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ACTIVE LEARNING WITHIN ATHLETIC TRAINING EDUCATION

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Abstract

The purpose of this quantitative survey study was to explore the prevalence of active learning methods within professional athletic training education programs (ATP). In addition, this study also examined the relationship between the active learning methods and the specific athletic training learning outcome of the Board of Certification (BOC) pass rate. The information processing system and adult learning theory were used as the theoretical foundation of the study. The outcomes of active learning at the department level, especially within science education, was significant in developing the study. Sixty-eight professional-level Commission on the Accreditation for Athletic Training Education (CAATE) Program Directors participated in this study. These participants completed the *Teaching Practices Inventory* (TPI) to assess active learning techniques within the programs. The primary investigator also collected BOC exam pass rates from the CAATE website. Findings concluded that ATPs that implemented active learning within their departments had much higher TPI scores, but these programs were not as prevalent as those with lower TPI scores. Furthermore, no significant relationship was demonstrated between active learning levels and BOC exam pass rates. However, when comparing the mean level of low BOC pass rates, those programs in the high active learning category were greater than in the low active learning category. Therefore, there is evidence to indicate that active learning may provide some benefit within athletic training education, and it is recommended that athletic training programs begin to utilize active learning methods throughout their entire department to develop a learner-centered culture, focused on improving learning outcomes within athletic training education.

Keywords: Active learning, athletic training education, prevalence, evidence-based

Dedication

This dissertation in practice is dedicated to my family. The love, faith, and continuous encouragement that you have provided as I journeyed along this path have been the greatest support. Without the foundation and emboldening words that you provided to persevere, this would not have been possible

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CHAPTER ONE: INTRODUCTION

Introduction and Background

Athletic trainers (AT) are healthcare professionals, working in a variety of clinical settings, required to have training in conducting evaluations, for acute and chronic conditions, developing rehabilitation and treatment programs, documenting medical procedures, communicating effectively to work with many different healthcare professionals, and in managing life-threatening injuries. To acquire this knowledge, professional level athletic training education programs (ATP) must be accredited by the Commission on Accreditation of Athletic Training (CAATE), to ensure that educational standards and competencies are being adequately implemented. These competencies consist of eight content areas: evidence-based practice; prevention and health promotion; clinical examination and diagnosis; acute care of injury and illness; therapeutic interventions; psychosocial strategies and referral; healthcare administration; and professional development and responsibility (*CAATE Standards*, 2012; *NATA Competencies*, 2011; Prentice, 2014). ATPs must meet all CAATE Standards and remain in good standings in order for their students to be able to sit for the Board of Certification (BOC) exam and practice as a certified athletic trainer.

Over the past sixty years, athletic training education has gone through many changes since its inception in 1959 (Delforge & Behnke, 1999). At that point, ATs were able to qualify for certification through an internship of at least 1500 hours in addition to coursework in anatomy, physiology, psychology, first aid, therapeutic exercise and pathology, and pharmacology (Delforge & Behnke, 1999). Starting in 1969 those within the profession realized that curricular content needed to change in order for athletic

training education to improve, thus the first undergraduate ATP was developed with curriculum approved by the National Athletic Trainers Association (NATA) (Delforge & Behnke, 1999). Furthermore, the Professional Education Committee was developed in order to evaluate and approve necessary athletic training curriculum (Delforge & Behnke, 1999). These measures paralleled the first national certification exam, in which there were four options for students to pursue in order to take this exam: graduation from an undergraduate athletic training program, completion of an internship program, graduation from a physical therapy program, or special considerations, such as a minimum of five years as an "actively engaged" AT (Delforge & Behnke, 1999). However, throughout the next forty years, the qualification to sit the certification exam was eventually limited to graduates from accredited entry-level professional athletic training programs, either at the bachelor's or master's level, as a means of developing consistency in education (Delforge & Behnke, 1999). In 2011, further changes were introduced as the decision was made that professional level programs will only be offered at the master's level after the year 2026. With these changes come new competencies and standard requirements, requiring programs to reevaluate their program delivery, curriculum, assessments, and outcomes.

Though professional committees and governing boards have made significant progress in athletic training education, there still are improvements that need to be made among individual programs. Specifically, course delivery and pedagogy methods among educators has been lacking in educational advancements. Many educators in athletic training education have not obtained appropriate education or guidance in effective teaching and pedagogical studies. Thus, as they transition from a clinician-focused career to athletic training educators, they are having to rely on teacher-centered practices that

they experienced as students, such as lecturing, which may not be the most effective in facilitating appropriate learning outcomes, as compared to the learner-centered approaches (Chasteen, Perkins, Beale, Pollock, & Wieman, 2011; Turocy, 2016; Wieman & Perkins, 2005). Just because teaching is occurring within a classroom, does not suggest that learning is always transpiring, and educators need to strive to seek practices which aid their students to achieve success (Peer, 2015). Therefore, administrators and faculty must work together to provide guidance and professional development efforts to improve educators and departments in pedagogical strategies and learning theories for effective methods and learning outcomes to occur.

Many methods have explored improving learning among undergraduate students, but research surrounding active learning techniques has been found to be a more effective intervention within science education at achieving better educational outcomes (Chasteen et al., 2011; Wieman, 2007; Wieman, 2012; Wieman, 2014; Wieman & Perkins, 2005). Active learning is defined as a learner-centered teaching method that requires students to spend a majority of class time in discussion or activities, thus creating an active process of engagement in the application of information (Wieman, 2014). The foundation of active learning is cognition and metacognitive thinking. Cognition is the method of organizing information in order to critically apply and understand information in order to come to a decision (Franek & Martin, 2008; Wieman, 2007). The human brain has been found to only comprehend a maximum of seven different items at once, while only being able to process four of those items at that time (Wieman, 2007). Therefore, educators must be able to break up their classes in different ways that facilitate cognitive strategies

for mental exercise in order for students to be able to organize information appropriately, thus allowing them to become expert problem-solvers (Wieman, 2007).

Metacognition, conversely, is the reflection of cognitive practices in order for students to build on their prior thinking and create their own understanding (Franek & Martin, 2008; Wieman, 2007). Active learning has allowed educators to reduce the cognitive load by focusing on only a few items at once within the classroom in order for students to understand and improve their learning (Wieman, 2007; Wieman, 2014). Then, through clear, reasonable, and explicit organizational strategies developed through learning outcomes, interventions have been utilized to allow students to apply this information in order to become critical thinkers (Wieman, 2007; Wieman, 2014). There are a variety of techniques that may be utilized to achieve these results, such as: peer-instructed, flipped classrooms, problem-based learning, audience response systems, self-directed learning, and discovery learning. These techniques take a learner-centered approach that encourages the engagement of students throughout the classroom, allowing students to utilize their foundational knowledge for application within real-world problems (Wieman, 2014). Through research within physics and other science courses, it has been found that these methods increase students' retention of information, critical thinking skills, and knowledge (Chasteen et al., 2011; Wieman, 2014; Wieman & Perkins, 2005).

Statement of the Problem

Active learning techniques have also been documented as effective methods within AT (Simons & DiStasi, 2008; Walker, 2003). Researchers have explored peer-assisted learning (Bates, 2016), flipped classrooms (Heinerichs, Pazzaglia, & Gilboy,

2016; Thompson & Ayers, 2015), problem-based learning (Gillette, 2017; Lesperance, 2008), learner-centered techniques (Heinerichs, Vela, & Drouin, 2013), and multi-media instruments (Schilling, 2017; Tivener & Hetzler, 2015) within athletic training classrooms. These various aspects within active learning were individually found to be effective in encouraging knowledge retention and critical thinking development (Bates, 2016; Gillette, 2017; Heinerichs, Pazzaglia, & Gilboy, 2016; Heinerichs, Vela, & Drouin, 2013; Lesperance, 2008; Schilling, 2017; Simons & DiStasi, 2008; Thompson & Ayers, 2015; Tivener & Hetzler, 2015). Active learning has been implemented in science education with effective outcomes, and while there has been literature to encourage the use of this method in athletic training (Walker, 2003), there has been no known research done to determine the prevalence of these methods currently throughout the profession and its effectiveness on learning outcomes. Challenges to improve the quality of athletic training education needs to be addressed to produce competent athletic trainers that are able to critically think and apply their skills in decision making within a variety of situations. Therefore, what is not known is whether educators and departments as a whole are utilizing these research-based techniques and whether these methods have an effect on learning outcomes.

Purpose of the Study

The purpose of this quantitative survey study was to explore the prevalence of active learning methods within professional athletic training education programs. In addition, this study also examined the relationship between the active learning methods and the specific athletic training learning outcome of the BOC pass rate.

Research Questions and Hypotheses

Athletic training education has had many changes over the last sixty years, with the most recent being a transition for all professional programs to be offered at the master-degree level. Programs need to ensure that they are providing their students with quality education that not only will provide them with the foundational knowledge and skills necessary to become an AT but also the ability to think critically for sound judgement in a variety of situations. While there is some research to demonstrate the effectiveness of active learning techniques within athletic training classrooms, there is little evidence to support that these methods are currently being utilized within current athletic training classrooms and programs and the effect on learning outcome. Therefore, the following research questions guided this quantitative study:

Research Question #1:

What is the prevalence of active learning methods currently being utilized throughout professional level athletic training programs?

Hypothesis #1:

Athletic training programs will have implemented active learning methods throughout their courses.

Research Question #2:

What are the differences between level of active learning methods and BOC pass rates for programs that utilize active learning methods?

Hypothesis #2:

Programs that have a higher level of active learning methods throughout their entire program will have higher BOC pass rates than those with a lower level of active learning methods.

Aim of the Study

The aim of this study was to evaluate the current status of educational methods in athletic training, specifically active learning, in order to develop a foundation of organizational change among athletic training education programs. Furthermore, this study aimed to compare learning outcomes in order to further the understanding of pedagogical techniques and their effectiveness on educating future athletic training students.

Methodology Overview

As a means to understand the level of integration of active learning techniques within athletic training classrooms, a survey was sent out to program directors within all professional level athletic training programs in the United States. To accomplish this, first a list of professional programs and contact information for program directors was accumulated from the CAATE website, which is available to the general public. Next, a survey utilizing the Teaching Practices Inventory (TPI), which was designed at the University of British Columbia as a means of measuring active learning activities among faculty, was sent to those on the collaborated list. The TPI is a quantitative measure that was designed to measure all teaching activities within science courses (*Teaching, Practices Inventory*, 2014; Wieman, 2015); however, to make this tool beneficial for this study some modifications were made.

Finally, in order to measure a learning outcome, BOC exam pass rates were collected. This information was available on the CAATE website as well as each institution's website. As part of the standards for CAATE-accreditation, all programs must list their cohort pass rates every year and must maintain a three-year aggregate of seventy percent for first time test takers in order to remain in good standing. Therefore, the BOC pass rate is an important learning outcome for programs as it measures foundational knowledge as well as critical thinking required of an entry-level athletic trainer, all of which are components that active learning techniques build on to create competent professionals.

Definition of Relevant Terms

The following terms are used throughout this study:

Active Learning: A learner-centered teaching method that requires students to spend a majority of class time in discussion or activities in order for students to actively process and engage in the application of information (Wieman, 2014).

Athletic Trainer (AT): A healthcare professional who collaborates with physicians to provide preventative services, emergency care, clinical diagnosis, therapeutic intervention and rehabilitation of injuries and medical conditions (NATA, n.d.).

Athletic Training Education Program (ATP): CAATE-accredited programs at the professional program level (bachelors or masters).

Board of Certification (BOC): The only credentialing agency for athletic training that established standards and continuing education for the practice of athletic training and provides a certification program for entry level athletic training professionals (BOC, n.d.).

Commission on Accreditation of Athletic Training Education (CAATE): Accrediting agency recognized by the Council of Higher Education (CHEA) responsible for developing, maintaining, and promoting appropriate minimum educational standards for quality athletic training programs (*CAATE Standards*, 2012).

Faculty: An individual who has full faculty status, rights, responsibilities, privileges, and full college voting rights as defined by institution policies (*CAATE Standards,* 2012).

Flipped Classrooms: An instructional approach that includes before-class components, such as readings, supplemental materials, or assessments, and during class interactions are student driven with the instructor being more passive (Heinerichs, Pazzaglia, & Gilboy, 2016; Thompson & Ayers, 2015).

Learner-Centered Techniques: A paradigm in which the student becomes the primary focus, leading discussions and interactions, thus the responsibility of learning becomes both the student's and instructor's (Heinerichs, Vela, & Drouin, 2013).

Multi-Media Instruments: Tools utilizing technology for presentations, polling, audience response systems, in order to facilitate student interactions (Schilling, 2017; Tivener & Hetzler, 2015).

Peer-Assisted Learning: Method in which students aid each other in learning through discussions or mentoring to improve confidence, skill performance, and critical thinking abilities (Bates, 2016).

Problem-Based Learning: Learning technique in which students are actively engaged in learning through investigation to solve a problem in order to improve critical thinking and application of foundational knowledge (Gillette, 2017; Lesperance, 2008).

Program Director (PD): A full-time faculty member of an institution and a BOC Certified Athletic Trainer, responsible for the implementation, delivery, and administration of the AT program (*CAATE Standards,* 2012).

National Athletic Trainers' Association (NATA): Professional association for certified ATs to support the profession of athletic training through engagements that foster and develop the continual growth as unique health care professionals (NATA, n.d.)

Limitations, Delimitations, and Personal Biases

Delimitations

As the focus of this study was on teaching methods within professional ATPs, post-professional programs and residencies were not included in this study. In addition, as this study only be looking at BOC pass rates for the last three years, as stated on ATPs' websites, this limited the generalizations to only practices within this time period and did not extend to active learning practices beyond that classification. Also, due to the transition of programs to a masters-level program, those programs that were classified as 'seeking accreditation' were not included as they had not attained CAATE-accredited yet and did not allow students to take the BOC despite providing learning opportunities and courses to athletic training students.

Limitations

The generalizability of this study was dependent on voluntary participants that completed the survey. Results were limited to only those individuals and institutions that participated and therefore is restricted to only those types of institutions and are not generalizable to all ATPs.

Bias

As an educator within a CAATE-accredited professional level athletic training program, there is a level of bias associated from understanding the profession, athletic training education, and the position of where the profession is heading. This position provided a sense of bias for creating a more efficient methodology within athletic training education that will benefit the entire profession. Also, as a member of the NATA, there are resources that were accessible to the researcher that would not have been to the public and may provide a better understanding of issues within athletic training.

The Role of Leadership in this Study

Under the direction of Dr. Carl Wieman, the Science Education Initiative (SEI) was introduced at the University of Colorado and the University of British Columbia to facilitate ground-breaking alteration within science education as a means of creating overall change in STEM teaching at large universities (Wieman, Perkins, & Gilbert, 2010; Wieman, 2017). This initiative did not attempt to just address individual faculty and their courses but endeavored to change the culture of entire undergraduate science and math departments as that was viewed as the necessary unit of change (Wieman, Perkins, & Gilbert, 2010). Discussions facilitated collaborations among faculty and administration, shifting the focus from coverage of specific topics within courses, to understanding how individuals learn, the specific pedagogical strategies to achieve improved outcomes, and evidence to support these theories (Wieman Perkins, & Gilbert, 2010). Over a three-year period, departments that utilized these collaborations were found to be more successful in their efforts for sustainability of transformation and coherent curriculum with their programs than those that focused on deficiencies of

students and the educational system (Wieman, Perkins, & Gilbert, 2010). Overall, the SEI found that there were improvements in learning throughout these programs as those involved sought to meet the needs of students for understanding specific knowledge, in addition to the needs of faculty to achieve these learning outcomes (Wieman, Perkins, & Gilbert, 2010). With a departmental focus, there was more success and improvements in teaching and learning.

These initiatives and findings coincide with those of organizational change theory. As those within the department began to investigate and understand the needs from individual faculty and staff to develop more efficient science students, they sought to change their perspectives and initiatives (Wieman, Perkins, & Gilbert, 2010). An organization must be able to evolve and change in order to improve on aspects of the organization and perform at a higher level to meet the needs of the external environment (Burke, 2014). Institutions of higher education have been at the forefront of different advances to enhance society through better healthcare, advanced technology, innovations in teaching and learning, and productivity based on the needs of students and the surrounding society. These advances would not have occurred without the direction of leaders collaborating with those throughout an organization and understanding the resources, culture, and capabilities of all involved (Burke, 2014). Within athletic training education, administrators of governing boards and committees have seen the need for adaptations as the profession evolves, making necessary changes to standards and competencies. However, it is vital for individual programs to also make these changes within their own departments in order to assess innovations and capabilities, ensuring that future ATs are equipped with the knowledge and skills to competently provide healthcare

within a variety of settings. Furthermore, revelations may ensure that faculty are provided with the resources and tools necessary to develop and improve in their pedagogical approaches to meet the needs of students and the healthcare realm.

Significance of the Study

Since the shift in the athletic training education paradigm in 1995 from teaching to learning, research has focused on effective methods and tools for faculty involvement in academic activities (Peer & Huston, 2009). Active learning has been found to be an effective technique in science education in providing students with foundational knowledge while also being able to critically apply that information to make decisions on various situations (Chasteen et al., 2011; Wieman, 2007; Wieman, 2012; Wieman, 2014; Wieman & Perkins, 2005). Some researchers have investigated the use of these techniques within athletic training, confirming similar findings to science education (Gillette, 2017; Heinerichs, Pazzaglia, Gilboy, 2016; Heinerichs, Vela, & Drouin, 2013; Lesperance, 2008; Schilling, 2017; Simons & DiStasi, 2008; Tivener & Hetzler, 2015; Thompson & Ayers, 2015; Walker, 2003). However, it is unknown to what extent athletic training educators and programs have utilized these techniques in current practice. As evidence-based medicine has become a large part of athletic training education, as well as in providing the best practices within the clinic, the methods used to provide that information should follow these best practices in educating future ATs. Therefore, this study provides an understanding of the innovations of active learning into athletic training education and the effect on learner outcomes (BOC exam pass rates), thus filling a gap within innovations for pedagogical strategy improvements. Athletic training students and educators spend a great deal of effort on improving their techniques

and understanding for appropriate education and practice. Therefore, evidence of where these efforts currently are at is important to ensure that time is spent efficiently for continual improvement of education and the athletic training profession.

Summary

Chapter one includes an introduction to athletic training education as well as active learning initiatives. The use of active learning within science education and athletic training is supported by the literature. This section also includes the purpose of the study, research questions and hypothesis that will guide the study and the methodology to achieve desired results.

CHAPTER TWO: LITERATURE REVIEW

Introduction

The aim of this study was to examine the prevalence of evidence-based active learning teaching methods within athletic training professional education programs. This section will provide readers with literature on the history of athletic training professional education, cognitive theory framework, adult learning theory, as well as define active learning and associated learning outcomes, and the application of active learning to athletic training education. The thorough investigation of these areas is important in understanding the components of active learning and the discovered effects in order to support the effectiveness and implementation throughout athletic training education.

Athletic Training Education

In the year 1983, requirements for athletic training education program curricula was properly adapted to include such topics as: prevention and evaluation of athletic injuries/illnesses, first aid and emergency care, therapeutic modalities, rehabilitation of athletic injuries, anatomy, physiology, kinesiology, and personal and community health issues (Delforge & Behnke, 1999). Since this point, program content, curricular delivery, operational design, and accrediting bodies have transitioned numerous times. The current accrediting body, the Commission on Accreditation of Athletic Training Education (CAATE) was established in 2006 to regulate and design standards for various athletic training education programs across the United States, in order to prepare entry-level athletic trainers (Prentice, 2014; *CAATE Standards*, 2012). Sponsored by the American Academy of Family Physicians, the American Academy of Pediatrics, and the American Orthopaedic Society for Sports Medicine, CAATE works in combination with the

National Athletic Trainers' Association (NATA) to develop, maintain, and promote standards for quality athletic training education (*CAATE Standards*, 2012).

In order for an individual to practice as a certified athletic trainer they must graduate from a CAATE-accredited professional program, either at the masters or undergraduate level, and successfully challenge the Board of Certification (BOC) exam. Program administrators are responsible for developing didactic and clinical curriculum that will integrate the *NATA Athletic Training Education Competencies*, in order to enhance professional preparation (*NATA Competencies,* 2011). These competencies are minimal tools provided to develop an inclusive professional level program composed of eight content areas: evidence-based practice; prevention and health promotion; clinical examination and diagnosis; acute care of injury and illness; therapeutic interventions; psychosocial strategies and referral; healthcare administration; and professional development and responsibility (*NATA Competencies*, 2011).

In conjunction with the National Athletic Trainers' Association (NATA) Educational Competencies, currently in the fifth edition, programs are able to develop, evaluate, analyze, and maintain the operation and delivery through their own discretion in order to provide knowledge, skills, and clinical abilities (*CAATE Standards*, 2012; *NATA Competencies*, 2011). Nonetheless, within allied healthcare professional education programs, it has become vital to develop competent graduates who are able to think critically and make sound judgments. During high pressure life-threatening situations, athletic trainers are required to make quick rational decisions based on sound reasoning and the best available evidence. The CAATE, in alliance with the NATA and the Board of Certification (BOC), have provided program administrators with operational standards

and educational competencies to produce programs that will graduate athletic trainers that are supplied with entry-level knowledge and skills in a variety of settings.

However, the need to provide professional development for educators to facilitate these engaging and learner-centered approaches needs to be addressed. Mensch and Ennis (2002) examined the perceptions of student learning and found that when educators created a learning environment that engaged students and fostered individual learning needs, students were more motivated to learn and be more persistent, thus having an enhanced learning experience (p. S-204). The efforts educators initiate within the classroom has an overwhelming effect on the lives of students and the future profession they embark on (Peer & McClendon, 2002). Therefore, methods must be evidence-based and reflect best practices tailored to actively engage students to facilitate intellectual curiosity.

Theoretical Foundation

Learning is defined as "a process that leads to change, which occurs as a result of experience and increases the potential for improved performance and future learning" (Ambrose, Bridges, Lovett, DiPietro, & Norman, 2010, p. 2). This is a developmental process built on the detection of cues, or prior information, and making patterns within the functions of the brain (Bartlett, 1932; Carbon & Albrecht, 2012; Craig, 2003). When new information is input, the brain processes and organizes it based on that which an individual already knows (Bartlett, 1932; Carbon & Albrecht, 2012; Woolfolk, 2005). This background knowledge is a strong indicator for how an individual may be able to learn new information (Bartlett, 1932; Marzano, 2004). Moreover, the more background and perceptions that one may have related to a specific area, the better able an individual

may be to recall and organize as new information is perceived, thus allowing for accumulation overtime (Bartlett, 1932; Marzano, 2004). With continual exposure to specific stimuli, the brain will strengthen these certain patterns making it more efficient (Craig, 2003; Woolfolk, 2005). It is these aspects of neuroscience that allows an individual to develop specific facts and information, combine that information with the development of skills, and facilitate mastery in order to know when and why specific content is utilized (Woolfolk, 2005).

The Information Processing System

Within the learning process, knowledge needs to be organized effectively for retrieval and application within certain circumstances (Piaget, 1936/1952). Similar to the operations of a computer, information processing allows individuals to retain information, recover it when necessary, and generate a response to specific situations. The cognitive approach, however, suggests that for new learning to occur, there must be a reference from previous knowledge in order for connections to be made within the brain (Bartlett, 1932; Craig, 2003; Woolfolk, 2005). Theorized by Sir Frederic Charles Bartlett in 1932, schema is the foundational component in which an individual is able to organize previous information along with new information in order to create a model that one is able to unconsciously recall later (p. 200). As an active organizational component within the brain, schemata allow an individual to relate previous facts or experiences to a similarly related item, thus permitting the individual components within that subject area to be combined and coordinated in a manner that will effectively allow for the organization of thinking processes and greater recall (Bartlett, 1932; Carbon & Albrecht, 2012).

Piaget, in his theory of cognitive development, believed that each individual person is born with the tendency to organize and process information into schemata to be able to access prior knowledge (Piaget, 1936/1952). The more organized that a person's thinking processes become, the more likely they will be able to try and relate background information into a particular schema, but when additional information does not make sense, a new schema is developed to try and understand this additional information, enhancing the background knowledge of each individual (Carbon & Albrecht, 2012; Piaget, 1936/1952; Woolfolk, 2005). As an individual assimilates and accommodates the new information and their schema becomes more defined, the ability to interact and adapt to the environment or different situations will be provided in a manner that will better suit each individual (Carbon & Albrecht, 2012; Piaget, 1936/1952).

Therefore, the process of learning must begin with prior knowledge of each individual student (Ambrose et al., 2010). Educators may be able to assist this process by providing prompts and cues within a classroom in order for students to be able to recall prior information and draw on it more efficiently for proper application. Gick and Holyoak (1980) found that when small prompts and cues were utilized by instructors, students were able to actively draw on background knowledge more effectively. The more times that an educator engages a student on a particular subject area, the more likely it will become imbedded into their background knowledge (Marzano, 2004). Additionally, as educators go into more details and elaborate on various connections, students will be able to integrate that within their individual schema and background knowledge throughout the information processing system (Marzano, 2004). Wagoner (2013) explored this concept through the analysis of Bartlett's schema theory and other

learning related theories, concluding that when individuals are provided with tools to externalize and self-reflect on specific conditions, a schema may be "turned around" in a manner that allows for better clarification and understanding within an individual's learning (p. 571). Through this framework, information may be evaluated from the learner themselves, providing cues and other stimuli that will enhance the schema and information processing system for future recall (Wagoner, 2013).

The information processing system states that when information is organized within the brain, first the sensory memory must be activated through engagement, motivation, and attention; perceptions will determine what is to be held within the area of working order (Woolfolk, 2005). This temporary storage area is utilized and capable of maintaining information for a short period of time (Marzano, 2004). It is when an individual consciously focuses on that particular information will it progress into working memory (Marzano, 2004; Schunk, 2012; Wagoner, 2013). Working memory is the area of temporary storage, focusing on what one is thinking of at the time (Schunk, 2012; Woolfolk, 2005). Through repetition of a stimulus, information within the working memory is strengthened and becomes a part of the long-term memory area of the brain, allowing for ease of retrieval when needed (Marzano, 2004; Schunk, 2012; Woolfolk, 2005). Once information is within the permanent memory center, information located within schemata, may be activated at any moment when a stimulant occurs that requires that information (Marzano, 2004; Piaget, 1936/1952; Schunk, 2012; Wagoner, 2013). Often times, this recall occurs unconsciously based on the level of background knowledge that an individual has and the experiences that one incurs (Bartlett, 1932; Marzano, 2004; Schunk, 2012).

Through the organization of knowledge, students are able to learn more efficiently and richly connect information for problem solving. Students typically begin with organizational processes that are superficial, enabling retrieval of information at a slower pace, reducing the ability of efficient problem-solving (Ambrose et al., 2010; Marzano, 2004). If students do not develop appropriate organizational processes and information does not become a part of permanent memory, individuals may not be able to make the necessary connections of specific information and may fail to recognize mistakes in their foundational knowledge for efficient cognition (Ambrose et al., 2010). Therefore, information needs to be provided to students in such a way that provides multiple stimuli, with additional details that will clarify associations within schemata for easier recall (Marzano, 2004). Furthermore, if students are guided in applying their knowledge with examples and opportunities to practice application, they are able to recognize when and why to apply this information at the appropriate time (Woolfolk, 2005). Students must not only be able to develop the knowledge necessary in performing a task, but they must also practice the application, integrating within specific situation or scenarios to improve fluency and automaticity for more efficient problem-solving within real-world settings (Ambrose et al., 2010).

Metacognition

Metacognition is the ability of an individual to have awareness of their cognitive abilities, reasoning, comprehension, and learning (Flavell, 1979; Hacker, Dunlosky, & Graesser, 2009; Woolfolk, 2005). Specifically, metacognitive knowledge is the specific knowledge or belief that one may have acquired, and the ability to understand interactions among variables to attain specific outcomes (Flavell, 1979). This is a

component of learning in which a student goes from not knowing information that they need to know, to understanding that there is specific knowledge that one understands but not how to utilize that information (Flavell, 1979). Subsequently, once understanding and distinguishing between what one knows and may not know, a student can successfully utilize information within specific context, just needing further practice; leading to the eventual development of mastery in a specific content area. Metacognition is a component of constructivism theory and the view that an individual has an active role in developing and understanding information (Flavell, 1979; Woolfolk, 2005). This focus on the individual within the cognitive processing system, comes from Piaget's theory of cognition and is just part of constructivism and effective learning (Piaget, 1936/1952).

When metacognition and constructivism are applied there are steps that may be utilized for mastery to be attained. First, a novice student that is considered to be in a state of *unconscious incompetence* and not yet having developed skills or sufficient knowledge to recognize what they need to learn has yet to organize their cognitive abilities and schemata (Ambrose et al., 2010). Next, as these students begin to gain knowledge and develop schemata, they are able to repetitively engage in certain knowledge and skills, entering a state of *conscious incompetence* (Ambrose et al., 2010; Hacker et al., 2009). This state allows for an increase in the development of connections between certain cues and what an individual may already know, furthering the development of schemata and cognitive organization (Flavell, 1979; Piaget, 1936/1952). The third step focuses on an individual having awareness of gaps within knowledge, progresses to *conscious competence* in which students have a considerable amount of

knowledge but must consciously think about that information within deliberate action (Ambrose et al., 2010; Flavell, 1979; Hacker et al., 2009). Finally, the highest level of mastery is *unconscious competence* where actions and knowledge are automatically produced and drawn upon in an instinctual manner (Ambrose et al., 2010). In order to attain this level of mastery, students must first acquire key knowledge and skills, then practice integrating them effectively in a manner that will enhance cognitive organization and metacognition (Ambrose et al., 2010). From an educational stand point these steps to attain mastery may be addressed through the zone of proximal development (Vygotsky, 1978). The premise behind this theory is that there is a gap between the actual developmental level of an individual and the potential developmental level in which an individual is able to attain with guidance (Vygotsky, 1978). Through the use of this theory, the metacognitive steps towards mastery may be examined prospectively (Vygotsky, 1978). An educator may be able to examine the current level of development that a student is actually in, as well as the potential level one may achieve with guidance. Then as an individual develops in their knowledge and skills the zone of proximal development can be adjusted, allowing for development to occur throughout the learning process.

Adult Learning Theory

Within higher education, many of the students are at the stage of their lives in which they are leaving adolescents and entering adulthood. Because of this transition, learning needs to be altered in order to allow for change to occur throughout cognitive processes. However, when approaching learning, many people have traditionally followed the theory of pedagogy, the art and science of teaching children (Knowles,

1972; Knowles, Holton, & Swanson, 2015). With this methodology, the learner is very passive and dependent on what the instructor dictates that they should learn (Knowles, Holton, & Swanson, 2015). For children, this is necessary as psychologically their dependence on others is rather high compared to adults, where as they develop become less dependent and more self-directional (Knowles, Holton, & Swanson, 2015). Adulthood can be defined on various applications: biologically, legally, socially, and psychologically (Knowles, Holton, & Swanson, 2015). At the psychological aspect, which is most appropriate for learning, individuals are considered adults when they are able to conceptualize their responsibilities and self-direct their actions and learning in order to deal with these situations as need be (Knowles, Holton, & Swanson, 2015). Culturally, the developmental rate at which individuals are considered to be adults is much slower than what may be actually occurring psychologically as indicated in Figure 2.1. Thus, for those students within higher education, educational tactics need to be altered for adults as learning becomes an internal process, which is controlled by the learner. This approach allows for students to engage and adapt within the entire environment, increasing knowledge, skills, and attitudes to be applied toward specific context (Knowles, Holton, & Swanson, 2015).

Learning is the process by which behavioral changes occur as knowledge, skills, and attitudes are acquired (Knowles, Holton, & Swanson, 2015). As an individual matures, the ability to self-direct, use their experience in learning, and identify the need and readiness to learn increases rapidly during adolescences (Knowles, Holton, & Swanson, 2015). Therefore, pedagogical practices, which rely on dependence of a facilitator or educator, need to be restrained as an individual learner transitions towards

being more psychologically an adult and self-directional in their learning. Thus, as methods aimed at increasing learning become tailored toward the learner, facilitating the learning environment, the educator will take more of a passive position.

Andragogy

To compensate for the holes that pedagogy leaves in educating adults, the theory of andragogy has been found to be more applicable as it focuses on the specific methodology of the adult mind. As adult-learners become capable of categorizing needs and responsibilities for their own lives and begin self-directing themselves, they become

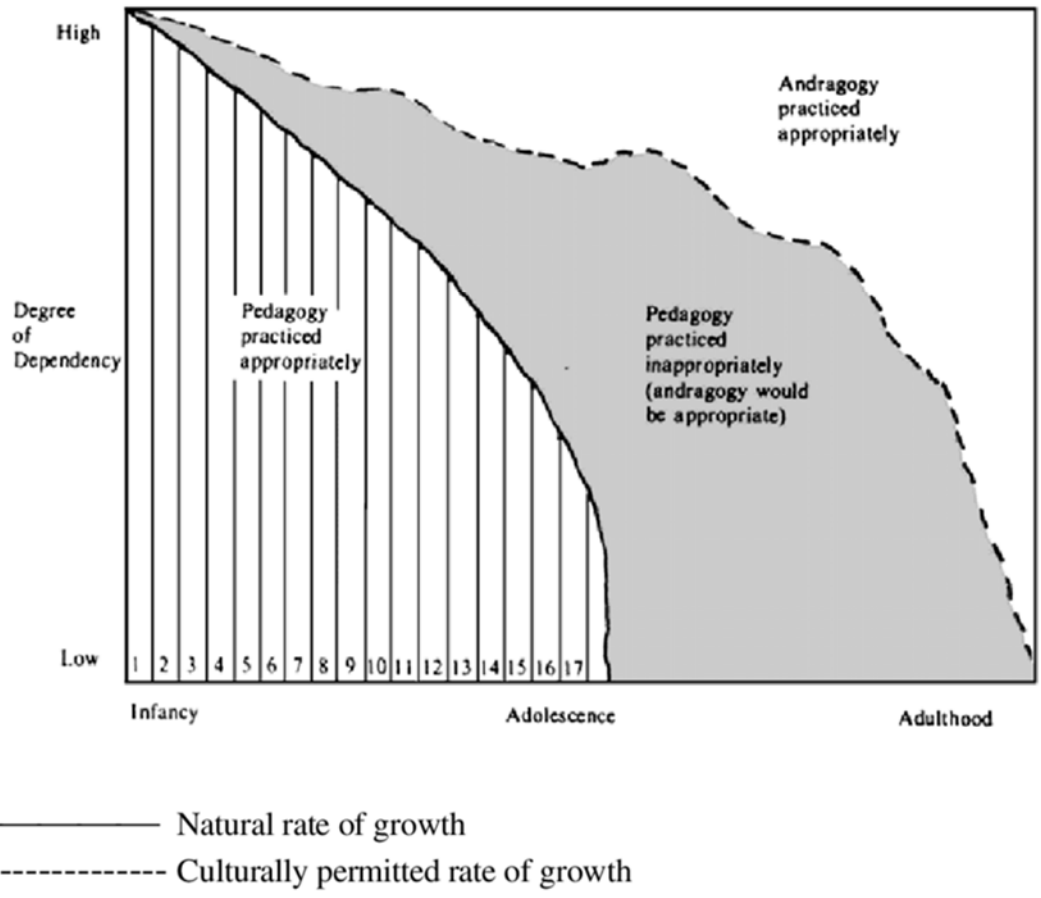

Figure 2.1. The natural maturation towards self-direction as compared to the culturally permitted rate of growth of self-direction. Adapted from "The Adult Learner: The Definitive Classic in Adult Education and Human Resource Development," by M. S. Knowles, E. F. Holton III, and R. A. Swanson, 2015, Routledge: New York, NY, p. 42.

more motivated in their learning endeavors (Knowles, Holton, & Swanson, 2015). Therefore, as students within higher education begin to understand what they want and need to know, their ability to orientate their learning becomes more efficient.

In andragogy there are six assumptions that define andragogy:

1. The need to know
2. The learner's self-concept
3. The role of experience
4. Readiness to learn
5. Orientation to learning
6. Motivation (Knowles, 1972; Knowles, Holton, & Swanson, 2015)

This theory describes the learning process as being slow to begin if individuals are not internally-motivated or provided with an understanding of the need to learn a subject (Knowles, 1972; Knowles, Holton, & Swanson, 2015). Adults are independent in their self-concept, as they have gathered more experiences and are more willing to learn when issues are problem-centered and allow for coping with real-life situations in support of development (Knowles, 1972; Knowles, Holton, & Swanson, 2015). Therefore, through this theory, adults are more likely to improve in their development and tap into techniques such as group discussions, simulated exercises, problem-solving activities, and laboratory methods in order to emphasize experiences (Knowles, 1972; Knowles, Holton, & Swanson, 2015). Thus, throughout these assumptions of andragogy, learning within higher education, especially athletic training education, should focus on developmental elements that will assist learners and allow educators to meet the needs of

adult-learners, as this methodology may be more beneficial in effectiveness and implementation of applicable educational learning sessions.

Active Learning

In order to effectively utilize the adult learning theory, as well as metacognition and cognitivism, students must become an active, rather than a passive part of their learning experience (Ambrose et al., 2010). One of the most important aspect of the learning process is what the student brings to and applies into the new learning situation (Woolfolk, 2005). In order to successfully educate students, teaching methods must reflect the way in which knowledge is organized by learners (Peer & McClendon, 2002).

Active learning is defined as a teaching method that utilizes any instructional technique to engage students in the classroom (Prince, 2004; Rau, Kennedy, Oxtoby, Bollom, & Moore, 2017). Additionally, Bonwell and Eison (1991) defined active learning as "instructional activities involving students in doing things and thinking about the things that they are doing" (p. 19). These methods of engagement are varied, covering techniques of: writing exercises, games, problem-solving, discussions, debates, and class response systems (Brame, 2016; Bonwell & Eison, 1991; Patrick, Howell, & Wischusen, 2016; Smith et al., 2009; Welsh, 2012). These learner-centered approaches use a different strategy to initiate an active role of students within the classroom allowing for knowledge to be developed further based on prior knowledge (Akilli & Genc, 2017).

Traditional vs. Active Learning Approaches

Lecturing within classes has been utilized for many decades as a means of distributing information, but after the invention of the printing press, materials could also be disseminated through other means. However, despite these advances, in addition to

the technological tools available today, many educators continue to lecture as that is what they were exposed to as students and were not given any other guidance in pedagogical methods. Active learning, conversely, is based on research and data that supports its practices to engage students and improve learning outcomes (Wieman & Perkins, 2005). To date, much of the research surrounding active learning has been focused within science education (Freeman, Eddy, McDonough, Smith, Okoroafor, Jordt, & Wenderoth, 2014). The main focus is on developing methods that will improve approaches to educate students thus allowing them to engage in deeper thinking based on their own understanding and organizational processes (Bain, 2004).

The active learning technique, though not completely free from some of the course material being lectured, differs significantly in results when compared to courses that are strictly taught for 50 minutes in the traditional lecture approach. Freeman et al. (2014) performed a metaanalysis of 225 studies that examined traditional versus active learning courses in the undergraduate STEM area. The study indicated that students actually had an increase in their performance on examinations when the active learning approach was used compared to the traditional lecture approach (Freeman et al., 2014). In addition, active learning methods were found to reduce the failure rate of students within these classes, as students in a lecture course had a 55 percent failure rate for students within science courses (Freeman et al., 2014). Moreover, in a study examining fourteen science courses, it was determined that only about 30 percent of key concepts taught were mastered by students (Hake, 1998). Therefore, despite an educator being experienced and considered “good”, the pedagogical approach associated with lecturing is simply not efficient enough in allowing students to develop mastery of materials as

students are learning through memorizations and following cookie-cutter processes for problem-solving, reducing the critical thinking component that is required within the real-world (Wieman, 2007; Wieman & Perkins, 2005).

Deliberative Practice and Peer Instruction

Active learning emphasizes the principles associated with cognitive psychology, utilizing a process of deliberate practice to develop expertise (Wieman & Gilbert, 2015). The intent behind deliberative practice is to allow for many hours of practice towards a specific focus (Schwartz, Tsang, & Blair, 2016; Wieman & Gilbert, 2015). Tasks associated with this practice are those which are challenging for learners in order to develop skills and knowledge, while also being attainable (Schwartz, Tsang, & Blair, 2016; Wieman & Gilbert, 2015). Through the implementation of deliberative practice, active learning events within education allow students to become engaged with their peers, discussing specific topics and problems, building their problem-solving skills during class time, while also providing constant feedback from the instructor (Deslauriers, Schelew, & Wieman, 2011). A philosophy that was originally developed by Lev Vygotsky, sociocultural theory focuses on the cognitive processes that may occur through social interactions (Vygotsky, 1978). He believed that foundational knowledge and specific schemata are related to social interactions, and through continual interaction these schemata continue to develop and evolve (Woolfolk, 2005). Piaget also emphasized social interactions within the cognitive process; however, where Vygotsky believed that effective interactions were between those of unequal intelligence (i.e., students and teachers), Piaget believed that effective interactions occur between peers as this exchange between equals provides cognitive conflict, challenging thinking and

clarifying schemata and foundational knowledge (Piaget 1936/1952; Woolfolk, 2005; Vygotsky, 1978). Applying this theory to the classroom, learning is thought to be transpiring when students interact with each other through deliberative practice activities that facilitate problem-solving and discuss to develop a solution that goes beyond a current cognitive level. Additionally, with the aid of their instructor, students are more likely to cognitively process information through these social interactions (Brame, 2016; Vygotsky, 1978).

One method of initiating these practices within classrooms, known as Peer Instruction, may take the form of posing questions designed to require students to practice reasoning and problem-solving as well as testing foundational knowledge (Deslauriers, Schelew, & Wieman, 2011). This approach originally introduced by Eric Mazur, has become the basic method utilized within science courses to apply deliberate practice (Mazur, 1997). Based on the cognitive theory in which the brain can only process so much information at once, Mazur (1997) decided to utilize the deliberative practice by breaking up each course, exploiting the use of student interactions and collaborations to focus on specific key concepts through the use of concept inventories (p. 10). Through the presentation of a multiple-choice question, or concept inventory, in class, students first reflect on the answer, drawing on their prior knowledge, answer the question via a polling system, and then discuss their response with their peers in order to critically think through a response, developing an understanding of concepts and application (Mazur, 1997). It is this method of peer instruction that has become widely used within science education courses at the higher education level.

In a study by Crouch and Mazur (2001), ten years' worth of teaching with peer instruction within introductory physic courses was examined to determine the overall effectiveness of peer instruction, as well as explore specific areas that could be improved upon (p. 970). This study indicated a positive benefit over the ten-year period since the initial utilization of this active learning method, specifically demonstrating increased results in student mastery of conceptual reasoning and problem-solving (Crouch & Mazur, 2001). These same findings were indicated within many other science education studies, where increases in learning and problem-solving occurred (Arikan, Yilancioglu, & Sonusen, 2014; Fagen, Crouch, & Mazur, 2002; Gok, 2013; Gok, 2014; Hake, 1998; Kjolsing & Van Den Einde, 2016; Rao & DiCarlo, 2000). These interactive engagement methodologies have positively been found to effect conceptual learning and problem-solving performances when compared to traditional teacher-centered courses (Fagen, Crouch, & Mazur, 2002; Gok, 2014; Hake, 1998; Trout, Borges, & Koles, 2014). To further support these findings, Rao and DiCarlo (2000) found that pausing three to four times during a fifty-minute class period to allow for discussion, reflection, and answering of questions associated with peer instruction, enhanced understanding of certain knowledge as well as increased the ability to integrate materials efficiently (p. 55). Therefore, by actively involving students into the learning process, attention spans can be greatly increased and the quality, details, and depth of course materials enhanced (Rao & DiCarlo, 2000).

Furthermore, within the exercise science domain, Cortright, Collins, and DiCarlo (2005) studied the effect of peer instruction on an introductory exercise physiology class (p. 108). Utilizing the procedure established by Mazur, the class was separated into two

groups, and those groups were further divided into groups of three to four students (Cortright, Collins, & DiCarlo, 2005). One group was allowed to discuss their answers to the posed question for one minute after a short lecture period by the instructor, while the other group was not allowed to consult with their peers (Cortright, Collins, & Di Carlo, 2005). What this study found was that those that were not allowed to participate in peer instruction, answered questions correctly 44 ± 5 percent of the time, compared to the 59 ± 6 percent for those allowed to participate in peer instruction, thus indicating a significant increase in scores (Cortright, Collins, & DiCarlo, 2005). Therefore, peer instruction has been indicated to enhance learning in a meaningful manner, providing experiences that transferred problem-solving skills and knowledge from one context to the next efficiently (Cortright, Collins, & DiCarlo, 2005).

Though peer instruction has been shown to be effective at improving critical thinking and understanding of participating students, another component to consider in peer instruction is the intervention of the instructor. Normally, after peer discussion has occurred, the instructor of the course further expands on concepts and particular elements to the entire class. In a study examining the effect of this interaction, Zingaro and Porter (2014) determined that with class wide discussion, led by the instructor, occurred before each individual student provided a final second answer had a greater impact than when students just discussed after the final answer as a class (p. 94). In addition, when the instructor participated and led the whole-class discussion, lower performing students improved in their performance just as well as higher performing students (Zingaro & Porter, 2014). Therefore, the intervention of an instructor within the peer instruction method is a crucial component in conjunction to peer discussion and should be

implemented within the course of a class. As a whole, however, the peer instruction method has been reported by students as an effective teaching method in improving understanding of difficult concepts when compared to the traditional lecture method as students found that being actively involved in class allowed for more time to think and reflect within class, motivating them to respond and improve based on individual learning needs (Nicol & Boyle, 2003).

Peer Discussion. An important key element within the peer instruction model is the use of peer discussion after a concept test has been posed. In a few studies, when students were allowed to interact with their peers, performance levels improved on problem-solving questions compared to the traditional format; as the ability to verbalize, process, and interact with peers enhanced a student's critical thinking and problem-solving skills, providing an alternative solution to students, indicating cognitive functioning improvements (Cortright, Collins, & DiCarlo, 2005; Gok, 2013; Morgan & Wakefield, 2012). Smith et al. (2009), investigated the use of concept inventories and peer discussion within undergraduate science courses. It was discovered that when students first answer the question on their own, whether they are correct or not, they are able to learn from interactions and discussions with their peers (Smith et al., 2009). When students were asked a second question, similar to the first, 77 percent of students answered correctly, demonstrating an increase in learning and suggesting peer discussions to be effective in developing cognitive processing (Smith et al., 2009).

These same results were found throughout many other studies within the science education field, in which it was discovered that students performed significantly better on the concept tests after discussion with their peers, finding that these collaborations do not

just transfer knowledge but through the use of debate and discussion new knowledge is formed as different cognitive models are constructed (Brooks & Koretsky, 2011; Rao & DiCarlo, 2000; Pollock, Chasteen, Dubson, & Perkins, 2010; Relling & Giuliodori, 2015). Deslauriers et al. (2011) demonstrated that learning improved considerably for students in a course based on the active learning techniques of peer instruction and deliberative practice (p. 864). When one introductory physics course was taught through traditional lecturing and another utilizing peer discussion, the average test score was 41 ± 1 for the lecture course and 74 ± 1 for the active learning course (Deslauriers et al., 2011). This significant difference suggests that teaching methods, which engage students in peer discussion, requiring them to utilize prior knowledge in order to effectively problem solve, improves learning (Deslauriers et al., 2011; Lasry, Charles, & Whittaker, 2016). Thus, increasing the necessity for other fields, such as athletic training, to consider the use of such methods in educating students.

Before prior knowledge can be utilized within group discussion, it has been found that an initial thinking period for each individual student is important (Morice, Michinov, Delaval, Sideridou, & Ferrieres, 2015; Nicol & Boyle, 2003; Nielsen, Hansen, & Stav, 2016). This period before group discussion was found to be beneficial and preferred by students to allow them to gather their thoughts while reflecting on the question before other perspectives became influential to the learning process (Nicol & Boyle, 2003; Nielsen, Hansen, & Stav, 2016). With each individual developing their own reasoning and solutions before group discussion, students felt that group discussion allowed for critical thinking and more effective problem-solving as students would not become passive through collaborations and would engage by defending their own rationale for an

answer and be able to identify gaps within their thinking, furthering the cognitive thinking model (Nicol & Boyle, 2003). Therefore, individual reflective time after a concept test has been posed as an important element before group discussion in providing students with the ability to cognitively develop their own rationale adding to the learning of individual students.

Typically, the technique used for group discussions has been separating classes into smaller groups, with two to four students within a group. However, this practice may not be as beneficial for students hesitant on verbalizing their perspective. Therefore Michinov, Morice, and Ferrieres (2015) examined the use of the stepladder technique and its effectiveness on improving participation rates (p. 1). The stepladder technique is a discussion protocol that begins with an initial group of two students working together to share perspectives and thoughts on a problem (Michinov, Morice, & Ferrieres, 2015). One at a time, other group members are added to the initial group, sharing their thoughts on the problem before hearing the core group's potential solution (Michinov, Morice, & Ferrieres, 2015). As the group members take time to listen to each individual and understand the presented views, the process ends with discrepancies among the group being solved and a final consensus attained (Michinov, Morice, & Ferrieres, 2015). This study suggests that the step ladder technique is a method that can expand on the traditional peer discussion process and is beneficial in increasing learning gains among students and encouraging participation among all types of students (Michinov, Morice, & Ferrieres, 2015). Furthermore, Chou and Lin (2015) demonstrated that implementation of preassigned discussion partners or accountability scoring mechanisms may be effective in promoting student discussion and increasing engagement and understanding among

students that may not be as willing to participate in open discussion as others (p. 846). By promoting particular methods within the classroom to facilitate discussion from all students, engagement begins to occur, and students positively become interdependent among their peers enhancing the discussion further (Chou & Lin, 2015; Michinov, Morice, & Ferrieres, 2015).

Personal Response Systems. In addition to peer discussion, another component that is included within peer instruction is the use of personal response systems (PRS), commonly called 'clickers', in order to poll students and attain results from concept tests proposed within class (Mains, Cofrancesco, Milner, Shah, & Goldberg, 2015). This polling of classes can be achieved through the raising of hands or colored cards but is most commonly done with electronic devices specifically designed for classroom use to engage students actively within the learning process (Mains et al., 2015l Stowell & Nelson, 2017). The addition of this component within peer instruction has been found to interactively engage students adding to the increase in their performance (Hubbard & Couch, 2018; Mains et al., 2015; Oliveira-Santos, Tirapelli, Rodrigues, Domaneschi, & Monteiro, 2017; Stowell & Nelson, 2007; Tlhoaele, Hofman, Naidoo, & Winnips, 2014). Furthermore, the use of clickers also has been found to improve outcomes on exam performance and increase retention of knowledge (Millor, Etxano, Slon, Cargia-Barquin, Villanueva, Bastarrika, & Pueyo, 2015; Shapiro & Gordon, 2012). Shapiro and Gordon (2012), when examining the effect of PRS, found that asking multiple-choice questions and having students respond within the classroom enhanced memory and improved the performance on content area related to those questions by alerting students to relevant information thus improving retention rates (p. 640).

Additionally, students, when surveyed on PRS, indicated support and recommend the use of these devices within science education courses (Barr, 2017; Brown, Morse, & Morrison, 2016; Perkins & Turpen, 2009; Wolter, Lundeberg, Kang, & Herreid, 2011). Students felt that the use of PRS within their courses increased the engagement within the classroom and increased their level of understanding of material (FitzPatrick, Finn, & Campisi, 2011; Sternberger, 2012). Moreover, students also indicated that the use of PRS added to the collaboration, discussion, and interactions between the students and educator, making the classes in which PRS were used more enjoyable and satisfactory (Brown, Morse, & Morrison, 2016; FitzPatrick et al., 2011; Wolter et al., 2011). These responses from students may be due to the ability for anonymity, decreasing pressure and anxiety some students may feel when being called on individually to answer a question; thus, increasing students' willingness to participate and expand their engagement with the materials being presented and improving performance (Barr, 2017).

As PRS itself is only a component within active learning, and peer instruction, other methodologies need to be utilized in order to fully engage students and develop increases in performance and outcomes (Morling, McAuliffe, Cohen, & DiLorenzo, 2008). Daniel and Tivener (2016), when examining the effects of students sharing a PRS device compared to individual usage, found that small group collaborations increased awareness of peer opinions but did not decrease individual participation or contributions within the groups (p. 264). Therefore, when used in conjunction with peer discussion, as well as other active learning methods, PRS is an effective tool to achieve positive outcomes, such as increase in knowledge, critical thinking skills, educational performance, and engagement (Daniel & Tivener, 2016; Morling et al., 2008).

Flipped Classrooms and Just in Time Teaching

While the majority of research within active learning has related to peer instruction, discussion, and personal response systems, other active learning methods within science and medical education have evolved under the terms of flipped classroom and Just-in-Time Teaching. The traditional face-to-face class has the instructor introducing newer materials and going over concepts to the students and then providing assignments to be done outside of class on the student's own time. However, the flipped classroom method takes a reverse approach and provides materials to students prior to class in which they will be able to begin conceptualization of the topic (Bishop & Verleger, 2013; Hurtubise, Hall, Sheridan, & Han, 2015; Talbert, 2017). These materials could potentially be recorded lectures, webcasts, readings, or quizzes that students are expected to complete before class (Bauer & Haynie, 2017; Hurtubise et al., 2015). Once in class the instructor acts as a facilitator of activities, or assignments, that are designed to engage the student and develop critical thinking abilities (Bauer & Haynie, 2017; Talbert, 2017). The instructor aids students on concepts that may be found difficult, as well as provide feedback to align cognitive models for adequate learning gains. The benefit of the flipped classroom model provides educators with an infrastructure to build competency through a framework of learning experiences from basic knowledge application to practical integration (Hurtubise et al., 2015).

However, despite the theoretical basis for this method, much of the research available is inconclusive on the effects that flipped classrooms may have on learning and performance (Chen, Lui, & Martinelli, 2017). Regardless of this, studies have been able to find a positive effect from the perspective of the students as they believe this technique

to be engaging, improving their interest in learning (Fatima, Arain, & Enam, 2017; O'Flaherty & Phillips, 2015). The pre-class materials that are provided with flipped classrooms, though initially thought of as busy work, were indicated by students within the studies to enhance learning and provide a foundation that allows for correlations between conceptual knowledge and application (Fatima, Arain, & Enam, 2017; White, Naidu, Yuriev, Short, McLaughlin, & Larson, 2017). In addition, these students also found the activities provided in class to be beneficial as collaborations and engagement helped to reinforce concepts and provide clarification for misconceptions (McNally, Chipperfield, Dorsett, Fabbro, Frommolt, Goetz, Lewohl, Molineux, Pearson, Reddan, Roiko, & Rung, 2017; O'Flaherty & Phillips, 2015; White et al., 2017). Therefore, though effects may not be conclusive within science or medical education research, the current findings indicate that flipped classrooms are beneficial when strategically designed to enhance student engagement and overall learning (O'Flaherty & Phillips, 2015).

Because peer instruction requires students to be actively involved and independent within the learning process, it has been determined that motivational components, such as graded pre-class reading quizzes and incorporating conceptual questions into exams, may aid students in understanding the process and reinforce the critical thinking element instead of just memorization of materials (Crouch & Mazur, 2001). With the pre-class reading assignments, Crouch and Mazur (2001) mentioned that though the method is useful in providing incentives for students to complete the readings before class, it does not provide measures of developing understanding of materials (p. 973). Therefore, the quiz was changed to a three-question web-based assignment that

were due before class and probed students to indicate difficult components of the readings, beginning the cognitive process (Crouch & Mazur, 2001). Kjolsing and Van Den Einde (2016) confirmed these same results, finding that pre-class readings may not statistically affect learning gains with peer instruction but that other methods, such as free-response questioning to encourage readings or recorded mini lectures before class would be more beneficial (p. 6).

The aforementioned method, known as Just-in-Time Teaching, is a newly developed type of active learning that has students reading and engaging in the materials prior to class (Simkins & Maier, 2010). After students read the assigned text, they are asked to participate in a series of questions, with the last one asking what they found to be the most interesting or difficult component from the reading (Muzyka, 2015; Novak, Patterson, Gavrn, & Christian, 1999; Simkins & Maier, 2010). Through these responses, an educator can determine areas of concentration to include in their class content as well as provide feedback to students to encourage conceptual understanding or correct misconceptions (Muzyka, 2015; Novak, Patterson, Gavrn, & Christian, 1999; Simkins & Maier, 2010). This method, in conjunction with peer instruction and personal response systems has been found to be effective in facilitating effective learning within science courses (Darabi, Pourafshar, Suryavanshi, & Arrington, 2016; Muzyka, 2015; Riskowski, 2015).

Problem-Based Learning

Another active learning method that has been introduced over recent years is problem-based learning (Barrow & Tamblyn, 1980). Similar to a flipped classroom, classes that utilize this method are using authentic problems to allow students to learn and

understand how to apply their critical thinking skills and abilities in order to come to an outcome or resolution, and with this approach educators can assess the problem-solving abilities of students (Barrows & Tamblyn, 1980; Grabinger & Dunlap, 2002). Within sports and general medicine, it has been determined that the best method to motivate students and engage them on a deeper level is through content that is similar to situations that they may encounter while practicing as a physician, exercise physiologist, athletic trainer, physical therapist, or other healthcare professional (Barrows & Tamblyn, 1980; Franklyn-Miller, Falvey, & McCrory, 2007; Grabinger & Dunlap, 2002). When the problem being presented to students is authentic and realistic, students are much more likely to activate prior knowledge in order to understand the context of the newer information being presented within the case, or problem (Grabinger & Dunlap, 2002; Lee, Blackwell, Drake, & Moran, 2014). The instructor, then, presenting questions and monitoring individual student progress, are challenging each student to reflect on what has been learned, facilitating the metacognitive functioning (Grabinger & Dunlap, 2002).

In a study examining the critical thinking effects among athletic training students, it was found that those exposed to problem-based learning performed at or a little above the level as those exposed to a traditional lecture course in regard to critical thinking abilities (Lesperance, 2008). In addition, this study also determined that those students exposed to problem-based learning reported as being more motivated and enjoyed being more actively engaged within the class, adding to the benefits of problem-based learning within athletic training and other healthcare related fields (LaForce, Noble, & Blackwell, 2017; Lesperance, 2008). Similarly, in a study done in Saudi Arabia, examining the effects of problem-based learning on medical education students, it was also reported by

students that the technique used added value as they advanced into their own practice (Alhaqwi, Mohamed, Al Kabba, Alotaibi, Al Shehri, Abdulghani, & Badri, 2015). From these studies the motivational effects reported by students demonstrates a beneficial effect of problem-based learning (LaForce, Noble, & Blackwell, 2017; McParland, Noble, & Livingston, 2004). As students are motivated to engage in the problem being set before them, they are more likely to engage their previous knowledge and develop critical thinking abilities that will enhance their future practices.

Application of Active Learning within Athletic Training

While the CAATE, NATA, and the BOC have provided program administrators with the tools necessary for specific content material delivery, it has been left up to the individual programs on their program design, mode for curriculum approach, and pedagogical practices in attaining the desired outcomes of competent clinicians. It should be the goal of each professional program to educate students to think critically in order to develop understanding and make decisions in a variety of situations. Over the last decade there has been a push for institutions to utilize the various strategies associated with active learning (Armstrong, 2010; Gillette, 2017; Peer, 2015; Ryan, Murray, & Martin, 2009; Simmons & DiStasi, 2008; Smith-Goodwin & Wilmer, 2010; Turocy, 2016; Walker, 2003). Mensch and Ennis (2002) first examined pedagogical strategies that were being utilized in athletic training in order to determine the perceptions of students' learning and instructors' teaching (p. S-199). Similar to techniques found within active learning, the use of scenarios and case studies, authentic experiences, and a positive educational environment were the major themes discovered to be effective within athletic training courses encouraging engagement and development of knowledge and thorough

understanding (Mensch & Ennis, 2002). Therefore, ATPs should be teaching in a manner that sets students up to do these skills and be able to make competent decision.

Moreover, in support of these findings, active learning within athletic training education has been found to increase engagement of students, increasing their retention of knowledge and critical thinking, and improve students' attitude towards learning (Bates, 2016; Heinerichs, Pazzaglia, & Gilboy, 2016; Heinerichs, Vela, & Drouin, 2013; Thompson & Ayers, 2015; Tivener & Hetzler, 2015). Within the context of a flipped classroom, in which students become the ones directing the dialogue throughout a class and educators being more passive, active learning techniques were found to be beneficial at engaging students in levels of higher learning (Heinerichs et al., 2016; Thompson & Ayers, 2015). Students exposed to these methods were able to apply, analyze, and evaluate their knowledge and skills, thus maximizing their learning (Heinerichs et al., 2016). Additionally, the materials learned in classes were perceived by students as applicable to their future professional goals, facilitating a higher degree of relevance of the materials and a more dynamic involvement in the educational process (Thompson & Ayers, 2015).

Through the implementation of teaching techniques that encourage collaborations, confidence in knowledge and skills, and allow for various techniques to be introduced, athletic training students appear to have enhanced abilities to acquire knowledge and think critically (Bates, 2016). A study by Tivener and Hetzler (2015) resulting in students having an improved ability to attain knowledge, was completed through the use of a PRS (p. 212). Students that were exposed to the interactive classroom approach facilitated by the PRS, were found to perform better in exam scores than the control

(Tivener & Hetzler, 2015). Thus, indicating that through classroom interactions, students have an improved ability to acquire knowledge more efficiently (Tivener & Hetzler, 2015). Active learning, learner-centered approaches enforce clinical reasoning by placing students at the center of the educational paradigm, allowing for more autonomy in interactions and decision-making, as students make their own connections based on their prior knowledge (Heinerichs et al., 2013). These processes build confidence as students are able to develop their knowledge acquisitions and apply information more efficiently through repetition of experiences (Bates, 2016; Heinerichs, et al., 2013).

Leadership Literature

It is important for leaders to take on the responsibility of improving those within an organization in order to improve outcomes. In educational institutions, as leaders within a department investigate and understand the needs of individual faculty and staff, development opportunities are implemented for more efficient teaching. Also, perspectives and initiatives change from an internal-focus to external, or departmental focus, to meet the demands of all associated within the department for greater outcomes (Wieman, Perkins, & Gilbert, 2010). An organization must be able to evolve and change in order to improve on aspects of the organization and perform at a higher level to meet the needs of the external environment (Burke, 2014).

Institutions of higher education have continually endeavored to advance on multiple levels in order to improve teaching, learning and productivity. These initiatives have been not for institutional advancement but to enhance the external environment and focus on the needs of students. These advances would not have occurred without the direction of leaders collaborating with those in an organization to understand the

capabilities of all involved (Burke, 2014). In order for the effects of active learning to be most effective, implementation should be undergone at the departmental level within an institution. This approach was taken through the Science Education Initiative (SEI) at the University of Colorado and the University of British Columbia (Wieman, Perkins, & Gilbert, 2010; Wieman, 2017). In an endeavor to address development of individual faculty and their courses, the culture throughout undergraduate science and math education departments, was addressed to facilitate change as these departments were viewed as the necessary unit of change (Wieman, Perkins, & Gilbert, 2010).

Methodology to approach these changes began with discussions to facilitate collaborations among faculty and administration, shifting the focus from coverage of specific topics within courses, to pedagogical approaches for understanding of how individuals learn, achieving improved learning outcomes, and evidence to support these theories (Wieman Perkins, & Gilbert, 2010). Over a three-year period, departments that utilized these collaborations were successful in their efforts of sustainability in transformation and coherent curriculum within programs (Wieman, Perkins, & Gilbert, 2010). Overall, the SEI found that there were improvements in learning throughout these programs as a cultural paradigm shifted to meet the needs of students for thorough understanding, and also to meet the needs of faculty to achieve these learning outcomes (Wieman, Perkins, & Gilbert, 2010). With a departmental focus, there were more success and improvements in teaching and learning.

Within athletic training education, administrators of accreditation bodies and educational committees have seen the need for adaptations as the profession evolves, making necessary changes to standards and competencies. Therefore, it is vital for

leaders of individual programs to ensure that faculty are provided with the resources and tools to develop and improve in their pedagogical approaches, meeting the needs of students and the healthcare realm. Furthermore, individual programs should undertake initiatives of changes within their own departments in order to assess innovations and learning outcomes to ensure that future athletic trainers are equipped with the knowledge and skills to competently provide healthcare to a variety of patients.

Summary

The aim of this study was to evaluate the prevalence of active learning techniques throughout professional athletic training programs in order to provide evidence on the effectiveness of these techniques as supported by research. A key component of any research study is to provide a deep understanding of published literature and theoretical frameworks surrounding the identified issue. Within athletic training, evidence-based practices have been highly prescribed in order to provide the best practices within healthcare. This same logic needs to be taken in educating healthcare professionals, through the utilization of evidence-based teaching methods within the classroom. The previous section identifies active learning techniques as highly effective teaching approaches within science education and athletic training education. Additionally, a review of cognitive and metacognitive theories provides a framework for understanding why these approaches are important in learning and how it applies to athletic training educational approaches.

SECTION THREE: METHODOLOGY

Introduction

Within healthcare, it is important for professionals to be able to react quickly and have critical thinking abilities during life-threatening situations. One important component of achieving this result is through the educational curriculum that students receive. Traditionally, the method of lecturing has been the primary method of educating athletic training students. However, a review of literature has demonstrated that this may not be the most effective teaching method in facilitating critical thinking for thorough application of skills and knowledge of students as they transition into practicing as a healthcare professional. Active learning is a research-based teaching method that is effective in improving foundational knowledge and skill development, however, it is unclear to what extent these methods are being utilized throughout athletic training programs.

Purpose of the Study

The purpose of this quantitative survey study was to explore the prevalence of active learning methods within professional athletic training education programs. In addition, this study also examined the relationship between the active learning methods and the specific athletic training learning outcome of the BOC pass rate.

Aim of the Study

The aim of this study was to evaluate the current status of educational methods in athletic training, specifically active learning, in order to develop a foundation of organizational change among athletic training education programs. Furthermore, this study aimed to compare learning outcomes in order to further the understanding of

pedagogical techniques and their effectiveness on educating future athletic training students.

Research Questions and Hypotheses

As higher education advances and more research-based methods are implemented into the teaching of certain disciplines, educators and departments need to ensure that they are providing their students with best practices that not only will provide them with the foundational knowledge and skills necessary to become an athletic trainer, but also the critical thinking abilities to make decisions in a variety of situations. While there is research to demonstrate the effectiveness of some active learning techniques within athletic training classrooms, there is little evidence to support that these methods are currently being utilized within current athletic training classrooms and programs and the effect on learning outcomes. Therefore, the following research questions and hypotheses will guide this quantitative study:

Research Question #1:

What is the prevalence of active learning methods currently being utilized throughout professional level athletic training programs?

Hypothesis #1:

Athletic training programs will have implemented active learning methods throughout their courses.

Research Question #2:

What are the differences between level of active learning methods and BOC pass rates for programs that utilize active learning methods?

Hypothesis #2:

Programs that have a higher level of active learning methods throughout their entire program will have higher BOC pass rates than those with a lower level of active learning methods.

Research Design

In order to identify active learning prevalence within athletic training education programs this study utilized a quantitative survey design. As survey studies provide a numerical description of trends within a population, this methodology was selected as an appropriate approach in order to determine whether active learning methods are being implemented and effectively have an influence on the learning outcomes associated with athletic training education (Creswell, 2014).

The Teaching Practices Inventory (TPI) was developed at the University of British Columbia as a means of measuring active learning activities within the classroom. Though originally designed to be completed by individual instructors, Wieman and Gilbert (2014) indicated that this instrument may be just as beneficial at the departmental or program level as well (p. 555). Reported active learning methods with the TPI from Program Directors (PD) was the dependent variable within the first portion of this study.

To further this study and understand the effects of active learning on overall learning outcomes, another dependent variable was the program reported three-year aggregate first-time pass rate of the Board of Certification (BOC) entry-level exam. This exam is the fundamental learning outcome for every athletic training program, as it measures entry-level knowledge required of an entry-level athletic trainer. These scores, reported in percentages, consisted of the number for students that passed the exam the

first time, out of the total attempted for those that took the BOC over each of the last three cohorts of each institution.

Participants/Data Sources

The population of this study consisted of 364 Commission on Accreditation of Athletic Training Education (CAATE)-accredited professional programs (bachelors or masters) throughout the United States. The sample being utilized was PDs from these programs. The PDs are responsible for maintaining program compliance with the CAATE standards and overseeing the clinical education and program budget (*CAATE Standards*, 2012). Moreover, they are also responsible for the "planning, development, implementation, delivery, documentation, and assessment of all components of the curriculum (*CAATE Standards*, 2012)". Therefore, PDs should be well aware of the content and teaching methods utilized throughout their programs and therefore are a quality population for this study. As PDs are the ones establishing these guidelines, they will be knowledgeable in the implementation of active learning methods within their program and thus appropriate in surveying to represent their program.

Participant Recruitment

Following IRB approval, participants were recruited via the CAATE website, a public access website that includes institutional information, PD contact information, and program standing. This website allowed the researcher to identify which programs are professional-level and their accreditation status, as well as collect the contact information for all PDs. From this information, a list was accumulated of all 364 PDs in order to send out the survey, using the Qualtrics platform, via email.

Description of Participants

The sample included 68 PD of professional-level programs. Over half of the study, (52.9%), included programs whose student enrollment ranged from zero to thirty (n = 36). 32.4% of the study included programs that ranged from 31 to 48 students enrolled (n = 22), and only 14.7% of the study included programs with enrollments ranging between 50 and 100 students (n = 10). The majority of the participating programs consisted of two full-time faculty (47.1%, n = 32); however, 27.9% of the programs had three full-time faculty members (n = 19), and the remainder of the programs ranged from four to fifteen (23.6%, n = 16). Additionally, part-time faculty ranged from zero to fifteen with the majority being zero part-time faculty (39.7%, n = 27) then one (14.7%, n = 10) and two (14.7%, n = 10) part-time faculty members. The majority of participating PDs (66.2%, n = 45) had no more than ten years implementing active learning methods within their programs, while the remaining PDs (n = 23) reported having twelve or more years of implementing active learning methods into their programs (33.8%). Finally, of the three-year aggregate BOC pass rate for these programs the range was from 20 to 100 with the majority of scores being within the 80 to 100% range (72.1%, n = 49), while the remaining (n = 19) programs reported their BOC pass rate as below this level (see Table 3.1).

Table 3.1

Demographic Descriptions of Athletic Training Programs (N=68)

Variable	Mean	Frequency	Percentage
Number of Students	30.75		
0-30		36	52.9
31-48		22	32.4
50-100		10	14.7
Full-Time Faculty	2.96		
1		1	1.5
2		32	47.1
3		19	27.9
4		10	14.7
5		5	7.4
14		1	1.5
Part-Time Faculty	1.91		
0		27	39.7
1		10	14.7
2		10	14.7
3		7	10.3
4		7	10.3
5		4	5.9
6		1	1.5
10		1	1.5
15		1	1.5
Years of Active Learning	8.96		
0-10		45	66.2
12-32		23	33.8
BOC Pass Rate (%)	83.88		
20-79		19	27.9
80-100		49	72.1

Data Collection Tools

The Teaching Practices Inventory (TPI) is a quantitative measure that was designed and evaluated over a six-year period to measure all teaching practices within science courses and was able to measure these same activities within athletic training programs (*Teaching, Practices Inventory*, 2014; Wieman & Gilbert, 2014). This instrument is a 72-item inventory (Appendix A) that is divided into eight categories as

illustrated in Table 3.2. The majority of the questions were close-ended questions in which participants selected answers from a list provided within the questionnaire. There were also options available for participants to provide subjective information, adding context to responses from other questions. The total mean scores for the instrument ranged from 0 to 67 ETP, or extent of use of research-based teaching practices (Wieman & Gilbert, 2014). The rubric developed with this inventory was reviewed by the same three experts that also reviewed the inventory and was scored based on the level of research available to support the rationale of individual items (Wieman & Gilbert, 2014).

Table 3.2

Teaching Practices Inventory Categories.

I.	Course information provided (including learning goals or outcomes)
II.	Supporting materials provided
III.	In-class features and activities
IV.	Assignments
V.	Feedback and testing
VI.	Other (diagnostics, pre-post testing, new methods with measures, etc.)
VII.	Training and guidance of TAs
VIII.	Collaboration or sharing in teaching

Note. Adapted from "The Teaching Practices Inventory: A New Tool for Characterizing College and University Teaching in Mathematics and Science," by C. Wieman and S. Gilbert, 2014, *CBE- Life Sciences Education, 13*, p. 553.

Test instruments are typically validated and found reliable as a measure of a particular context to demonstrate trust throughout the instrument. However, as the initial focus for validating the TPI was to accurately characterize teaching practices and the extent of these practices used within courses, the intent was to ensure that instructors accurately interpreted the items consistently and that the inventory covered all manner of active learning teaching practices (Wieman & Gilbert, 2014). To this extent, traditional statistical measures for reliability and validity, such as Cronbach's alpha, were not

applicable in the case of the TPI (Wieman & Gilbert, 2014). Furthermore, as the TPI simply examines whether certain practices are being used and did not analyze the quality of implementation, the many tests for reliability, which are designed to measure correlations between items within a questionnaire does not provide meaningful measurement of this instrument (Wieman & Gilbert, 2014). Therefore, to validate and develop this instrument, the original instrument was distributed to approximately a dozen instructors within the science and math departments at University of British Columbia in order to refine and improve the instrument (Wieman & Gilbert, 2014). This process was continued a second time with a revised version of the TPI which was distributed to 179 instructors, leading to further feedback for improvements and a third and final version (Wieman & Gilbert, 2014).

With the second research question and hypotheses, the overarching goal of every athletic training program has been to have a 100% first-time pass rate of their students taking the board of certification (BOC) exam. The CAATE requires a 70% first-time, three-year aggregate pass rate for all programs in order for it to maintain an 'in good standing' accreditation status. The BOC exam measures entry-level knowledge required of an athletic trainer. Therefore, it is measuring the overall learning of a student. As active learning has been found to produce an increase in exam performance when compared to the traditional lecture method (Freeman et al., 2014), then programs that have fully implemented active learning method for all curricular content should have different outcomes than those not utilizing these methods. To measure this learning outcome, the BOC exam three-year aggregate pass rate for each program was collected. CAATE, maintains updated BOC pass rate information for all accredited institutions,

therefore the necessary data for this study was available on the CAATE website. Additionally, each institution is required to post this information to their institution's website, in order to fulfill Standards 7 and 8 for CAATE-accreditation (*CAATE Standards,* 2012). Therefore, this data is available through two different avenues if needed.

Data Collection Procedures

Participants were approached via email by the principle investigator and were asked to voluntarily participate in the study. An introductory letter (Appendix B) was provided to all subjects that describe the main focus and goals of the study as well as illustrated any consent and confidentiality aspects of the study. To accomplish this, first a list of professional programs and PD contact information was accumulated from the CAATE website, which is available to the general public.

After IRB approval (Appendix C), the letter and a link to the TPI survey were distributed to those on the collaborated list of PDs. Utilizing the Qualtrics platform to disseminate the survey electronically to all PDs within the specified population the first survey was disseminated. After two weeks of initially distributing the survey a second email was sent to the remaining prospective participants to complete the survey. Finally, a third email was sent for a final reminder a month after the initial email in order to measure prevalence of active learning methods among athletic training education programs. In addition, due to the low response rate after the proposed data collection methodology, the survey was sent out again to reach the required number of participants.

Next, once the TPI survey was collected, the CAATE website was utilized a second time to obtain programs' BOC pass rates. The BOC first-time pass rate is

measured by programs and the CAATE as a determination of program effectiveness and measure of graduates' foundational knowledge and skills. Therefore, a three-year aggregate first time BOC-pass rate, reported as a percentage, for professional-level programs was collected, and programs that were determined from the initial survey as utilizing active learning methods were compared to those that had not implemented these methods in order to determine if these methods had an effect on learning outcomes. All of this information was available via public access on the CAATE website as well as each programs' website as a requirement of CAATE standards.

Ethical Considerations

Prior to the start of the study, all participants were informed of the study and completed the introductory letter/consent form if willing to participate. To protect the privacy of all participants, the data collected was stored in a secure encrypted file available to only the principle investigator. No personal identifying information was collected with the survey, except the identification of the institution the PD associated with. However, it was indicated that this information was only to identify BOC pass rates and was eliminated from the data once that piece of information was gathered. Furthermore, it was indicated to participants that no identifying information would be used in any published report or presentation of the collected data.

Ethically, with quantitative research, all results discovered must be reported. Though potentially contradicting to the original aim of the study, any information potentially collected may be beneficial for future research in order to further future conduction of research (Babbie, 2014). Additionally, as I am an administrator within an athletic training program, though not a program director, I have somewhat of a bias on

the aim of this study and the potential results that occurred. Accordingly, my intent was to keep an unbiased approach with the process to maintain and ensure that there were no ethical issues in the outcome.

Summary

This study used a qualitative survey design to determine the prevalence of active learning methods throughout CAATE-accredited professional-level athletic training programs. The TPI survey instrument was employed with the purpose of specifically measuring active learning techniques being utilized by different athletic training programs. To ensure that findings were generalizable to the population of 361 programs, the TPI was distributed to all PDs with a sample of 68 PDs collected. The aim of this study was to evaluate the current state of educational methods being used within athletic training education in order to develop a foundation for organizational change based on the best practices for facilitating learning at the higher education level.

CHAPTER FOUR: FINDINGS

Introduction

The purpose of this quantitative survey study was to explore the prevalence of active learning methods within professional athletic training education programs. In addition, this study also examined the relationship between active learning methods and the specific athletic training learning outcomes of the BOC pass rate. This chapter begins by reviewing the data analytics used and presents the results of the research questions. Finally, this chapter concludes by presenting further analyses that clarify the findings.

Data Analysis

Responses from the TPI survey instrument as well as the BOC pass rate results were recorded and analyzed in the IBM SPSS Statistical Package for MacOS (Version 25; SPSS). Following the recommendations of Field (2013) on how to analyze categorical statistics, data was screened for linearity, independence, and expected frequencies. No violations of the assumptions in relation to the data were found.

Results

Sixty-eight Program Directors (PD) participated in the study. Descriptive variables included number of professional level students within the program, numbers of full-time and part-time faculty, years implementing active learning methods, TPI Scores, and BOC pass rates. The demographic data describing the sample are provided in Table 3.1. Additionally, descriptive statistics for means and standard deviations are portrayed in Table 4.1.

Table 4.1

Descriptive Statistics of Results

Variable	*N*	Mean	Standard Deviation
Number of Students Enrolled in Program	68	30.75	18.80
Full-Time Faculty	68	2.96	1.67
Part-Time Faculty	68	1.91	2.56
Years Using Active Learning	68	8.96	7.27
TPI Score	68	42.88	6.86
BOC Pass Rate (%)	68	83.88	14.50

Hypothesis One: Active Learning Implementation

Hypothesis one stated that athletic training programs will have implemented active learning methods throughout their curriculum. To categorize the level of active learning for programs to determine implementation of active learning, those that had TPI scores from zero to forty-six were classified as low active learning and those with TPI scores from 47 to 67 were classified as high levels of active learning within their program. An independent-samples *t*-test was conducted to compare active learning methods between athletic training programs. TPI scores for programs with low active learning ($M = 39.38$, $SD = 5.57$) were significantly different than for programs with high active learning ($M = 49.74$, $SD = 2.60$), $t(65.63) = -10.44$, $p < .001$, as reflected in Table 4.2. Levene's test indicated unequal variance ($F = 20.99$, $p < .001$), so degrees of freedom were adjusted from 66 to 65.63. These findings suggest that though the number of programs with high active learning methods were much lower ($N = 23$), the average score is significantly higher than those programs with lower active learning methods ($N = 45$). However, it represents a large-sized effect, $r = .79$, $d = 2.58$. Hypothesis one was not supported.

Table 4.2

Independent Samples TPI Scores Mean and Standard Deviation

Variable	*N*	Mean	Standard Deviation
Low Active Learning Methods	45	39.38	5.57
High Active Learning Methods	23	49.74	2.60

Hypothesis Two: Active Learning and BOC Relationship

Hypothesis two stated that programs that implemented active learning methods throughout their program will have higher BOC pass rates than those that do not implement these methods. A Pearson's Chi Square test was conducted to determine the relationship between active learning levels and BOC pass rates. There was not a significant association between the level of active learning and BOC pass rate score percentages $\chi^2(1) = .11$, $p = .74$. Hypothesis two was not supported and is represented in Figure 4.1 on the comparison between active learning method levels and mean BOC pass rate scores. Furthermore, based on the odds ratio, the odds of an athletic training program having higher BOC pass scores was 0.83 times higher if they implemented active learning methods than those that do not implement these methods.

Analysis and Synthesis of Findings

Though neither of the hypotheses were supported, the results from this study provided information toward answering the associated research questions. The first research question guiding this study was: What is the prevalence of active learning methods currently utilized throughout professional level athletic training programs? Of those PDs surveyed, the number of programs scoring within the high active learning level was much lower than those indicating to have low active learning implementation. This

finding indicates that athletic training programs are not implementing active learning methods within their programs. Therefore, the prevalence of active learning methods within athletic training programs is low and hypothesis one is not supported.

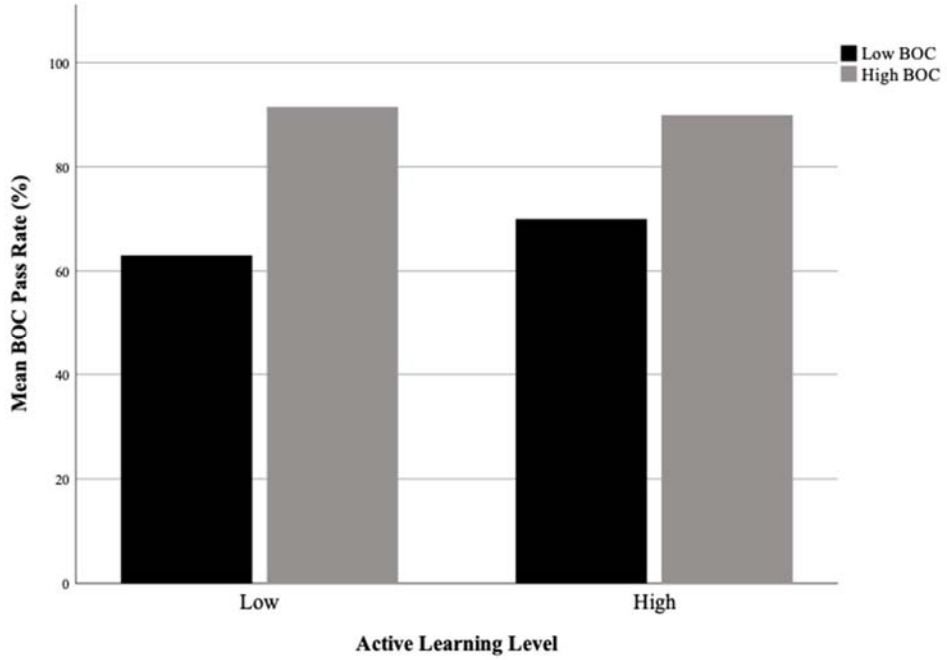

Figure 4.1. *Comparison of Mean BOC Pass Rate by Active Learning Level*

To take this study a step further, the second research question aimed to examine the differences between level of active learning methods and BOC pass rates for programs that utilize active learning methods. The hypothesis associated with this question sought to find a relationship between active learning method use and BOC scores, in order to demonstrate the effectiveness of active learning on the overall assessment measure for professional level athletic training programs. However, this relationship was not demonstrated as there were no significant difference between those that implemented higher levels of active learning methods and those with lower levels of active learning, and hypothesis two is not supported. These results are illustrated in Figure 4.1, but what should also be noted within this figure is that when comparing the

mean level of low BOC pass rates, those programs in the high active learning category were greater than in the low active learning category. Therefore, there is evidence provided to indicate that active learning may provide some benefit to athletic training program curriculum though they may not be measurable with the assessment outcome of the BOC pass rate and other learning outcomes should be examined.

Summary

Responses from the TPI survey instrument and BOC pass rates were recorded and analyzed to answer two hypotheses in this study. Results concluded that athletic training programs that implemented active learning had a much higher mean TPI score, but these programs were significantly less than those that had not implemented active learning methods. Thus, the prevalence of active learning implementation is low among athletic training programs. Additionally, there was no significant relationship between active learning method levels and BOC pass rates as both low and high active learning levels had similar high BOC pass rates. However, the lower mean BOC pass rate were higher for those programs that had higher active learning implementation than those with lower active learning implementation. Therefore, there may be some effect from implementation of active learning methods throughout athletic training curriculum but not significant enough to determine with the BOC pass rate outcome variable.

FIVE: CONCLUSIONS AND RECOMMENDATIONS

Introduction

Within higher education, innovations to current teaching methods need to occur in order to address the needs of students and continue to build on their foundational knowledge. Active learning has been found to be an effective teaching method that places the students' learning at the center of education making them an active component in which they are engaging in problem-solving, skill application, and critical thinking (Chasteen et al., 2011; Wieman, 2007; Wieman, 2012; Wieman, 2014; Wieman & Perkins, 2005). This relates to athletic training for if a student is provided with the structure and guidance to be able to adequately apply their knowledge and skills in a critical manner within the classroom, they will be able to more effectively apply those skills in a real-world setting as they engage with patients and provide best-practice healthcare.

Within athletic training, and other healthcare professions, evidence-based medicine is becoming the norm in providing the most current research supported practices to attain health of individual patients and these same principles should be applied to educational pedagogy. Thus, this study provided an understanding of the current application of active learning into athletic training education and the effect on learning outcomes, filling a gap in didactic strategy improvements. As athletic training educators spend a great deal of time and effort improving teaching techniques, understanding effective methods and practices is vital for professional advancement, and evidence of current trends of active learning practices currently being used is important to understand where continual improvements and research need to be directed for future

athletic training educational success. Therefore, the study's aim will be addressed through proposed solution, implications for implementation of that solution, as well as research and leadership implications, and final conclusions will be presented in this chapter.

Purpose of the Study

The purpose of this quantitative survey study was to explore the prevalence of active learning methods within professional athletic training education programs. In addition, this study also examined the relationship between the active learning methods and the specific athletic training learning outcome of the BOC pass rate.

Aim of the Study

The aim of this study was to evaluate the current status of educational methods in athletic training, specifically active learning, in order to develop a foundation of organizational change among athletic training education programs. Furthermore, this study aimed to compare learning outcomes in order to further the understanding of pedagogical techniques and their effectiveness on educating future athletic training students.

Proposed Solution

Though significant progress has been made over the last fifty years with athletic training education, there are still improvements that need to be made to address course delivery and pedagogical methodology. As many educators within athletic training have not gone through appropriate education or guidance in order to effectively teach, they are having to rely on their own experiences with their instructors. These older practices have centered around more teacher focused lecturing, or "sage on the stage" type methods that

have been found to not be the most effective in developing critical thinking, problem-solving, or other learning outcomes (Chasteen et al., 2011; Mazur, 2009; Turocy, 2016; Wieman & Perkins, 2005). Within higher education, just because a class is occurring does not necessarily imply that those students within the class are learning the materials in a manner that will allow them to apply and solve problems within real-world situations. Therefore, reform must occur in order to provide athletic training educators with the professional development needed to improve their teaching methods toward more "guide on the side" components and overall departmental strategies for effective learning outcomes.

One of the first steps in creating this change in policy and reforming higher educational departments is in descriptive research on classroom teaching (Hora, 2015). As current research provides indication to increase the use, and adoption of, active learning methods, the evidence to support instructors in utilizing these best practice methods is limited. The results of this study identified that active learning methods are not currently being implemented within some athletic training education programs or departments despite the encouragement from previous sources to utilize these research-based methods. Furthermore, though a relationship between active learning use and BOC pass rates was not detected, there were some indications, however, that those programs that have implemented higher levels of active learning throughout their entire department had a slightly increased level of BOC pass rates than those that did not utilize active learning. Therefore, it is recommended that athletic training programs begin to utilize active learning methods throughout their entire department in order to fully develop a

culture that is learner-centered and focused on improving learning outcomes for the athletic training students attending that organization.

Support for the Solution

Though the results of this study did not support the hypotheses, there has yet to have been any research such as this within athletic training education exploring didactic methods. Many studies within science education (Crouch & Mazur, 2001; Freeman et al., 2014; Hake, 1998) and nursing (Corbridge, Corbridge, Tiffen, &Carlucci, 2013; Stevenson & Gordon, 2014) have examined the in-class effect of various active learning methods. Also, within athletic training, these in-class effects have been observed when active learning techniques were implemented (Gillette, 2017; Heinerichs, Pazzaglia, Gilboy, 2016; Heinerichs, Vela, & Drouin, 2013; Lesperance, 2008; Schilling, 2017; Simons & DiStasi, 2008; Tivener & Hetzler, 2015; Thompson & Ayers, 2015; Walker, 2003). However, these disciplines have not examined the overall prevalence of the use of this learning method, especially at the department level. Thus, this study provides evidence to begin developing best practices within athletic training education, enhancing the diffusion of the active learning innovation within athletic training education departments to ensure efficiency and continual improvement of education and the athletic training profession.

The current findings determined that the use of active learning among athletic training programs at the department level is low. This is consistent with research conducted by Hora (2015) in which three large, public university engineering courses were observed to examine teaching practices being utilized (p. 783). When teaching practices were broken down to isolate what was occurring, it was determined that lower

rates of active learning methods were being utilized and the majority of those methods being employed were classified as “being active”, or not going beyond students answering questions when prompted by the instructor or problem solving (Hora, 2015). Though these methods are more effective than simply lecturing and students remaining passive, within class, this is merely a minimal application to facilitate engagement of students, and those methods that are more effective in facilitating learning are less commonly utilized throughout courses (Hora, 2015). Therefore, in developing reforms within classroom teaching, these descriptive findings are important for gaining support.

Alternatively, Kunkel (2016), when examining prevalence of learner-centeredness methods, a component of active learning theory, within the clinical education of professional level athletic training students, reported findings in which these active learning methods were occurring within athletic training clinical education experiences (p. 80). Moreover, when students were surveyed on their perception of preparedness to practice as a Certified Athletic Trainer, those with higher levels of preparedness correlated with higher levels of learner-centered utilization (Kunkel, 2016). Therefore, active learning methods are being utilized within athletic training programs clinical education and positive results are occurring with learning outcomes and self-efficacy, but these methods are not prevalent within the didactic element of athletic education, thus supporting the proposed solution.

Furthermore, as it has been proposed that the adoption of active learning implementation occur department wide, with the findings from the current study, there were indications that the higher utilization of active learning may have some effect on the learning outcome of the BOC pass rate for athletic training programs. Shin (2014), when

exploring the effect of an active learning program on nursing students in regard to educational competencies examined traditional learning when compared to active learning by altering the curricular design of the end of the nursing program (p. 593). By infusing active learning methods into the didactic curriculum for the experimental group in the form of simulations and standardized patients, the newer approach aimed to enhance students' clinical performance and critical thinking abilities as they applied their foundational knowledge to treat patients (Shin, 2014). Findings from Shin's study determined that the overall scores for the competencies were significantly higher for those students within the active learning group than the traditional learning group (Shin, 2014). Therefore, through a more engaging and motivating curriculum students were more willing to participate and that aided them to think critically; suggesting a positive effect when incorporating active learning methods throughout curriculum (Shin, 2014). As nursing curriculum and professional outcomes are similar to those within athletic training, findings from Shin's study may be applied to the proposed solution of incorporating active learning methodology into departmental curriculum.

Furthermore, the current findings found there to be no significant relationship between the level of active learning and BOC pass rates, as it was anticipated that higher levels of active learning implementation would increase the overall learning outcome of higher BOC pass rates. In addition to determining prevalence within clinical education, Kunkel (2016) also examined learner-centeredness, a component of active learning theory, within clinical athletic training demonstrating alternative findings (p. 80). This study found that BOC pass rate have a significant correlation with student perceptions of higher self-efficacy of preparedness for transitioning into practice when greater levels of

learner-centered practices were utilized (Kunkel, 2016). Not only were these components of active learning methods being widely used within the clinical education components of an athletic training program, but it was also determined that these methods correlate to higher BOC pass rates (Kunkel, 2016). Even though the BOC pass rate is a minimum standard required for a program to maintain an 'in good standings' CAATE- accreditation status, this learning outcome is ultimately measuring overall learning and critical thinking abilities of future athletic trainers (*CAATE Standards*, 2012). Therefore, despite the findings within this current study, the BOC pass rate is still an important learning outcome to be used within the proposed solution.

Factors and Stakeholders Related to Implementing Active Learning Curriculum

The main stakeholders related to implementing active learning throughout an athletic training department are the students and faculty with the professional level program. Though tasked with different methods to attain the desired outcomes, both faculty and students share the same goal: to provide and participate in an educational experience that will produce qualified professional healthcare providers able to critically apply their knowledge and skills effectively. To attain this desired outcome, each stakeholder will have challenges to face. Faculty will need to dedicate extra time and effort in re-designing their courses to align with the new direction of the department. Whether they had already been teaching the course, or are designing the curriculum for the first time, active learning course design takes a significant amount of effort as there are concept inventories, assignments, activities, recorded lectures, or problems to create in order to meet the objectives of each course and allow for students to be an active part of their learning, building on prior knowledge and developing critical thinking skills.

Students then, will need to dedicate their time outside of class to participate in completing additional readings and activities, viewing recorded lectures, or other components within active learning curriculum. In order to attain the goal of being proficient in skills and developing a solid foundation of knowledge, students will need to put in extra effort for their studies. As this method is different to what they previously have been exposed to, adjustments will need to be made that will take time, but as active learning is continually utilized throughout an entire department, athletic training students will become used to these changes and begin to be motivated, active participants in their education. Chasteen et al. (2011), when implementing active learning throughout a science department, found that students were more likely to attend study sessions and reported more time on their out-of-class activities as they found the changes to be positive and motivated them to attain excellence (p. 27). Additionally, these students achieved higher scores on assessments and their attendance to classes increased (p. 27). Though the change required of students will be difficult, as adjustments are made eventually the desired students' outcomes will be observed, motivating further student involvement.

Another stakeholder associated with this proposal is the department and university administrators. The department is the critical unit of change for active learning and teaching to be successful (Wieman, 2017). Administrators at the department level control what and how materials are taught. Consequently, for there to be success, administrators must develop a culture, in which there is coherence and collaborative efforts to maximize instructional materials and allow for effective teaching (Wieman, 2017). Providing professional development opportunities, in-services, or workshops may be the support

and resources that faculty need to support these changes and truly transform athletic training programs. Also, administrators throughout the university, related to this department, needs to be committed to these changes in order to adequately allocate resources, whether in personnel or monetary, for this innovation to be successful.

When all of these stakeholders are taken into consideration at the beginning of the innovation of active learning throughout a department, then an emerging culture evolves. An example of this at the University of Colorado, faculty, staff, and administrators came together to address the gap between research supported learning outcomes within science education and application of these evidence-based methods (Chasteen et al., 2011; Wieman, Perkins, & Gilbert, 2010; Wieman, 2017). To begin this process, as a department, those stakeholders involved met to determine the scope of the project, learning goals at the course and program level, documentation and assessment processes, teaching methods, materials to be utilized, and plans for sustainability (Chasteen et al., 2011, Wieman, 2017). For each course a transformational model was utilized that allowed all faculty to provide input and develop a level of engagement within a community, allowing for collaborations to occur in which stakeholders become involved inside and outside of the classroom (Chasteen et al., 2011; Peer & Huston, 2009).

In order to place students at the center of a department's focus, how a department as a whole considers and operates needs to be evaluated. The mission statement, vision, teaching methods, and assessments need to be reevaluated to create a paradigm shift from teaching to learning (Peer & Huston, 2009). Though changes to courses and curriculum is important for making a transformational change within a department, the foundation of cultural change needs to occur for there to be successful innovation and sustainability.

By taking this approach and applying it to the stakeholders associated to an athletic training professional program, implementation and sustainability of the proposed solution is more likely to be achieved.

Policies Influencing the Implementation of Active Learning Curriculum

The Commission on Accreditation of Athletic Training Education (CAATE) along with the National Athletic Trainers' Association (NATA) establishes and mandates the curricular content, competencies, and standards that an athletic training program is required to instruct within their curriculum, but these organizations do not mandate the manner in which these programs may go about these implementations. Furthermore, the institutions accredited by the CAATE are going through a transitional period as all bachelor level programs are required to either teach-out or be offered at the master's level (MAT) by 2020. With this transition to the MAT professional programming, there are new standards that must be implemented but programs are given academic freedom in their approach of these implementations.

CAATE has created new standards that redirect the profession of athletic training by having more concise curricular content areas, but also address the components of a program framework. Specifically, standards two and three of the latest standards indicate that a new framework must be developed that describes how a program is designed, how faculty are engaged within, and how it all relates to the mission of the program (*CAATE Standards*, 2020). With this addition in the newer standards, CAATE has ensured that athletic training programs are addressing policies to adapt the new standards and curricular content as well as including stakeholders within the development, implementation, and assessment. Therefore, departments, stakeholders, and leaders will

need to re-evaluate their current department and program structure, policies, and mission and vision statements to align with these new standards related to the programmatic framework.

One manner that departments and leaders will be able to go about addressing these new standards is through an analysis. By taking some time to explore internal and external elements, as well as the opportunities that may occur in the future, an organization will be able to develop a 360-degree view of the potential strengths and weaknesses within the organization and additionally examine threats that may inhibit productivity or success. Stakeholders will be better able to answer the questions of: "what needs to be changed?", "how should we go about developing these changes?", and "when should these changes be implemented?" Therefore, when attempting any policy changes, an athletic training department needs to perform some type of analysis to be able to answer these questions and establish a sense of direction that will guide the framework that is being required by CAATE for accreditation.

Potential Barriers and Obstacles for Implementing Active Learning Curriculum

With the proposed solution of implementing active learning curriculum within athletic training departments, the ultimate goal should be to improve athletic training professional program teaching, but this attempt runs into many barriers and obstacles that can influence the implementation process. As institutions of higher education have long standing histories of certain traditions, practices, and established cultures, implementing a newer culture and process can be complex. Part of these complexities is the governance system of each individual university or college in getting academic affairs proposals passed. If an institution of higher education requires programs to have curricular changes

approved by either the entire faculty or the academic affairs committee then that will create obstacles in developing the proposed solution as this process can take a significant period of time, delaying implementation.

Though research has demonstrated that students are enthusiastic and motivated by the active environment of the classroom (Wieman, 2014; Wieman & Perkins, 2005), there are still potential barriers that need to be considered with students as their work outside of the classroom will change, and in many cases increase extensively. In order to overcome this barrier, students must be convinced of the benefits and value that they will gain from this new approach (Wieman, 2012). They need to be provided with rationale for the changes and how hard work, focus, and effort will allow them to attain their goals as professional healthcare providers. Then, when they begin to apply the new approach and participate in active learning, they will begin to see the effects and how they will benefit, but for those that will need to make a change in the midst of their program, rationale and explanation will be beneficial in creating change.

In addition, faculty involved in the change may also become a barrier in the development of the proposed solution. In order to create these new courses, faculty will need to be involved, as indicated earlier, and will be the ones using a large portion of their time on developing or re-creating courses. In some institutions this extra time may be spent on research or other responsibilities, so the time that is involved in transitioning courses within a department to be more active learning focused may be a large barrier to change when pursuing this solution (Wieman, 2017). Therefore, compensation or other incentives may need to be considered in order to motivate faculty to continually pursue

this new innovation and improvement to athletic training education. If there are not contingencies made, then faculty may be very resistant to this proposed solution.

Financial/Budget Issues Related to Implementing Active Learning Curriculum

As the majority of the proposed solution is more culturally based and involves a cultural change, there are not many financial considerations to be taken into consideration as equipment is either inexpensive or these innovations do not require any more than typical classroom set-up. However, a few components that may require monetary consideration, if an institution had the means, would be compensation for faculty to address course and curricular changes. As there is a significant amount of time needed to transform courses and create an element of ownership within faculty. Some abilities to compensate faculty may be in course release in their current teaching schedules for the time being, or through monetary compensations for the additional time.

Additionally, supplementary personnel may be hired to aid in curricular and course design. The idea behind these staff members could be to assist faculty in their course changes, allowing for an external viewpoint to ensure that objectives and goals are properly aligning throughout the department. These individuals may also be designated to create these changes and then work with faculty for implementation (Wieman, 2017). Either way that an institution may choose to utilize these curricular specialists, budgets will need to be addressed in order to ensure that there are enough funds allocated for the salary of this individual and that all other budgetary items are still adequately addressed.

Other Issues or Stakeholders Related to Implementing Active Learning Curriculum

Within the different systems of higher education, a current issue is the number related to enrollment and retention. As higher education goes through many changes and

addresses what students are seeking on their return on investment, programs that are making these changes and providing research-based teaching methods that have been shown to improve learning outcomes may be more able to retain students and increase enrollment and recruitment. Within athletic training and healthcare, providing educational programs that engage students and focus on methods that will build on foundational knowledge providing students with the ability to think about a problem critically utilizing a different approach will only enhance patient care. Therefore, if institutions of higher education create changes within their department, then external factors, such as patients, will be benefited by these changes and that will improve an institutions reputation and the program will continue to improve for future healthcare professionals to effectively learn and provide better care.

Additionally, this proposed solution will also affect the NATA and the Board of Certification (BOC). These organizations have a large role in developing the competencies and education that programs should be using toward educating students. However, if athletic training departments implement active learning within their entire department and the curriculum improves, that will enhance the strength of the members within the NATA. Additionally, as professional athletic trainers are better prepared as they enter the workforce, not only will they perform better on the BOC exam, indicating higher levels of learning outcomes, but these professionals will be more competent and better able to apply critical thinking skills, increasing the importance for the athletic training profession and elevating the status among other healthcare professions, which has been a struggle among athletic trainers for many years. Therefore, though the NATA and BOC may provide some issues with the proposed solution, these changes will only

provide benefits to these organizations as professionals continue to improve and enhance the profession and the care that athletic trainers can provide.

Change Theory

The research surrounding the effects of active learning within educational disciplines and implementation is just one component in adopting this proposed solution and having success within higher education. Within higher education, demographics are shifting and with economic issues, the type of student able to afford to attend college has changed (Wildavsky, Kelly, & Carey, 2011). However, just because an institution of higher education needs to change does not automatically indicate that advances will occur. Innovations must be diffused in a method that allows for maximum dissemination and success. Rogers (2003) developed the innovation-decision process in which an advance is introduced to individuals, or groups, and as knowledge progresses on that innovation into a formation of an attitude, a decision is made on whether to adopt or reject (p. 20). In developing change within the proposed solution, collective innovation-decision must occur, in which a consensus is made within the members of an athletic training department in order for all members to conform to the decisions being made and allow for implementation (Rogers, 2003).

In order to facilitate this change theory, the innovation-development process must occur. Typically, this process begins with recognition or identification of a problem or need within an organization (Rogers, 2003). To address this problem, research and analyses are done to assess how to develop solutions towards the problem (Rogers, 2003). The findings from this study provide research to add to the literature for the proposed solution. After the research and analyses have been conducted, development

begins as a new idea is formed to meet the needs of the potential stakeholders (Rogers, 2003). Then the innovation is commercialized and disseminated to those within the department toward enhancing the innovation-decision process before it is officially diffused and adopted by key stakeholders (Rogers, 2003). At the end of this process assessment and determining the consequences and outcomes occurs examining the results from the adoption of this innovation (Rogers, 2003). Within change theory, adoption of an innovation is not simply achieved by addressing those factors once they become a necessity to change but to seek advances for the long-term based on external factors. The following section describes the implementation of active learning curriculum within athletic training departments and will address the innovation-development process within diffusion of innovation theory.

Implementation of Active Learning Curriculum

Using the best practice approach developed through the Science Education Initiative (Wieman, 2017), I would implement active learning curriculum through a series of four steps. First, the faculty and administrators within the athletic training department will be gathered in a series of meetings that will focus on identifying values, beliefs, and practices within the department, ultimately leading towards a new mission and vision statement. This first step is designed to work on the culture of the organization and create support from all those involved in the implementation process. Additionally, administrators and faculty would also agree on the vision and steps associated with this new initiative and would clearly establish responsibilities and expectations for each individual involved in order for there to be effectiveness in carrying out this new strategic plan.

Second, the faculty would gather in order to 1) examine the curriculum and course offerings, 2) determine teaching methods and philosophy, and 3) establish assessment plans (Wieman, 2017). The specific course- and topic-level learning goals would be necessary to map the curriculum throughout the program and to ensure that all faculty are in agreement of what students are to be learning within each course for knowledge advancement and development. The final piece of this step is the establishment of assessments of the specific learning goals as educators need to ask themselves how learning can be measured to determine whether students are achieving the necessary learning outcomes (Wieman, 2017).

Third, faculty will then work on the individual courses. Whether that is re-designing a previous course or designing a new course within the curriculum, utilization of the learning goals needs to be considered as well as the specific teaching methods established from the previous step for the department (Wieman, 2017). Though there are many different approaches to take in achieving this step, the important thing for faculty to consider is that the individual course must align with the established learning goals and assessments previous established (Wieman, 2017). As mentioned previously, if an organization and department have the budget for hiring personnel, then a curricular or education specialist within the athletic training field may be hired to provide another viewpoint in observing curricular design and ensure that faculty are continually aligning their courses and materials with the established learning goals.

Lastly, once the courses have been re-designed and aligned within the active learning model then assessment needs to occur within the course of that class and at the end to measure established benchmarks that will allow for learning outcomes to be

measured. It is important for sustainability of the program for these assessments to occur to allow for reflection and improvements throughout the transformational process (Wieman, 2017). These assessments will vary based on what the individual departments determine as important for their program, but typically within athletic training programs, BOC exam pass rate, course exams, and mock assessments are most commonly used. However, formative and summative assessments throughout individual class periods may be beneficial toward documenting learning. This may be done with concept inventories, quizzes, or polling within classes. Despite what an instructor may choose to implement, they must document these results and provide them to administrators for evidence of learning to be established throughout the course of the transformation of the active learning curriculum and to provide continual improvement in teaching and learning methods.

Factors Related to the Implementation of Active Learning Curriculum

In the consideration of implementation of active learning curriculum throughout an athletic training department I considered the diffusion of innovations by Rogers (2003) and the innovation-development process. Within the implementation plan this process sufficiently addresses the components of recognizing a problem or need, research, development, diffusion and adoption, and consequences (Rogers, 2003).

Recognizing a problem or need. As research on the effectiveness of active learning within education becomes more prominent, educators cannot ignore these elements that will provide for a better learning environment within the classroom. By recognizing the need for improvement on teaching methods, especially with the majority of athletic training faculty never having undergone any formal educational training, the

innovative-development process can begin with stakeholders having more of an open mind set on possible solutions toward solving this problem.

Research. Though the findings from this study as well as those from other studies within athletic training and other disciplines can provide stakeholders with evidence on the effectiveness of active learning methods within higher education and the implementation within an athletic training program, it can also aid in the development and planning process of this implementation. Therefore, faculty and administrators should seek research among other departments to determine how they implemented similar programs. Having evidence and other models to utilize as references may aid in the planning process and provide evidence on the effectiveness of active learning when applied at the department level.

Development. One of the first components of gaining support is through the creation of a vision that will contribute to active learning being perceived as an effective implementation and better than traditional, or current, teaching methods. From examining where a department wants to go in their long-term goals and where and how active learning can fit within that structure, the development of a vision allows stakeholders, especially faculty and department administrators, to understand the rationale and possibilities of the proposed solution. This component is able to address the structure of the active learning program, the different techniques that may be used in implementing different classes, as well as where active learning will fit within the athletic training department. Through this component of the innovation-development process, stakeholders will be able to see the impact that this proposed solution may have on

students, faculty, administrators, as well as the overall university in providing quality education.

Diffusion and Adoption. With active learning having many different techniques and approaches, faculty may find it complex in determining the best method of adapting this proposed solution. This may be one of the largest factors associated with implementing active learning throughout an entire department. Professional development and assistance from administration, or educational experts, may provide mechanisms to allow for diffusion and adoption that restrains the complexity and makes utilizing active learning a more manageable endeavor.

Consequences. The final piece of implementation of active learning within athletic training departments requires those involved to have faith in what they are doing and rely on the research as being accurate and follow implementation in a logical manner (Rogers, 2003). As faculty implement active learning through the newly designed courses, they must rely on the results of assessments to guide they future direction and adaptations. This is a continual process that will require many attempts at trial and error before an effective method is found to work. Students within different programs are different in how they learn, therefore methods will need to continually be adapted depending on the circumstances, but once faculty and administrators analyze those assessments, they may begin to gather evidence within their own programs that will indicate learning outcomes are being met and close the loop of assessments and the innovation-development process.

Leader's Role in Implementing Active Learning Curriculum

Within the employment of active learning throughout an entire department of athletic training, the leader plays a large part in the beginning, middle, and end stages of implementation. The primary role of a leader is to direct the faculty and other administrators in the direction of collectively developing a mission and vision. At the beginning of implementing this solution, a leader must gather support and increase relative advantage (Rogers, 2003). By having all stakeholders play a role in a Strength, Weaknesses, Opportunities, and Threats (SWOT) analysis, a leader will be able to gather 360-degrees of feedback to be able to gain a better perspective of what is currently occurring, strengths and weaknesses of the program, as well as future opportunities, and external threats for long-term success (Bryson, 2011). It is with this first step a leader may begin to develop support from those that will be involved in the development.

Throughout the processes, there are many logistical elements that a leader will need to oversee in order to adequately foster the innovation-development process. A leader will have the responsibilities of: administering funding and managing budgets, providing training to staff to provide a knowledge base on active learning methods and application, advising on course proposals and curricular design, supporting the learning community within the athletic training department, and leading meetings to solicit feedback and provide guidance as the innovation is implemented and throughout the assessment process (Wieman, 2017). It is these elements that a leader must manage to ensure that the implementation process is continuous and not becoming a standstill thus decreasing development.

As the program is proceeding, the leader must also analyze assessment data and determine the effectiveness throughout the department and whether learning outcomes for the program are being met. It is this component of implementation that is important to ensure that active learning throughout the department is being utilized effectively, but also to ensure that learning outcomes are continually aligning through the program. As a leader this aspect of addressing continual assessment and determining where there are gaps and additional support is needed is vital for the long-term success of the implementation of active learning within athletic training (Wieman, 2017). Without a leader to guide the development over time, then implementation may come to a standstill and full success may be difficult to achieve.

Building Support for the Implementation of Active Learning Curriculum

As athletic training education programs have to maintain accreditation in order to graduate students that are eligible to sit the BOC exam, it is imperative that departments have the support from the entire university and academic structures. Within higher education one means of doing this is through the utilization of effective assessment tools. With the use of these assessment tools leaders are able to provide evidence to external stakeholders and other components within higher education that athletic training programs need for implementation of active learning. The BOC exam pass rate has been an overall learning outcome for athletic training programs within the United States, as that is required for accreditation maintenance. While this exam measures an individual's foundational knowledge and critical thinking ability required to enter the profession of athletic training, it however does not necessarily measure the learning that is occurring over time. Therefore, if a leader implements different assessment tools throughout the

department to measure learning effectiveness within course offerings, they will be able to presents that data to higher administration. This will demonstrate the effectiveness of the new curriculum and how the implementation of active learning has improved not only the culture but learning for students as they are more able to critically apply their knowledge and skills. With this kind of evidence, support for continuation of a program within higher education, will be provided as upper administrators begin to understand the effectiveness of this solution, as learning outcomes improve and support for the continuation of this program will be provided.

Evaluation and Timeline for Implementation and Assessment

The implementation for active learning within athletic training departments will depend greatly on the institutions governance system and how curricular changes are handled. If the institution requires these changes to be run through an academic affairs system then the process will take longer, but if it only requires proposals for entirely new programs, then the process may not take as long. Because some athletic training departments differ in how their institution practices academic affairs changes, the implementation plan timeline will be broken down into three phases.

Timeline. Phase one will include the SWOT analysis, or some similar systematic analysis, as well as the development of a mission and vision, and initiating professional development for faculty to become familiar with active learning methods. As the SWOT analysis will require feedback from a multitude of stakeholders, the anticipated time line would be a couple of months to allow the leader to meet with all stakeholder groups deemed necessary. Once this analysis has occurred and the information has been disseminated to the department, then a time period of two to three weeks will be used for

developing a mission and vision. Finally, depending on the type of professional development utilized within the department, this component may be utilized throughout the entire planning phase, occurring while the SWOT analysis, development of mission and vision statements are all being organized. Therefore, professional development, though an ongoing process, may be estimated to last a few months for the initial training to occur.

Phase two will involve the creation of learning objectives, curricular mapping, and the development, or re-design, of courses to align with the learning objectives. Also, within this phase is the development of assessment tools in order for them to align with learning objectives and be considered throughout a course design process. Once the mission and vision have been determined, then development of the learning objectives may begin. It is important to wait until the mission and vision are complete in order to make sure there is complete alignment among the different elements of the department. This portion of phase two is estimated to take two to four weeks for completion. Because faculty will not have time to go through all of the courses within a program at one time, this will be the most time-consuming portion. From beginning to completion, this process will take one to two years. So, if faculty begin in the spring or summer addressing the fall courses of the upcoming year then they can begin to work on spring courses during the fall term and spread out the load of course design. However, if there are some courses that are only offered every other year then this phase will take a little longer for all courses to have been included in the implementation process.

However, despite phase two taking a little longer, phase three may be able to begin after the beginning of the first set of courses is in progress. This phase involves the

actual implementation of active learning methods within courses as well as the beginning of the collection of data. Depending on the assessment procedures determined by the department, this may occur on a daily, weekly, monthly, or bi-annual basis, but assessments will be discussed in the next section. Thus, a complete cycle of assessment data collection will take a year for a full loop of data to be collected and analyzed. It is essential for adequate time to be allowed for multiple rounds of data collection to occur. Therefore, this implementation plan will take some time and consideration before it is completely underway, but an estimated time frame of one to two years will be needed in order for a department to have fully implemented the active learning curriculum throughout their entire program.

Assessment. As stated previously, assessment of active learning throughout an athletic training department may occur in many ways but at a minimum should be assessed annually in order to measure learning outcomes. This can be done with the BOC exam pass rate for an annual measure. However, to truly determine if learning is occurring it would be more beneficial if learning outcomes were measured either on a weekly, monthly, or bi-annual basis. I propose that each faculty member implement an assessment method at the end of every week to measure learning throughout their course. Some effective assessment tools that may be utilized at this level are weekly quizzes, problem-based assignments with associated rubrics, or learner-centered assessments, such as the Learner-Centeredness Scale. With these types of assessments being simple, allowance can be made for maximum participation from students, but also for the collection of data on a regular basis within a course in order to fully measure learning

within active learning curriculum. Thus, allowing for changes and improvements to be made, as needed, for continual long-term development of departmental success.

In addition to assessments for learning outcomes, I also propose that in order to maintain documentation and assurance that active learning methods are being used, a leader could utilize the Teaching Practices Inventory (TPI), as used within this study, or some other inventory, as a means of determining what active learning methods are being performed by each individual faculty member within the department. This assessment can be performed in a self-analysis manner, with each faculty completing the TPI and evaluating their own performance and implementation of active learning. However, an administrator, or leader of the department, may also observe the faculty member through one or multiple classes to complete the TPI. Through the utilization of both of these methods of the TPI, a clearer picture may be attained, and analysis can occur between what the faculty member perceives they are doing and what the observer notices is actually occurring.

Implications

Practical Implications

The current study demonstrated that the prevalence of active learning methods within athletic training at the department level is considerably low, allowing for understanding on the gap between application of techniques and implementation at the departmental level. This is important to the overall cultural element surrounding the teaching and learning component within athletic training education because individual active learning techniques have been shown to facilitate knowledge, critical thinking, and more effective problem-solving abilities within athletic training (Gillette, 2017;

Heinerichs, Pazzaglia, Gilboy, 2016; Heinerichs, Vela, & Drouin, 2013; Lesperance, 2008; Schilling, 2017; Simons & DiStasi, 2008; Tivener & Hetzler, 2015; Thompson & Ayers, 2015; Walker, 2003). However, as there is evidence to support this active learning methodology implementation at the department level within science education (Chasteen et al., 2011; Wieman, 2007; Wieman, 2012; Wieman, 2014; Wieman & Perkins, 2005), these data may aid in the progression of the paradigm shift within athletic training education, from a teacher-centered to a learner-centered approach. Therefore, this study provides athletic training educators and departmental administrators with a foundational component that can be built upon to enhance the educational experience and provides rationale for departments to develop a culture in which all involved are working together to provide active learning methods for a learner-centered program.

It is important to note that while the current study demonstrated this low prevalence within athletic training educational departments, the response rate was relatively low to gather complete representation of all professional level athletic training programs within the United States. Therefore, the findings from this study may not be as complete as if a more robust sample would have been possible. Additionally, if individual faculty members would have been surveyed then more specific results on learning outcomes may have provided a different perspective within athletic training education programs at the class level as has been done within studies examining individual active learning techniques. Because the aim of this study was to gain information about the departmental level, then observing learning outcomes of the BOC exam pass rate and gathering information from the program directors provided a viewpoint of the entire athletic training department for each program. Moreover, if the

Learner-centeredness Scale, or other learning outcome scales, were modified to reflect learning outcomes at the departmental level then perhaps then more specific outcomes may be measured and active learning effectiveness may have provided different results.

The literature suggested that active learning methods at the departmental level are effective techniques in providing students with foundational knowledge while also allowing them to critically apply that information to make decision on various situations (Chasteen et al., 2011; Wieman, 2007; Wieman, 2012; Wieman, 2014; Wieman & Perkins, 2005). The current study supports the literature. Though there was no significance found in this sample between BOC exam pass rates and levels of active learning methods, it was evident that those programs that had higher levels of active learning use within their departments did not have as low of BOC exam pass rate scores as those that did not utilize active learning methods throughout their departments. Therefore, this finding is important as it provides support for the use of active learning within the department level and provides a tool for educators and department administrators in implementing these research-based methods to enhance the educational experience for athletic training students by improving teaching methods that will enhance learning outcomes and effective skill and knowledge application.

Implications for Future Research

As this is an area of research that in which there has been little, to no research, similar to it within athletic training education, there are many different avenues that can be explored based on the findings of this study. First, additional descriptive studies need to be conducted to gather a more representative image of all athletic training professional programs within the United States. Thus, additional survey studies may be needed to

gather more quantitative information. In addition, qualitative data may also be conducted through interviews with faculty and program directors within these programs to gain a more rounded view of current practices within athletic training education.

Though a descriptive study, such as this, is important to develop a basis for policy change, more experimental research may be a next step in determining effectiveness within athletic training classrooms. Freeman et al. (2014) performed a study examining differences between a traditional lecture class and an active learning class (p. 8410). Research such as this examining the individual components will add to the current research available and will supplement the case of policy changes within departments for implementing active learning methods.

The current study and proposed solution indicated full adaptation within an entire athletic training department. Examining case studies in which this mechanism has already been implemented would add to the evidence on effectiveness when compared to individual faculty adaptations. Chasteen et al. (2011) mentions that when implementing a departmental active learning curriculum that there can be some effectiveness from one faculty implementing active learning, but there is more transformational effectiveness observed within learning outcomes if the entire department gets behind the adaptation (p.28). Therefore, examining the effects within those programs that have gone through the implementation process would aid other programs in their approaches.

Finally, examining the student perspective is research that will add to the literature and provide more robust viewpoints with implementation. As students are the ones on which active learning is being implemented and the learning objectives are focused, then it would be beneficial to understand their perspective within this process

and whether they find the methods effective or not throughout the program. As it is important to focus on enhancing students' academic experiences, this effect may be different for faculty and administrators as it is for the students (Welsh, 2010). Thus, gathering perspective from students is beneficial within future research and application of active learning within athletic training departments.

Implications for Leadership Theory and Practice

As higher education continues to evolve to meet the needs of prospective students, the leaders within these organizations will need to influence and motivate all those associated with the institution. Though these leaders may be able to take an approach that addresses the bare minimum of what individuals within an organization need to feel fulfilled, satisfied, and motivated as they go about their responsibilities, this leadership is not completely effective when trying to bring about change. To be an effective leader, one needs to influence others in a manner that motivates contributions for overall success of the group and the specific aims and goals that have been established (Haslam, Reicher, & Platow, 2011). These leaders must be able to convince those they work alongside to contribute to the overarching mission and encourage ideas that will add to the vision of bringing about change (Haslam, Reicher, & Platow, 2011). A cultural change is at the forefront of this effective leadership, shifting the focus from each individual and internal focus to the group and an external focus that will aid the greater good.

What active learning and the implementation of this curriculum within higher educational departments does is allow for administrators and faculty to harness what each individual may want to do and uses that as visionary changes within the culture and the

group identity. Transformational leadership may aid in this evolution. These leaders are more likely to increase self-esteem, competence, and fulfillment within individuals, changing the very nature of a group (Johnson, 2015). When a leader takes the time to work individually with a follower, they provide them with empowerment as they begin to develop personally based on their individual goals and strengths. And when a leader takes that information and guides it in an avenue that will allow for a sense of interdependence among team members then a new culture develops in which all begin to have the same goals and aims. As transformational leaders engage and energize those they work with, they allow all within a group to become focused on a shared goal and objective (Johnson, 2015). Therefore, as athletic training education begins to shift to a learner-centered focus, leadership approaches that engage and transform the faculty in a departmental emphasis enhances motivation and fosters personal strengths and development, allowing for motivation to occur that fosters desirable visions for the future of a program.

Summary of the Study

The aim of this study was to evaluate the current status of active learning methods in athletic training in order to develop a foundation of organizational change among athletic training programs. Furthermore, this study aimed to compare learning outcomes in order to further the understanding of pedagogical techniques and the effectiveness on educating future athletic training students. This was achieved through providing athletic training program directors an opportunity to provide inventory of the active learning practices being utilized within their departments. Through a quantitative survey study, it was found that the prevalence of active learning methods within athletic training

programs was low. Additionally, there was no significant relationship between active learning levels and learning outcomes, specifically BOC exam pass rates. Despite this lack of significance, evidence does indicate that programs with higher use of active learning levels throughout their department had higher levels for lower BOC exam pass rates scores. It can be concluded that active learning methods throughout an athletic training department may have some effect on learning outcomes for athletic training students.

Based on the results of this study, it is recommended that active learning curriculum be implemented within an entire athletic training department. This proposed solution should be implemented throughout a professional-level athletic training department through four steps; 1) developing a new culture with a revitalized mission and vision statement; 2) examination of curriculum as well as determining teaching methods and assessment plans to be implemented; 3) implement individual course development; 4) assessment implementation, collection, and alterations. A leader within this department should consider the innovation-development process of: recognition of a problem or need, research, development, diffusion and adoption, and consequences (Rogers, 2003). Through the utilization of this process in implementing the proposed plan phases, barriers may be reduced, increasing the chances of success.

The current study demonstrated that active learning is not prevalent throughout athletic training departments. Active learning facilitates increase levels of engagement from students within the classroom as well as improved learning outcomes of critical thinking and problem-solving abilities (Chasteen et al., 2011). Therefore, if an athletic training department is not utilizing evidence-based teaching methods, athletic training

students are not receiving educational experiences based on best practices, reducing foundational knowledge and applying that knowledge critically, limiting effective healthcare for patients. From the outcomes of the current study, it is evident that these effective teaching methods are not being utilized much within athletic training education, and with the research to support these techniques, implementation within athletic training educational departments, may improve athletic training education.

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Appendix A

Teaching Practices Inventory of Athletic Training

Demographic Information

1. **Name of Institution:**

2. **Number of Students enrolled in undergraduate program:**

3. **Number of Faculty:**
   a. **Full-time:**
   b. **Part-time/ Split Position:**

I. Course information provided to students via hard copy or course webpage. (check all that occurred in courses)

- ☐ List of topics to be covered
- ☐ List of topic-specific competencies (skills, expertise, …) students should achieve (what students should be able to do)
- ☐ List of competencies that are not topic related (critical thinking, problem solving, …)
- ☐ Affective goals- changing students' attitudes and beliefs (interest, motivation, relevance, beliefs about their competencies, how to master the material)
- ☐ Other (please specify)

If you selected other, please specify _____

II. Supporting materials provided to students (check all that occurred in courses)

- ☐ Student wikis or discussion boards with little or no contribution from you.
- ☐ Student wikis or discussion boards with significant contribution for you or TA.
- ☐ Solution to homework assignments
- ☐ Worked examples (text, pencast, or other format)
- ☐ Practice or previous year's exams
- ☐ Animations, video clips, or simulations related to course material
- ☐ Lecture notes or course PowerPoint presentations (partial/skeletal or complete)
- ☐ Other instructor selected notes or supporting materials, pencasts, etc.
- ☐ Articles from scientific literature
- ☐ Other (please specify)

If you selected other, please specify _____

III. In-class features and activities

A. Various

Give approximate average number:

Average number of times per class: pause to ask for questions _____
Average number of times per class: have small group discussion or problem solving _____
Average number of times per class: show demonstrations, simulations, or video clips _____
Average number of times per class: show demonstrations, simulations, or video where students first predicted behavior and then afterwards explicitly compare observations with predictions _____
Average number of discussions per term on why materials useful and/or interesting from students' perspective _____

Comments on above (if any):

_____

Check all that occurred in your course:

- ☐ Students asked to read/view material on upcoming class session
- ☐ Students read/view material on upcoming class session and complete assignments or quizzes on it shortly before class or at beginning of class
- ☐ Reflective activity at end of class, e.g. "one-minute paper" or similar (students briefly answering questions, reflecting n lecture and/or their learning, etc.)
- ☐ Student presentations (verbal or poster)

Fraction of typical class period you spend lecturing (presenting content, deriving mathematical results, presenting a problem solution, …)

- o 0-20%
- o 20-40%
- o 40-60%
- o 60-80%
- o 80-100%

Considering the time spent on the major topics, approximately what fraction was spent on the *process* by which the theory/model/concept was developed?

- o 0-10%
- o 11-25%
- o More than 25%

B. Personal Response System (PRS)

If a student response system is used to collect responses from all students IN REAL TIME IN CLASS, what method is used? (check all that apply)

- ☐ Electronic ("clickers") with student identifier
- ☐ Electronic Anonymous
- ☐ Colored Cards
- ☐ Raising Hands
- ☐ Written student responses that are collected and reviewed in real time
- ☐ Other (please specify)

If you selected other, please specify _____
Number of PRS questions posed followed by student-student discussion per class _____

Number of times PRS used as quiz device (counts for marks and no student discussion) per class _____

IV. Assignments (Check all that occur in courses)

- ☐ Problem sets/homework assigned or suggested but did not contribute to course grade
- ☐ Problem sets/homework assigned and contributed to course grade at intervals of two weeks or less
- ☐ Paper or project (an assignment taking longer than two weeks and involving some degree of student control in choice of topic or design)
- ☐ Encouragement and facilitation for students to work collaboratively on their assignments
- ☐ Explicit group assignments
- ☐ Other (please specify)

If you selected other, please specify _____

V. Feedback and testing; including grading policies (check all that occurred in your course)

A. <u>Feedback from students to instructor during the term</u>

- ☐ Midterm course evaluation
- ☐ Repeated online or paper feedback or via some other collection means such as clickers
- ☐ Other (please specify)

If you selected other, please specify _____

B. <u>Feedback to students</u> (check all that occurred in your course)

- ☐ Assignments with feedback before grading or with opportunity to redo work to improve grade
- ☐ Students see graded assignments
- ☐ Students see assignment answer key and/or grading rubric
- ☐ Students see graded midterm exam(s)
- ☐ Students see midterm exam(s) answer key(s)
- ☐ Students explicitly encouraged to meet individually with you
- ☐ Other (please specify)

If you selected other, please specify _____

C. <u>Testing and grading</u>

Number of midterm exams _____
Approximate fraction of exam mark from questions that required students to explain reasoning _____%

Approximate breakdown of course mark (% in each of the following categories)

Final Exam _____%
Midterm Exam(s) _____%
Homework Assignments _____%
Paper(s) or project(s) _____%
In-class activities _____%
In-class quizzes _____%
Online quizzes _____%
Participation _____%
Lab component _____%
Other _____%

If you selected other, please specify _____

VI. Other (check all that occurred in your course)

- □ Assessment given at beginning of course to assess background knowledge
- □ Use of instructor-independent pre-posttest (e.g. concept inventory) to measure learning
- □ Use of a consistent measure of learning that is repeated in multiple offerings of the course to compare learning
- □ Use of pre-post survey of student interest and/or perceptions about the subject
- □ Opportunities for students' self-evaluation of learning
- □ Students provided with opportunities to have some control over their learning, such as choice of topics for course, paper, or project, choice of assessment methods, etc.
- □ New teaching methods or materials were tried along with measurements to determine their impact on student learning

VII. Training and guidance of Teaching Assistants (Check all that occurred in your course)

- □ No TAs for course
- □ TAs must satisfy English language skills criteria
- □ TAs receive ½ day or more of training in teaching

- There are Instructor-TA meetings every two weeks or more frequently where student learning and difficulties, and the teaching of upcoming material are discussed.
- TAs are undergraduates
- TAs are graduate students
- Other (please specify)

If you selected other, please specify _____

VIII. Collaboration or sharing in teaching

- Used or adapted materials provided by colleague(s)
- Used "Departmental" course materials that all instructors are expected to use

Discussed how to teach the course with colleague(s)

- 1 Never
- 2
- 3
- 4
- 5 Very Frequently

Read literature about teaching and learning relevant to this course

- 1 Never
- 2
- 3
- 4
- 5 Very Frequently

Instructors sit in on colleague's class (any class) to get/share ideas for teaching

- 1 Never
- 2
- 3
- 4
- 5 Very Frequently

IX. General (open-ended comments)

Please write any other comments here. If this inventory has not captured an important aspect of teaching within your courses, or if you feel you need to explain any of your above answers please describe here.

_____

_____

_____

How long has your program utilized any, or all, of the techniques indicated in this inventory? _____

Appendix B

Dear Participant,

My name is Lisa Bengtson and I am a doctoral candidate at Creighton University, requesting your help to complete a research study on active learning methods within athletic training education. The primary purpose of this study is to explore the current prevalence of active learning methods within athletic training education programs and discover whether a connection exists between these approaches and learning outcomes. Participants are not required to participate and can discontinue at any time without penalty.

This survey consists of questions related to techniques and methods implemented within your athletic training program. The general nature of these questions is to gauge the current practices within your program in order to collectively provide evidence throughout the entire profession. Please follow the link at the end of this letter to an online survey titled: *Teaching Practices Inventory of Athletic Training Education.*

The only potential risk to participants is a breach of confidentiality, which will be prevented by ensuring that all information be kept in an encrypted file only accessible to myself. This study is not expected to be of any direct benefit to you. However, it may lead to recommendations for beneficial teaching methods for educators within athletic training that will provide students with a higher quality of education, which will allow them to achieve better learning outcomes and become more competent healthcare professionals.

Persons who participate in research are entitled to certain rights. These rights include but are not limited to the participant's right to:

1. To have enough time to decide whether or not to be in the research study, and to make that decision without any pressure from the people who are conducting the research.

2. To refuse to be in the study at all, or to stop participating at any time after you begin the study.

3. To be told what the study is trying to find out, what will happen to you, and what you will be asked to do if you are in the study.

4. To be told about the reasonably foreseeable risks of being in the study.

5. To be told about the possible benefits of being in the study.

6. To be told whether there are any costs associated with being in the study and whether you will be compensated for participating in the study.

7. To be told who will have access to information collected about you and how your confidentiality will be protected.

8. To be told whom to contact with questions about the research, about research-related injury, and about your rights as a research participant.

9. If the study involves treatment or therapy:

    a. To be told about the other non-research treatment choices you have.

    b. To be told where treatment is available should you have a research-related injury, and who will pay for research-related treatment.

If you have any questions about the study, please contact Lisa Bengtson. If you have questions about research participants' rights, contact the Creighton University Institutional Review Board.

Your participation in this study is voluntary. If you choose to participate, please follow the link: https://blueq.co1.qualtrics.com/jfe/form/SV_0oYQquuhNyZvEzP and proceed to the survey.

Thank you,
Lisa Bengtson MS, ATC, LAT
Doctoral Candidate
Creighton University

Appendix C

Creighton UNIVERSITY

Institutional Review Board
2500 California Plaza • Omaha, Nebraska 68178
phone: 402.280.2126 • fax: 402.280.4766 • email: irb@creighton.edu

DATE:	March 20, 2018
TO:	Lisa Bengtson
FROM:	Creighton University IRB-02 Social Behavioral
PROJECT TITLE:	[1211139-1] Active Learning Within Athletic Training Education
SUBMISSION TYPE:	New Project
ACTION:	DETERMINATION OF EXEMPT STATUS
DECISION DATE:	March 20, 2018
REVIEW CATEGORY:	Exemption category # *2*

Thank you for your submission of New Project materials for this project. The following items were reviewed in this submission:

Application Form - 402 Application for Determination of Exempt Status Observation, Survey, Interview (1).doc (UPDATED: 03/12/2018)

Creighton - IRB Application Form - Creighton - IRB Application Form (UPDATED: 03/11/2018)

Letter - 408 Template Information letter.doc (UPDATED: 03/12/2018)

Questionnaire/Survey - Teaching Practices Inventory of Athletic Training.docx (UPDATED: 03/12/2018)

This project has been determined to be exempt from Federal Policy for Protection of Human Subjects as per 45CFR46.101 (b) 2.

All protocol amendments and changes are to be submitted to the IRB and may not be implemented until approved by the IRB. Please use the modification form when submitting changes.

If you have any questions, please contact Christine Scheuring at 402-280-3364 or christinescheuring@creighton.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Creighton University IRB-02 Social Behavioral's records.