. Research expectations were explained, as well as the anonymous

and voluntary nature of the study. During each class meeting time there was an attendance sheet in which students notated if they had attended and participated in class. This sheet did not have any identifying markers other than the last four digits of the students' school identification number. In the letter, students in the treatment group were reminded that if they had any health concerns for the day, they did not need to participate in the activities. If so, those students were exempt from the movement activities.

Minor(s) subjects could perform the movements with the class, but their data were excluded from collection and analysis. The research was not directed toward pregnant subjects. If there were an issue of involvement because of not knowing about a pregnancy or no disclosed information, this study did not present more than a minimal risk to a developing fetus since the movement activities were brief, non-impact, and low-intensity. The movements are not any more strenuous than walking to get to class on campus.

Professors signed a letter of consent prior to the start of the semester and their information was kept confidential (Appendix D). By participating in the study, the professors agreed to the qualitative portion of data collection which was a phone conversation every three weeks and a face-to-face follow-up interview with the researcher once the university's final exams were complete and grades had been submitted. The letter explained how the professor's participation in this study was beneficial to the perceptions of effectiveness of the research method used. Consent letters and any other identifying documents will be kept on file with the researcher for up to 5 years and then shredded.

## Research Procedures

### *Quantitative*

A between subjects research design was used wherein there were four professors who taught undergraduate classes with a minimum of two course sections using the same instructor for each subject matter. One class was involved in the movement activities and was considered the treatment group and the other class of the same subject had review breaks and was considered the control group. Random assignment was used to decide which class received the treatment and the one that did not.

A pilot study was conducted one semester prior to the semester used in this study. The movement activities were examined to ensure a minimal increase in heart rate by the participating students, illustrating that concerns about excessive heart rate and returning to a sedentary seated position for the lecture to not be a major concern. Yet the heart rate did slightly increase, which was one of the aspects needed for this study. There was minimal risk to the subject since the activities performed were designed by a fitness expert allowing for only enough movement to engage the circulatory system to a limited extent.

On the first day of class professors read a letter from the researcher to the students informing them of their participation in a research project (Appendix B & C). Students were told the attendance policy and how the breaks in each class were to occur. Each day a role sheet circulated or was posted, depending on professor preference, and students put a verifying mark in the correct box associated with the class meeting date. Student names were not listed; instead the last four digits of their university student identification number were numerically notated on the role sheet. Students were told that they should

only notate their attendance and no one else's. There was a statement made about how the role sheet and student attendance notation would have no bearing on the professor's attendance policy and grading procedures. If students were having health issues on any given day, they were not to notate that they participated in movement activities in class on the role sheet.

*Treatment group.* The randomly assigned treatment group classes had the instructor stop lecturing at pre-determined times during class to have students get up from their desks to move (Appendix E). The subjects moved according to pre-determined activities at 15 minutes into the class meeting time and then again in 15 minute intervals. Each activity lasted no longer than 45 to 50 seconds and lecture continued momentarily. The activities that students performed were chosen randomly. Each activity was typed onto a piece of paper and folded, then put into a container by the researcher who gave the container to the instructor to keep in their possession for the whole semester. Additional containers were prepared by the researcher to subsidize any lost or broken ones. The instructors drew a piece of paper from a container that housed up to eight different circulation inducing movement activities using locomotor and non-locomotor skills (Appendix F & G). Subjects were asked to activate their circulatory systems by performing a low-impact and/or low-intensity movement activity. Classes with limited area to move used a list with five activities utilizing only non-locomotor skills (Appendix G).

Students were to perform the activities in a somewhat simultaneous manner. Once the activity had been announced by the instructor, students were to stand and perform the activity together. If the professor deemed one or two students would be helpful in



designating a start and stop signal, they recruited them as they saw fit as long as the movement activities were performed and there was no undue burden placed on the cooperating student.

*Control group.* The control groups followed the same pre-determined stop times during class as the treatment groups, but instead of moving they were offered the same amount of time for a break to review their notes or whatever the students choose. These breaks were consistent in time and duration as the treatment group. The control group was given the ostensible review breaks at the same time as the treatment group received movement breaks. These review breaks could have been misconstrued as time students could and would use to their advantage by prying the instructor for deeper knowledge and information that is found to enhance the control groups' grasp of certain subject area concepts. The time used by the control group was not to be considered as strictly study or review time; instead professors were directed to signify the beginning and the end of the break time without further discussion. If students had questions they were to wait until the lecture time began again.

### *Qualitative*

Every three weeks the professors were contacted by phone to discuss questions about the research project. The researcher asked how the professor perceived the overall procedure was effecting the classroom environment and if they were having any difficulties (Appendix H). At the end of the conversation, professors were asked if they were in need of any additional support to help them proceed with the research project. The rationalization for the phone call was to reassure the professors as to their role in the

project and how their assistance in the project was helpful to not only the researcher but the breadth of knowledge in their career field.

Face-to-face interviews with participating professors occurred once the university's final exams were complete and data were submitted for the semester used in this study. Appointments with each professor were made, using a location chosen by the professor. The interview was semi-structured using a mix of predetermined and open-ended questions to allow the researcher to probe deeper into participant responses by determining potential world-views on educational topics (Merriam, 1998). By asking questions related to the perceptions of the instructor, the researcher was able to answer research question number three (Appendix I).

The researcher looked for how the instructors perceived the quality of the movement and learning experiment related to ease of use, perception of student gains and/or losses, extenuating circumstances, and challenges. Since the researcher followed the perception of socially constructed knowledge, during the interviews with the participating professors, the questions were broad and general to invite the interviewee to make subjective statements in response. The interview was conducted by the researcher who took brief notes while audio recording the data at the same time.

### Data Collection

#### *Quantitative*

Data were collected at the end of the semester from each class. Instructors provided the researcher with each student's final grade percentage as well as a letter grade associated with the percentage. Attendance was taken daily in terms of participation in the chosen activities. If a student had a medical reason for not

participating, it was notated in the attendance roster. Students who did not participate or attend class for 10% or more of the scheduled class meeting times did not have their grades collected.

A blank template was given to instructors who labeled each student randomly with numbers or other coding system. Instructors could choose their own process for coding the students in a way that the students were not identifiable to the researcher. At the end of the semester using the same template, instructors gave each student's final grade percentage on a list next to the code used by the professor (Appendix I). The daily attendance sheet which was created and given to the instructor at the beginning of the semester was given to the researcher, also, but the list of student identification numbers were removed and the student codes were placed next to the line where the student kept track of their attendance/participation (Appendix J).

### *Qualitative*

There were two segments to the qualitative phase of data collection. The first included a phone conversation every three weeks between the researcher and participating professors. The conversations were documented by the researcher through handwritten notes. After each conversation the notes were typed and saved in an electronic file folder named after the subject of the class, not the professor's name. The electronic folders were kept on a removable, portable USB drive and placed in a locked cabinet. Secondary copies of the folders were sent electronically to the researcher's university email address to save in a folder that will be password protected.

The second phase of qualitative data collection involved follow-up interviews. Each professor participated in a face-to-face interview with the researcher when the

semester was over and grades had submitted. As soon as each interview was complete, the researcher transcribed the interaction verbatim using the audio recorded conversation. The interview transcripts were kept in the same manner as the phone conversations. The interviews took no longer than 30 to 45 minutes and were held at locations selected by the participating professors.

## Data Analysis

### *Quantitative*

The researcher entered data into the computer software program SPSS. A frequency distribution was graphed to determine the shape of the grade distributions. For each set of classes, the mean final grade percentage and standard deviation were determined to find the summary of data and how spread out the scores were according to central tendency. A *t*-test was computed to compare the two means within each set of courses to determine if there was a significant difference between them. If there was a noteworthy difference, it directed the reader and the researcher toward possible conclusions and recommendations for important resolving factors. The quantitative test, if significant using the .05 alpha intervals, suggests whether the movement breaks were effective in improving student achievement. For each class an independent *t*-test was run to compare the mean score between the treatment and control sections. The *t*-test showed how one class compared to another class in the same subject to answer research question number one. The Levene's test was run to determine if there was homogeneity of variance between the groups (Field, 2005). The homogeneity of variance is concerned with estimating differences within the groups tested.

Once results were determined for each individual subject matter class, the researcher looked for differences between all instructors and subjects to answer research question number two. Using a one-way ANOVA test, the data were analyzed to determine if there were significant differences across the subjects using pairwise comparisons. A post-hoc test of Games-Howell was also performed since the sample sizes were unequal (Field, 2005). The Games-Howell test was considered more liberal with smaller sample sizes, but it was also accurate when the sample sizes were unequal and this could not be determined until the first research question was answered.

### *Qualitative*

At the conclusion of the phone conversations with professors, the researcher consolidated responses and reviewed for common themes and key words that were used to answer questions. The constant comparative method of data analysis was used to review remarks from respondents; therefore, as one set of responses were reviewed the next one was examined and compared to the previous one (Merriam, 1998). The researcher then created a timeline of when phone conversations were conducted and categorized the professor's thoughts during each interview. Analytical coding occurred using an open form of analysis by reviewing each documented interview response looking for ideas, themes, and issues that coincided with other remarks made based on the timeline (Emerson, Fretz, & Shaw, 1995).

Since the phone conversations were informal with a few structured questions, the range of information received was examined for commonalities in professors' perceptions of phone conversation questions. These perceptions then became markers to align with the timeline to look for highs and lows in how the professors deemed the research

methods were affecting their students and their teaching routine over the course of the semester. Patterns of words used to describe how they felt the research project was occurring at the different times during the semester were examined to align with the timeline. These words created units of data that were compared to each other and then placed into a category based on commonality and timeline markers (Merriam, 1998). This information was used to enhance the results from the follow-up interviews.

When all face-to-face, follow-up interviews were completed, the researcher reviewed the transcriptions looking for consistent themes and key words that were answers to questions asked by the researcher by using focused coding (Emerson et al., 1995). Focus coding occurred when the researcher reviewed data on a line-by-line basis looking for connective statements to themes. For the data to be placed into thematic categories, the interview transcripts needed to be aligned with the data from the phone conversations. To do this, the interview data underwent open coding searching for ideas, themes, and issues that may have fit into the categories created from the timeline markers (Emerson et al.). Data from the interview were then consolidated using main idea headings that corresponded to the marker categories used to analyze phone conversations.

In totality, the data were sorted according to reoccurring statements and ideas which were then be grouped according to major themes. For instance, one question asked professors to describe extenuating circumstances that may have occurred during the semester. First, either the professor had a response or not. If there were a response the circumstance could be related to an answer to another question in the interview. Those ideas were grouped together within the same major theme. When reviewing the interview transcripts, the researcher made integrative memos in the margins which pulled

key components from the data so the researcher could make links between respondents (Emerson et al., 1995). As a whole, the answer to the questions gave insight into the perceptions of the participating professors. Once the themes were grouped, the researcher drew a narrative to describe how professors perceived the teaching method using quotes and key concepts that were coded from the transcripts. To answer research question number three, the researcher distinguished among the themes to develop a pattern of educated responses showing how the professors may have deemed the teaching method as usable or not.

Once the main themes and categories were created, the information was sent to the professors for member checking. Member checking is used to determine the accuracy of the descriptions and themes (Creswell, 2003). Professors were asked if they agreed or disagreed with the results from the transcription and consolidation. Basically, the professors were to examine the consolidated data to see if they agreed with the supplementations by the researcher. Professors looked to see if their answers to the questions were perceived as they were meant.

Since the soundness of qualitative research is determined by trustworthiness, the researcher focused on credibility, dependability, and confirmability (Erford, 2008). Credibility was found using triangulation of data with multiple source verification from supporting literature for the Action Based Theory. The researcher also utilized two interview formats, the periodic phone conversations and the end of semester interview, where comparable data were found. Member checking was used once the transcripts were completed to verify accuracy of information received from the professors.

Researcher bias was reduced by not observing the classes and by only using statements from the professors for remarks about student gains or losses.

### Summary

Chapter three provided information about the research methodology used for this project. A mixed method was used to capitalize on the aspects of quantitative and qualitative research. The data from quantitative methods was used to answer research questions one and two, and then the method changed to qualitative. Interviews were conducted with the professors who participated in the study to determine their perceptions of the methods used.



## CHAPTER FOUR

### RESULTS AND FINDINGS

The purpose of this project was to determine if physical activity and circulation-encouraging movement activities occurring intermittently during a predominantly lecture style college course affected the achievement level of students. A mixed method was used for a deeper examination into how professors perceive using this interval method of lecture in relation to its effectiveness.

#### Research Questions

The overarching goal of this study was to find a means to help students increase their learning capacity in college classes knowing students are faced with many predominately lecture style classes. An increase in the number of high achieving students puts more pressure on professors to determine the most effective and efficient method to deliver information while maintaining course integrity and working within time constraints for class preparation.

The research questions that guided this study were:

1. Do circulatory enhancing movement breaks in a lecture-style college class affect student achievement over the course of a full semester, 16 weeks?
2. Is there a difference in student achievement between the classes used in this research among the various subjects when circulatory enhancing movement breaks are used in lecture-style college classes?
3. What are the professors' perceptions of the use of enhanced movement breaks in lecture-style college classes?

To acquire the data sought, this researcher used a mixed method of inquiry by first quantitatively addressing a real world phenomenon of lecturing and lack of student attentiveness then qualitatively asking in what ways professors may view the researcher's suggestion to change their teaching format. The procedures were sequential so the researcher could elaborate and expand on the findings from the quantitative method (Creswell, 2003). The quantitative data were compared to determine student achievement and the qualitative data were used to examine professor perceptions of the method of teaching.

### The Professors

Of the original six participants, four professors remained in the study and submitted their participating students' final grade percentages and attendance sheets. After the initial email was sent to qualifying professors (Appendix A), those who responded with questions were either called or answered electronically. There were six who confirmed participation, verbally or electronically. Two weeks before the beginning of the semester, an email was sent to all six of the consenting professors to request a personal meeting to review project requirements and collect letters of consent. At the same time, professors were given participation rosters, timers, a movement activities box, and a letter to the students. Once the project began, the researcher contacted each professor via the telephone throughout the semester to determine if there were any unmet needs and to verify continued participation. Within three days following the end of the semester, the remaining professors participated in a post-research interview. The two professors who did not complete the project had different reasons for not participating.

Fred and Darla

The day before the start of this research project Fred (pseudonym) sent the researcher a voicemail stating he would not be able to include the study's procedures into his class format. Fred's classes were considered general studies in the behavioral sciences and contained a large number of students. After looking more in depth at the research requirements, he did not think he could stop his lectures in the pre-determined time frames and then resume specific topic discussions.

At first, Fred had found the idea of the research project intriguing; therefore, after two email exchanges, a meeting was set to have a discussion about the specific details of the research procedures. Fred was shown the letter to the students, letter of consent, and an example of a class timeline of breaks. At the end of the first meeting, Fred agreed to participate in the project but wanted to look the forms over more thoroughly.

When the researcher requested another meeting to review procedures, as was done with the other professors, Fred did not remember the first meeting. After a phone conversation, another meeting time was established. The researcher went to Fred's office, as before, and he did not recall ever meeting the researcher or the conversations about the research project. Eventually, Fred decided to participate in the research and the procedures and paperwork were re-explained. Two days before the start time, an email was sent to all professors as a reminder about the project and to determine if there were any questions. Fred responded one day later, politely declining participation.

Another participant, Darla, also had to cease participation in the research project. While applying the teaching technique, a complaint from a student was given to Darla's supervisor. Initially, Darla thought the research procedures would help with maintaining

the students' attention. After Darla consented to participate, she called or emailed the researcher almost every day to ask questions about the classroom, the movement activities, the break times, the participation sheet, when to have exams, what to do with class time when movies are shown, what to do if class is cancelled, etc. There were many more questions than from the other professors and Darla seemed to need more directions than originally provided. The researcher met with her to check on the class layout and to ease some of her worries about not being extremely rigid.

Darla began the project by reading the instructional letter to each of the two groups as outlined by the research procedures. The difference was with the treatment group, in which she stated all students were to participate in the movement activities even though the process was to be voluntary. She wanted the whole class to move at the same time, without anyone sitting-out the treatment procedures. A student openly confronted her in the class about the voluntary aspect of the study. A disagreement ensued, which led to the student lodging a complaint with the department chair. Darla removed her classes from this research project. Afterwards, the researcher interviewed Darla to find out more information about the procedures she applied.

Darla had a large, newly remodeled classroom. The room had stadium-style rows of seats with continuous desks and fixed chairs. Instead of allowing students to choose their seats and place themselves throughout the room, she created a seating chart and placed all of the students in tightly packed rows toward the front of the classroom. Darla's expansive room allowed for the students to spread out around the room, giving each their own space, yet she was restrictive in using the room.

## The Remaining Four

Chuck (pseudonym), a tenured professor with over 20 years of teaching experience, taught a set of large-enrollment general studies classes consisting of mostly freshmen and sophomore students. His background is steeped in biological sciences which utilized mostly empirical research, yet he hoped the experience of applying a tactic related to human behavior would enlighten student perception of research. Chuck was diligent in asking questions about possible interruptions to the procedures and stated that he had to "mentally prepare for a different class format". Once he thought through possible scenarios, he was ready to begin implementing the treatment. He self-assessed himself as utilizing a laid-back approach to instruction while maintaining high academic expectations. Therefore, he hoped this research project would encourage students to become more involved with learning and other departmental endeavors by creating friendships and camaraderie.

Chuck's laid-back style was apparent by the percent of participating students. The control group had a total of 79 students, with 21 of these students meeting the criteria of a minimum of 90% participation/attendance. The treatment group for Chuck's class had a total of 83 students, with 20 of these students meeting the minimum participation percentage (see Table 1). He was adamant about reinforcing the voluntary aspect. To this end, the participation sheet was not always placed in a location that reminded students about the movement activities and the learning breaks. Students would forget to sign-in as they entered the classroom and Chuck did not remind them since participation was voluntary. Chuck remained in the research project for the entire 16 weeks and participated in the follow-up interview which was used for collection of qualitative data.

Sloan (pseudonym), a tenured professor with seven years of teaching experience, taught a set of classes that all majors in his department must take. Students in his class had a varied set of educational goals, yet each was required to take his class for any degree they wished to obtain within Sloan's department. The timing to take Sloan's class is not in a pre-determined sequential order unless the student needs it as a pre-requisite for post-graduate programs; as a result, students taking the class were from all class rankings, from freshmen to seniors.

Sloan's classes were scientific in nature and involved studying human movement. He was excited about this research project from the beginning, thinking that movement is the impetus for human knowledge. Sloan began the project with the same type of questions as Chuck in relation to normal class interruptions and how to handle the three days he included laboratory instruction. Since Sloan's classes consisted of different class rankings of students, most of the students were not necessarily friends beforehand. There were several college student athletes in the class, yet they participated in different sports. Even though Sloan taught preconceived hard classes, he wanted his students to understand how movement can alleviate perceived stress.

During Sloan's first day in class, he read the introductory letter to the students and then connected the idea of the course content with the research. Without explaining his expectations as to research outcomes, he rallied student participation. The control group had a total of 30 students, with 25 of these students meeting the criteria of a minimum of 90% participation/attendance. The treatment group for Sloan's class had a total of 30 students, with 27 of these students meeting the minimum participation percentage (see

Table 1). Sloan remained in the research project for the entire 16 weeks and participated in the follow-up interview which was used for collection of qualitative data.

Norm (pseudonym), an assistant professor with one year of teaching experience, taught a set of classes that were considered introductory to the degree program. As such, most students were either freshmen or sophomore students. The degree program had a high majority of females, which was demonstrated in Norm's classes with all female students. Norm immediately agreed to participate in the research project with a business-like attitude. He was able to decide exactly how the process would occur in his classroom. He only asked the researcher procedural questions. Norm wanted to know mostly about how the student grades were recorded and how to get more material if needed. His opinion about expected outcomes was unknown due to the limited conversations between Norm and the researcher.

On the first day of class, Norm read the instructional letters to the students. He later stated that he would have preferred to make student participation mandatory, but he was very clear to the students it was voluntary. With his quiet, monotonic style of speaking and his high academic expectations, students were told about the project in a directive manner. Even though he told the researcher that he indicated to the students that participation was voluntary, this notion was only reiterated when students complained. Norm followed the research protocol by reading the introductory letter, presenting the participation sheet, and maintaining the time schedule for the breaks. Otherwise, Norm did not speak about the process or the research study in any other way except to squash complainers. The control group had a total of 27 students, with 27 of these students meeting the criteria of a minimum of 90% participation/attendance. The

treatment group for Norm's class had a total of 25 students, with 20 of these students meeting the minimum participation percentage (see Table 1). Norm remained in the research project for the entire 16 weeks and participated in the follow-up interview which was used for collection of qualitative data.

Ashley (pseudonym), a temporary instructor at the university but having over 15 years of teaching experience elsewhere, taught a set of classes similar to Sloan, where the classes were a requirement for all degree seeking students in her department. The classes were an upper-level course; therefore, students who enrolled were mostly juniors or seniors. This indicated most students were either acquaintances or friends. Course content focused on business and legal issues within a major subject area. Ashley quickly agreed to participate, stating the theory driving this study was crucial to her students' furthering education. She thought by showing students that their attention span may increase by involving movement, she would enrich learning about personal behaviors and personal responsibility. Of all the participating professors, Ashley most strongly believed in the potential of the research outcomes.

After Ashley read the instruction letters to the students, she openly answered student questions about the project. She discussed his opinions and his expectations. Additionally, Ashley indicated her passion for the research project through her expression about course content and the connection between it and her hope for an increase in learning. She stated the participation sheet would always be near the main entrance into the room for students to sign-in as they entered the room. The convenient location of the sign-in sheet and the class discussions increased student participation. The control group had a total of 29 students, with 26 of these students meeting the criteria of a minimum of



90% participation/attendance. The treatment group for Ashley's class had a total of 33 students, with 30 of these students meeting the minimum participation percentage (see Table 1). Ashley remained in the research project for the entire 16 weeks and participated in the follow-up interview which was used for collection of qualitative data.

Table 1

*Percent of Participation*

Professor	Group	N enrolled	N part.	% Part.	Availability of Part. Sheet
Chuck	Control	79	21	27	Inconvenient Location
	Treatment	83	20	24	
Sloan	Control	30	25	83	Passed around Class
	Treatment	30	27	90	
Norm	Control	27	27	100	Passed around Class
	Treatment	25	20	80	
Ashley	Control	29	26	90	Convenient Location
	Treatment	33	30	91	

*Note:* Percent of participation included students who voluntarily indicated their participation and did so at least 90% of the number of class meeting times.

Overall, there were four sets of quantitative data results used for analysis. For the qualitative methods portion, there were four post-treatment interviews with four periodic discussions with each of these professors during the course of the semester. Additionally, there was one interview obtained with Darla after she dropped from the research project.

### Achievement

For each set of classes, students' final grade percentages were calculated to determine achievement levels and the ability to demonstrate learning in subject specific

courses for comparison and contrast purposes. A *t*-test was computed to compare the two means within each set of courses to determine if there were significant differences between them. For each class an independent *t*-test was run to compare the mean score between the treatment and control sections. The *t*-test showed how one class compared to another class in the same subject to answer research question number one. The Levene's test was run to determine if there were homogeneity of variance between the groups (Field, 2005).

Chuck's control and treatment groups' means differed by 6.92 percent points, which meant the letter grades associated with the numerical data were the same (see Table 2). The final grade percentages were graphed to determine central tendency (see Figure 1 & 2). Data fell into a normal distribution for the control and the treatment groups. The independent *t*-test showed a significant difference between groups for Chuck's classes,  $t(19) = -2.358, p = .029$ .

Table 2

*Descriptive Data for Chuck*

Group	N	Mean	Std. Deviation	Std. Error Mean
Control	21	80.05	11.40	2.49
Treatment	20	86.97	6.17	1.38

*Note:* Means represent the final grade percentages.

Figure 1. Control group for Chuck's class.

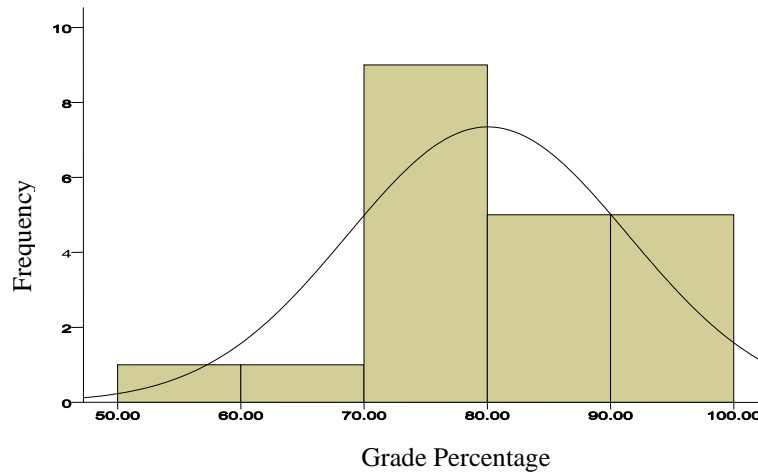
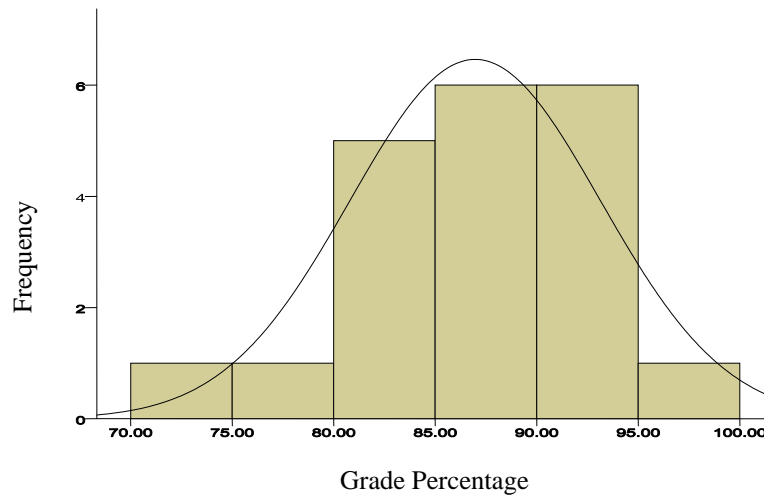


Figure 2. Treatment group for Chuck's class.



Sloan's control and treatment groups' means differed by 3.64 percent points, which meant the letter grades associated with the numerical data were the same (see Table 3). The final grade percentages were graphed to determine central tendency (see Figure 3 & 4). Data fell into a normal distribution for the control and the treatment groups. The independent *t*-test showed no significant difference between groups for Sloan's classes,  $t(24) = -.958, p = .348$ .

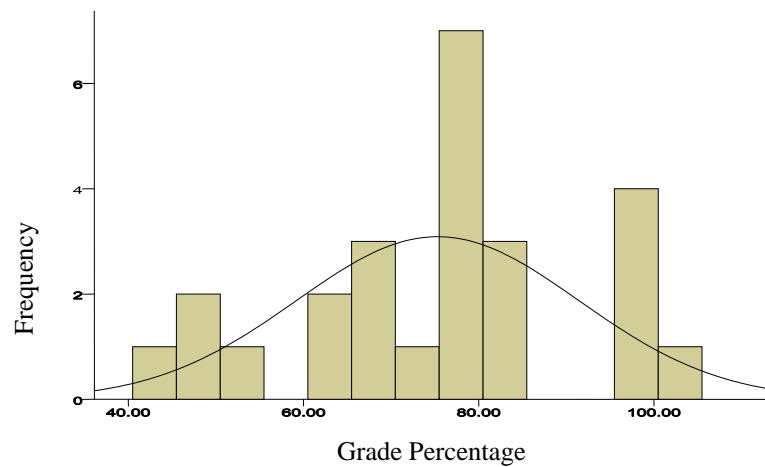
Table 3

*Descriptive Data for Sloan*

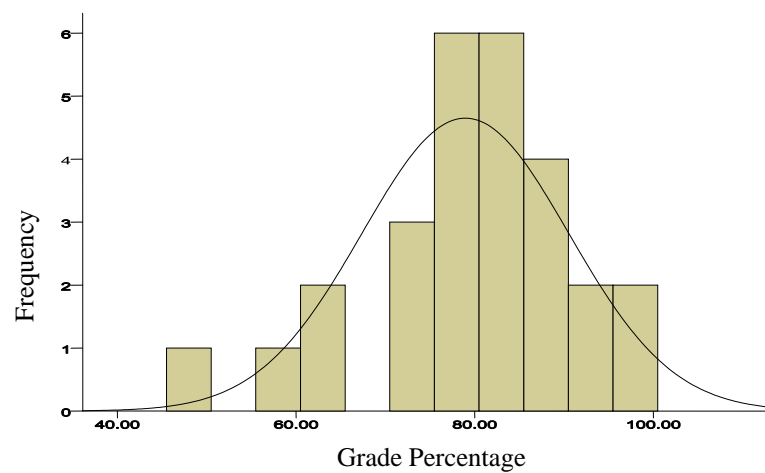
Group	N	Mean	Std. Deviation	Std. Error Mean
Control	25	75.32	16.14	3.22
Treatment	27	78.96	11.58	2.22

*Note:* Means represent the final grade percentages.

*Figure 3.* Control group for Sloan's class.



*Figure 4.* Treatment group for Sloan's class.



Norm's control and treatment groups' means differed by 1.09 percent points, which meant the letter grades associated with the numerical data were the same (see Table 4). The means were graphed to determine central tendency (see Figure 5 & 6). Data fell into a normal distribution for the control and the treatment groups. The independent *t*-test showed no significant difference between groups for Norm's classes,  $t(19) = .32, p = .752$ .

Table 4

*Descriptive Data for Norm*

Group	N	Mean	Std. Deviation	Std. Error Mean
Control	27	86.26	1.29	2.35
Treatment	20	87.35	12.19	5.78

*Note:* Means represent the final grade percentages.

Figure 5. Control group for Norm's class.

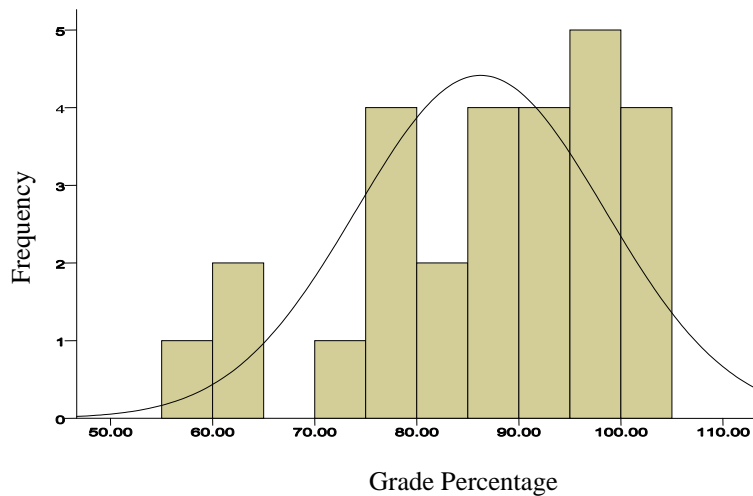
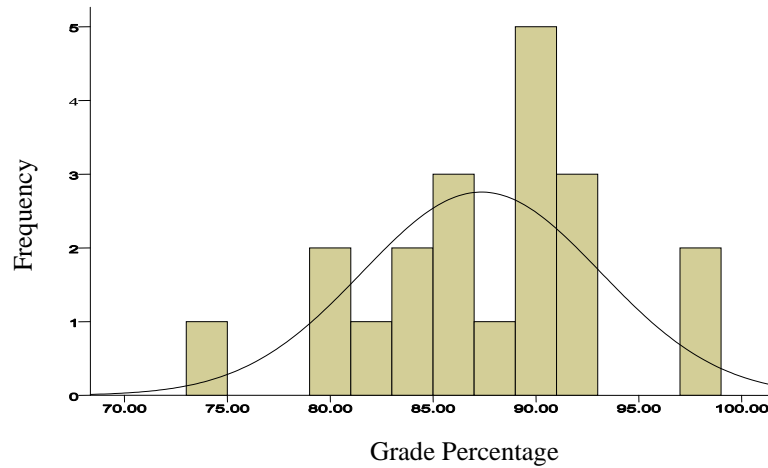


Figure 6. Treatment group for Norm's class.



Ashley's control class had a mean approximately ten points lower than the treatment group, which is a full letter grade difference (see Table 5). The final grade percentages were graphed to determine central tendency (see Figure 7 & 8). Data fell into a normal distribution for the control and the treatment groups. The independent  $t$ -test showed a significant difference between groups for Ashley's classes,  $t(25) = -2.488$ ,  $p = .020$ .

Table 5

Descriptive Data for Ashley

Group	N	Mean	Std. Deviation	Std. Error Mean
Control	26	77.42	17.54	3.44
Treatment	30	85.87	7.17	1.31

*Note:* Means represent the final grade percentages.

Figure 7. Control group for Ashley's class.

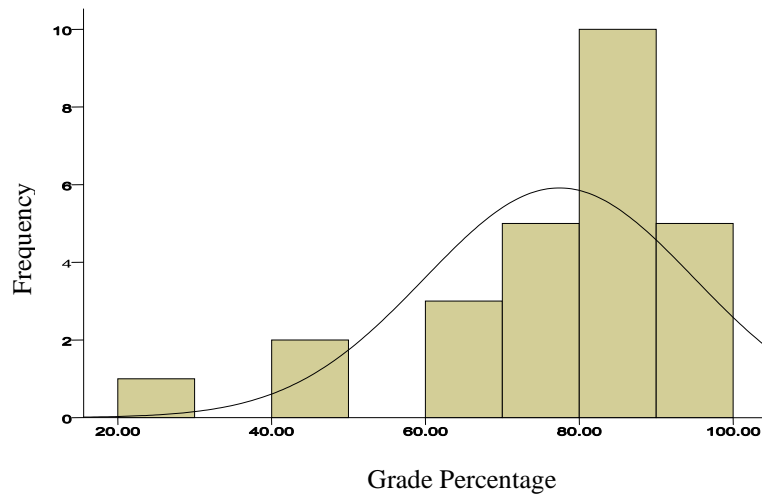
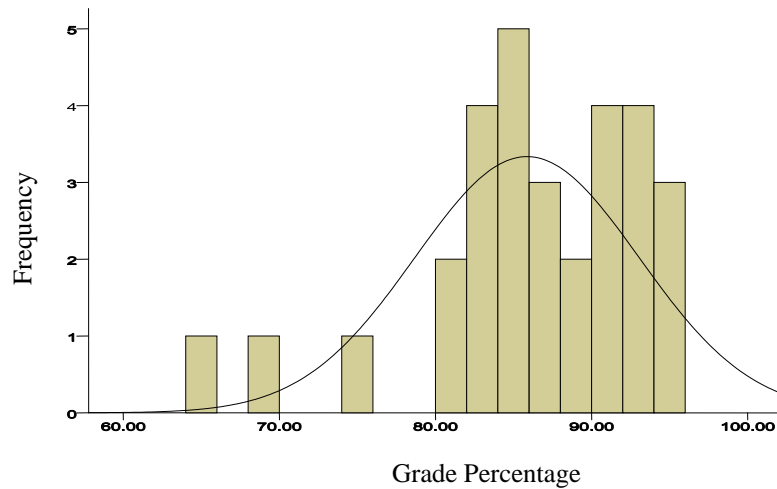


Figure 8. Treatment group for Ashley's class.



Of the four sets of classes with quantitative data from a two-tailed  $t$ -test, two were considered statistically significant and two were not (see Table 6). Chuck and Ashley's treatment and control groups' final grade percentages were significantly different. Within each of Chuck and Ashley's treatment and control classes, the students' final grades were statistically different post-research. Sloan and Norm's groups were not significantly different.

Table 6

*Significant and Non-significant Scores*

Professor	df	<i>t</i>	p	Significant
Chuck	19	-2.358	.029	yes
Sloan	24	-.958	.348	no
Norm	19	.32	.752	no
Ashley	25	-2.488	.020	yes

*Note.* Based on a 95% level of significance.

The scores were then compared across course subjects, thus across different professors, using only the treatment groups in an ANOVA,  $f=5.711$ , and then pairwise comparisons as notated in Table 7. Three of the pairs were statistically significant and three were not. Sloan's class was significantly different from all of the other classes.

Table 7

*Significant and Non-significant Scores for Paired Samples*

Paired Professors	Std. Error	Significance	Statistically Different
Chuck & Sloan	2.436	.009	Yes
Chuck & Norm	2.611	.839	No
Chuck & Ashley	2.383	.706	No
Sloan & Norm	2.436	.00	Yes
Sloan & Ashley	2.436	.022	Yes
Ashley & Norm	2.383	.526	No

*Note.* Based on a 95% level of significance.



## Practical Use of Project

All participating professors reported the methods used in this project were easy to carry out. The logistics of stopping periodically during class lectures to either perform a movement activity or to take a review break was considered consistent and well organized. Even though two professors considered the methods as different from their normal classroom process, they conceded the breaks were not time consuming or difficult to implement.

### *Logistics*

Sloan was enthusiastic about participating in the project, stating that he believed the data would support learning. He went into the research with a positive outlook. Sloan's only concern was related to the amount of time consumed by breaking and having the students pause from lecture. He thought that the 3 to 4 minutes used in each class for breaks spread over 3 class meetings each week for 16 weeks would accumulate in a substantial reduction in information sharing time. Sloan wondered how the loss of time would "eat into...class time, because [he] use[s] every bit of class time". With that being said, the expectation of increased learning outweighed the possible loss of lecture time.

Sloan was contacted every three weeks during the course of the project and each time he would state the process was becoming easier to implement since he did not need to take time to prepare. His overall attitude about participating was one that showed organization and a goal oriented determination, yet he appeared calm, as if knowing data would suggest that moving students periodically would increase learning capabilities. There was always an air of saying that nothing was wrong and the project was working as planned. According to the post-research interview, he found the breaks to work well with

his discussion points during lecture. He stated the stops seemed natural once the first few weeks were over. Although there was a phase of adjustment to the breaks, the professor and the students soon became accustomed to the new class format. Once the classes settled into the new routine and expectations were clarified, classes ran smoothly. Sloan stated, "So we were good on everything in terms of procedures. It was pretty simple". Sloan had asked several students to help him with the research procedures. He had one or two students assigned to remind him when breaks were to occur. There were also students who timed the breaks and others who chose the movement activity from the box. At the end of each class, Sloan would lock the items in a cabinet. At the beginning of each class, a student would make sure the cabinet was unlocked and the items were set out and ready to use.

Another professor who had the same attitude about participating and implementing this research project was Chuck. He was responsible for teaching classes with large enrollment numbers and he hoped that many students would participate because he appeared excited to see the results. Chuck had a helpful and positive outlook toward the research, yet in class he was laid-back and non-committal to the procedures, including when the students marked on the participation sheet. During our periodic phone conversations, he would comment on the students forgetting to sign the sheet or not knowing if the sheet had been signed on certain days.

To undertake this project, Chuck knew that there might be logistical issues due to the large class enrollment size. Chuck stated the hardest part about the process was remembering to include the breaks. He said, "Students would kinda remind me to do it a little bit" in the beginning. Chuck also mentioned, "We would slip within a minute or

two sometimes and catch ourselves, but it was never big". Chuck used student assistants; he thought that assigning tasks to students "helped more by keeping track of the time and the number of breaks more manageable". He found himself becoming involved with a discussion point which hindered his ability to remember to stop and have the students take a movement or review break.

Chuck, like Sloan, also assigned duties to students in the class, asking different students to be responsible for keeping track of time between and during breaks, getting out the box with movement activities, and choosing the movement. Chuck had "timers and back-up timers who stayed fairly close to the schedule, so if one wasn't there the other just automatically took over". Chuck asked for volunteers to help and Sloan assigned tasks to several students he recognized as responsible and diligent about attendance from previous classes. The assignments were divided between the students in Chuck's class. Students had an individual task of preparing for the upcoming class, signaling the beginning of a break, choosing the movement activity from the box, timing the break, or counting the number of movements performed, if necessary.

Norm's classes did not use student assistants; instead he kept track of the timed breaks and chose the movement activities from the box. He was very diligent with making sure each break was timed as accurately as possible. After reviewing his participation sheet, only three days were removed from the calculation to determine number of class meeting times. This is in comparison to the other professors who averaged six days removed for test or exam days, laboratory instruction, or electronic media use. Sloan took an entire week off from instruction due to a death in the family,

and those days were not included in his average. Norm appeared to have implemented the research procedures with no variance or adjustments for natural human tendencies.

Ashley used student assistants, but only as reminders of when to take breaks. She had the participation sheet near the entrance door and set out the other material on a central location or a desk at the front of the room. When a student reminded her to stop for a break, she would choose from the box of movement activities for the treatment group and set a timer for the control group. Ashley stated that the students were very good at keeping track of time and making sure breaks were as procedure indicated.

### *Procedural Suggestions*

During the first of the periodic phone conversations, the professors indicated they did not need any additional material and research procedures were easy to implement. The students appeared to have accepted the breaks as a natural part of the routine and once the professors settled into a routine. Ashley stated, "The classes ran like clockwork". In the treatment classes, students would remind each other about how to perform certain movement activities. Toward the end of the semester, students were tiring of the limited choices of activities. They had accomplished the ones provided and appeared ready to move on to newer ones.

When asked about changing the procedures if ever to use this teaching process again, all four professors suggested two of the same ideas. One was to have more variety of movement activities to choose from for the students to perform. Sloan found students became "bored with the types of movement activities toward the end of the semester". He did not see the students openly defiant, but their demeanor became less excited

compared to the first few months. Sloan stated, "it was almost a tedious task near the end".

Norm suggested having more "options since the students were oftentimes repeating the same" movements within the same class period. This was especially true of classes longer than the typical 50 minute class period. Norm's classes lasted for an hour and 15 minutes, which meant he had more breaks than a shorter class. Ashley knew some of her students who had been involved in the pilot study from the previous spring semester; therefore, they were aware of a more diverse set of movement activities that were utilized and initially tested to use in the principle research project. She thought the students were "hoping to add some of those movements to their choice box".

The second suggestion from all of the professors was to make student involvement mandatory instead of voluntary except for medical reasons. Chuck believed "the class would have an investment in participating if the movement activities were required as a part of the class content". He suggested using the movement activities as a part of the learning process by "linking the procedures to a scientific experimentation" assignment. Norm and Darla stated that if the course syllabus had included student involvement as part of the curriculum, participation would have increased. All four professors appreciated the voluntary portion of the research procedures, yet they also stated that student motivation to become involved with learning is difficult.

### Community Building

Overall, 99 students self-reported participation in the control group and 97 students self-reported participation in the treatment group (see Table 8). The control groups were not asked to become actively involved in a particular physical action,

whereas the treatment group participants had to stand up and move either in a locomotor or nonlocomotor manner. The control groups' participation was therefore more passive than the treatment groups. During the breaks, student behaviors and actions differed. All four of the participating professors found three main student actions or activities when it was time for a review or a movement break: (a) control group students read back through notes taken during lecture, (b) control group students sent text messages or talked to another student nearby, or (c) participating treatment group students "joked and poked-fun" (Sloan) at fellow students performing the movements.

Table 8

*Overall Participation Rates*

Group	N enrolled	N participated	Percentage
Control	165	99	60%
Treatment	171	97	57%
Overall	336	196	58%

*Note:* Percent of participation included students who voluntarily indicated their participation and did so at least 90% of the number of class meeting times.

During the periodic phone conversations with the professors, for the first few weeks, many control group students continued to speak or ask questions of the professors, who would remind the students of the research procedures and encourage them to take a review break. Sloan told his students "to take advantage of the break to review notes or check phone messages". He found students choosing to do both, yet mostly students would pull out their phones and check messages or texts. Norm told students who attempted to communicate during review breaks that "this is a time for you to look through your notes and come up with questions for me" to answer afterwards. He only

had to remind them a few times. After a few warnings, students were quiet and reviewed notes or exchanged small talk with a neighboring student.

Across all classes and professors, the treatment group students would talk to each other during the movement activities. Sloan stated her students would "critique each other in a joking manner". Sloan further stated there was a sense that the "students were a part of something" and felt an obligation to perform the movement activities in "good humor," yet with accuracy. He also noticed the students in the treatment class "were more outgoing and they had a more positive outlook" about upcoming classes. The student assistants for the treatment groups would get to class a few minutes early and set up the research material. Sometimes the material was locked in a cabinet and the students would find someone to unlock the cabinet and make sure the class was procedurally ready.

In general, the control groups did not "socialize in such an obvious way" as much during breaks as the treatment groups (Chuck). Chuck and Norm noticed treatment group classes having sections in the room where participating students "would congregate together" as a part of their normal seating arrangement. These groups of students were heard laughing and joking as they performed the activities. Sometimes the students would joke with the professors. Overall, the tension or the anxious atmosphere was lightened after a movement break. Professors reported that students appeared more comfortable and refreshed than the control groups who went from silence, text messaging, or small talk back to lecture material. Specifically, Sloan stated the students would joke with him during the movement activity breaks. He concluded these "lighter moments"

created a reduction in student tension, which allowed students to see the professor as "less intimidating", thus promoting a "less anxious" approach to the subject matter.

Although all of the participating professors determined the movement breaks to be "positively effective on student morale", Norm found a few students within one smaller group complaining about performing the movement activities even after he stressed on many occasions that participation was "voluntary and not linked to grades". He further stated that "even though they complained", the students continued to perform the movement activities with students who were in the same seating area. Students performed the activities and participated in the research while verbally telling Norm they were not happy about the process.

#### Professors' Approach to Research Procedures

Darla, the professor who participated in the research and then stopped after a student complaint, started the project with predetermined outcomes in mind. She stated she "wanted to have the students pay more attention in class and be more alert". Darla had read the instruction letter to her classes wherein it was stated that participation was voluntary. Yet, when the semester proceeded, she indicated to the treatment class her "expectation was to have all students participating in the movement activities together". In fact, she had created a seating chart according to the layout of the classroom to most efficiently accommodate the different pre-planned movements. The two concepts of stating expected participation and implementing seating assignments, indicated that students were mandated to be a part of the research project. There was one student in particular who took offense to directives from Darla and "complained in class and to [the]



department chair". Shortly thereafter, Darla indicated her inability to continue the research project.

Chuck, who had an overall participation rate of 25%, took the opposite approach as Darla (see Table 9). Chuck read the instruction letters to the respective classes, asked for a voluntary timer, showed the instructional video for the movements, and then preceded to "let the class self-monitor itself" for the remainder of the semester. During review breaks in the control group, most students went to the restroom or chatted with a nearby student. Chuck pointed out that initially all students indicated their willingness to participate in the research project, but "within the next few classes it dropped off pretty dramatically and a steady drop off throughout" the rest of the semester. He also mentioned there were "pockets" of students who remained active in the treatment group and "seemed to hold each other accountable for getting up and moving". The attendance sheet was placed at the front of the room, which was the largest classroom on campus at the time, and if students decided to participate on any given day, they would go to the front of the room and indicate so on the sheet. The sheet was on the table where the professor mainly kept other course material.

Table 9

*Total Percent of Participation*

Professor	N enrolled	N participated min.	Percentage
Chuck	162	41	25%

*Note:* Percent of participation included students who voluntarily indicated their participation and did so at least 90% of the number of class meeting times.

Sloan and Norm approached the participation sheet aspect of this project by passing the sheet around to each student at the beginning of class. During the first few

weeks of the semester, the professors would remind the students what they were to expect if they chose to participate. Meaning, students were told that the participation sheet was not for attendance purposes; instead, "it was an indicator that they wish to take part" in the research project. Sloan's overall participation rate was 87% and Norm's was 90% (see Table 10).

Upon turning in the final worksheet with participation indicators and final grade percentages, there was a marked difference in Chuck's sheet from Sloan and Norm's. Chuck's sheets were not organized in a manner that this researcher was able to easily sort. On the day of the post-research interview with Chuck, we sat together and attempted to clarify the sheets he had gathered since he had printed off additional copies from an electronic document file. Sloan and Norm had the original worksheets given to them during orientation and had all of the requested information in the correct areas. All of these professors had students indicating participation throughout the semester; the only portions completed by the instructors were the final grade percentages and participation rates.

Table 10

*Total Percentage of Participation*

Professor	N enrolled	N participated min.	Percentage
Sloan	60	52	87%
Norm	52	47	90%

*Note:* Percent of participation included students who voluntarily indicated their participation and did so at least 90% of the number of class meeting times.

Ashley also had the original worksheets with the requested information clearly notated and her class participation rate was 90% (see Table 11). Her technique for

student self-reporting of participation was similar to the other professors, yet she set the paper on a desk located between the entrance door to the classroom and the desk where she centralized her teaching material and asked students to sign-in. When the students walked into the classroom, they were to mark, in the correct location for date and day, with an affirmative mark if they intended to participate. Meaning, Ashley asked the students to "put a checkmark for participating". The marks were clear and easy to decipher. Ashley stated that there were two instances when class discussions centered on the subject of the purpose of this research project. She did not discourage nor initiate the topic and allowed the students to ask questions openly. Ashley believed in having students moving whenever possible, yet stated that she "was always concerned about not having enough time to cover all the material".

Table 11

*Total Percentage of Participation*

Professor	N enrolled	N participated min.	Percentage
Ashley	62	56	90%

*Note:* Percent of participation included students who voluntarily indicated their participation and did so at least 90% of the number of class meeting times.

### Conclusion

The findings of this study were explained by using quantitative and qualitative data. The participating professors were described in how they utilized the procedures within the classroom. A discussion then ensued to explain a possible connection between quantitative outcomes and the themes found from the qualitative information. Furthermore, data were provided indicating statistically significant or non-significant differences between treatment and control groups.

## CHAPTER FIVE

### DISCUSSION

The long-held tradition of remaining seated during educational lectures has placed today's student at a disadvantage. The walls and towers of higher education bring forth voices with orations carrying an astounding amount of information which students are to absorb, ponder, and apply (Horgan, 2003). All of this is to occur in the midst of a fog, a denseness within the brain because of a loss of attention and lack of blood circulation (Leppo, Davis, & Crim, 2000). This denseness takes place because the human body and its design for movement is forced into a fixed position while asking the brain to become stimulated enough to bring about a heightened awareness to a new set of knowledge. Professors are hoping to create new knowledge in their students but unfortunately, the brain is incapable of responding with maximum effort (Nonaka, 1991; Ratey, 2008).

Research has indicated a relationship between physical movement and brain activity (Colcombe et al., 2006; Madigan, 2004; Medina, 2008; Tremarche, Robinson, & Graham, 2007; VanPraag, Kempermann, & Gage, 1999; Vayman & Gomez-Pinilla, 2006). Therefore, physical activity and circulation-encouraging movement activities occurring intermittently during a predominantly lecture style college course, which is sedentary by design, can hopefully affect the overall grade or learning of students. "Nobody has yet directly tested the relative effectiveness of just breaking the lecture up against interspersing it with activities" (Young, Robertson, & Alberts, 2009, p. 43), therefore movement activities and lecture breaks should be compared to look further into Madigan's Action Based Learning Theory. Madigan's theory includes the idea of the

human brain's ability to better function during and with physical activity. Madigan's studies focused on how a teacher of elementary school-aged students can create a combined lesson plan with content area topics and movement activities. The movements did not necessarily need to correlate with specific details from the content area information, but Madigan suggested having a degree of content reinforcement of ideas if there is a relevant connection.

In a higher education setting, professors find time and effort become obstacles and a challenging task to undertake when trying to balance conveying a large amount of information, while at the same time ensuring students are absorbing enough information to be able to use the knowledge in their future career (Summers & Sviniki, 2007). What is needed is a procedure that is easy to follow, uses a small amount of time, and is effective in helping students learn. Breaks in the lecture where students perform activities related to class content, known as interactive windows, have been researched as a method for enhancing student learning, yet the preparation time to execute interactive windows properly is very time consuming (Huxham, 2005; Knight & Wood, 2005; Lake, 2001; Lea & Callaghan, 2005; Machemer & Crawford, 2007; Summers & Sviniki).

Higher education classrooms are not considered to be as creative in their information dissemination process as elementary schools, where Madigan (2004) focused her research, yet the learning of information is still the primary goal of both completely different arenas of education. Research needs to occur in higher education to see if Action Based Learning theory can be further expanded into another genre of student age and learning level. Another reason to study higher education classrooms was to determine if lecturing professors could employ a somewhat more simple technique to

assist students' knowledge acquisition without watering-down content and placing an additional burden on an instructor by increasing their preparation time, as interactive windows appeared to do.

### Purpose of the Study

While interactive windows have been found to be relatively successful in raising achievement levels, much preparation time is required to adequately implement this technique, as well as teach students the amount of content professors require for personal or professional reasons (Lea & Callaghan, 2005). A more undemanding method is needed to maintain the students' attention. According to Caldwell (2007), using simple "periodic breaks may help relieve student fatigue and restart the attention clock" (p. 12). The goal of this current project was to promote breaks that could afford a beneficial boost in student learning with much less preparation time than interactive windows. Questions then arose about what type of breaks should occur, specifically whether students would benefit more from being passive and sedentary or if movement would be beneficial. If students remain inactive, as they are during lecture time, they may not be able to jump-start their attention span without moving around and activating their circulatory system. A bonus effect might occur if the circulatory system is engaged which has demonstrated an increase in cognitive abilities (Medina, 2008). Medina has encouraged instructors to rethink the teaching process by understanding the human's primordial functioning.

Research has shown the inability of students to maintain an adequate amount of attention during lecture style classes (Beeks, 2006; Caldwell, 2008; Dyson, 2007). Furthermore, most research on college students has been related to using interactive windows as a means to enhance student learning and length of attention (Huxham, 2005;

Knight & Wood, 2005; Lake, 2001; Lea & Callaghan, 2005; Machemer & Crawford, 2007; Summers & Sviniki, 2007). Research on physical activity, fitness, and achievement levels has been conducted with elementary school-aged students (Colcombe et al., 2006; Madigan, 2004; Tremarche et al., 2007; VanPraag et al., 1999; Vayman & Gomez-Pinilla, 2006). The intention of the current study was to use the Action Based Learning theory on a more adult population who are undergraduate college-aged students to determine if movement breaks in a predominately lecture-style college class affected a student's ability to demonstrate learning.

The use of interactive windows was considered to be too burdensome for many professors, even though research demonstrated a positive connection between the interactive windows and student achievement (Huxham, 2005; Knight & Wood, 2005; Lake, 2001; Lea & Callaghan, 2005; Machemer & Crawford, 2007; Summers & Sviniki, 2007). Professors have relied on straight lecture techniques for centuries, and enormous efforts are needed to change a teacher's underlying beliefs (Lindblom-Ylanne et al., 2006). Therefore, to invoke a change in teaching techniques, the professor's perception of a method's ease of use and effectiveness would affect its validity. This means that in order for a method to become widely used, instructors would need to perceive the technique as helping student achievement, be relatively non-time-consuming, and eliciting few, if any, challenges.

One purpose of this study was to compare final grade percentages of college students to determine student achievement. These students were enrolled in one of two classes in which there were two course sections taught by the same instructor within the same semester. Of the two classes within each subject area, one class performed a

circulation inducing activity periodically during class. The activities were brief and then the class resumed lecture momentarily, hopefully only removing up to a total of 4 minutes of lecture while participating in the movements. The second class within each different subject area did not have the breaks involving movement. Instead of moving, the students in the control group were given review breaks. During this time, students in the control group had the same break opportunities as the treatment group but they were not given movement activities to perform.

Another purpose of this study was to become aware of how professors perceived the two methods of instruction. Instructors gave insightful information regarding how they believed the movement or review breaks affected students. These perceptions referred to the merit of its use in higher education classrooms and how the methods fit into a teaching routine. One way professor attitudes were determined was with phone conversations during the semester, as well as an end-of-semester personal interview. Participating professors were interviewed once the semester had been completed and answered questions about the teaching methods used with the goal of acquiring insight into the technicalities and nuances that arose during the initial stages of the study.

### Research Questions

The overarching goal of this project was to find a means to help students increase their learning capacity in college classes knowing students are faced with many predominately lecture style classes. An increase in the number of high achieving students puts more pressure on professors to determine the most effective and efficient method to deliver information while maintaining course integrity and working within time constraints for class preparation.



The research questions guiding this study were:

1. Do circulatory enhancing movement breaks in a lecture-style college class affect student achievement over the course of a full semester, 16 weeks?
2. Is there a difference in student achievement between the classes used in this research among the various subjects when circulatory enhancing movement breaks are used in lecture-style college classes?
3. What are the professors' perceptions of the use of enhanced movement breaks in lecture-style college classes?

### Methods

A mixed method of inquiry was used by first quantitatively addressing a real world phenomenon of lecturing and lack of student attentiveness then qualitatively asking in what ways professors may view the researcher's suggestion to change their teaching format. The procedures were sequential so the researcher could elaborate and expand on the findings from the quantitative method (Creswell, 2003). The quantitative data consisted of the means associated with final grade percentages which were then compared to determine student achievement within and across each subject. The qualitative data consisted of post-research interviews as well as phone conversations periodically during the semester, which were used to examine professor perceptions of the method of teaching and to assess needs as they arose.

### Summary of Quantitative Findings

There were four professors who remained in the study for the full 16 weeks. The course final grade percentages from the four professors' classes were compared using a *t*-test and a one-way ANOVA. Of the four sets of classes with quantitative data from a

two-tailed *t*-test, two were considered statistically significant and two were not (see Table 6). Using a 95% level of significance for all the statistics, Chuck's treatment and control groups' final grade percentages were significantly different,  $t(19) = -2.358$ ,  $p = .029$ . This means the treatment group had a significantly higher overall grade percentage than the control group. Ashley's treatment and control groups' final grade percentages were significantly different, as well,  $t(24) = -.958$ ,  $p = .348$ . This meant, within each of Chuck's and Ashley's treatment and control classes, the students' final grades were statistically different post-research which indicates the treatment worked. The other two professors, Sloan and Norm, did not have classes showing statistically significantly different. This meant, within Sloan's and Norm's treatment and control classes, the students' final grade percentages were not significant enough to indicate the treatment worked.

All four professors' treatment class scores were then compared across course subjects, thus across different professors, using only the treatment groups in a pairwise one-way ANOVA. Each treatment class was compared to each other to see if there were an indication that there were differences among the professors' classes. Scores were distributed as notated in Table 7. There were a total of six pairings of treatment groups. Three of the pairs were statistically significant and three were not. Sloan's class was statistically significantly different from all of the other sample groups.

### Summary of Qualitative Findings

Qualitative findings were analyzed using focus coding and a line-by-line examination of statements made by the participating professors. Creswell suggested "organizing the material into chunks" when analyzing transcripts and other data gathered

from the research project (2003, p. 191). Therefore, the data were sorted according to reoccurring statements and then were placed into categories to represent one of three ideas: (a) the classroom, (b) the students, or (c) the professors. Next, within each of the categories the information was then grouped according to major themes: (a) incorporating the movement breaks in the classroom, (b) student gains or losses via creation of community and camaraderie, and (c) student gains or losses via reduction of anxiety. Sometimes the themes contained overlapping information which is normal considering the categories were intertwined during the research process.

There were five professors who were involved in the post-research interviews; four completed the study in totality and one who stopped participating after three weeks. The division of data gathered was furthered organized into two main reoccurring themes: incorporation of movement breaks, and student gains or losses. The incorporation of movement breaks theme was examined by looking at student participation and use of break times. The students' gains or losses theme was further divided into sub-categories of community building and reduction of anxiety.

### Theoretical Framework

Professors are more likely to maintain student attention when as many elements related to effective learning are present. Additionally, while attempting to increase a student's knowledge base, length of attention span is important to staying focused on content. According to Action Based Learning theory, movement is the catalyst for the brain to acquire knowledge (Madigan, 2004). Thus, the brain is more receptive for responding to and absorption of information. Medina (2008) agreed with Madigan that movement is the spark to increase the human brain's ability to grasp information for

processing and storage. Findings support the connection of early motor development, intentional movement, increased physical activity, and exercise for improved cognition (Madigan). Action Based Learning intimates that physical movement is the link to learning in the cognitive domain since 85% of students are predominantly kinesthetic learners (Medina). Movement elevates the heart rate which increases oxygen consumption, thus feeding the body and brain with essential nutrients of oxygen and glucose. The movement actions then prepare the brain for learning by refueling and revitalizing.

Students in elementary and secondary schools are exposed to a variety of teaching methods, as classrooms are environments that are rich with techniques to reach the three learning domains of audio, visual, and kinesthetic (Carlson et al., 2008; Ousten, 1999). The progression to post-secondary educational environments includes a shift in class format to consist of predominantly lecture-style information dissemination (Lea & Callaghan, 2005). Not all students are ready for such a dynamic change and struggle in classes that rely on this design. Therefore, professors in higher education have been encouraged to rethink the tradition of lecture-style class format and attempt to include innovative techniques such as interactive windows, which is often considered too time consuming (Lea & Callaghan, 2005). Caldwell (2007) suggested trying periodic breaks instead, which is what the researcher has studied with this research project.

While there were four professors who participated in the full length of the study, there was a significant difference in the final grade percentages of two. Further improvement of the technique used in this study could enhance the project's outcome potential. An important aspect found when students were asked to move around enough

to reset their attention clock and then return to lecture or the regular class format was the overall acceptance of using this format in the future. All of the professors believed that the movement breaks were easy to implement as a normal part of their class routine without losing much, if any, time that would have been devoted to lecture.

## Discussion

### Research Question One

Research Question One asked if circulatory enhancing movement breaks in a lecture-style college class can affect student achievement over the course of a full semester, 16 weeks. The standard error of the means for all of the classes was a small number which indicated there was very little variability between the means of the different samples. Three of the professors' standard error of the mean were close to two and one professor's was close to five. These small numbers suggest the sample population used was fairly close to the population as a whole. Findings suggest that out of four professors who taught eight classrooms in the sample, two classes indicated a significant difference between the control and treatment groups. Similarly, the two other classes' treatment and control groups were not significantly different.

Literature suggests that any movement is better than no movement in order for the brain to maximize its working capacity (Colcombe et al., 2006; Madigan, 2004; Medina, 2008; Tremarche, Robinson, & Graham, 2007; VanPraag, Kempermann, & Gage, 1999; Vayman & Gomez-Pinilla, 2006). The quantitative findings for the two significant sets of courses indicate that for Chuck's treatment class there was only a 2.9% chance that the *t*-test value received could happen by mere chance. Additionally, Ashley's treatment class data showed there was only a 2.0% chance that the *t*-test value received could

happen by mere chance. These chances or opportunities suggest that movement activities in these two professors' classes made a difference in the levels of learning and its demonstration on course assignments.

The other two courses that did not indicate a significant difference had *t*-test values associated with 34.8% and 75.2% chances that their scores could occur by chance. Since they were not significant, this means the treatment classes, even though the means were higher, did not demonstrate a high enough level of learning to be of importance and to be an indicator that it could happen again with a degree of reliability. A more in-depth look into possible differences between the teaching styles and use of research procedures is needed to determine if there is an explanation as to the reason for such a large difference in *t*-test scores between the four professors.

#### Research Question Two

Research Question Two considered the difference in student achievement between the classes that participated in this research project among the various subjects, using the treatment groups for comparison. All four professors' treatment class scores were compared across course subjects, thus across different professors, using only the treatment groups in a one-way ANOVA. There was a total of six pairings of treatment groups using the four professors' classes. Each treatment class was compared to each other to see if there were an indication that there were differences among the professors' classes. There were three pairings of classes considered different and three that were not which was further explained by attempting to answer the next research question. For example, since Norm and Ashley's classes did not show a significant difference to each other, they were more similar than dissimilar (see Table 6). Therefore, this researcher

looked to the outcome of the third research question to examine more details for possible reasons there were or were not differences among the treatment classes using the categories identified from the post-research interviews.

### Research Question Three

Research Question Three delves into the aspect of the professors' perceptions of the use of enhanced movement breaks in lecture-style college classes. The division of data gathered began with two main reoccurring themes: incorporating movement breaks and student gains or losses. The incorporating movement breaks theme focuses strictly on the professors' approaches to the research project and student participation. The student gains and losses theme is further divided into sub-categories of community building and reduction of anxiety.

#### *Incorporation of Breaks*

Instructors create a routine and a method of teaching that has been individualized based on comfort and ability (Dyson, 2008). When asked to participate in this research project, professors were not to change their particular style of teaching while implementing either pre-determined activities or passive review breaks. The remaining time in class was to maintain the same individualized integrity the professor deemed routine for his/her class. There was an assumption that the treatment and the control group would be able to receive the same type and amount of instruction as each other to keep the groups as equal as possible. Yet the differences between how the professors approached the breaks could have been the impetus behind the significant or non-significant data analysis between treatment and control groups, as well as during the

pairwise one-way ANOVA. In addition, the participation rates may have been affected by the professor's approaches.

Listed in Table 12 are a few attributes associated with each of the participating professors. As discussed in the findings, two professors began the research project thinking the treatment would increase learning capabilities, one was just interested to see how the process worked with a behavioral science study, and one was business-like. How the professors handled procedures was also different.

Table 12

*Teacher Implementation of Research Procedures*

Professor	Expected Participation	Expectations of Results	Participation Sheet Available	Student Assistants
Chuck	No	Undecided but hopeful	No	Volunteers
Sloan	Yes	Positive viewpoint	Yes	Assigned Duties
Norm	Yes	Undecided	Yes	None
Ashley	Yes	Positive viewpoint	Yes	All students helped

Classroom culture is created by the instructor and students walk into the learning environment created by the professor, which was different for each professor (McKinley, 2007; Weimer, 2002). Some students may have felt pressured by the professor to participate by the way he/she eluded to his/her expectations about the research project in general. Since the researcher did not observe any of the professors' classes, Martin and Lueckenhausen's (2005) impact teaching style were applied to the participating professors only as it related to how they approached the research procedures and student involvement (Table 13).



Table 13

*Impact Teaching Styles as Demonstrated through Research Procedures*

Professor	Teaching Style	Key Identifiers
Chuck	Navigator	Highlight key areas; students chart their own course
Sloan	Builder	Give pieces and parts; students gather and collect
Norm	Courier	Deliver package to be received by students
Ashley	Navigator	Highlight key areas; students chart their own course

*Note:* Based on Martin and Lueckenhausen's (2005) styles of teaching approaches. This is only on the professors' approach to the research project, not on their classroom teaching style.

Chuck and Ashley had statistically significant differences between their treatment and control classes. These same professors were considered to not have a significant difference between their treatments groups. Therefore, from the quantitative data this researcher assumes Chuck and Ashley had similar approaches to these classes in relation to the research portion of class time. This means, instead of assigning students tasks to help with the research project, students volunteered to help. In Chuck's classes, students were asked to help him keep track of time and if something else needed to be done, someone would volunteer to help. Ashley's students gradually began to help with keeping track of time without any requests for assistance. Summers and Sviniki (2007) found students became involved with class functioning when there was a sense of community; learning also increased with the increase of connectivity. By allowing the students to choose helping or not, professors are giving back some of the perceived power to the students. As a result, Chuck and Ashley thought they did not appear as intimidating to the students.

Conversely, Sloan and Norm did not have significant differences between their treatment and control classes. Yet, these professors were considered to have a significant

difference between their treatment groups. Since this researcher assumed similar approaches for Chuck and Ashley, one would think the same for Sloan and Norm. This dichotomy encouraged a more thorough look into individual professor approaches to the project used to find a common theme.

Chuck's approach to the project included a lenient, relaxed attitude about signing the participation sheet and made the sheet not easily accessible. Even though he was diligent with continuing the research project, there was a mind-set that everything would work out and resolve itself. Ashley also carried an easy-going air to the research project as demonstrated by not showing the instructional video that illustrated how to perform the movement activities. Ashley thought that the students were "smart enough to figure them out". Ashley made the sheet more accessible than Chuck, yet it was located in an area near the entrance to the room instead of handed to each student as Sloan and Norm had in their classes. Chuck and Ashley made sure the students understood their participation was completely voluntary and did not have to participate. This gave the power to the students, which in turn could have lowered any barriers to the treatment's effectiveness because of an ill attitude.

Sloan's approach to the project included the use of strict procedures with the execution of the movements as well as the passing around of the participation sheet. He reminded students of the voluntary nature, yet students made comments to Sloan about making sure to do everything "right". This attitude may have led students to think involvement in the project was the right thing to do instead of choosing to participate based on personal motives. His treatment class students were laughing and joking during movement activity breaks which encouraged camaraderie. But, the control class students

were encouraged to check phone messages, which was not academic in nature or a part of the project's original procedures. This researcher is not implying that laughing and checking phones caused his two classes to not show a significant difference. Instead, this researcher is suggesting the class procedures related to the voluntary nature of the movements and the use of review breaks as personal breaks instead, may have not been equal. This means many college students carry their phone to class which then caused Sloan's control group students to want to participate, and then to indicate so on the participation sheet, based on being able to check their phone during class. The treatment group did not get this opportunity, which led this researcher to believe the control group was not a true control group as originally designed for this project.

Norm's approach to this research project included passing the participation sheet around to each student and a strict adherence to the review portion of the review break. The control group was reminded the reason for the review break whenever questions were asked. The treatment group had sections of the class who participated in the movement activities, yet there was a lot of complaining about "having to do this". Again, this researcher was lead to believe the students in the treatment class did not think participation was completely voluntary. Students may have determined the classroom culture was one where the professor sets the tone by maintaining a rigid outlook about other learning activities that may occur in his classes.

In conclusion, the more students believed they were not in control of the choice to participate the less likely there was a significant effect of the treatment. Meaning, the two professors whose treatment classes thought they were in some way expected to participate did not have an academic advantage by the end of the semester. Whereas the

professors who appeared to give power to the students without too much input from the instructor were able to statistically demonstrate a higher level of learning than their control group counterparts. In addition, the location and accessibility of the participation sheet was somewhat different for each professor. The handling of the participation sheet suggested power was given to the students when it was set in an area for self-reporting, or the handling suggested power maintained by the professor by passing it around to the students.

### *Student Gains or Losses*

Professor perceptions of the effectiveness of the research project while considering extenuating circumstances and challenges left this researcher asking about community building and course anxiety felt by students. These topics were noticed in the post-research interviews and were further examined in relation to how the research project may have contributed. Based on how the professor handled the procedures, as discussed in the previous section, students had a reaction which was noticed through their actions and statements as reported by the professors.

*Community building.* When students have the sense they are accepted within a group of peers, they will work toward common goals with more effort (Summers & Svinicki (2007). One way the acceptance occurs is to have students work toward a common goal and believe by doing this their efforts are making a difference and are appreciated. Acceptance may have occurred during the treatment groups' movement activity time together. According to the four core professors, the students who participated in the movements demonstrated a more positive mood before, during, and after each break. This occurs because exercise and movement provide the brain with

more oxygen-rich blood, allowing more neurotransmitters to be engaged, more endorphins to be released, and the overall groups of neural networks to develop, becoming stronger (Tremarche et al., 2007). The students who moved during the breaks provided were showing signs of a positive mood because of the increase in blood flow to the brain which released endorphins.

Chuck and Norm stated that the movement groups became a group of people in and of themselves. There were "pockets" of students who would regularly participate and began to sit close to one another and carry on conversations even as they entered or exited the classroom. This could mean the students created a friendship or a kinship since they were working toward a common goal. Since each of those groups of students were performing the same activities or attempting to move in synchronicity, they became a community of students. Acceptance was created due to the commonality of achievement and goal acquirement.

*Reduction of anxiety.* Certain college courses cause a sense of anxiety due to the reputation of the professor or the degree of difficulty traditionally deemed by subject matter (Lindblom-Ylanne et al., 2006). Classrooms are oftentimes tense and appear scary to students who are already apprehensive about taking particular courses. Nervousness and trepidation are common for beginning freshmen and other students who understand the course they are about to take is going to require a lot of attention to studying and learning large amounts of material (Gray & Madson, 2007; Horgan, 2003). Movement activities appeared to alleviate some of the apprehension. The treatment classes in this research project were found to have a lighter, friendlier atmosphere than the control classes. Since the students were in an environment where their attention and

concentration levels must remain highly alert in order to respond mentally to information, such as a classroom, their bodies could become stressed (Leamnsen, 2000). By increasing the blood flow to their brains, releasing endorphins, and increasing cognitive abilities, students were able to calm down.

There was a reduction in the quiet, non-engaging student persona. Students in the treatment classes had a sense that speaking and asking questions was acceptable since the professor and the other students enjoyed moments of good-natured teasing and joking. The professors appeared less abstract and more real to the students. Students were able to see their once feared, all knowing teachers in a different perspective.

In conclusion, by building an atmosphere of community acceptance through breaks in the serious matter of academia, students were able to remove barriers to learning. Ashley had commented on the conversations she had with her treatment group students about the research project. This created an understanding that the learning in her class was valuable and each student was important enough for her to involve the students in a new approach to accomplish a common goal. According to the post-research interviews, the professors became more genuine and authentic in the eyes of the students due to the breaks from the normal, typical routine found in higher education lecture-style classrooms. It was as if the classes were special.

#### Implications for Practice

This research study showed a statistically significant gain in student achievement in two of the four classes. While there were two with statistically significant difference and two without, the professors noted other benefits to the learning environment in the treatment classes. The professors' perceptions of student gains were noted as an effect

from the movement activities. By combining the data and different attributes of the professors, there appears to be a manner of incorporating the movement activities technique most effectively to achieve the greatest outcome. Therefore, this researcher encourages and recommends further development and use of the techniques used in this project. The following are explanations of how the technique would look if this researcher were to recommend the movement breaks to other educators and possible benefits to the students and the instructors.

Due to the nature of research, and of this study in particular, participation is voluntary to avoid coercion. In a regular classroom, instructors can incorporate the movement activities without having to follow research protocol. As such, the movement activities could be an integrated portion of class procedures where participation is expected. Instructors will explain to their students how their classroom functions differently. From the very beginning of the class, students will be educated on why movement increases cognition, resets the attention span clock, elevates mood, and develops camaraderie. While explaining, instructors will need to address students in such a way to demonstrate concern for their learning and welfare while taking a firm stance on expectations about participating in the movement activities. Of course, instructors will also need to allow for student physical limitations by discussing the need to communicate whenever an issue arises. Students will need to accept the explanations about incorporating the movement activities; therefore, the idea needs to be delivered in a delicate and persuasive tone (Kemper, Leung, & McNaught, 2008). There should be no need to give directives or commands once students see that the professor is only trying to improve static, boring, and tense situations common to lecture-style classes. Finally, and

most importantly, students must think participation is in their best interest. To accomplish this, professors must be positive and encouraging while maintaining a firm stance.

Even though this research study was designed for higher education classes, it is recommended to use in secondary schooling, as well. Knowing many students, as they progress from elementary to high school, are receiving varying degrees of interactive and creative instruction, the transition to higher education and lecture-style classrooms is abrupt. Yet, there are many high school classes that rely on lecture-style instruction. By incorporating movement activities into high school classrooms that are using mostly lecture-style, students can begin to prepare for post-secondary education. This means students will be better prepared for higher education while experiencing a moderate version of a lecture-style class environment.

Another suggestion is to make the movement breaks last for 45 seconds to one minute. The movements should include an expansive amount of variety with repetition of specific activities occurring intermittently. The movements should be fun while avoiding things that could cause embarrassment. In this research study, one of the most common complaints was that the movements became monotonous. All of the participating professors recommended using more of a variety. The suggestion is aligned with the concept of the technique since an important goal is to engage students in a manner that will reset their attention clock. Instructors would not want to have boring or repetitive movement that would discourage or annoy the students. Knowing the average student has an attention span of only around 20 minutes, the breaks should be timed to occur within an approximate range around 20 minutes (Beeks, 2006).



Maintaining students' attention is important to increasing learning opportunities, and much information is lost when students are not actively listening (Caldwell, 2007). Educators know attention is important and would like students to be more aware, yet to do so, educators would need to do more than straight lectures. Young et al. (2009) found traditional lecture format to result in the greatest lack of concentration. Preparing for a lecture requires less time and effort than other methods of instruction, and previous, more interactive methods proposed for use by college professors have been considered complicated and time consuming (Huxham, 2005). The breaks with preplanned movement activities do not take extra preparation time, as indicated by the professors who participated in this research study.

Community within a classroom has shown to improve student retention and learning while reducing anxiety (Summers & Sviniki, 2007). This researcher found the creation of a classroom community by using the movement breaks technique. Students were a part of a shared experience with their fellow students that was separate from course content. All of the participating professors indicated the reduction of perceived student anxiety and negative attitudes. Professors watched groups of students congregate together and have interchanges indicative of camaraderie. Students were openly interactive with the professors which can translate into meaning the students were relaxed and uninhibited with regards to how the professors were perceived. When utilizing the movement breaks, instructors should interact in a light-hearted manner with students, encouraging an atmosphere reflecting a true break from content. Instructors will need to appear with an attitude of lightheartedness about the breaks and the movements. Personal

participation may be necessary to sway students who are shy or do not believe in the process.

### Recommendations for Further Research

The use of this experimental design can hinder the underlying or outlying cause and effect results from research since one group was compared to another without looking at other indicators of achievement (Field, 2005). A few contributors to high achievement have been the instructors' pedagogical ability, subject matter degree of difficulty, preparedness and clarity of expectations, and student motivation. The instructors who participated in this project were not screened for teaching ability, but each instructor's class was compared to another one in which he/she taught. Future research may involve comparing grades from previous semesters to those using the movement breaks. The use of historical data could help with internal validity of the results.

Since instructors and students vary, using the incorporation of movement activities with classes made up of similar students is suggested. If the research were to focus strictly on achievement, a strong control over homogeneity of participants is more likely to produce results specific to a particular population. Further research using specific subject matter, teachers, and class demographics compared against each other would demonstrate a stronger correlation between achievement levels. To do this an assumption is to have the professors involved in a more detailed orientation of research procedure expectations and to have similar pedagogy philosophies.

The courses in this project represented a variety of subjects across campus which consisted of a variety of students, as well. Yet, assumptions about class demographics is

a common practice in research as long as the data meet the criteria set forth in the statistics one wishes to calculate. According to the university in this project, gender division for the entire campus was 56% female and 44% male, yet this researcher used a class whose entire class consisted of females (UCM, 2010). More research is needed to determine course demographics before initiating the use of the treatment. Additionally, further research using groups of students within one class compared to other students within the same class would remove the teacher's limitations from differences among styles of instruction and show if small community building assists in learning.

Another suggestion for future research is to have the professors participate in the movement activities. This research project showed how professor interaction with students during the movement breaks improved the learning atmosphere by assisting in the creation of a classroom community and reducing student anxiety. Therefore, further research may show an increase in student participation rates since the professor is more involved in the activities. Along the same line, a question may arise wondering if the movement breaks increase the professor's ability to be more engaging during lectures.

### Conclusion

Overall, the findings indicate movement and learning are aspects that support each other. Movement is necessary for resetting the attention clock which is needed to assist in absorbing information. To what degree this information is absorbed is based on the individual, yet learning can increase when movement is involved. Students are not just looking around a room or working toward a personal goal during a normal class break, they are united in a common cause. The students who complained about moving were also the ones who got up and did so based either on perceived teacher expectations

or on peer pressure to fit in with a group of other students. A sense of belonging is a common need of all humans and the occurrence of fitting in with a group of other students in a new or different environment is difficult (Bloom, 1956). As such, this researcher found groups of communities form when movement was involved. These communities became alert and more fully functioning within the classroom as a result.

Professor attitudes and approaches used during this study appeared to effect student participation. Once the students who participated began involvement with the movements, there was an evident change in the classroom atmosphere. Even though some of the classes or the professors may have had the reputation of being difficult, the movement breaks eased the levels of anxiety by breaking up the explosion of information delivered during lecture. According to literature cited in this paper, student perception of difficulty affects learning. Therefore, the movement breaks not only reduced anxiousness, the breaks also increased the positive mood that was felt by the professors and the students.

The overarching goal of this research project was to find a way to help students increase their learning capacity in college lecture style classes. An increase in the number of high achieving students puts more pressure on professors to determine the most effective and efficient method to deliver information while maintaining course integrity and working within time constraints for class preparation. The results of this study indicate the use of movement activities at regular intervals during lecture style classes might help to increase the learning capacity of students.

## References

- Beeks, W. (2006). The 'millionaire' method for encouraging participation. *Active Learning in Higher Education*, 7(1), 25-36.
- Bligh, D. A. (2000). *What's the use of lectures?* San Francisco: Jossey-Bass Inc., Publishers.
- Bloom, B. S. (1956). *Taxonomy of educational objectives, handbook I: The cognitive domain*. New York: David McKay Co Inc.
- Caldwell, J. E. (2007). Clickers in the large classroom: Current research and best-practice tips. *Cell Biology Education*, 6, 9-20.
- Carlson, S. A., Fulton, J. E., Lee, S. M., Maynard, L. M., Brown, D. R., Kohl, III, H. W., & Dietz, W. H. (2008). Physical education and academic achievement in elementary school: Data from the early childhood longitudinal study. *American Journal of Public Health*, (98)4, 721-726.
- Castelli, D. M., Hillman, C. H., Buck, S. M., & Erwin, H. E. (2007). Physical fitness and academic achievement in third- and fifth-grade students. *Journal of Sport & Exercise Psychology*, 29, 239-252.
- Caterino, M. C. & Polak, E. D. (1999). Effects of two types of activity on the performance of second-, third-, and fourth-grade students on a test of concentration. *Perceptual and Motor Skills*, 89, 245-248.
- Coe, D. P., Pivarnik, J. M., Womack, C. J., Reeves, M. J., & Malina, R. M. (2006). Effects of physical education and activity levels on academic achievement in children. *Medicine and Science in Sports and Exercise*, (38)8, 1515-1519.
- Colcombe, S. J., Erickson, K. I., Scalf, P. E., Kim, J. S., Prakash, R., McAuley, E., et al. (2006). Aerobic exercise training increases brain volume in aging humans. *The Journals of Gerontology*, 61A(11), 1166-1170.
- Colcombe, S. J. & Kramer, A. F. (2003). Fitness effects on the cognitive function of older adults: A meta-analytic study. *American Psychological Society*, 14(2). 125-130.
- Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed methods approaches*, (2<sup>nd</sup> ed.). Thousand Oaks, CA: Sage Publications, Inc.
- Daud, S., Rahim, R. E. A., & Alimun, R. (2008) Knowledge creation and innovation in classroom. *Proceedings of World Academy of Science, Engineering, and Technology*, 29, 241-245.

- Dwyer, T., Sallis, J. F., Blizzard, L., Lazarus, R., & Dean, K. (2001). Relation of academic performance to physical activity and fitness in children. *Pediatric Exercise Science, 13*, 225-237.
- Dyson, B. J. (2008). Assessing small-scale interventions in large-scale teaching: A general methodology and preliminary data. *Active Learning in Higher Education, 9*(3), 265-282.
- Elias, J. L. & Merriam, S. B. (1995). *Philosophical foundations of adult education*, (2<sup>nd</sup> ed.). Malabar, FL: Krieger Publishing Co.
- Emerson, R. M., Fretz, R. I., & Shaw, L. L. (1995). *Writing ethnographic field notes*. Chicago: University of Chicago Press.
- Erford, B. T. (2008). *Research and evaluation in counseling*. Boston: Houghton Mifflin Company.
- Field, A. (2005). *Discovering statistics using SPSS*, (2<sup>nd</sup> ed.). Thousand Oaks, CA: Sage Publications.
- Graham, G., Holt/Hale, S. A., & Parker, M. (2007). *Children moving: A reflective approach to teaching physical education*, (7<sup>th</sup> ed.). New York: McGraw-Hill.
- Gray, T. & Madson, L. (2007). Ten easy ways to engage your students. *College teaching, 55*(2), 83-87.
- Hall, E. M. (2007). Integration: Helping to get our kids moving and learning. *Physical educator, 64*(3), 123-128.
- Hillman, C. H., Buck, S. M., Themanson, J. R., Pontifex, M. B., & Castelli, D. M. (2009). Aerobic fitness and cognitive development: Event-related brain potential and task performance indices of executive control in preadolescent children. *Development Psychology, 45*(1), 114-129.
- Hillman, C. H., Erickson, K. I., & Kramer, A. F. (2008). Be smart, exercise your heart: Exercise effects on brain and cognition. *Neuroscience, 9*, 58-65.
- Horgan, J. (2003). Lecturing for Learning. In Fry, H., Ketteridge, S., & Marshall, S. (2003). *A Handbook for Teaching and Learning in Higher Education: Enhancing Academic Practice*, (2<sup>nd</sup> ed.), (pp. 75-90). New York: Routledge.
- Huxham, M. (2005). Learning in lectures: Do interactive windows help? *Active Learning in Higher Education, 6*(1), 17-31.

- Kember, D., Leung, D. Y., & McNaught, D. (2008). A workshop activity to demonstrate that approaches to learning are influenced by the teaching and learning environment. *Active Learning in Higher Education*, 9(1), 43-56.
- Kesslak, J. P., So, V., Choi, J., Cotman, C. W., & Gomez-Pinilla, F. (1998). Learning upregulates brain-derived neurotrophic factor messenger ribonucleic acid: A mechanism to facilitate encoding and circuit maintenance? *Behavioral Neuroscience*, 112(4), 1012-1019.
- Kluka, D. A. (1999). *Motor behavior: From learning to performance*. Englewood, CO: Morton Publishing Company.
- Knight, J. K. & Wood, W. B. (2005). Teaching more by lecturing less. *Cell Biology Education*, 4, 298-310.
- Lake, D. A. (2001). Student performance and perceptions of a lecture-based course compared with the same course utilizing group discussion. *Physical Therapy*, 81(3), 896-902.
- Lammers, W. J. & Murphy, J. J. (2002). A profile of teaching techniques used in the university classroom. *Active Learning in Higher Education*, 3(1), 54-67.
- Larson, C. L., & Ovando, C. J. (2001). *The color of bureaucracy: The politics of equity in multicultural school communities*. Belmont, CA: Wadsworth.
- Lea, S. J. & Callaghan, L. (2005). Lectures on teaching within the supercomplexity of higher education. *Higher Education*, 55, 171-187.
- Leamson, R. (2000) Learning as biological brain change. *Change*, 35-40.
- Leppo, M. L., Davis, D., & Crim, B. (2000). The basics of exercising the mind and the body. *Childhood Education*, 142-147.
- Lindblom-Ylaine, S., Trigwell, K., Nevgi, A., & Ashwin, P. (2006). How approaches to teaching are affected by discipline and teaching context. *Studies in Higher Education*, 31(3), 285-298.
- Machemer, P. L. & Crawford, P. (2007). Student perceptions of active learning in a large cross-disciplinary classroom. *Active Learning in Higher Education*, 8(1), 9-30.
- Madigan, J. B. (2004). *Thinking on your feet* (2<sup>nd</sup> ed.) Murphy, TX: Action Based Learning.
- Marmeleira, J. F., Godinho, M. B., & Fernandes, O. M. (2009). The effects of an exercise program on several abilities associated with driving performance in older adults. *Accident Analysis and Prevention*, 41, 90-97.

- Martin, L. T. & Chalmers, G. R. (2007). The relationship between academic achievement and physical fitness. *Physical Educator*, 64(4), 214-221.
- Martin, E. & Lueckenhausen, G. (2005). How university teaching changes teachers: Affective as well as cognitive challenges. *Higher Education*, 49, 389-412.
- McCombs, B. L. & Whisler, J. S. (1997). *The learner-centered classroom and school: strategies for increasing student motivation and achievement*. San Francisco: Jossey-Bass Inc., Publishers.
- McKinney, K. (2007). *Enhancing learning through the scholarship of teaching and learning: The challenges and joys of juggling*. San Francisco: Jossey-Bass.
- Medina, J. (2008). *Brain rules: 12 principles for surviving and thriving at work, home, and school*. Seattle, WA: Pear Press.
- Merriam, S. B. (1998). *Qualitative research and case study applications in education: Revised and expanded from case study research in education*. San Francisco: John Wiley & Sons, Inc.
- Merriam, S. B. & Brockett, R. G. (2007). *The profession and practice of adult education: an introduction*. San Francisco: John Wiley & Sons, Inc.
- Merriam, S. B. & Caffarella, R. S. (1999). *Learning in adulthood: A comprehensive guide*, (2<sup>nd</sup> ed.). San Francisco: Jossey-Bass Inc., Publishers.
- Nonaka, I. (1991). The knowledge-creating company. *Harvard Business Review*, 96-104.
- Ouston, J. (1999). School effectiveness and school improvement: Critique of a movement. In T. Bush, L. Bell, R. Bolam, R. Glatter, & P. Ribbins (Eds.), *Educational management: Redefining theory, policy, and practice* (pp. 166-177). London: Paul Chapman Publishing.
- Plowman, S. & Smith, D. (2008). *Exercise physiology for health, fitness, and performance*, (2<sup>nd</sup> ed.). Baltimore, MD: Lippincott Williams & Wilkins.
- Prosser, M., Ramsden, P., Trigwell, K., & Martin, E. (2003). Dissonance in experience of teaching and its relation to the quality of student learning. *Studies in Higher Education*, 28(1), 37-48.
- Ramsden, P., Prosser, M., Trigwell, K., & Martin, E. (2007). University teachers' experiences of academic leadership and their approaches to teaching. *Learning and Instruction*, 17, 140-155.
- Ratey, J. J. (2008). *Spark: The revolutionary new science of exercise and the brain*. New York: Little, Brown and Company.



- Shields, C. M. (2004). Dialogic leadership for social justice: Overcoming pathologies of silence. *Educational Administration Quarterly*, 40, 109-132.
- Silbey, B. A. & Etnier, J. L. (2003). The relationship between physical activity and cognition in children: A meta-analysis. *Pediatric Exercise Science*, 15, 243-256.
- Stipek, D. (2002). *Motivation to learn: Integrating theory and practice*, (4<sup>th</sup> ed.). Boston: Allyn & Bacon.
- Summers, J. J. & Svinicki, M. D. (2007). Investigating classroom community in higher education. *Learning and Individual Differences*, 17, 55-67.
- Tomporowski, P. D., Davis, C. L., Miller, P. H., Naglieri, J. A. (2007). Exercise and children's intelligence, cognition, and academic achievement. *Educational Psychological Review*, 20, 111-131.
- Tremarche, P. V., Robinson, E. M., & Graham, L. B. (2007). Physical education and its effect on elementary testing results. *The Physical Educator*, 64(2), 58-64.
- University of Central Missouri. (2010). *UCM by the numbers*. Office of Institutional Research. <http://www.ucmo.edu/ir/documents/factbook.pdf>.
- Van Praag, H., Kempermann, G., & Gage, F. H. (1999). Running increases cell proliferation and neurogenesis in the adult mouse dentate gyrus. *Neuroscience*, 2(3), 266-270.
- Vaynman, S. & Gomez-Pinilla, F. (2006). Revenge of the sit: How lifestyle impacts neuronal and cognitive health through molecular systems that interface energy metabolism with neuronal plasticity. *Journal of Neuroscience Research*, 84, 699-715.
- Weimer, M. (2002). *Learner-centered teaching*. San Francisco: Josey-Bass.
- White, C. (2007). Levels of understanding: A guide to the teaching and assessment of knowledge. *Journal of Education for Business*, 159-163.
- Wulff, S. S. & Wulff, D. H. (2004). "Of course I'm communicating; I lecture every day": Enhancing teaching and learning in introductory statistics. *Communication Education*, 53(1), 92-103.
- Yukl, G. (2006). *Leadership in organizations*, (6<sup>th</sup> ed.). Upper Saddle River, NJ: Pearson Education, Inc.
- Young, M. S., Robinson, S., & Alberts, P. (2009). Students pay attention!: Combating the vigilance decrement to improve learning during lectures. *Active Learning in Higher Education*, 10(1), 41-55.

## Appendix A

### Initial Email Contact with Professors

Dear Dr. \_\_\_\_\_,

While working here at \_\_\_\_\_ in the Department of \_\_\_\_\_, I am working on my dissertation. My research project involves a group of instructors who teach two sections of the same course that uses predominantly lecture as an information delivery method.

One class will move for 45-60 seconds three times during the entire class period during a lecture pause and then resume class. The other class will receive "review" breaks for 45-60 seconds three times during the entire class with a lecture pause.

The students in one class will get out of their seats to perform a pre-practiced activity that is randomly chosen from a "box". The other class members will not intentionally move out of their seats, instead they will be given a "review" break so they can look at notes or whatever they chose. Each break in lecture will last less than one minute.

I will demonstrate the movements to the class on the first day of the semester.

You will need to rotate a daily attendance sheet around class for students to mark, give activity or review breaks at their scheduled times each class period, and provide final grade percentages for the two classes at the end of the semester without student names or identifying marks. At the completion of this study I would like for you to participate in a face-to-face interview with me so I may gain a better understanding of your perceptions of this project.

If you are willing to participate or want to know more information, please contact me either by phone or email. I would appreciate your help.

Thank you  
Paige Patterson

## Appendix B

### Letter to Students (Treatment Group)

Professors: Read ONLY the statement below to students on the first day of class and then again on the second day.

Students,

By enrolling in this class you have agreed to participate in a research project about effectiveness of teaching and learning. You will only be asked to do two things. One is to keep track of your attendance in class. This attendance is in no way associated with the professor's attendance policy or will be used in association with your grade. You will be asked to mark yourself as a participating student on a roster that will have you listed using the last four digits of your university student identification number. At the end of the semester, your student number will be removed and given to the researcher. With this portion of the research there are two concerns. First, on any given day, if you have any concern about participating in the additional activities, please do not mark yourself as a participating student. Second, please do not mark a student other than yourself as participating. Remember, this attendance sheet is in no way associated with assessing your academic performance in this class.

The second aspect to this research is for you to participate in a movement activity after 15 minutes upon class start time, and then again in 10 minute intervals. The activities will last no longer than 45 seconds. They are simple to perform and you will perform them as a group. Hopefully, you will find someone who will help with facilitating the timing and the activities since you are now a group of learners in this class and may need to work together. As soon as the activity is complete, you are to return to your seat or regular classroom practices allowing your professor to continue as quickly as possible.

## Appendix C

### Letter to Students (Control Group)

Professors: Read ONLY the statement below to students on the first day of class and then again on the second day.

Students:

By enrolling in this class you have agreed to participate in a research project about effectiveness of teaching and learning. You will only be asked to do two things. One is to keep track of your attendance in class. This attendance is in no way associated with the professor's attendance policy or will be used in association with your grade. You will be asked to mark yourself as a participating student on a roster that will have you listed using the last four digits of your university student identification number. At the end of the semester, your student number will be removed and given to the researcher. With this portion of the research there are two concerns. First, on any given day, if you have any concern about participating in the additional activities, please do not mark yourself as a participating student. Second, please do not mark a student other than yourself as participating. Remember, this attendance sheet is in no way associated with assessing your academic performance in this class.

The second aspect to this research is for you to have a brief review break after 15 minutes upon class start time, and then again in 10 minute intervals. The break will last no longer than 45 seconds. You are not to ask follow-up questions to the instructor or make this your opportunity to leave the room. Hopefully, you will find someone who will help with facilitating the timing and the breaks since you are now a group of learners in this class and may need to work together. As soon as the break is complete, you are to return to regular classroom practices allowing your professor to continue as quickly as possible.

## Appendix D

### Letter of Consent

Researcher's Name: M. Paige Patterson

Researcher's Contact Information: UCM  
Humphreys 220  
Warrensburg, MO 64093  
660-543-8881  
[mpatterson@ucmo.edu](mailto:mpatterson@ucmo.edu)

Project Title: Movement and Learning in Kinesiology

You are being asked to volunteer to participate in a research study. The purpose of this project is to determine if physical activity and circulation-encouraging movement activities occurring intermittently during a predominantly lecture style college course affects the overall grade or learning of students. When you are invited to participate in research, you have the right to be informed about the study procedures so you can decide whether you want to consent to participation.

You have the right to know what you will be asked to do so you can decide whether or not to be in the study. Your participation is voluntary. You do not have to be in the study if you do not want. You may refuse to be in the study and nothing will happen. If you do not want to continue to be in the study, you may stop at any time without penalty or loss of benefits to which you are otherwise entitled.

The purpose of this research is to determine if college students who perform low-impact, low-intensity movements score higher final percentages over the course of a semester. As you were pre-scheduled according to the university and specific department, you will be teaching two sections of the same course. One section will be the control group and the other will be the treatment group. There will be pre-determined breaks given in both classes using intervals that will not last more than 45 seconds. The control group will have review breaks without formal discussions occurring, and the treatment group will perform a locomotor or non-locomotor movement.

The movements will be chosen at random from a pre-set group of activities given to you by the researcher. To begin the semester you will read a note of instructions to each class informing them of the class procedures which will include student, self-monitoring of participation. You will have a roster of students and class meeting days. Each class you will circulate the roster for students to notate their daily participation. Additionally, at the end of the semester you will need to code students in a manner that you can record their final grade percentage. You will be provided with templates to use for the roster and the grades. These will be given to the researcher at the end of the semester.

Over the course of the semester, the researcher will place a phone call to you to see how you are progressing and to receive feedback. The phone call should last no longer than five minutes. The researcher will make hand-written documentations which will be saved electronically that you may review at the end of the semester. Once the semester is

complete, grades and participation roster will be given to the researcher. At this time you are to participate in a face-to-face interview with the researcher that will be audio recorded. The time and location of the interview will be at your convenience lasting no more than 30 minutes. Questions will be asked about your perceptions of the methods used over the course of a semester. You will be asked to review the data from the phone conversations and the face-to-face interview for accuracy.

The study will take one college semester to complete. You will be among at least six professors asked to participate in this study. Your participation will benefit the research project to help instructors and professors find ways to increase the number of high achieving students in a given course. Your participation in this study is not expected to cause you any risks greater than those encountered in everyday life.

Your identity and participation will remain confidential. The transcripts from the interview and any other identifying documents will be kept by the researcher in a locked cabinet for five years and then they will be shredded. The information gathered will be used in the research without any identifications and the results will be published the same. The only person who will have access to the interview data will be Mrs. M. Paige Patterson, the researcher, and her advisor, Dr. Sandy Hutchinson.

Informed consent is an ongoing process that requires communication between the researcher and participants. The participant should comprehend what they are being asked to do so that they can make informed decisions about whether they will participate in the research study. You will be informed of any new information discovered during the course of this study that might influence your health, welfare, or willingness to be in this study.

Please contact M. Paige Patterson or advisor, Dr. Sandy Hutchinson, if you have questions about the research.

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You may contact the Campus Institutional Review Board if you have questions about your rights, concern, complaints, or comments as a research participant. You can contact the Campus Institutional Review Board directly by telephone at 573-882-9585.

A copy of this informed consent form will be given to you before you participate in the research.

### Signatures

I have read this consent form and my questions have been answered. My signature below means that I do want to be in the study. I know that I can remove myself from the study at any time without any problems.

---

Your Signature

---

Date

---

Legal Guardian/Advocate/Witness Signature (if required)

---

Date

## Appendix E

### Class Timeline

The following is a sample course timeline schedule for a 50 minute lecture class that meets at nine a.m.

9 a.m. to 9:05 a.m. – Plenary

9:05 a.m. to 9:15 a.m. – Lecture

9:15 a.m. to 9:16 a.m. – Activity One or Review Break One

9:16 a.m. to 9:17 a.m. – Re-settle class

9:17 a.m. to 9:27 a.m. – Lecture

9:27 a.m. to 9:28 a.m. – Activity Two or Review Break Two

9:28 a.m. to 9:29 a.m. – Re-settle class

9:29 a.m. to 9:39 a.m. – Lecture

9:40 a.m. to 9:41 a.m. – Activity Three or Review Break Three

9:41 a.m. to 9:42 a.m. – Re-settle class

9:42 a.m. to 9:50 a.m. – Lecture



## Appendix F

### Movement Activities for Locomotor Moves

The following is the list of movement activities.

One – Student will stand up, step-tap with feet while performing unilateral arm raises

Two – Student will stand up and shuffle to the right and left

Three – Student will stand up, walk briskly around the perimeter of the room while alternating air punches

Four – Students will stand up; perform a chest stretch with hands grasped together behind lower back while raising alternating knees

Five – Students will stand up and perform 20 low-impact jumping jacks simultaneously as a group and then march in place

Six – Students will stand up, balance on one leg and perform leg extensions at hip level with the other leg and then switch legs after mid-way with time remaining

Seven – Students will stand up, get into a plie lunge and perform waist rotations with hands held in a bent position

Eight – Students will stand up, leap right and left 20 times per side and then march in place

## Appendix G

### Movement Activities for Non-Locomotor Moves

The following is the list of movement activities.

One – Students will stand up; perform a chest stretch with hands grasped together behind lower back while raising alternating knees

Two – Students will stand up and perform 20 low-impact jumping jacks simultaneously as a group and then march in place

Three – Students will stand up, balance on one leg and perform leg extensions at hip level with the other leg and then switch legs after mid-way with time remaining

Four – Students will stand up, get into a plie (sumo) lunge and perform waist rotations with hands held in a bent position

Five – Students will stand up, balance on one leg and switch the standing leg repeatedly, right and left 20 times per side and then march in place

## Appendix H

Phone call questions to professors; every three weeks.

1. How do you feel the project is progressing?
2. Are the students cooperating with the procedures?
3. Are you having any difficulties?
4. Do you need any more information from the researcher?

## Appendix I

### Interview Questions

1. In what ways did you find the research procedure easy to use?
2. In what ways did you find the research procedures difficult to use?
3. Did you notice any student noncompliance to the breaks?
4. If you were to use this teaching method again, what would you do differently?
5. What are your perceptions of student gains and losses when using or not using the research method?
6. Were there any extenuating circumstances, if so, what were they?
7. What types of challenges did you notice during the study?

## Appendix J

### Instructor Final Report

Instructor Name: \_\_\_\_\_

Course Name and Section Number: \_\_\_\_\_

Class Meeting Days and Times: \_\_\_\_\_

Number of Class Meetings: \_\_\_\_\_

Movement or Review Break: \_\_\_\_\_

Student Code	Final Grade Percentage	Letter Grade
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

## Appendix K

### Roster for Attendance/ Participation

Please, **ONLY** mark your attendance/participation. This roster is in no way associated with the professor's attendance policy or will be used in association with your grade. **DO NOT** mark yourself as present on any given day that you have concerns with participating.

Last Four Digits of Student ID	Tu 1-15	Th 1-17	Tu 1-22	Th 1-24	Tu 1-29	Th 1-31	Tu 2-5	Th 2-7	Tu 2-12	Th 2-14	Tu 2-19	Th 2-21	Tu 2-26	Th 2-28	Tu 3-4	Th 3-6	Tu 3-18	Th 3-20	Tu 3-25	Th 3-27	Tu 4-1	Th 4-3	Tu 4-8	Th 4-10	Tu 4-15	Th 4-17	Tu 4-22	Th 4-24	Tu 4-29	Th 5-1

## VITA

Michala Paige Patterson was born in Alabama and moved to Florida when she very young. Her father was a plant pathologist working for Minute Maid and her mother was a middle school math teacher. Both believed strongly in the power of education and knowledge. Paige moved to Missouri in 1993 where she has stayed. Paige attended the Central Missouri State University studying Agriculture, specializing in Horticulture Technology. Several years later, she returned to focus on education in the realm of Agriculture and received a Masters Degree in Occupational and Technology Education. Paige worked for the University managing the Agriculture Education Center where she facilitated outdoor and conservation education as it was related to agricultural practices. She then returned to school to enter into the cooperative doctoral program at the University of Missouri.