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Impact of an Educational Gymnastics Course on the Motor Skills and Health-Related Fitness Components of Physical Education Teacher Education Students

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DEDICATION

To my late grandmother, Liana Orsini, who passed away on December 3, 2013. She was always supportive of my educational goals, and I know that she would have been proud to hear that I finished my dissertation and my Ph.D.

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ABSTRACT

Standard 2 of the National Initial Physical Education Teacher Education Standards indicates physical education teacher candidates are physically educated individuals with the knowledge and skills necessary to demonstrate competent movement performance and health enhancing fitness (NASPE, 2008). Many PETE programs seek to develop candidates' content knowledge through various physical activity courses. However, limited empirical evidence exists that links activity courses to the development of content knowledge in the form of motor skill proficiency or fitness outcomes. This study examined the impact of an educational gymnastics course on PETE students' motor skill proficiency and health-related fitness. A mixed method, pre-post no control group design was used. Participants (N = 22) included PETE students enrolled in a 16-week educational gymnastics course. Data were collected from three primary sources including, 1) four individual skills tests and the South Carolina Physical Education Assessment Program elementary school educational gymnastics assessments for combining and sequencing skills, 2) the FITNESSGRAM test battery, and 3) a survey (with a Likert scale and open ended questions) that assessed perceptions related to the qualities of a good instructor of educational gymnastics and comfort level for teaching and performing educational gymnastics. The International Physical Activity Questionnaire served as a secondary data source. Pre-test and post-test scores on motor skills assessments were analyzed in separate related-samples Wilcoxon signed rank nonparametric tests to determine if there was any improvement in educational gymnastics

skills. The pre-test and post-test scores on each item of the FITNESSGRAM fitness test battery were analyzed using separate, repeated measures within-subjects analysis of variance (ANOVA) tests to determine if there were any improvements in fitness. A Spearman's rho correlation coefficient was used to analyze whether any relationships existed between motor skill level and fitness. Responses to the two Likert Scale survey questions were analyzed using separate, repeated measures ANOVA tests to determine if there were any changes in comfort levels with teaching and performing educational gymnastics. The open-ended survey data were analyzed qualitatively using constant comparison. Findings indicate that motor skill proficiency improved significantly on all educational gymnastics tasks from pre-test to post-test. Scores improved on the Curl-Up and Body Composition tests from pre-test to post-test. Scores on the 90° Push-Up and Back-Saver Sit and Reach tests improved, although not significantly. Scores on the PACER test decreased significantly from pre-test to post-test. Primary findings suggest 1) an educational gymnastic course can improve the content knowledge/motor skill proficiency of PETE students, 2) a relationship may exist between certain fitness indicators and motor skill level across the stages of content development in educational gymnastics and 3) comfort level for both teaching and performing educational gymnastics can be significantly impacted by an educational gymnastics course. The results of this study may be used by PETE programs to make decisions regarding the inclusion of an educational gymnastics course in their programs as such a course may help assure that teacher candidates are physically educated individuals who are able to demonstrate competent movement performance and health enhancing fitness (NASPE, 2008).

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ABBREVIATIONS

CAEP ..... Council for the Accreditation of Educator Preparation

HFZ ..... Healthy Fitness Zone

IPAQ ..... International Physical Activity Questionnaire

MVPA ..... Moderate to Vigorous Physical Activity

PE ..... Physical Education

PETE ..... Physical Education Teacher Education

SCPEAP ..... South Carolina Physical Education Assessment Program

CHAPTER 1

Introduction

Introduction to the Study

Two components are said to be critically important in teacher preparation: Teacher knowledge in the subject to be taught, and knowledge and skill in how to teach that subject (NCATE, 2006). In the field of teacher education, a teacher's knowledge and skills are known as content knowledge. Content knowledge is important because teachers should be competent in the knowledge and skills that are to be learned by school children (Shulman, 1987). The importance of having content knowledge as a PETE student is reflected in the National Initial Physical Education Teacher Education Standards. Standard 2: Skill and Fitness Based Competence says that physical education teacher candidates are physically educated individuals with the knowledge and skills necessary to demonstrate competent movement performance and health enhancing fitness as delineated in the NASPE K–12 Standards (NASPE, 2008).

Content knowledge in physical education is acquired, in part, during activity courses designed for PETE students (Ayvazo, Ward, & Stuhr, 2010). There is much variability in both the amount and types of content courses provided by Physical Education Teacher Education programs to their PETE students in colleges and universities in the United States (Bahneman & McGrath, 2004). This is due to the long-standing issue of determining exactly what should represent the essential movement

content core for PETE programs (Collier, 2006), and compounded by the issue of curricular space in these programs (Ayers & Housner, 2008).

Educational gymnastics is one content area commonly included in PETE programs. It is an activity with many benefits, to the point that it has been described as a fundamental and critical part of the physical education curriculum that should be offered in preschool through college (Donham-Foutch, 2007). One such benefit is that it promotes abilities related to health and fitness (Werner, Williams, & Hall, 2012; Baumgartner & Pagnano-Richardson, 2010). However, limited empirical evidence exists linking content courses to the development of motor skills or health-related fitness in PETE students.

Statement of the Problem

The purpose of the study is to examine the impact of an educational gymnastics course on physical education teacher education students' motor skills and health-related fitness over the course of a semester.

Research Questions

The research questions that guide this study include:

1) Does instruction in an educational gymnastics course improve the motor skill levels of physical education teacher education students on selected educational gymnastics tasks?

2) Does participation in an educational gymnastics course improve the health-related fitness of physical education teacher education students?

3) Does a relationship exist between physical education teacher education students' fitness and motor skill levels across the stages of content development in educational gymnastics?

4) What do physical education teacher education students consider to be the qualities of a good instructor of educational gymnastics?

Assumptions

Certain key assumptions have been made in order for this study to take place. One assumption is that participants will follow instructions and perform to the best of their ability on the motor skills testing and fitness testing. Another key assumption is that participants will answer truthfully and completely on the survey that will be administered. A final assumption is that participants will honestly report their participation in physical activity outside of class time on the physical activity recall instrument.

Limitations

There are several limitations to this study. One limitation is the relatively small sample size (N = 22). Another limitation is that it utilizes a one-group pre-test/post-test design with no control group. Enrollment in the educational gymnastics course was too low to easily support using a control group. Additionally, having a control group would involve randomly assigning PETE students enrolled in the educational gymnastics course to sit out. It would be unethical to not allow certain PETE students to participate in a required content course for PETE majors. A third limitation is the possible effect of physical activity participation outside of class time on participants' motor skill levels and

health-related fitness. This will be accounted for through the administration of physical activity recalls throughout the semester.

Delimitations

Participants will be undergraduate and graduate Master of Arts in Teaching (MAT) Physical Education Teacher Education students enrolled in an educational gymnastics course during the Fall 2013 and Spring 2014 semesters at the University of South Carolina. The two key criteria for inclusion in this study were 1) being a PETE major and 2) being enrolled in the educational gymnastics course during the 2013-2014 academic year. The university's Institutional Review Board approved the study as "exempt," meaning that neither obtaining informed consent from participants nor informing students that their data would be used as part of a study was necessary.

Since the educational gymnastics course is a physical activity course designed specifically for PETE majors to prepare them for work in K-12 school settings, as opposed to a physical activity course for the general student population, typically only students who are in the major enroll in this course. Students who attempt to enroll in the course who are not PETE majors will be notified of this and advised to drop the course before the drop/add deadline set by the university. In view of the possibility that students who are not PETE majors enroll in the course and do not drop the course by drop/add deadline, they will participate in all of the same activities as the rest of the class, however, their data will simply be excluded from this study.

The measurements selected for this study will be the South Carolina Physical Education Assessment Program for motor skills testing, the FITNESSGRAM test battery for fitness testing, the International Physical Activity Questionnaire as a physical activity

recall instrument, and a survey created by the researcher to address the fourth research question regarding what PETE students consider to be the qualities of a good instructor of educational gymnastics.

Significance of the Study

If this study can determine that an activity course in educational gymnastics improves the motor skill levels and/or fitness of Physical Education Teacher Education students, it could potentially benefit many groups. This includes PETE programs at colleges and universities, K-12 school physical education teachers and programs, and students of physical education. PETE programs at colleges and universities will be able to use the evidence that this study provides to better make decisions regarding the inclusion of content courses such as educational gymnastics in their teacher preparation programs. This will in turn impact the content knowledge of physical education teachers as they enter the field, and ultimately the programs and students who they serve.

CHAPTER 2

Literature Review

Introduction

Until recently, physical education teacher education students were not required to demonstrate competence in motor skills or exhibit personal fitness as part of their skillset. This changed with the approval of new accreditation guidelines for physical education teacher education (NCATE, 2013), meriting a closer look at PETE students' ability to perform skills and be physically fit. One content area that is typically included in a PETE program is educational gymnastics. Educational gymnastics is an activity with many benefits, including the potential to develop PETE students' motor skills and health-related fitness. The purpose of this review is to inform the reader on topics related to NASPE/CAEP standards, educational gymnastics and how it is taught, and motor skill and health-related fitness measures. Topics that will be covered include the following: NASPE/CAEP requirements for PETE students, skill and fitness development, educational gymnastics as a unique component of the physical education curriculum, the content of educational gymnastics, how educational gymnastics is taught, research on the relationship between skill and fitness, and measurements of skill and fitness.

Review of the Literature

The first section of the literature review will provide an overview of NASPE/CAEP and the National Initial Physical Education Teacher Education Standards, with a particular focus on Standard 2: Skill and Fitness Based Competence.

NASPE/CAEP standards for PETE students. The Council for the Accreditation of Educator Preparation (CAEP) is the teaching profession's mechanism to help establish quality and accountability in teacher preparation programs. CAEP, formerly the National Council for Accreditation of Teacher Education (NCATE), is the only accrediting organization for colleges, schools, and departments of education that is officially recognized by the U.S. Department of Education. When a school of education is CAEP accredited, it provides an assurance that the school's teacher preparation program has met national standards set by the teaching field and has undergone rigorous review by professionals, policymakers, and representatives. CAEP also includes a network of Specialized Professional Associations (SPAs). The SPA recognized by CAEP for the subject area of physical education is the National Association for Sport and Physical Education, or NASPE (NCATE, 2013). NASPE is a professional association and national authority on physical education. NASPE sets the standards for best practices in quality physical education and teacher education in physical education (American Kinesiology Association, 2014).

In 2008, NCATE approved a new set of standards and guidelines for physical education teacher education (NCATE, 2013). There are a total of six National Initial Physical Education Teacher Education Standards, addressing the areas of 1) Scientific and Theoretical Knowledge, 2) Skill and Fitness Based Competence, 3) Planning and Implementation, 4) Instructional Delivery and Management, 5) Impact on Student Learning, and 6) Professionalism (NASPE, 2008). A summary of the six standards is presented in Table 2.1.

Table 2.1 National Initial Physical Education Teacher Education Standards

Standard 1: Scientific and Theoretical Knowledge	Physical education teacher candidates know and apply discipline-specific scientific and theoretical concepts critical to the development of physically educated individuals.
Standard 2: Skill and Fitness Based Competence	Physical education teacher candidates are physically educated individuals with the knowledge and skills necessary to demonstrate competent movement performance and health enhancing fitness as delineated in the NASPE K–12 Standards.
Standard 3: Planning and Implementation	Physical education teacher candidates plan and implement developmentally appropriate learning experiences aligned with local, state, and national standards to address the diverse needs of all students.
Standard 4: Instructional Delivery and Management	Physical education teacher candidates use effective communication and pedagogical skills and strategies to enhance student engagement and learning.
Standard 5: Impact on Student Learning	Physical education teacher candidates utilize assessments and reflection to foster student learning and inform instructional decisions.
Standard 6: Professionalism	Physical education teacher candidates demonstrate dispositions essential to becoming effective professionals.

Standard 2 is designed to promote skill and fitness based competence. According to Standard 2, physical education teacher candidates are physically educated individuals with the knowledge and skills necessary to demonstrate competent movement performance and health enhancing fitness as delineated in the NASPE K-12 Standards (NASPE, 2008).

Each standard is divided into Element Statements. Standard 2 has three Element Statements that describe what a teacher candidate should know and/or be able to do. Furthermore, NASPE (2008) dictates what is considered to be Unacceptable, Acceptable, and Target for teacher candidates (TC) for each Element Statement. A summary of the Standard 2 Element Statements, including what is Unacceptable, Acceptable, and Target for each, is provided in Tables 2.2, 2.3, and 2.4.

Table 2.2 Standard 2 Element Statement 2.1

Element Statement	Unacceptable	Acceptable	Target
2.1: Demonstrate personal competence in motor skill performance for a variety of physical activities and movement patterns.	TC can demonstrate all fundamental movement skills at the automatic stage, but only in isolation (a non-authentic environment; not within a variety of physical activities or in coordination with other movement patterns). TC demonstrates movement skills at the control level. Skills competency is at the recreational level of motor performance.	TC demonstrates all fundamental movement patterns at the automatic stage in an authentic environment. TC demonstrates the ability to combine movement patterns into a sequence. TC demonstrates movement skills at the utilization level across a variety of physical activities. TC demonstrates competency in a variety of physical activities.	TC demonstrates all fundamental movement patterns at the automatic stage in an authentic environment. TC demonstrates the ability to combine and adapt skills during game play. TC consistently performs at the utilization level of motor competency across all activities. TC demonstrates proficiency in a variety of physical activities.

Table 2.3 Standard 2 Element Statement 2.2

Element Statement	Unacceptable	Acceptable	Target
2.2: Achieve and maintain a health-enhancing level of fitness throughout the program.	TC performs below the age- and gender-specific levels for one or more of the 5 components of health-related physical fitness (cardiorespiratory endurance, muscular strength, muscular endurance, flexibility, and body composition) using standards established by national, state or program level testing.	TC meets the age- and gender-specific levels for each of the 5 components of health-related physical fitness (cardiorespiratory endurance, muscular strength, muscular endurance, flexibility, and body composition) using standards established by national, state or program level testing.	TC exceeds the age- and gender-specific levels for each of the 5 components of health-related physical fitness (cardiorespiratory endurance, muscular strength, muscular endurance, flexibility, and body composition) using standards established by national, state or program level testing.

Table 2.4 Standard 2 Element Statement 2.3

Element Statement	Unacceptable	Acceptable	Target
2.3: Demonstrate performance concepts related to skillful movement in a variety of physical activities.	TC cannot select what to do and/or cannot execute that selection appropriately in the authentic environment for a variety of physical activities. TC uses ineffective strategies in attempting to create open space (offensive tactics) or close open space (defensive tactics) while participating in physical activity.	TC correctly selects what to do and executes that selection appropriately in the authentic environment for a variety of physical activities. TC can apply strategies that effectively create open space (offensive tactics) and close open space (defensive tactics) while participating in physical activity.	TC correctly selects what to do and executes that selection appropriately in a variety of activities. TC executes advanced strategies using skills at appropriate times and/or appropriate situations. In addition, TC anticipates and gains an advantage while participating in physical activity.

Based on Standard 2, and in particular the Targets for Standard 2 Element Statements, it is clear that being personally competent in motor skill performance and being physically fit are valued parts of a PETE student's repertoire according to NASPE. It follows that research in the areas of PETE students' skill and fitness levels would be valuable.

This section provided an overview of NASPE/CAEP and NASPE standards for PETE students, with a particular focus on National Initial Physical Education Teacher Education Standard 2 and its corresponding Element Statements. The next section will focus on research on skill and fitness development in PETE programs.

Skill and fitness development in PETE. In the sections that follow, the literature on the reasoning behind Standard 2 will be examined. The first section will review the literature that suggests effective teachers should be skilled. The second section will

review the literature that suggests effective teachers should be physically fit. Lastly, the third section will contain strategies that teacher education programs have employed to ensure that PETE majors are skilled and fit.

Evidence that effective PE teachers should be skilled. Competence in motor skills is important to being an effective physical education teacher (Capel & Whitehead, 2010; NASPE, 2009; Mitchell, 2007; Bailey, 2001; Staffo & Stier, 2000; Martens, Burwitz, & Zuckerman, 1976). Physical educators, coaches, and other fitness and physical activity professionals exert a strong effect on youth as role models. Role modeling can influence motor skill acquisition (NASPE, 2009). Physical educators and coaches often demonstrate the skills that they want their students and athletes to learn as part of the instructional process. Demonstration as a method of skill modeling is an important part of skill instruction (Staffo & Stier, 2000).

Demonstration has been found to be a critical aspect of presenting information to learners (Martens et al., 1976). The ability to provide clear, appropriate demonstrations is an essential skill in physical education lessons. Demonstrations provide a clear visual picture of the task or skill to be performed (Bailey, 2001). It is important for the physical education teacher to be able to demonstrate competently, because pupils imitate good practice in order to become more proficient. Effective demonstrations set up tasks quickly, help pupils to better understand tasks, and help them to recognize their value in the learning process (Capel & Whitehead, 2010).

Evidence that effective PE teachers should be fit. Being personally fit is also important if one is to be an effective physical education teacher (Gold, Petrella, Angel, Ennis, & Woolley, 2012; Kamla, Snyder, Tanner & Wash, 2012; NASPE, 2009;

Mitchell, 2007; Cardinal, 2001; Thomson, 1996; Melville & Maddalozzo, 1988). Physical educators, coaches and other professionals in fitness and physical activity carry strong modeling status among many children and youth (NASPE, 2009). Research suggests that physical education teachers modeling a physically active lifestyle can exert a positive influence over youth (Cardinal, 2001; Melville & Maddalozzo, 1988). Physical education teachers modeling a lifestyle that promotes fitness and physical activity are better able to reinforce student learning about fitness concepts and will influence their students to adopt similar lifestyles (Kamla et al., 2012). On the other hand, it is unlikely that students can be motivated to value fitness, an active lifestyle, and skillful performance when the message is delivered by a physical education teacher who is not fit, active, or highly skilled (Mitchell, 2007).

A recent study by Gold et al., (2012) examined students' perceptions of the physical educator as a role model based upon physical appearance. The study examined 1) the effect appearance had on the instructors' ability to instill exercise intentions, 2) the effect the instructor's body image had on their credibility, 3) the students' perceptions of the instructor as being knowledgeable, 4) the students' belief that the instructor was a role model, and 5) the effect of gender on students' perceptions. Over 800 middle school students completed a survey which consisted of four images with varying body types, from physically fit to obese. The results of the study provided empirical evidence of the disconnect between the professional physical educator's appearance and his/her message to students (the importance of engaging in good health behaviors and leading an active lifestyle). Physical educators need to take seriously their duty to be a role model for

fitness by being physically fit themselves, as children and adults alike are more likely to follow a physically fit individual who advocates physical fitness (Gold et al., 2012).

In addition to role modeling, there is evidence that a physical education teacher's appearance of fitness may matter from a pedagogical perspective (Melville & Maddalozzo, 1988; Thomson, 1996). A study conducted by Melville & Maddalozzo (1988) revealed that a physical educator's appearance of fatness has an effect on students' learning of exercise concepts. A total of 850 students viewed one of two 20-minute videotapes in which exercise concepts were presented. In one of the tapes the instructor appeared to be fit, and in the other tape the instructor was made to look overweight with a "fat suit." Students completed a content examination and questionnaire immediately after viewing the tapes. Results revealed that students who watched the "overweight" instructor's tape scored lower on all aspects of the examination. Additionally, they viewed the teacher as less of an expert, thought that the instructor did not engage in physical activity, liked the teacher less, and tended to engage in less exercise.

Finally, the consequences of future physical educators being or appearing unfit may be felt on a personal as well as a professional and societal level (Staffo & Stier, 2000). A lack of fitness can reflect negatively on the physical activity professional and even hinder employability (NASPE, 2009). Personnel responsible for hiring physical educators may intentionally or inadvertently discriminate against candidates who seem unfit or present an image of being less than physically fit (Staffo & Stier, 2000). Accordingly, NASPE recommends that physical activity professionals strive to achieve at least minimum levels of each component of health-related fitness (NASPE, 2009).

Strategies for assuring that PETE majors are skilled and fit. A major way that physical education teacher preparation programs ensure that PETE students are skillful in a variety of movement forms is by building their content knowledge via physical activity courses. PETE programs use a variety of strategies to ensure that their majors are physically fit, including fitness testing and screening, fitness programs, advising/counseling on fitness, and other interventions. The strategies used for improving PETE students' skills and fitness will be discussed individually in the sections that follow.

Content knowledge. In the field of teacher education, content knowledge, also known as subject matter knowledge, has been said to be the first source of the knowledge base. It refers to the knowledge and skills that are to be learned by school children. The teacher serves as the primary source of student understanding of the subject matter (Shulman, 1987), therefore, teachers should have a reasonable mastery of the content they will teach to their students (Siedentop, 2002). Content knowledge is typically acquired during content courses designed for teacher candidates (Ayvazo et al., 2010). These courses usually aim to help teacher candidates acquire substantive knowledge of the subject, including specific information, ideas, and topics (Ball & McDiarmid, 1990). Mathematics education majors, for instance, take courses in mathematics at the university as part of their teacher preparation programs. This content knowledge that they receive in mathematics is clearly related to the content that they will teach to children in schools. In physical education, content knowledge may be gained and demonstrated both at the cognitive level and the performance level (i.e., within their motor skill and fitness competence/ability).

Unfortunately, the content knowledge domain for physical education is not as easily identifiable as in other subject areas, making it a source of controversy in the field (Siedentop, 2002). If physical education teacher education programs were to prepare their majors with courses in the content most closely connected with school physical education, they would require them to take courses in such areas as sports, movement, and fitness. In PETE programs, these are often referred to as "activity," "performance," or "skills" courses. However, determining exactly what should represent the essential movement content core for PETE programs is a long-standing issue (Collier, 2006). A 2004 study sought to identify and enumerate the activity course requirements of PETE programs in colleges and universities throughout the United States. It was found that there are discrepancies relative to what constitutes movement content and how much emphasis or space is given to the movement curriculum in PETE programs in the US. Of the 180 programs that participated in the study, less than half required any type of fitness activity. Approximately half (49% or more) required the following 12 activities: Aquatics, badminton, basketball, field hockey, golf, gymnastics, softball, team handball, track and field, volleyball, wrestling and football (flag or touch). Movement skills such as locomotor and manipulative skills were required by all (100%) of the programs, however, the credit hour requirement ranged from one to three credits (Bahneman & McGrath, 2004).

The issue of curricular space in PETE programs is significant (Ayers & Housner, 2008). Even when activity courses are present within teacher certification programs in physical education, many programs have seriously reduced the credit hours for these courses. Furthermore, some have no within-program requirements for these courses

whatsoever (Siedentop, 2002). Programs may instead choose to offer more courses in the kinesiology disciplines, such as biomechanics, exercise physiology, motor learning, and sport psychology. Other programs fill their programs of study with credit hours in pedagogy courses, such as courses in methodology and curriculum. A 2008 study by Ayers and Housner sought to identify how PETE programs in the US allocate courses, field experiences, and other learning activities as well as areas that may be receiving inadequate curricular attention. Of the 116 programs that participated, it was found that, on average, only 9.61 credits in a 130-credit-hour program (55 credit hours in the major) were allocated to what teachers will be expected to teach in K–12 programs. Meanwhile, an average of 18.2 credits in a 130-credit-hour program was allocated to disciplinary courses, and another 16.10 credits on average to courses in pedagogy (Ayers & Housner, 2008).

When content courses are included a PETE program, they are typically offered as one-credit, single-sport experiences. However, this approach may limit the breadth of activities that can be taught. As an alternative, some programs conserve curricular space and manage the volume of sport skill-related courses typically provided in PETE programs by classifying sports into categories. Providing content in this manner can benefit PETE students by demonstrating how to organize K–12 content into conceptual categories to take advantage of the time available in their programs (Ayers & Housner, 2008). Instead of teacher candidates taking a course in basketball, a course in soccer, and so on, they may take a course in "team sports," for instance. Similarly, instead of taking separate courses in badminton and tennis, majors may take a class in "dual sports."

In terms of how content knowledge courses should be structured, delivering content knowledge courses within the context of a curricular model may facilitate a better understanding and hands-on experience with the model. It is recommended that content courses include sequences of tasks that help PETE students learn the content progressively. Teacher candidates should learn and be assessed on all of the following: 1) the rules and etiquette of the activity, 2) the techniques or tactics required to perform the activity, 3) common errors in performance, and 4) tasks that facilitate learning of the content. Teaching physical education is enhanced if the teacher has been able to perform the content to be taught, therefore, one primary objective of content courses is to help teacher candidates to develop performance competence associated with the activity. Additionally, content knowledge courses should train teacher candidates to analyze performance and to detect and correct errors in performance (Ayvazo et al., 2010).

Fitness testing and interventions. PETE students lacking fitness or skill may not have a sense of professional obligation to improve on their own (Mitchell, 2007), and little can be done to improve the habits of physical educators once they have entered the field (Staffo & Stier, 2000). That puts the responsibility of ensuring that PETE majors are fit in the hands of the programs preparing these students. Mitchell (2007) says that while accreditation agencies can offer guidance, teacher educators (PETE faculty) in individual programs are better positioned to make these decisions. Among the suggestions of Melville and Maddalozzo (1988) following their study on the appearance of physical education teachers were that departments should help students in developing special long-term fitness programs, establish exit standards for graduating majors, and/or provide some type of post-graduate follow-up assistance for unfit graduates.

Staffo and Stier (2000) agree that colleges and universities with PETE programs are in an excellent position to help future teachers in the area of fitness. Some institutions have already taken steps to ensure that their PETE majors are fit and to screen out those who are not. Standardized physical fitness tests have been used to determine which students may proceed to the latter stages of the PETE program. Those students who fail to demonstrate fitness competency are not allowed to graduate with teacher certification in physical education. In another program, PETE students must complete an entry and exit physical fitness test as well as continued wellness/fitness advising (Staffo & Stier, 2000).

In their study of the fitness testing practices in PETE programs across the country, Staffo and Stier (2000) found that of the departments requiring fitness testing, 36% used the tests to help screen or "weed out" teacher certification students who are not physically fit. PETE students who failed to pass their department's fitness tests faced a wide range of possible consequences. These included requiring students to make satisfactory improvement in subsequent tests, a conditioning class specifically designed to improve the fitness of students who performed poorly on the tests, individual counseling about changing majors, and at worst, elimination from the program.

Currently, CAEP requires programs to list a minimum of six assessments as evidence for meeting the NASPE standards elements. The assessment that addresses each standard element must be identified. One assessment may apply to multiple NASPE standards. Therefore every CAEP-accredited PETE program must submit evidence of at least one assessment reaching the Standard 2 elements. Fitness testing is commonly reported as the assessment for Element Statement 2.2 (see previous section titled

"NASPE/CAEP standards for PETE students"). Staffo and Stier (2000) found that of the programs that fitness tested their students, the most extensively used test was FITNESSGRAM. Examples of assessments that might be submitted for Element Statements 2.1 and 2.3 would be assessments in content or "activity" courses, such as SCPEAP (refer to section titled "Measurement of fitness and skill").

This section covered skill and fitness development in PETE programs, including literature on the importance of motor skill competence, literature backing the importance of PETE students being fit, and strategies for assuring that PETE majors are both skilled and fit. The next section will discuss educational gymnastics as a unique component of the physical education curriculum.

Educational gymnastics as a unique component of the PE curriculum. One content area that is typically included in a PETE program is educational gymnastics. Educational gymnastics is a unique movement form in that it focuses on the functional use of the body rather than manipulation of some type of equipment (as in game/sport activities) or the use of the body in an expressive manner (as in dance). In this section, the literature base of educational gymnastics will be reviewed in terms of 1) the differences between educational and traditional gymnastics, and 2) the nature and benefits of educational gymnastics.

Differences between educational and traditional gymnastics. Gymnastics is an umbrella term that includes many forms of movement. It may be globally defined as any physical exercise on the floor or apparatus that is designed to promote endurance, strength, flexibility, agility, coordination, and body control (Werner et al., 2012). Authors who distinguish educational gymnastics from traditional (also known as "formal,"

"Olympic," or "artistic") gymnastics in their work include Nilges (2008; 2002; 1999; 1997), Williams (1987), Sitzman (1987), Capel (1986), Widdop (1973), and Proyer (1973). This is an important distinction to make, as the type of gymnastics that is taught in school physical education classes (educational) is very different from the Olympic-style gymnastics that one might see on television.

Williams (1987) describes educational gymnastics as a term applied to a form of gymnastics taught in schools. It is based on traditional gymnastics, where Olympic gymnastics is the paradigm example. Williams acknowledges similarities in the content, but in practice educational gymnastics is more loosely structured and there are major differences in the methodology. When it comes to content, similarities include the basic forms of gymnastic movement in balance, rolling, and flight, and in their elaboration in sequences. Mechanically speaking, there are similarities of body action. The differences are seen in the context in which the forms of gymnastics are practiced, the aims and objectives of each, and in the methods of teaching.

Olympic gymnastics is competitive. Objectives are concerned with sequences of action which include set skills that are specific to the sport. The teaching method involves training individual skills, combining the skills into sequences, and having the individual practice to as near a perfect performance as possible. The aim of educational gymnastics, on the other hand, is to develop skill, but always in the context of the ability and understanding of the individual student. The method of teaching is one of guided discovery and self-selection within the limits and freedoms of a general objective (Williams, 1987).

Proyer (1973) suggests that the main differences between traditional and educational gymnastics include the apparatus used, the subject-matter, and the methodology. In traditional gymnastics, which the author calls "formal" gymnastics, the apparatus may be such equipment as parallel bars, beams, or rings. The subject matter is based upon skill-learning, and the teaching style is usually direct. Educational gymnastics, on the other hand, uses non-traditional apparatus, a theme or idea based upon a movement concept is the subject-matter, and indirect teaching methods are used. The purpose of educational gymnastics is development of control of the body in functional movement.

Widdop (1973) sought to clarify the terminology and methodology of gymnastics, and to show the ways in which formal and educational gymnastics differ with regard to teaching methods and type of apparatus used. The author concluded that the terminology used in gymnastic texts can be vague or misleading, and that the choice of teaching method may be influenced by the teacher's and students' backgrounds, and by the apparatus being used. Finally, she identifies the two most usual combinations of methods and apparatus as 1) a method of finality using traditional apparatus, resulting in formal (traditional) gymnastics, and 2) an open-ended method using a non-traditional apparatus, resulting in educational gymnastics.

Capel (1986) provides a similar comparison of educational and traditional (which the author calls "Olympic") gymnastics, saying that they have similar content but differ in their philosophy, aims, objectives, and teaching methods. Similarities of the two approaches include the mechanical and anatomical actions of the basic gymnastics movements. In both types of gymnastics, these are incorporated into sequences which

have both logical structure and aesthetic appeal. In terms of the differences, Olympic gymnastics is essentially competitive and judged by set criteria. The aim is to win, and objectives are related to sequences which include sport-specific skills and actions. Therefore, Olympic gymnastics develops depth within a narrow range. This is in contrast to educational gymnastics, which stresses a broad range of activities and then gradually selects, arranges, and refines them. The aims of educational gymnastics include 1) developing the body's efficiency and skilled use in practical situations when working alone and with others, on the floor and on apparatus, and 2) stimulating an understanding and appreciation of objective movement, coupled with an ability to invent and select appropriate actions.

Sitzman (1987) makes similar distinctions between the two forms of gymnastics. He describes traditional gymnastics (which the author calls "artistic" gymnastics) as a sport with a high threshold of success that requires years to develop the skills necessary to perform at a high level competency. In educational gymnastics, on the other hand, learning a wide variety of movement patterns in a wide variety of situations is key. He describes educational gymnastics as non-competitive, inexpensive, and having a lower entry level threshold in comparison to traditional gymnastics. Educational gymnastics offers youth the opportunity to develop a wide variety of movement patterns, which will fit well into many sports and recreational skills as the youth matures in skill, strength, and endurance.

Nilges (1997) describes educational gymnastics as an alternative for teachers who find traditional gymnastics incongruent with developmentally appropriate physical education practices. Nilges (1999) says that in traditional Olympic gymnastics, students

conform to externally imposed movement patterns. Learners are asked to repeat ideas and perform and practice as told, and this typically results in identical outcomes for all students (Nilges, 2002). Educational gymnastics can be defined as an approach to teaching students the foundational body-management skills of movement and stillness, while focusing on the body, space, effort, and relationship concepts from the movement framework. Educational gymnastics differs considerably from traditional gymnastics in that a variety of student responses is desirable rather than conformity to a single movement form (Nilges-Charles, 2008). The teaching methodology of educational gymnastics will be described in a later section titled "Teaching educational gymnastics."

The nature and benefits of educational gymnastics. The nature and benefits of educational gymnastics can be used to make cases for its continued inclusion in school physical education curriculums, particularly at the elementary level (Werner et al., 2012; Baumgarten & Pagnano-Richardson, 2010; Donham-Foutch 2007; Sloan, 2007; Williams, 1987; Sitzman, 1987; Capel, 1986; Mauldon & Layson, 1979; Beaumont, 1979; Hardy, 1978; and Bean, 1977). Gymnastics has been described as a perfect venue for teaching movement concepts, developing and maintaining overall body fitness, fostering personal and social responsibility, and encouraging self-expression while enhancing self-esteem in a success-oriented environment (Baumgarten & Pagnano-Richardson, 2010). Many view gymnastics as originating in children's natural activities and bringing the natural environment within the range of all children (Mauldon & Layson, 1979). According to Donham-Foutch (2007), gymnastics is a fundamental and critical part of the physical education curriculum that should be offered in preschool through college.

Many agree that involvement within gymnastics can contribute greatly to the all-around development of a child (Sloan, 2007) and that a physical education program in gymnastics benefits children in many areas (Werner et al., 2012). At its best, educational gymnastics is body management using functional movement to master the body. Functional movement is related to body management or the ability to control the body in a variety of positions both moving and while still. It plays a role in sports and everyday life by helping people learn how to manage their bodies efficiently and safely. It is different from other activities in that it includes learning to develop locomotor and balance skills as well as body and space awareness. It improves body management and control and aids the development of locomotive, nonlocomotive, and manipulative skills. The abilities that it promotes relate to health and fitness (Werner et al., 2012).

Moreover, gymnastics can promote cognitive and affective outcomes in physical education and other areas of the school through the development of problem solving, body mechanics, and aesthetic awareness (Werner et al., 2012). It has been claimed to provide opportunities for children not only to acquire specific neuromuscular skills, but also to be initiated into certain social mores, such as sharing, leading and following, and participating in the give-and-take of group situations (Mauldon & Layson, 1979). As such, it should be placed within the broader context of the physical education program, curriculum, and philosophy of schools (Sloan, 2007). It enables pupils to perform at a level at which they feel comfortable and encourages them to be unique. It embraces the promotion of intrinsic rewards such as excitement about sport and personal accomplishment. It allows for an increased level of creativity within a group and promotes a greater degree of individual and group assessment through peer observation.

Beaumont (1979) describes educational gymnastics as an area of the curriculum emanating from the needs, interests, and capabilities of children. Bean (1977) describes educational gymnastics as a process based upon sound educational principles. He credits educational gymnastics for acknowledging many fundamental aspects of educational theory: The awareness of individual differences and standards, the concern for creativity, and the need for greater movement understanding. He describes educational gymnastics as a subjective process, where content and approach are related to the needs and aptitudes of the individual. Hardy (1978) suggests that through educational gymnastics tasks, the child learns how his own body structure functions in a variety of situations. The author goes on to suggest that educational gymnastics taught to primary school children might be beneficial not only to their development as "total" human beings, but also to their future development in motor skills.

Capel (1986) describes educational gymnastics as an ideal medium through which the goals and objectives of physical education in elementary school may be achieved. According to this author, gymnastics provides opportunities for inventiveness, creativity, challenge, and adventure. She says that a well-planned educational gymnastics program contributes to the total development of the child, and that gymnastics builds increasingly complex body management and control skills which are the bases for later skill learning. Sitzman (1987) also promotes educational gymnastics in the primary grades, describing it as an ideal program for the elementary schools. Overall, educational gymnastics can be described as a form of movement in which everyone can find meaning and satisfaction and some understanding of their own movement ability (Williams, 1987).

Educational gymnastics clearly offers a multitude of benefits to learners. A summary of the benefits just described is provided in Table 2.5 below.

Table 2.5 Summary of the Benefits of Educational Gymnastics

Benefits of Educational Gymnastics	Source
-Uses functional movement to master the body -Helps people learn how to manage their bodies efficiently and safely -Improves body management and control -Develops locomotive, nonlocomotive, and manipulative skills -Develops BSER movement concepts -Promotes abilities that relate to health and fitness -Cognitive and affective outcomes such as in the areas of problem solving, body mechanics, and aesthetics	Werner et al., 2012
-Teaches movement concepts -Develops and maintains overall body fitness -Fosters personal and social responsibility -Encourages self-expression -Enhances self-esteem -Environment is success-oriented	Baumgarten and Pagnano-Richardson, 2010
-Contributes to the all-around development of a child -Allows for differences in ability, uniqueness, and creativity -Promotes intrinsic motivation for physical activity	Sloan, 2007
-Allows one to find meaning, satisfaction, and understanding of their own movement ability	Williams, 1987
-Provides opportunities for inventiveness, creativity, challenge, and adventure -Contributes to the total development of the child -Builds increasingly complex body management and control skills that contribute to later skill learning	Capel, 1986
-Provides opportunities to acquire specific neuromuscular skills -Opportunities to develop social skills such as sharing, leading and following, and participating in groups	Mauldon and Layson, 1979
-Allows for learning how one's own body structure functions in a variety of situations -Contributes to children's development as "total" human beings -Contributes to children's future development in motor skills	Hardy, 1978
-Acknowledges individual differences and standards -Allows for creativity and greater movement understanding	Bean, 1977

This section discussed the differences between educational and traditional gymnastics as well as the nature and benefits of educational gymnastics. The next section will focus on the content of educational gymnastics.

Content of educational gymnastics. In this section, the content of educational gymnastics will be discussed in terms of 1) the movement framework and the conceptual basis, 2) schemes for organizing the content, and 3) developing the content of educational gymnastics.

The movement framework and the conceptual basis of educational gymnastics. The movement education framework serves as the basis for educational gymnastics. Abels and Bridges (2010), Rink (2009), Kulinna (2008), Siedentop, Herkowitz, and Rink (1984), and Mauldon and Layson (1979) each help us to understand the movement education approach to teaching physical education.

Abels and Bridges (2010) provide an overview of the history and philosophy of movement education and describe the concepts surrounding this framework. The earliest inklings of movement education occurred in the late 1800s in the field of dance, but the concept did not gain popularity and become known as movement education until the 1960s, 1970s, and into the 1980s. In summarizing the historical development of educational gymnastics, Mauldon and Layson (1979) say that the 1940s and 1950s was a period of innovation, that the material and the methods were clarified in the 1960s, and that the emphasis of the 1970s was theoretically and conceptually oriented. Rudolf von Laban (1879-1958) is considered to be the pioneer of movement education. A critical contribution was his theory of movement, and the four factors Laban identified- weight,

space, time, and flow- are the foundation for what became known as movement education.

Those who came after Laban sought to provide a way of regarding movement and applying this perspective to the teaching of physical education. Logston and colleagues (1977) identified four major movement concepts: body (representing the instrument of the action), space (where the body is moving), effort (the quality with which the movement is executed), and relationships (the connections that occur as the body moves- with objects, people, and the environment). Movement education is about developing a broad skill base so that students can execute many types of movement (Abels & Bridges, 2010). To establish this wide base, the movement education approach uses a specific framework for classifying movement and encourages learners to build a movement vocabulary that they can transfer to all subsequent movement content.

The focus of educational gymnastics is not only on fostering motor success, but also developing cognitive knowledge about movement. Children in movement education programs learn to apply movement elements and create solutions to both simple and complex movement problems. Movement education is adaptable to students of all ages and developmental stages, and serves a thread that runs through all movement in all situations (Abels & Bridges, 2010). Kulinna (2008) describes movement education as students integrating concepts (such as changing directions or using force) into movement skills that are later extended and refined in other units. Movement education assumes that by mastering key concepts of fundamental human movement, students are prepared to explore and succeed in any specific movement format.

According to Siedentop et al. (1984), the purpose of movement education is to develop each child's potential for versatile and skillful movement in a variety of movement settings. The content includes educational gymnastics, educational games, and educational dance. It is primarily focused on Laban's movement framework which is organized by movement concepts rather than by the activity itself or the equipment being used (Siedentop et al., 1984). Rink (2009) describes the framework for the educational gymnastics component as teaching gymnastics as body management skills rather than formal gymnastics skills. The goal is to have students manage their body weight in traveling, balancing, and weight transference actions rather than the development of isolated gymnastics skills.

Schemes for organizing the content. The content of educational gymnastics has been organized in a number of ways, including by themes (Williams, 1987), by the Movement Wheel (Graham, Holt/Hale, & Parker, 2010), and by stages (Nilges, 1997). Each scheme for organizing the content of educational gymnastics will be discussed individually.

Themes. According to Williams (1987), a theme is a particular aspect of movement chosen by the teacher as the focal point around which a series of lessons can be built. The aims of the theme are to bring about certain changes in the understanding and behavior of the students in a class. In educational gymnastics, the teacher will gradually emphasize this one element through a variety of movement experiences, showing how it is present in many different situations and how it can be developed. Williams (1987) classifies themes by the four categories of 1) themes concerned with gross body action, 2) themes concerned with particular body parts, 3) spatial and dynamic

themes, and 4) relationships. Examples of themes concerned with gross body action would be travelling and stopping, transferring weight from one body part to another, flight, and balance. Examples of themes concerned with body parts might include use of hands and arms, symmetry and asymmetry, and emphasis on body surfaces in rolling, falling, and recovery. Spatial and dynamic themes may include such things as levels and directions as well as changes of speed. Finally, relationships would include concepts like partner work and group work.

Additionally, Williams (1987) says that movement themes assume a hierarchical structure. Grouping themes as introductory, intermediate, and advanced is suggested. Introductory themes have different focal points. One such focal point would be action themes, which are basic to all movements. Examples of introductory themes include travelling and stopping (locomotion), weight-bearing, and use of legs and feet. Intermediate themes concentrate on body parts, refining actions, and introducing more challenging tasks. Examples of intermediate themes include use of body surfaces in rolling, rising and falling, and body shape. Finally, advanced themes are for those students who are skilled in movement, as they further refine bodily movement and make heavier physical and aesthetic demands. Advanced themes include such concepts as the relationship of hands and feet, rhythmic patterns, and work in small and large groups.

Movement wheel. Graham is known for the skill theme approach to physical education as well as his movement analysis framework "wheel." According to Graham et al. (2010), skill themes are the fundamental movements that form the foundation for success in sports and physical activities in later years. They say that initially, the focus is on one skill at a time, and then later skills are combined and used in more complex

settings, such as those found in dance, games, and gymnastics. They describe the intent of skill themes as to help children learn a variety of locomotor, non-manipulative, and manipulative skills that provide the foundation to enjoyably and confidently engage in various sports and physical activities.

The movement analysis framework, which has been nicknamed "the movement wheel," is intended to show how skill themes and movement concepts interact with each other. Skill themes are analogous to verbs, or movements that can be performed. They are subdivided into the three categories of locomotor, non-manipulative, and manipulative skills. Movement concepts are analogous to adverbs, describing how a skill or action is to be performed. They are subdivided into the three categories of space awareness (where the body moves), effort (how the body moves), and relationships (among people, body parts, and/or equipment). In essence, movement concepts are employed to enhance, expand, or enrich skill themes. Skill themes can stand by themselves, or movement concepts can modify them (Graham et al., 2010).

Foundational skills and stages. The movement concepts and skill themes from the movement wheel are important to Nilges' (1997) approach, in that the content in Nilges' approach also uses concepts from the movement wheel by Graham et al. (2010). Nilges (1997) organizes her conceptualization of educational gymnastics as a series of four foundational skills across four stages of content development. The four foundational skills include 1) rolling actions, 2) step-like actions, 3) balancing actions, and 4) flight actions. The four stages of content development include 1) Exploration and Variation of Individual Skills, 2) Combining Individual Skills, 3) Beginning Sequence Work, 4)

Advanced Sequence Work. Refer to the next section titled "Developing the content" for more a more detailed description of Nilges' framework.

Similarities exist between the schemes for organizing the content. The stage framework of Nilges (1997) is very much embedded in the movement framework of Graham et al. (2010). Williams' (1987) classification of themes into four categories overlaps with many of the skill themes and movement concepts on the movement wheel as well. Williams' grouping of themes as introductory, intermediate, and advanced is similar to Nilges' stages of content development of individual skills, combinations, and sequencing. Both represent vertical progression in the educational gymnastics curriculum. For the purpose of this study, educational gymnastics will utilize Nilges' framework.

Developing the content. In Nilges' (1997) framework, there are four foundational skills and four stages of content development. Movement concepts such as those found on the movement wheel (Graham et al., 2010) allow the foundational skills to be varied, thus enhancing the movement repertoire of the student. The stages are designed to reduce the educational gymnastics learning process into four broad stages of development. They serve as a generic framework for progressively developing skill, providing physical education teachers with a starting point to begin working with educational gymnastics content (Nilges, 1997).

The four foundational skills of educational gymnastics include 1) rolling actions, 2) step-like actions, 3) balancing actions, and 4) flight actions. Nilges (1997) defines rolling actions as weight transfer over adjacent body parts, citing the forward roll as an example. Step-like actions involve weight transfer onto and off of non-adjacent body

parts, as in cartwheels and walkovers. Balancing involves maintaining a position of stillness, such as in a headstand or handstand. Flight is defined as a weight transfer involving a loss of contact with the supporting surface, such as in a jump.

The four stages of content development include Stage 1: Exploration and Variation of Individual Skills, Stage 2: Combining Individual Skills, Stage 3: Beginning Sequence Work, and Stage 4: Advanced Sequence Work. Stage 1 experiences include the exploration and variation of individual skills, allowing students to develop a broad base of foundational skills in each of the skill themes of gymnastics (Werner et al., 2012). Exploratory tasks are unlimited in structure and challenge students to find many solutions to tasks. In variation tasks, students are guided to vary the task in ways that may not have been considered (Nilges, 1997).

Stage 2 involves learning to combine individual skills into a logical order. Students learn to link two or more skills together using smooth transitional movements. Transitional movements create continuity, which can be thought of as the look and feel of one action resulting as a natural outcome of the previous action. These movements allow one to smoothly transition from one skill to the next without unnecessary or extra movements in between. Transitional movements can take the form of jumps, hops, turns, spins, short periods of traveling, or gradual changes in shape (Nilges, 1997).

Stage 3 and 4 experiences involve sequencing. Creating sequences involves selecting actions appropriate for a given theme and arranging the actions within a framework established by the teacher. A sequence includes a beginning shape, several actions representing the focus of the theme, and finishes with an ending shape. Beginning sequence work is less complex and more limited, in that there is a designated order for

the actions of the sequence to occur. In Stage 3 work, students learn to make choices and narrow their work into limited, repeatable sequences. The focus is on how to put actions that the student already knows together in an aesthetically pleasing way (Werner et al., 2012). As sequence work becomes more advanced, it will require students to both select appropriate actions and order them within the sequence. Stage 4 sequence work distinguishes itself from Stage 3 sequence work with four characteristics: 1) The sequence is more unlimited, 2) work from several themes is integrated into the sequence, 3) students select and arrange their own equipment, and 4) the performance is more fully refined (Nilges, 1997).

Nilges' (1997) four stages represent vertical progression within the educational gymnastics curriculum, however, progression can also take place within the stages, or "horizontally." The number of students involved in a task and the type of equipment used can be manipulated as well. At first, students will work individually and without equipment other than their own mat or floor space. As students gain more experience, they can begin to work in partners, and small pieces of equipment such as hoops or ropes on the floor can be added to enhance the movement experience. Finally, students can progress to working in small groups and being to use larger pieces of equipment, such as benches, vaulting blocks, and other apparatuses.

This section covered the content of educational gymnastics, including the movement framework and the conceptual basis, schemes for organizing the content, and developing the content of educational gymnastics. The next section will focus on the teaching of educational gymnastics.

Teaching educational gymnastics. This section will discuss the teaching of educational gymnastics, including 1) the role of the indirect teaching approach, and 2) the nature of an educational gymnastics task.

The role of the indirect teaching approach. An indirect teaching style is promoted in educational gymnastics. This is a style of teaching that is oriented to discovery, questioning, and problem-solving. Often called "inquiry," it features convergent and divergent thinking. It empowers students to make movement decisions, giving them ownership of the material. They can work at their own level of ability and sequence work in their own unique ways (Werner, Williams, and Hall, 2012). An educational gymnastics setting characterized by indirect teaching is conducive to teachers practicing the best possible pedagogy. It provides a developmentally appropriate approach to teaching gymnastics when varied ability groups exist within a class and teachers wish to meet the needs of all students. The teacher assumes the role of facilitator, and instruction is delivered in a way that transfers decision-making and responsibility to the learner (Nilges, 2002).

The indirect teaching style stands in contrast to a direct teaching style. Also known as "invariant" or "command oriented" teaching, the teacher sets a standard of performance and children attempt to conform to the standard, having little or no choice. Direct teaching is usually reserved for a traditional gymnastics setting; however, it tends to work well at beginning levels of skill development in educational gymnastics. At times, it is appropriate to teach specific skills, principles for good body mechanics, and movement fundamentals directly. It is these aspects that serve as the building blocks from which children can begin to make choices (Werner et al., 2012).

The nature of an educational gymnastics task. Tasks and movement problems in educational gymnastics are designed to allow for differences in students' individual levels (Werner et al., 2012). The method of teaching focuses attention on the best bodily solution for the individual, and no two responses to the same task are alike (Hardy, 1978). Nilges (2002) suggests that it is vital to recognize the relationship between multiple correct solutions as a valued outcome of educational gymnastics. The teacher presents open-ended tasks and invites students to discover and refine actions that fit the parameters of the task.

Examples of beginning educational gymnastics tasks involving individual skills include "Find as many ways as possible to balance using three body parts as bases of support" or "See how many different ways you can come up with to travel across your mat without using your feet." When looking at combination work, an example of educational gymnastics tasks might be "Balance at a high level followed by a rolling action, finishing in a balance at a low level." Finally, an educational gymnastics task involving sequence work might be "Start in a balancing pose in which you match your partner, use a step-like action to part from each other ending up on opposite ends of your mat, roll to the middle to meet again, and finish in a partner balance in which you are mirroring each other."

This section focused on the teaching of educational gymnastics, including the important role of the indirect teaching approach and the open-ended nature of an educational gymnastics task. In the next section, research on the relationship between skill and fitness will be reviewed.

The relationship between skill and fitness. There is an emerging relationship between skill and fitness (Stodden, Langendorfer, Goodway, Ferkel, & Gao, 2012; Webster et al., 2014; Stodden, Langendorfer, & Robertson, 2009; Barnett, Beurden, Morgan, Brooks, & Beard, 2008). Barnett et al. (2008) sought to determine whether childhood fundamental motor skill proficiency predicts subsequent adolescent cardiorespiratory fitness. They found that children with good object control skills are more likely to become fit adolescents, and fundamental motor skill development in childhood may be an important component of interventions aiming to promote long-term fitness.

Stodden et al. (2009) provided the strongest evidence to date on the relationship between motor skill competence and health-related aspects of physical fitness. The study examined the relationship between competence in three fundamental motor skills (throwing, kicking, and jumping) and six measures of health-related physical fitness in young adults (ages 18–25) and found that developing motor skill competence may be fundamental in developing and maintaining adequate physical fitness into adulthood. Stodden et al. (2012) also examined the relationship between motor competence and physical fitness in children and adolescents (456 boys and girls ages four to 13 years). The data demonstrated significant relationships among motor skill competence (throwing velocity, kicking velocity, and standing long jump) and health-related fitness (PACER, curl-ups, push-ups, and grip strength) in children and adolescents. This was also the first study to demonstrate that relationship strengths generally increase over time.

Finally, Webster et al. (2014) examined the relationship between teacher fitness (muscular strength/endurance, flexibility, body composition) and movement competence

in a series of gymnastics skills, based on the role of motor competence in performing effective demonstrations of movement skills to learners. This study is significant because the current National Initial Standards for Physical Education Teacher Education state that pre-service teachers should achieve and maintain a level of health-related fitness consistent with that expected of K-12 learners, and movement competency functions to increase demonstration accuracy when presenting skills to learners. Participants were 115 pre-service PETE, Athletic Training, Early Childhood Education, and Elementary Education students. Results showed gymnastics performance to be directly and significantly correlated with muscular strength/endurance after controlling for previous gymnastics experience. This suggests that muscular strength, especially core (abdominal) strength, could be an important factor in teachers' ability to competently demonstrate certain fundamental skills in educational gymnastics.

Educational gymnastics, skill, and fitness. Several studies have examined the relationship between educational gymnastics specifically and the development of skill and/or fitness (Coelho, 2010; Donham-Foutch, 2007; Farrington, 1985; Davies, 1971; Cottril, 1965). The earliest of these, a 1965 thesis by Cottril, analyzed the relative degree of physical fitness achieved by four women's classes in calisthenics, modern dance, gymnastics, and swimming at the University of Wyoming. The purpose of the study was to determine and evaluate the improvement in physical fitness of the subjects included in the sample group in terms of their performance on selected test items from the AAHPER Youth Fitness Test. The results of the study were as follows: 1) There was significant improvement by members of all four classes on the 50-yard dash, shuttle-run, and standing broad jump, 2) there was significant improvement by members of calisthenics,

modern dance, and gymnastics on sit-ups and the 600-yard run-walk, 3) all of the sample classes did as well as or better when compared to the national norms, 4) the sample classes did as well as or better than the tentative norms established on previous tests at the University, and 5) the shuttle-run was the only one of the five AAHPER test items which showed significant differences in its contribution to fitness when each class's test results were compared to each other class's test results. The author concluded that physical education activity classes promote gains in physical fitness as indicated by the significant improvements made by the classes.

Another early study by Davies (1971) investigated the effects of an educational gymnastics program on the development of selected motor activities. The researcher sought to determine whether boys aged nine to 10 who were taught educational gymnastics would show as much or more progress in a group of selected motor activities as a control group of boys who were taught calisthenics, wrestling, rebound tumbling, and games. Methods involved both groups being given initial and final tests to determine improvement in the motor activities. Twelve weeks of educational gymnastics improved measurements of extent flexibility and grip strength significantly more than the boys in the control group. Additionally, the educational gymnastics group tended to improve more than the regular physical education group in dynamic flexibility, trunk endurance, balance, and gross body coordination.

Farrington (1985) identifies several ways to improve the contribution of gymnastics to health-related fitness, including increasing our own understanding of the subject and the lessons themselves (warm-up, content, and selection of material), sequence building, and apparatus. The author suggests that if we can improve our

teaching of gymnastics, then we can provide a valuable contribution to the overall philosophy of health-related fitness.

Donham-Foutch (2007) describes a gymnastics course that was designed to prepare future physical educators to teach skill progressions through a developmentally appropriate gymnastics program. The goals of the program for participating children were 1) to improve fundamental motor skills (nonlocomotor and locomotor), 2) to improve health-related fitness (flexibility, strength, endurance, and cardiovascular fitness), 3) to develop motor fitness skills (such as coordination, balance, and agility), 4) to provide different methods to introduce gymnastics skills, and 5) to help children at all skill and fitness levels develop the confidence to maintain future lifetime activities. The pre- and post-assessments that were collected for all children showed statistically significant improvement in all skills. These gains, evidenced over a nine-week period in a class that met once a week, strongly suggests that the program was effective.

Lastly, Coelho (2010) makes a case for gymnastics in fighting the decline in motor fitness in children. The author cites the essential role that gymnastics has historically played in the development of physical fitness and in military training and the Center for Disease Control and Prevention's reports that children are becoming more sedentary. He feels that all children deserve the opportunity to develop effective movement skills and motor fitness, and that a solid foundation of motor fitness can be acquired by participating in basic gymnastics activities. Furthermore, in reference to the school physical education curriculum, he indicates that the absence of basic tumbling, gymnastics, and movement skills leaves children unprepared for more complex movement patterns and deprived of functional fitness benefits. To reiterate Standard 2 of

the National Initial Physical Education Teacher Education Standards, physical education teacher candidates should be physically educated individuals with the knowledge and skills necessary to demonstrate competent movement performance and health enhancing fitness as delineated in the NASPE K-12 Standards (NASPE, 2008).

This section summarized research on the relationship between fitness and skill, including the relationship between fitness and skill as it applies to educational gymnastics. The final section of this literature review will be on measurements of fitness and skill.

Measurement of skill and fitness. In the sections that follow, the South Carolina Physical Education Assessment Program (SCPEAP) will be discussed as a tool for measuring students' motor skills, and FITNESSGRAM will be discussed as a tool for measuring students' fitness. These were the instruments utilized for data collection in this study.

SCPEAP. The South Carolina Physical Education Assessment Program (SCPEAP) is a program designed to do state level assessment of physical education programs in South Carolina. SCPEAP is an organizational structure of the South Carolina Alliance for Health, Physical Education, Recreation, and Dance (SCAHPERD). SCPEAP's mission is to develop appropriate assessment material for the state standards and to collect and report assessment data for the State Department of Education (SDE).

The assessment task for elementary school educational gymnastics (second grade) is to demonstrate a sequence of a balance (a shape held still), a roll, and a different balance. Participants should show a clear, still beginning and ending, holding the balances for a minimum of three seconds with clear body shapes. Balances must show at

least two of the following changes: Base of support, level, and/or shape. Standing upright on two feet is not considered to be an acceptable balance for this task. The roll should be performed smoothly with good technique and control. The trunk should make contact with the mat during the roll. Transitions should be smooth getting into and out of the roll. Finally, participants should repeat the same sequence in the second testing trial (SCPEAP, 2007).

The assessment task for elementary school educational gymnastics (fifth grade) is to create, write and perform a gymnastics sequence including a beginning balance and different ending balance with four different movement elements. These movement elements include the following: Mount, travel along, and dismount apparatus, turning or change of direction, change in speed, upright or inverted balance showing clear shapes and extensions held for three seconds, aerial movement (i.e., no handed cartwheel, back flip, etc.) or shape in flight, a skill requiring some support on hands (handstand, cartwheel, round-off), and rolling (linking action). Participants are assessed on having a clear beginning and ending balance (held for at least three seconds with a clear body shape), demonstration of at least four movement elements with good technique, continuity/smooth transitions (one action logically linked to another with no extra steps), controlled use of momentum and balance, and their written narrative matching their performance (SCPEAP, 2007).

FITNESSGRAM. According to the test administration manual, FITNESSGRAM/ACTIVITYGRAM is the national educational assessment, data management, and reporting software program. The primary goal of FITNESSGRAM is education with a focus on lifelong physical activity promotion. FITNESSGRAM physical

fitness assessment program includes a variety of health-related physical fitness tests designed to assess cardiovascular fitness, muscular strength and endurance, flexibility, and body composition (Meredith & Welk, 2010).

Aerobic capacity is perhaps the most important area of any fitness program. A laboratory measure of maximal oxygen uptake (VO2max) is generally considered to be the best measure of aerobic capacity. FITNESSGRAM provides three different field tests of aerobic capacity, including the PACER, the one-mile run, and the walk test. All three tests have demonstrated strong reliability and validity against measured VO2max, but the PACER (Progressive Aerobic Cardiovascular Endurance Run) is the default aerobic capacity test in FITNESSGRAM. The PACER is recommended for a number of reasons, including that all students are more likely to have a positive experience in performing the test, the PACER helps students learn the skill of pacing, and students who have a poorer performance finish first and therefore will not be subjected to the embarrassment of being the last person to complete the test. The objective of the test is to run as long as possible back and forth across a 20-meter space at a specified pace (guided by audio cueing) that gets faster each minute. The test is progressive in intensity. It is easy at the beginning and gets harder at the end. The progressive nature of the test provides a built-in warm-up and helps children to pace themselves effectively (Meredith & Welk, 2010).

Tests of muscular strength, muscular endurance, and flexibility have been combined into one broad fitness category because the primary consideration is determining the functional health status of the musculoskeletal system. It is equally important to have strong muscles that can work forcefully and over a period of time and to be flexible enough to have a full range of motion at the joint. The upper body and the

abdominal/trunk region have been selected as areas for testing because of their perceived relationship to activities of daily living, correct posture, and the development/maintenance of a healthy, well-functioning back (Meredith & Welk, 2010).

The 90° Push-Up is the recommended test for upper body strength and endurance. The benefits are that test administration requires little or no equipment, multiple students may be tested at once, and few zero scores result. It has generally been shown to produce consistent scores. The objective of the test is to complete as many 90° push-ups as possible at a rhythmic pace. FITNESSGRAM recommends the Curl-Up test for measuring abdominal strength and endurance. It is safer and more effective than the sit-up used in many fitness tests. The objective of the test is to complete as many curl-ups as possible up to a maximum of 80 at a specified pace. For flexibility, the Back-Saver Sit and Reach is recommended. The objective of the test is to be able to reach the specified distance on both the right and left sides of the body (Meredith & Welk, 2010).

A number of methods are available for estimating body composition, including underwater weighing, bioelectrical impedance, skinfold measures, and other anthropometry measures such as body mass index (BMI) that are based on height and weight. A number of portable bioelectric impedance analyzer (BIA) devices are now commercially available at a price that is reasonable for most physical education programs. These devices estimate body composition by measuring the body's resistance to current flow. The positive aspects of using BIA devices for FITNESSGRAM are that it is faster and less invasive than skinfold measures, and it does not require specific skill or experience on the part of the test administrator (Meredith & Welk, 2010).

FITNESSGRAM uses a "Healthy Fitness Zone" to designate the range of fitness scores associated with good health. The Healthy Fitness Zone standards were established by the FITNESSGRAM Scientific Advisory Board, which includes some of the foremost scientists and practitioners in fitness and physical activity. Scores falling below the "Healthy Fitness Zone" are categorized as "Needs Improvement" to indicate that efforts are needed to bring the score into the Healthy Fitness Zone. The Healthy Fitness Zone scores are criterion-referenced health standards because they are based on how much fitness a child needs for good health. The FITNESSGRAM assessment battery can be used for personal fitness self-testing, personal best testing, institutional testing, parental reporting, and personal tracking. Institutional Testing is done to help teachers and other educators determine the fitness level of groups of students and may provide direction for curriculum planning (Meredith & Welk, 2010).

This section covered SCPEAP as a tool for measuring students' motor skills and FITNESSGRAM as a test battery for measuring students' health-related fitness. SCPEAP and FITNESSGRAM were the instruments used for data collection in this study.

Summary and Statement of Purpose

This review of the literature included NASPE/CAEP statements on PETE students, skill and fitness development in PETE, educational gymnastics as a unique component of the physical education curriculum, the content of educational gymnastics, how educational gymnastics is taught, research on the relationship between skill and fitness, and measurements of skill and fitness. NASPE/CAEP standards for beginning teachers specifically state that physical education teacher education students should be competent in motor skills and maintain a health-enhancing level of physical fitness.

Educational gymnastics is an activity with many benefits, including the potential to develop PETE students' motor skills and health-related fitness. Therefore, the purpose of this study was to examine the impact of an educational gymnastics course on physical education teacher education students' motor skills and health-related fitness over the course of a semester. The research questions guiding this study are: 1) Does instruction in an educational gymnastics course improve the motor skill levels of physical education teacher education students on selected educational gymnastics tasks? 2) Does participation in an educational gymnastics course improve the health-related fitness of physical education teacher education students? 3) Does a relationship exist between physical education teacher education students' fitness and motor skill levels across the stages of content development in educational gymnastics? 4) What do physical education teacher education students consider to be the qualities of a good instructor of educational gymnastics?

CHAPTER 3

Methods

Participants and Setting

Participants (N = 22) were PETE students enrolled in an educational gymnastics course during the Fall 2013 (n = 10) and Spring 2014 (n = 12) semesters at the University of South Carolina. Nineteen participants were undergraduate PETE students and three participants were Master of Arts in Teaching (MAT) PETE students. Nine participants were female and 13 were male. The typical undergraduate PETE student who enrolled in educational gymnastics was a second-year (sophomore) or third-year (junior) student. All MAT PETE students were in their first year of the two-year MAT program. The typical PETE student enrolled in educational gymnastics had no previous experience or formal training in gymnastics. They were not knowledgeable in gymnastics coming in to the class.

The researcher was the instructor of the course, therefore the terms "researcher" and "instructor" are used interchangeably. The educational gymnastics class met three days per week for 16 weeks totaling 41 class meetings over the course of each semester. Each class was 50 minutes in length. All class meetings took place in an average-sized indoor gymnasium. All data collection for the study took place during the scheduled class meeting times. An exception to this was if students were absent on any testing dates, they were required to make up the test as soon as possible outside of class time.

Procedures and Instrumentation for Data Collection

Approval was obtained from the institutional review board (IRB) for research with human subjects at the university where the study took place prior to any data collection. It was determined that the study fell under the category of Exempt, which meant that it was not necessary to obtain informed consent from participants. PETE students were tested on selected motor skills related to the content of the course as well as on health-related fitness at the beginning of the semester and again at the end of the semester, for a total of two motor skills testing sessions and two fitness testing sessions. To account for participation in any outside activities that could potentially impact health-related fitness or motor skills, PETE students completed physical activity recalls every two weeks in class (a total of eight physical activity recalls were completed). PETE students were also surveyed at baseline on the first day of class and again on the last day of class on their comfort level for teaching educational gymnastics and performing educational gymnastics, as well as on what they believe to be attributes of a good teacher of educational gymnastics content.

In this section, the instruments and procedures followed for data collection in this study will be discussed in detail. The section will begin with a description of the motor skills tests, including the modified SCPEAP assessment, how the assessment was scored, the reliability of the assessment, and procedures for data collection. This will be followed by a description of fitness testing using the FITNESSGRAM test battery, including the protocol for the test items, the reliability of the test, and procedures followed for the collection of data. A description of the short version of the International Physical Activity Questionnaire survey will follow, including the additional questions that were added.

There will then be a description of the survey that was administered. The section will conclude with a description of the treatment verification to summarize the lesson tasks and sample of lessons that were videotaped.

Motor skills. Motor skills in the content area of educational gymnastics were measured at baseline during the first week of class and 16 weeks later during the last week of class using SCPEAP for Elementary School Educational Gymnastics (second and fifth grades). The Elementary School SCPEAP assessments were selected rather than the Middle or High School SCPEAP assessments because the content most closely resembled what is taught in the educational gymnastics class.

Motor skills assessments. The tests for educational gymnastics were divided into three stages. Stage 1 consisted of four individual skills. Stage 2 followed the SCPEAP second grade test protocol involving a combination of skills. Stage 3 followed the SCPEAP fifth grade test protocol involving a sequence of skills. The nature of the three tests will be discussed individually in the following sections. Information on the SCPEAP test items can also be found in Chapter 2 in the "Measurement of fitness and skill" section.

Stage 1: Individual skills. A test of individual skills was included in order to match the skill progression taught in the educational gymnastics class, which is practicing individual skills, followed by combining skills, and finally sequencing. The test of individual skills was created by two experts in educational gymnastics (the researcher and one other expert). Four basic skills were selected to represent each of the four foundational skills of educational gymnastics: Rolling actions, balancing actions, step-like actions, and flight actions. A forward roll was selected as the rolling action, a

cartwheel was selected as the step-like action, a still shape involving standing on one foot with arms out to the sides was selected as the balance, and performing a tuck jump off of a block mat and landing was selected as the flight action. Each of these actions is eventually taught in the educational gymnastics class and generally considered to be safe for individuals to perform without extensive instruction or spotting.

Each of the individual skills had cues associated with quality performance. For the forward roll, PETE students were instructed to keep a C-shaped back (back curled throughout the roll), tuck (chin tucked to chest throughout roll), and keep their feet together. For the balance, they were instructed to make a T-shape with their bodies, keep both legs straight, and hold the balance in stillness for at least three seconds. For the cartwheel, the instructions were to move in a "hand-hand-foot-foot" pattern (one hand is placed on the floor at a time, followed by one foot being placed on the floor at a time), have strong arms, and keep legs straight. For the tuck jump from a block mat, the instructions were to swing upwards (use arms to propel the body upwards and keep arms close to ears), bring knees to chest, and land lightly ("seat to feet").

Stage 2: Combinations. For the combinations of skills (second grade SCPEAP protocol), PETE students were asked to show a balance (a shape held still), a roll, and a difference balance. They wrote down their combination in the specified area of their worksheet, practiced, and performed it. Balances were to show at least two of the following changes: Base of support, level, and shape. PETE students were assessed on the clear shapes at the beginning and the end of the combinations and their ability to hold these shapes still for three seconds each. They were also assessed on how they performed the roll and the transitions (smoothness) getting into and out of the roll (SCPEAP, 2007).

Stage 3: Sequence. For the sequence portion of the motor skills test, PETE students were instructed to plan and perform a sequence. They were permitted to use a mat and a piece of apparatus (such as a block mat or bench). The sequence had to include a beginning balance and a different ending balance with a minimum of four different movement elements: Mount, travel along, and dismount apparatus, turning or change of direction, change in speed, upright or inverted balance showing clear shapes and extensions held for three seconds, aerial movement (i.e., no handed cartwheel, back flip, etc.) or shape in flight, a skill requiring some support on hands (handstand, cartwheel, round-off), and rolling (linking action) (SCPEAP, 2007).

Scoring of motor skills assessments. PETE students were scored using three different rubrics on their ability to perform 1) the individual skills, 2) a combination of skills, and 3) a sequence of skills. The rubric that was created for the scoring of individual skills can be found in Appendix A. Appendix B contains the SCPEAP Elementary School Educational Gymnastics- Second Grade Assessment Task Scoring Rubric. The SCPEAP Elementary School Educational Gymnastics- Fifth Grade Assessment Task Scoring Rubric can be found in Appendix C.

Each of the rubrics used to score the motor skills tests is a four-level rubric where Level 3 is the highest possible score and Level 0 is the lowest possible score. At Stage 1, PETE students initially receive a total of 12 scores, as there are three criteria (the cues) for each of the four individual skills. At Stage 2, they initially receive five scores corresponding to the five criteria. They also receive five scores for Stage 3, again corresponding to the five criteria. However, SCPEAP protocol dictates that one final level must be determined for each participant, and the final level is determined by the

lowest performance level on any component (SCPEAP, 2007). This means that if a participant were to receive a Level 3 on four of the criteria and a Level 1 on the last criteria, their final level would be a 1.

Since Stage 1 is not bound by SCPEAP protocol, it was decided that the mode for each skill would determine the final level. This meant that if a participant were to receive two scores of 3 and one score of 2 on one of the skills, their final level would be a 2. If the three scores were all different, as in the case of a score of 3 for one cue, a score of 2 on another cue, and a score of 1 on the third cue for the same skill, it was decided that the middle number would be the final level. In the case just described, the participant would receive a final level of 2 for that skill. Each participant was therefore given a total of six final scores: A final level for each of the four Stage 1 individual skills, a final level for the Stage 2 combination, and one for the Stage 3 sequence.

Inter-rater reliability was established between the researcher and the same expert who assisted in creating the individual skills tests. They independently scored the motor skills pre-tests of seven of the 10 PETE students who took the educational gymnastics course in Fall 2013. After independently scoring the seven tests, they reconvened to compare scores. A summary of the inter-rater reliability data is presented in Table 3.1 below.

Table 3.1 Summary of Inter-Rater Reliability for Motor Skills Tests

Motor Skills Test	**Scores Agreed Upon (out of 7)**	**% Agreement**
Rolling Action	7	100%
Balancing Action	7	100%
Step-Like Action	6	85.7%
Flight Action	6	85.7%
Combination	6	85.7%
Sequence	6	85.7%

Stability of motor skills assessments. A pilot study conducted in Spring 2013 was used to establish the stability of the motor skills assessments. Eleven undergraduate and MAT PETE students who were enrolled in the educational gymnastics course at the time served as participants for the pilot study. Participants were pre-tested one week and post-tested the next week following the protocol described in the next section. All pilot testing was video recorded. In scoring the pilot test data, inter-rater reliability was established between the researcher and the same expert who assisted in creating the individual skills tests. Three of the 11 participants' pre-test and post-test videos were randomly selected. They worked together to review, discuss, and score the performances until there seemed to be little need for cross-checking. After reaching 100% agreement on all of the pre-test and post-test data for three of the pilot study participants, the researcher independently scored the remaining data. Pre- and post-test scores are presented in Tables 3.2, 3.3, and 3.4. Any instance of a participant's score being different from pre-test to post-test is indicated with an asterisk (*).

Table 3.2 Pilot Study Individual Skills Pre-Test and Post-Test Scores

Partici-pant Number	Rolling Action Pre-test	Rolling Action Post-test	Balancing Action Pre-test	Balancing Action Post-test	Step-Like Action Pre-test	Step-Like Action Post-test	Flight Action Pre-test	Flight Action Post-test
1	3	3	2	2	2	2	2	2
2	3	3	3	3	3	3	3	3
3	3	3	2	2	2	2	2	2
4	2	2	2	2	3	3	2	2
5	3	3	2	2	3	3	2	2
6	3	3	2	2	2	2	2	2
7	3	3	3	3	2	2	2	2
8	3	3	3	3	3	3	3	3
9	2*	3*	2	2	2	2	3*	2*
10	2	2	2	2	3	3	3	3
11	0	0	2	2	0	0	2	2

Table 3.3 Pilot Study Combination of Skills Pre-Test and Post-Test Scores

Participant	Combination Pre-test	Combination Post-test
1	2	2
2	3	3
3	1	1
4	2	2
5	3	3
6	3	3
7	3	3
8	2	2
9	2	2
10	2	2
11	1	1

Table 3.4 Pilot Study Sequence of Skills Pre-Test and Post-Test Scores

Participant	Sequence Pre-test	Sequence Post-test
1	2	2
2	3	3
3	2	2
4	2	2
5	2	2
6	3	3
7	2	2
8	2	2
9	3	3
10	2	2
11	2	2

The pilot study demonstrated that participants' scores on motor skills tests generally did not improve from pre-test to post-test. All scores on the individual skills tests remained the same from pre-test to post-test for 10 of the 11 participants. One participant's score improved on the rolling action from pre-test to post-test, and the same participant's score decreased on the flight action from pre-test to post-test. All scores on the combination of skills and the sequence of skills remained the same from pre-test to post-test for all participants. This suggests that the motor skills assessments were stable and that participants' scores did not improve as a result of taking the test a second time.

Procedures for motor skills data collection. The following sections detail the procedures that were followed for motor skills data collection. This includes a description of the training of assistants, the testing set-up, and testing day procedures that were followed.

Assistants. Three physical education doctoral students were recruited to assist the researcher with motor skills testing. They were recruited on the basis of having assisted in the operation of video cameras during the pilot study in the spring of 2013 and/or for educational gymnastics motor skills testing in a previous study (Webster et al., 2014). The assistants' primary responsibility during motor skills testing was to operate video cameras. The researcher met with assistants prior to motor skills testing taking place to discuss testing protocol and inform each assistant of their assigned camera operating location in the gymnasium.

Testing set-up. Mats for each PETE student (between 10 and 12) were arranged in four rows of two to three mats in the gymnasium. A camera was set up on a tripod at one end of each row of mats for a total of four cameras operating at once. Each camera was set at a wide angle the performers from the side. Placed at the head of each mat was a block mat or a folded panel mat approximately 12 inches high to be used for the Stage 1 flight action skill.

Testing day procedures. Upon arrival, PETE students received a worksheet packet for the planning of the second and third stages of the motor skills tests (see Appendix D). This worksheet packet also served as instructions for students to reference throughout the entire motor skills testing process. The worksheets used for the motor skills test at the beginning of the semester were kept and used again for the motor skills testing at the end

of the semester for scoring purposes. The researcher explained the test protocol to students, and students were encouraged to ask questions. Students were instructed to select a mat and to remain at the same mat for all three stages of motor skills testing. Assistants operated the same camera for all stages of motor skills testing.

The researcher served as the official time-keeper and called out when it was time to start and stop an activity. For Stage 1 of motor skills testing, PETE students had one minute to practice each of the individual skills, followed by one testing trial of each of the individual skills. For Stage 2, they had five minutes to plan and practice their combinations of skills using their worksheets. They then performed two testing trials of the same combination in front of the video cameras. PETE students had 10 minutes to plan and practice their Stage 3 sequences using their worksheets. Each of them then performed their sequence once for the camera. Worksheets were collected from PETE students at the end of each motor skills testing day.

Fitness. Fitness was measured at baseline during the first week of class and 16 weeks later during the last week of class using the FITNESSGRAM test battery. As previously discussed in Chapter 2, the FITNESSGRAM physical fitness assessment program includes a variety of health-related fitness tests designed to assess cardiovascular fitness, muscular strength and endurance, flexibility, and body composition (Meredith & Welk, 2010). The specific tests selected for this study were the PACER test for cardiovascular fitness, and 90° Push-Up and Curl-Up tests for muscular strength and endurance, the Back-Saver Sit and Reach test for flexibility, and the handheld bioelectrical impedance analyzer device for body composition. Each test was selected on the basis of being the test recommended by the FITNESSGRAM program.

The only exception to this was the BIA device for body composition, which was selected on the basis of the handheld BIA devices being available for this study. FITNESSGRAM recognizes this technique as an option; however, the availability of methods for measuring body composition varies among programs. Therefore the Skinfold Caliper is recommended as the default test.

FITNESSGRAM test items. The following sections describe the protocol for the administration of the FITNESSGRAM test items used in this study. For further information on the nature of each test including the rationale, objectives, and benefits, please refer to Chapter 2. All test items required a score sheet and a writing utensil for each participant. A copy of the fitness testing score sheet is provided in Appendix E.

PACER. Administering the PACER requires a flat, non-slippery surface at least 20 meters long (such as a gymnasium floor), a CD player, the FITNESSGRAM CD containing the PACER test cadences, measuring tape, and cones. A 20-meter course is measured in the testing area and marked with cones. Participants are instructed to line up behind the starting line and run across the 20-meter distance and touch the line with a foot by the time the beep (e.g., the PACER cadence) sounds. Participants should take full weight on the foot that is touching the line. At the sound of the beep, the participant turns around and runs back to the other end. If some participants get to the line before the beep, they must wait for the beep before running in the other direction. Participants continue in this manner until they fail to reach the line before the beep for the second time (Meredith & Welk, 2010).

A single beep sounds at the end of the time for each lap. A triple beep sounds at the end of each minute. The triple beep serves the same function as the single beep and

also alerts the runners that the pace will get faster. When the triple beep sounds, they should not stop but should continue the test by turning and running toward the other end of the area. The first time a participant does not reach the line by the beep, the participant stops where he or she is and reverses direction immediately, attempting to get back on pace. The test is completed for a participant the next time (second time) he or she fails to reach the line by the beep (the two misses do not have to be consecutive; the test is over after two total misses). A participant who remains at one end of the testing area through two beeps (i.e. does not run to the other end and back) should be scored as having two misses and the test is over. In scoring the PACER test, a lap is one 20-meter distance (from one end to the other). Participants record the total number of laps that they successfully completed according to protocol on a score sheet (Meredith & Welk, 2010).

90° Push-Up. The 90° Push-Up test requires the FITNESSGRAM CD containing the Push-Up test cadence and a CD player. Participants assume a prone position on the mat with hands placed under or slightly wider than the shoulders, fingers stretched out, legs straight and slightly apart, and toes tucked under. Participants push up off the mat with the arms until arms are straight, keeping the legs and back straight. The back is kept in a straight line from head to toes throughout the test. Participants then lower the body using the arms until the elbows bend at a 90° angle and the upper arms are parallel to the floor. This movement is repeated as many times as possible. The participant should push up and continue the movement until the arms are straight on each repetition. The rhythm should be approximately 20 90° push-ups per minute or one 90° push-up every three seconds. Participants stop when the second form correction (mistake) is made. Only one

form correction is allowed. Participants record the total number of push-ups successfully completed according to protocol on a score sheet (Meredith & Welk, 2010).

Curl-Up. Gym mats, 4.5-inch strips, floor tape, a CD player, and the FITNESSGRAM CD containing the Curl-Up test cadence are needed to administer the Curl-Up test. Participants lie in a supine position on the mat, with knees bent at an angle of approximately 140°, feet flat on the floor, legs slightly apart, arms straight and parallel to the trunk, and the palms of hands resting on the mat. The fingers are stretched out and the head is in contact with the mat. Participants extend their feet as far as possible from the buttocks while still allowing feet to remain flat on floor. Keeping heels in contact with the mat, participants curl up slowly, sliding their fingers across the measuring strip until their fingertips reach the other side. Participants then curl back down slowly until heads touch the mat.

A recorded cadence is used to ensure accurate testing. Pauses and rest periods are not allowed. The movement should be continuous and with the cadence. Participants stop after completing 80 curl-ups, when the second form correction (mistake) is made, or when they can no longer continue. Participants should not forcibly "reach" with their arms and hands but simply let the arms passively move along the floor in response to the action of the trunk and shoulders. Participants should reposition themselves if the body moves so that the head does not contact the mat at the appropriate spot or if the measuring strip is out of position. Participants record the number of curl-ups successfully completed according to protocol on their score sheets (Meredith & Welk, 2010).

Back-Saver Sit and Reach. Administration of the Back-Saver Sit and Reach requires a box approximately 12 inches high with a measuring scale on the top. The box

can be one specifically designed for the FITNESSGRAM test or constructed using a wooden box and a yard stick taped to the top with the 9-inch mark at the nearest edge of the box. Participants remove their shoes and sit down at the test apparatus. One leg is fully extended with the foot flat against the face of the box. The other knee is bent with the sole of the foot flat on the floor. The instep is placed in line with, and two to three inches to the side of, the straight knee. The arms are extended forward over the measuring scale with the hands flat and placed one on top of the other (Meredith & Welk, 2010).

With palms down, the participant reaches directly forward (keeping back straight and the head up) with both hands along the scale four times and holds the position of the fourth reach for at least one second. After one side has been measured, the participant switches the position of the legs and reaches again. The participant may allow the bent knee to move to the side as the body moves forward if necessary, but the sole of the foot must remain on the floor. The trial should be repeated if the hands reach unevenly or the knee bends. Hips must remain square to the box. Participants record their scores for each leg on a score sheet. Participants should record the number of inches on each side to the nearest 1/2 inch reached, to a maximum score of 12 inches. Performance is limited in this way to discourage hypermobility (Meredith & Welk, 2010).

BIA. The FITNESSGRAM test administration manual does not provide a detailed protocol for hand-held bioelectrical impedance analyzers, as this is one of many techniques available for measuring body composition. Administration of the test requires the BIA device. Participants enter their height, weight, age, and gender into the device. The device uses a handgrip system that has participants squeeze the handles while

extending the arms (Meredith & Welk, 2010). Two readings are produced: Body mass index (BMI), and percent body fat. Participants record these readings on a score sheet.

Reliability of FITNESSGRAM. The reliability and validity of the FITNESSGRAM assessments are thoroughly documented in the FITNESSGRAM Reference Guide (Welk & Meredith, 2008). Many experts consider the FITNESSGRAM test battery to be the most psychometrically sound assessment of fitness available for fitness testing in youth. FITNESSGRAM uses criterion-referenced standards that are based on appropriate health-related criteria (Meredith & Welk, 2010). Methods for measuring body composition such as bioelectrical impedance have some limitations leading to overall measurement errors of 2% to 3% for estimates of percent body fat. The BIA device also estimates BMI based on height and weight, which is known to result in 5% to 6% error because body weight reflects muscle and bone mass in addition to fat mass. The reliability of the Curl-Up test is higher for college students than it is for children. The reliability of the 90° Push-Up test depends on how it is administered. Objectivity is a factor in this item because of the necessity of judging the 90° angle. Scores from student partners have been found to be consistently higher than adult counts because students tend to simply count each attempted push-up without evaluating whether it was performed correctly. The Back-Saver Sit and Reach test has been shown to provide extremely consistent scores when administered under standardized conditions. To improve the reliability and validity of the results in institutional testing, it is recommended that teachers closely adhere to the established FITNESSGRAM test protocols (Meredith & Welk, 2010).

Procedures for fitness data collection. The following sections detail the procedures that were followed for fitness data collection. This includes a description of the selection and training of assistants, the testing set-up, and testing day procedures followed in addition to the specific FITNESSGRAM test administration protocol described in the section titled "FITNESSGRAM test items."

Assistants. Three physical education doctoral students were recruited by the researcher to be assistants during fitness data collection. Criteria for selection as an assistant included having previous experience with FITNESSGRAM test administration. Each of the assistants had previous experience as station monitors for the annual fitness testing of PETE students at the institution where the study took place following FITNESSGRAM protocol. Additionally, one of the assistants had the previous experience of acting as a station monitor during another study that involved FITNESSGRAM test administration (Webster et al., 2014).

Training of assistants consisted of the researcher meeting with each assistant several days before the initial administration of fitness testing at the beginning of the fall semester. At this meeting led by the researcher, FITNESSGRAM testing protocol was thoroughly reviewed and assistants were informed of their responsibilities. Responsibilities included setting up the fitness test stations prior to the PETE students' arrival, assisting in supervising PETE students to make sure that they followed protocol and accurately recorded results, and working the video cameras during each test. Fitness testing protocol was reviewed prior to each successive fitness testing day, including at the end of the fall semester, the beginning of the spring semester, and at the end of the spring semester.

Testing set-up. The 20-meter PACER test course was measured out and marked with floor tape in the center of the gymnasium. Cones were spaced 40 to 60 inches apart on the floor tape on each end of the gymnasium to create lanes. A CD player containing a CD with the PACER test cadence sat on a bench off to the side of the PACER test course. The other four FITNESSGRAM tests were set up in separate stations around the perimeter of the gymnasium. The body composition station consisted of BIA devices lined up on a bench against the wall. At the Curl-Up station, mats were spaced next to each other approximately one foot apart. A 4.5-inch strip designed specifically for the FITNESSGRAM test was taped width-wise across each mat. A CD player containing a CD with the Curl-Up test cadence was placed on a bench against the wall at the station. The 90° Push-Up station consisted of a CD player containing a CD with the Push-Up test cadence. The Back-Saver Sit-and-Reach station consisted of two metal boxes designed specifically for this test spaced several feet apart on the gymnasium floor. Two video cameras were placed on tripods at opposite ends of the Push-Up, Curl-Up, and Back-Saver Sit-and-Reach stations. The cameras were positioned in such a way that each camera clearly captured all fitness testing activity occurring at that station, but from an angle different from the other camera at that station. For the PACER test, a video camera was set up on a tripod in each corner of the gym for a total of four cameras.

Testing day procedures. When the PETE students arrived on each of the fitness testing days, the researcher explained the fitness testing protocol and distributed score sheets (Appendix E). For each test, instructions and demonstrations were provided by the researcher, then the researcher and assistants monitored students as they performed the

test. The PETE students were responsible for recording their own scores as soon as they finished each test.

At the 90° Push-Up and Curl-Up stations, the researcher and assistants carefully observed the PETE students for errors in form and informed them of any mistakes. Per FITNESSGRAM protocol, a PETE student was instructed to stop after the second mistake and record the number successfully completed. At the Back-Saver Sit-and-Reach station, the researcher ensured that each PETE student assumed the correct position and maintained it during the test. The researcher also assisted each PETE student in recording the correct number on the Sit-and-Reach box. Since a maximum of two participants could perform at one time at the Back-Saver Sit-and-Reach station, the PETE students completed the test for both right and left leg and recorded the results on their score sheets before the next person in line took a turn. At the BIA analyzer station, the researcher and assistants assisted each student individually in entering information into the device and correctly reporting the results. Finally, during the PACER test, the researcher and assistants circulated around the gym and observed the PETE students to be sure that they reached the lines before the beeps and stopped after two misses. Score sheets were collected from the PETE students at the end of each fitness testing day.

Since the PETE students recorded all of their own data during the fitness testing, the researcher checked scores for accuracy by reviewing all video footage of the tests and personally scoring each PETE student on the tests. If there was a discrepancy on any test between a score recorded by a PETE student and the score that the researcher assigned, the researcher recruited one of the assistants to observe the footage, and a consensus was reached between the researcher and the assistant.

Physical activity recall. The PETE students provided recalls of physical activity in order to account for any outside activities that could potentially impact their health-related physical fitness or motor skills. The recalls included a formal physical activity recall instrument as well as several additional questions about their physical activity participation. The physical activity recall instrument selected for this study was the International Physical Activity Questionnaire (IPAQ) short version. PETE students were required to complete a physical activity recall (IPAQ plus additional questions) in class once every two weeks for a total of eight physical activity recalls per PETE student by the end of the semester. The instrument was administered at the start of class on the last class meeting day of the second week, the fourth week, the sixth week, the eighth week, the 10^{th} week, the 12^{th} week, the 14^{th} week, and the 16th week. The instrument was explained to students early in the semester and students were given the opportunity to ask questions. The IPAQ instrument, the open-ended questions that were added to supplement this instrument, and the procedures for collecting survey data are discussed in the sections below.

IPAQ. The purpose of the IPAQ questionnaire is to provide common instruments that can be used to obtain internationally comparable data on health-related physical activity. The IPAQ has been found to have acceptable measurement properties for use in many settings and in different languages, and are suitable for national population-based prevalence studies of participation in physical activity. It asks participants to provide information regarding the time that they spent being physically active in the last seven days, focusing on the four areas of vigorous physical activity, moderate physical activity,

walking, and sitting (IPAQ, 2002). A copy of the IPAQ instrument can be found in Appendix F.

The IPAQ was selected as the physical activity recall instrument for this study for several reasons. First, the questions on the instrument most closely represented the information that the researcher sought to obtain from the study participants when compared to other commonly used physical activity recall instruments. Second, the reliability and validity of this instrument has been well-established. Third, this survey could be self-administered, allowing for more frequent data collection. Finally, this instrument is appropriate for use with young and middle-aged adults aged 15-69 years, which encompassed the age range of all of the PETE students in this study (IPAQ, 2002).

Additional questions. The types of physical activities performed were of interest in this study in addition to the amount and intensity of physical activity. However, while use of the IPAQ instruments for monitoring and research purposes is encouraged, it is recommended that no changes be made to the order or wording of the questions, as this will affect the psychometric properties of the instrument (IPAQ, 2002). The solution was to create additional questions regarding types of physical activities performed (cardiorespiratory, flexibility, and muscular strength and endurance) as part of the physical activity recall process without altering the content of the IPAQ. The four additional questions that were added can be found in Appendix F.

Survey. In order to address the fourth research question, the PETE students completed a survey assessing 1) their comfort level for teaching educational gymnastics, 2) comfort level for performing educational gymnastics, and 3) what they believe to be attributes of a good teacher of educational gymnastics content. Responses to the first two

items were assessed using a Likert scale with free responses to justify their ratings. The third item was a free response. The survey was administered at baseline on the first day of class and again on the last day of class for a total of two surveys per PETE student. A copy of the survey can be found in Appendix G.

Treatment verification. For treatment verification, the researcher kept detailed records of all lessons taught during the semester, including the specific tasks within lessons. Additionally, four lessons were videotaped each semester. In the following sections, the tasks are summarized and analyzed with attention to foundational skill focus (rolling actions, step-like actions, balancing actions, or flight actions) and stage of content development (individual skills, combinations, sequencing). The four videotaped lessons were analyzed with attention to how much time was spent in activity and instruction on those days. Treatment verification assures that the nature of the content course was consistent with educational gymnastics and that students had consistent opportunities within the class to develop skill.

Summary of lesson tasks. A course outline in Appendix H reveals that psychomotor tasks related to the development of gymnastics skills occurred in 13 out of 41 lessons. The 13 lessons where instruction occurred are marked in Appendix H with an asterisk (*). A summary of tasks presented during each of these 13 lessons can be found in Appendix I. Out of the 13 class meetings with instruction related to the development of gymnastics skills, one day was spent exploring the BSER movement framework, and three days were spent on each of the four foundational skills of educational gymnastics: Rolling actions, step-like actions, balancing actions, and flight actions. The other 28 class meetings were necessarily spent in course introduction (one day), a cognitive lesson (one

day), fitness testing (two days), motor skills testing (two days), written assessments (three days), sequence practice (12 days), sequence performance assessment (four days), and preparing for and carrying out an educational gymnastics lesson with children (three days).

The 12 days spent on the foundational skills included both individual skills and combinations of skills. Skills were always presented individually before combinations were introduced, indicating appropriate progressions in terms of stage of content development. Instructional time was not spent on sequencing, however, 12 class days were dedicated to planning, practicing, and analyzing sequences.

Sample of lessons videotaped. Four of the 12 days spent on foundational skills were videotaped each semester in order to analyze how time was spent during the lessons. The second day of instruction for each of the four foundational skills was selected to be videotaped, as it was thought that this "intermediate" day would best represent the three days of instruction spent on each skill. The instrument used to examine time was the Basic Academic Learning Time- Physical Education (B-ALT-PE). This instrument is designed to measure time spent in activity, instruction, transitions, management, and waiting in a physical education setting. A copy of this instrument is provided in Appendix J.

The lessons were filmed by placing a video camera on a tripod in one far corner of the gymnasium at such an angle that all activity that occurred was captured on film. The researcher viewed the films and coded each one using the B-ALT-PE instrument. While the researcher coded for all types of time (activity, instruction, transitions,

management, and waiting), time spent in activity and instruction was of primary interest. A summary of time spent in activity and instruction can be found in Table 3.5 below.

Table 3.5 Time Spent in Activity and Instruction

Foundational Skill	Fall 2013	Spring 2014	Average
Rolling Actions: Activity	34 minutes 68% of class time	35 minutes 70% of class time	34.5 minutes 69% of class time
Rolling Actions: Instruction	9 minutes 18% of class time	9 minutes 18% of class time	9 minutes 18% of class time
Rolling Actions: Activity/Instruction	43 minutes 86% of class time	44 minutes 88% of class time	43.5 minutes 87% of class time
Step-Like Actions: Activity	27.5 minutes 55% of class time	25.5 minutes 51% of class time	26.5 minutes 53% of class time
Step-Like Actions: Instruction	14 minutes 28% of class time	14.5 minutes 29% of class time	14.25 minutes 28.5% of class time
Step-Like Actions: Activity/Instruction	41.5 minutes 83% of class time	40 minutes 80% of class time	40.75 minutes 81.5% of class time
Balancing Actions: Activity	25 minutes 50% of class time	25 minutes 50% of class time	25 minutes 50% of class time
Balancing Actions: Instruction	15 minutes 30% of class time	15 minutes 30% of class time	15 minutes 30% of class time
Balancing Actions: Activity/Instruction	40 minutes 80% of class time	40 minutes 80% of class time	40 minutes 80% of class time
Flight Actions: Activity	25 minutes 50% of class time	26 minutes 52% of class time	25.5 minutes 51% of class time
Flight Actions: Instruction	16 minutes 32% of class time	15.5 minutes 31% of class time	15.75 minutes 31.5% of class time
Flight Actions: Activity/Instruction	41 minutes 82% of class time	41.5 minutes 83% of class time	41.25 minutes 82.5% of class time

On the rolling action days, an average of 43.5 minutes out of the 50-minute lesson (87% of class time) was spent in activity or instruction. An average of 40.75 minutes (81.5% of class) was spent in activity or instruction on the step-like action days. On the balancing action days, 40 minutes (80% of class) was spent in activity or instruction. An average of 41.25 minutes (82.5% of class) was spent in activity or instruction on the flight action days.

Design and Analysis

This study followed a one-group pre-test/post-test design. A summary of the research questions, data collected to address each research question, when data were collected, and how data were analyzed are presented in Table 3.6 below.

Table 3.6 RQs, Data Collected, When Collected, and How Data were Analyzed

Research Question	Data Collected to Answer Question	When Data were Collected	How Data were Analyzed
RQ#1: Does instruction in an educational gymnastics course improve the motor skill levels of PETE students on selected educational gymnastics tasks?	1. Motor skills testing (four individual skills tests, SCPEAP 2nd and 5th grade educational gymnastics assessments) 2. Physical activity recalls (IPAQ)	1. Pre and post 2. Eight times (every other week during the semester)	1. Separate related-samples Wilcoxon signed rank nonparametric tests 2. Descriptively
RQ#2: Does participation in an educational gymnastics course improve the health-related fitness of PETE students?	1. Fitness testing (FITNESSGRAM test battery) 2. Physical activity recalls (IPAQ)	1. Pre and post 2. Eight times (every other week during the semester)	1. Separate repeated measures within-subjects ANOVA tests 2. Descriptively; MVPA vs. fitness post-test using Spearman's rho correlation coefficient
RQ#3: Does a relationship exist between PETE students' fitness and motor skill levels across the stages of content development in educational gymnastics?	Motor skills and fitness testing (see above)	Pre and post	Spearman's rho correlation coefficient
RQ#4: What do PETE students consider to be the qualities of a good instructor of educational gymnastics?	Survey (five questions)	Pre and post	-Two Likert Scale questions: Separate repeated measures ANOVA tests -Three qualitative questions: Constant comparison

All data was collected at baseline and again at the end of the semester, with the exception of the physical activity recall data, which was administered eight times (every other week) during the semester. All data were quantitatively analyzed with the exception of the survey data, which were analyzed using both quantitative and qualitative methods. For all statistical tests, alpha levels were set at $p < .05$.

Quantitative data. The pre-test and post-test scores on each motor skills assessment (individual skills tests, combinations, and sequences) were analyzed in separate related-samples Wilcoxon signed rank nonparametric tests to determine if there was any improvement in educational gymnastics skills. The pre-test and post-test scores on each item of the FITNESSGRAM fitness test battery (PACER, BIA analyzer, Curl-Up, 90° Push-Up, and Back-Saver Sit-and-Reach) were analyzed using separate repeated measures within-subjects analysis of variance (ANOVA) tests to determine if there were any improvements in fitness. A Spearman's rho correlation coefficient was used to analyze whether any relationships existed between motor skill level and fitness. Responses to the two Likert Scale survey questions were analyzed using separate repeated measures ANOVA tests to determine if there were any changes in comfort levels with teaching and performing educational gymnastics.

Qualitative data. Responses to the three open-ended questions on the pre-survey and post-survey were analyzed using constant comparison. The first step in this method involves open coding, where raw data are examined to begin to develop names and categories. The researcher then relates the initial codes to one another and makes choices regarding the most important codes. A small number of codes are chosen to represent the

key concepts drawn from the raw data. Theory can then be derived from the concepts (Lichtman, 2013).

Responses to the three open-ended questions at pre-survey and post-survey were analyzed separately for a total of six datasets. Open coding was applied to each of the six datasets. The most important codes that emerged from each dataset were selected and combined to create themes. Comparisons were then made between the results from pre-survey to post-survey for each of the three open-ended questions.

Physical activity recall data. Descriptive methods were used to analyze the types of activities that students participated in outside of the educational gymnastics class (cardiovascular endurance, flexibility, and muscular strength/muscular endurance) as well as the intensity of the activities (moderate and vigorous). Time spent in moderate to vigorous physical activities and fitness post-test scores were compared using a Spearman's rho correlation coefficient.

CHAPTER 4

Results

The purpose of this study was to examine the impact of an educational gymnastics course on physical education teacher education students' motor skill development and health-related fitness over the course of a semester. The results of the study are organized into four main sections by research question. The first section will be the results of the motor skills tests, followed by the second section with the results of the fitness tests. Physical activity recall data will be presented with the fitness test results. In the third section, motor skills test results and fitness test results will be compared. The last section will summarize the survey data.

Research Question One: Does instruction in an educational gymnastics course improve the motor skill levels of PETE students on selected educational gymnastics tasks?

Motor skills were measured at baseline and again at the end of the semester using the South Carolina Physical Education Assessment Program for Elementary School Educational Gymnastics (second and fifth grades) and four individual skills tests representing the four foundational skills of educational gymnastics. Motor skills test scores from pre-test to post-test were analyzed using a related-samples Wilcoxon signed rank test. The results of the motor skills tests are presented in Table 4.1.

Table 4.1 Motor Skills Test Results

Motor Skill	Level	Pre-Test Frequency	Pre-Test %	Post-Test Frequency	Post-Test %	X^2	Asymptotic Sig. (2-sided test)
Stage 1 Part 1: Rolling Action	0	0	0	0	0	21.0	.020
	1	1	4.5	0	0		
	2	5	22.7	0	0		
	3	16	72.7	22	100.0		
Stage 1 Part 2: Balancing Action	0	0	0	0	0	71.5	.004
	1	1	4.5	0	0		
	2	17	77.3	9	40.9		
	3	4	18.2	13	59.1		
Stage 1 Part 3: Step-Like Action	0	2	9.1	0	0	55.0	.003
	1	2	9.1	1	4.5		
	2	9	40.9	5	22.7		
	3	9	40.9	16	72.7		
Stage 1 Part 4: Flight Action	0	0	0	0	0	97.5	.001
	1	4	18.2	1	4.5		
	2	15	68.2	9	40.9		
	3	3	13.6	12	54.5		
Stage 2: Combination	0	17	77.3	0	0	190.0	<.001
	1	5	22.7	7	31.8		
	2	0	0	7	31.8		
	3	0	0	8	36.4		
Stage 3: Sequence	0	18	81.8	0	0	253.0	<.001
	1	4	18.2	2	9.1		
	2	0	0	14	63.6		
	3	0	0	6	27.3		

Results of a related-samples Wilcoxon signed rank test revealed that the PETE students' ability to perform each of the six selected educational gymnastics tasks improved significantly from baseline to post-test. There was a significant increase in scores on the rolling action, the balancing action, the step-like action, the flight action, the combination of skills, and the sequence of skills from pre-test to post-test.

Rolling action. At pre-test, 4.5% of the PETE students (n = 1) performed the rolling action at a Level 1, 22.7% (n = 5) performed at a Level 2, and 72.7% (n = 16) performed at a Level 3. No PETE students performed the rolling action at a Level 0 at

pre-test. At post-test, 100% of the PETE students (n=22) performed the rolling action at a Level 3. No PETE students performed the rolling action at a Level 0, Level 1, or Level 2 at post-test.

Balancing action. At pre-test, 4.5% of the PETE students (n = 1) performed the balancing action at a Level 1, 77.3% (n = 17) performed at a Level 2, and 18.2% (n = 4) performed at a Level 3. No PETE students performed the balancing action at a Level 0 at pre-test. At post-test, 40.9% of the PETE students (n = 9) performed the balancing action at a Level 2, and 59.1% (n = 13) performed at a Level 3. No PETE students performed the balancing action at a Level 0 or a Level 1 at post-test.

Step-like action. At pre-test, 9.1% of PETE students (n = 2) performed the step-like action at a Level 0, 9.1% (n = 2) performed at a Level 1, 40.9% (n = 9) performed at a Level 2, and 40.9% (n = 9) performed at a Level 3. At post-test, 4.5% of PETE students (n = 1) performed the step-like action at a Level 1, 22.7% (n = 5) performed at a Level 2, and 72.7% (n = 16) performed at a Level 3. No PETE students performed the step-like action at a Level 0 at post-test.

Flight action. At pre-test, 18.2% of the PETE students (n = 4) performed the flight action at a Level 1, 68.2% (n = 15) performed at a Level 2, and 13.6% (n = 3) performed at a Level 3. No PETE students performed the flight action at a Level 0 at pre-test. At post-test, 4.5% of the PETE students (n = 1) performed the flight action at a Level 1, 40.9% (n = 9) performed at a Level 2, and 54.5% (n = 12) performed at a Level 3. No PETE students performed the flight action at a Level 0 at post-test.

Combination of skills. At pre-test, 77.3% of the PETE students (n = 17) performed the combination of skills at a Level 0, and 22.7% (n = 5) performed at a Level

1. No PETE students performed the combination of skills at a Level 2 or Level 3 at pre-test. At post-test, 31.8% of the PETE students (n = 7) performed the combination of skills at a Level 1 and 31.8% (n = 7) performed at a Level 2. Only 36.4% (n = 8) performed at a Level 3. No PETE students performed the combination of skills at a Level 0 at post-test.

Sequence of skills. At pre-test, 81.8% of PETE students (n = 18) performed the sequence at a Level 0, and 18.2% (n = 4) performed at a Level 1. No PETE students performed the sequence at a Level 2 or Level 3 at pre-test. At post-test, 9.1% of the PETE students (n = 2) performed the sequence at a Level 1 and 63.6% (n = 14) performed at a Level 2. Only 27.3% (n = 6) performed at a Level 3. No PETE students performed the sequence at a Level 0 at post-test.

Research Question Two: Does participation in an educational gymnastics course improve the health-related fitness of PETE students?

Fitness was measured at baseline and again at the end of the semester using the FITNESSGRAM test battery. Fitness test scores from pre-test to post-test were analyzed using separate, repeated measures within-subjects analysis of variance (ANOVA) tests. The results of the fitness tests are presented in Table 4.2.

Table 4.2 Fitness Test Results

Test	Pre-Test Mean	Pre-Test SD	Post-Test Mean	Post-Test SD	F	Sig.
PACER	33.50	13.60	27.68	14.83	5.23	.033
90° Push-Up	15.77	8.78	16.41	7.90	.598	.448
Curl-Up	26.96	13.25	36.91	14.29	25.82	<.001
Back-Saver Sit and Reach	12.39	2.18	12.80	2.83	2.25	.148
Body Composition	20.13	7.34	18.65	7.65	14.61	.001

The results of the separate, repeated measures within-subjects ANOVA tests revealed a significant improvement in scores on two of the five health-related fitness

measures from pre-test to post-test, no significant change in scores on two of the measures, and a significant decrease in scores on one of the measures from pre-test to post-test. There was a significant improvement in scores on the Curl-Up and Body Composition tests from pre-test to post-test. No significant difference was found between pre-test and post-test scores on the 90° Push-Up test or the Back-Saver Sit and Reach test. There appeared to be a significant decrease in scores on the PACER from pre-test to post-test.

The mean number of laps completed on the PACER was approximately 34 laps at pre-test and 28 laps at post-test. The mean number of push-ups completed on the 90° Push-Up test was approximately 16 push-ups at both pre-test and post-test. The mean number of curl-ups completed on the Curl-Up test was approximately 27 at pre-test and 37 at post-test. The mean score on the Back-Saver Sit and Reach test was approximately 12 inches at pre-test and 13 inches at post-test. The mean reading on the Body Composition test was 20.1% body fat at pre-test and 18.7% body fat at post-test, indicating that the PETE students had a significantly lower (i.e., more favorable) percentage of body fat at post-test.

Healthy Fitness Zones. Scores on the fitness test battery were examined to see whether they fell within the FITNESSGRAM Healthy Fitness Zone ranges at pre-test and post-test. The FITNESSGRAM Healthy Fitness Zone ranges for females and males age 17 years and older is provided in Table 4.3. A summary of whether the PETE students met or did not meet the Healthy Fitness Zone ranges at pre-test and post-test is provided in Table 4.4.

Table 4.3 FITNESSGRAM Healthy Fitness Zones for Females and Males age 17+

Test	Females	Males
PACER	41-72 laps	72-106 laps
90° Push-Up	7-15 push-ups	18-35 push-ups
Curl-Up	18-35 curl-ups	24-47 curl-ups
Back-Saver Sit and Reach	12 inches	8 inches
Body Composition	13-32% body fat	7-25% body fat

Table 4.4 Healthy Fitness Zones Met or Not Met at Pre and Post

Test	Met Pre and Post	Not Met at Pre or Post	Not Met at Pre, Met at Post	Met at Pre, Not at Post
PACER	1	21	0	0
90° Push-Up	12	5	4	1
Curl-Up	19	1	2	0
Sit and Reach	20	1	1	0
Body Composition	19	3	0	0

One PETE student's PACER test scores met HFZ at both pre-test and post-test, and 21 PETE students' PACER test scores did not meet HFZ at pre-test or post-test. This is significant because the results of the statistical test indicated that scores on the PACER test significantly decreased from pre-test to post-test, but in terms of being in the Healthy Fitness Zone range on the PACER test, there were no changes in any of the 22 PETE students from pre-test to post-test. Only one PETE student had the potential to become worse on the PACER test in terms of HFZ (i.e., met HFZ at pre-test), but this PETE student also met HFZ at post-test. Therefore, no PETE students became worse in terms of meeting HFZ from pre-test to post-test on the PACER.

For the 90° Push-Up test, 12 PETE students' scores met HFZ at both pre-test and post-test, five did not meet HFZ at pre-test or post-test, four did not meet HFZ at pre-test but met HFZ at post-test, and one met HFZ at pre-test but not at post-test. In terms of

meeting HFZ on the 90° Push-Up test, 17 PETE students did not change, four improved, and one became worse from pre-test to post-test.

On the Curl-Up test, 19 PETE students' scores met HFZ at both pre-test and post-test, one did not meet HFZ at pre-test or post-test, and two did not meet HFZ at pre-test but met HFZ at post-test. In terms of meeting HFZ for the Curl-Up test, 20 PETE students did not change and two improved from pre-test to post-test.

For the Back-Saver Sit and Reach test, 20 PETE students' scores met HFZ at both pre-test and post-test, one did not meet HFZ at pre-test or post-test, and one did not meet HFZ at pre-test but met HFZ at post-test. This is significant because although the statistical test revealed no significant change in scores on the Back-Saver Sit and Reach from pre-test to post-test, 20 of the 21 PETE students who did not change were already within HFZ at pre-test, and one improved from pre-test to post-test. Therefore, only two PETE students had the potential to improve on the Back-Saver Sit and Reach in terms of HFZ from pre-test to post-test, and one of them did improve to meet HFZ at post-test.

Nineteen PETE students' Body Composition test readings met HFZ at both pre-test and post-test, and three PETE students' Body Composition test readings did not meet HFZ at pre-test or post-test. In terms of meeting HFZ on the Body Composition test, there were no changes for any of the 22 PETE students from pre-test to post-test.

Physical activity recall results. To account for participation in physical activity outside of class time that could have potentially impacted health-related fitness measures, the PETE students completed a total of eight physical activity recalls (each accounting for one week of activity) using the International Physical Activity Questionnaire. In order to interpret IPAQ data, the reported time spent in physical activity must be converted to

metabolic equivalents (METs) in order to get MET-minutes/week. Moderate MET-minutes/week are calculated by multiplying minutes spent in moderate-intensity activity per week by 4.0, and vigorous MET-minutes/week are calculated by multiplying minutes spent in vigorous-intensity activity per week by 8.0 (IPAQ, 2002). The means for reported time spent in moderate and vigorous physical activity at each recall, as well as the MET-minutes/week, are provided in Table 4.5.

Table 4.5 Average Time Spent in MVPA in Minutes/Week and MET Minutes/Week

PA Recall #	Moderate M	Moderate SD	Moderate MET min/week	Vigorous M	Vigorous SD	Vigorous MET min/week
1	295	410	1180	450	697	3600
2	326	320	1304	400	627	3200
3	527	687	2108	419	787	3352
4	276	410	1104	248	408	1984
5	356	505	1424	194	266	1552
6	342	381	1368	236	278	1888
7	252	338	1008	258	561	2064
8	277	322	1108	188	273	1504

The mean reported time spent in moderate physical activity ranged from 252 to 527 minutes per week, and the mean reported time spent in vigorous physical activity ranged from 188 to 450 minutes per week. This resulted in moderate MET-minutes/week ranging from 1008 to 2108, and vigorous MET-minutes/week ranging from 1504 to 3600.

The last step in interpreting the IPAQ data is giving it a categorical score to describe one's level of physical activity participation. There are three possible scores: Category 1 (Low), Category 2 (Moderate), and Category 3 (High), with criteria for each category. For the pattern of activity to be classified as Category 3 (High), one must either participate in 1) vigorous-intensity activity on at least three days achieving a minimum total physical activity of at least 1500 MET-minutes/week, or 2) seven days of any

combination of walking, moderate-intensity, or vigorous-intensity activities achieving a minimum total physical activity of at least 3000 MET-minutes/week (IPAQ, 2002). Based on the criteria for Category 3, the PETE students' average reported physical activity patterns would be classified as "high" across all eight physical activity recalls. For all eight physical activity recalls, the vigorous MET-minutes/week value was above 1500.

Time spent in moderate to vigorous physical activities and fitness post-test scores were compared using a Spearman's rho correlation coefficient. Moderate to vigorous physical activity (MVPA) was calculated by adding together the reported times spent in moderate and vigorous physical activity at each recall. The results of the comparisons are presented in Table 4.6 on the following page.

The results indicate that a relationship may exist between the time that the PETE students spent in moderate to vigorous physical activities outside of educational gymnastics class time and certain health-related fitness indicators at post-test. Scores on the PACER post-test were related to reported time spent in MVPA at Physical Activity Recalls 1, 7, and 8. Scores on the 90° Push-Up post-test were related to reported time spent in MVPA at Physical Activity Recalls 1, 4, 5, 6, 7, and 8. Scores on the Sit and Reach post-test were related to reported time spent in MVPA at Physical Activity Recall 7. Body Composition readings at post-test were related to reported time spent in MVPA at Physical Activity Recalls 1, 3, and 6.

Table 4.6 Correlations Between Time Spent in MVPA and Fitness Post-Test Scores

Correlations							
			PACER Post	Push-Up Post	Curl-Up Post	Sit and Reach Post	BodyComp Post
Spearman's rho	MVPA Recall 1	Correlation Coefficient	.448*	.452*	.211	-.163	-.569**
		Sig. (2-tailed)	.037	.035	.345	.469	.006
		N	22	22	22	22	22
	MVPA Recall 2	Correlation Coefficient	.367	.273	-.051	.052	-.264
		Sig. (2-tailed)	.093	.219	.823	.820	.235
		N	22	22	22	22	22
	MVPA Recall 3	Correlation Coefficient	.218	.403	.057	-.059	-.460*
		Sig. (2-tailed)	.330	.063	.800	.794	.031
		N	22	22	22	22	22
	MVPA Recall 4	Correlation Coefficient	.077	.452*	.202	-.080	-.407
		Sig. (2-tailed)	.732	.035	.368	.724	.060
		N	22	22	22	22	22
	MVPA Recall 5	Correlation Coefficient	.359	.493*	.090	-.156	-.407
		Sig. (2-tailed)	.101	.020	.689	.489	.060
		N	22	22	22	22	22
	MVPA Recall 6	Correlation Coefficient	.400	.539**	.295	-.262	-.525*
		Sig. (2-tailed)	.065	.010	.182	.239	.012
		N	22	22	22	22	22
	MVPA Recall 7	Correlation Coefficient	.677**	.590**	.402	-.493*	-.316
		Sig. (2-tailed)	.001	.004	.063	.020	.152
		N	22	22	22	22	22
	MVPA Recall 8	Correlation Coefficient	.451*	.434*	.195	-.355	-.273
		Sig. (2-tailed)	.035	.044	.385	.105	.218
		N	22	22	22	22	22
*. Correlation is significant at the 0.05 level (2-tailed).							
**. Correlation is significant at the 0.01 level (2-tailed).							

PACER and MVPA. Three positive correlations (one strong) were found between scores on the PACER post-test and MVPA reported on a physical activity recall. A

significant positive correlation was found between PACER post-test scores and MVPA reported on Recall 1 (r = .448), Recall 7 (r = .677), and Recall 8 (r = .451).

90° Push-Up and MVPA. Six positive correlations (two strong) were found between scores on the 90° Push-Up post-test and MVPA reported on a physical activity recall. A significant positive correlation was found between 90° Push-Up post-test scores and MVPA reported on Recall 1 (r = .452), Recall 4 (r = .452), Recall 5 (r = .493), Recall 6 (r = .539), Recall 7 (r = .590), and Recall 8 (r = .434).

Back-Saver Sit and Reach and MVPA. A significant positive correlation was found between Sit and Reach post-test scores and MVPA reported on Recall 7 (r = -.493).

Body Composition and MVPA. Three negative correlations (one strong) were found between readings on the Body Composition post-test and MVPA reported on a physical activity recall. A significant negative correlation was found between Body Composition post-test readings and MVPA reported on Recall 1 (r = -.569), Recall 3 (r = -.460), and Recall 6 (r = -.525).

A summary of the eight physical activity recalls can be found in Appendix K. The summary includes the activities reported at each recall, categorized by type (cardiovascular endurance, flexibility, or muscular strength and endurance), the mean reported time spent in each activity, and the number of PETE students who reported engaging in each activity.

Cardiovascular endurance activities. Five cardiovascular endurance activities were reported between all physical activity recalls. Reported activities included cycling, dance, running, swimming, and playing tag. Dance and running appeared in every recall. Of the cardiovascular endurance activities, the greatest average time was spent in dance

on each recall (122 to 150 minutes per week). However, more PETE students engaged in running (six to 14 PETE students) than in dance (one to six PETE students) on any given recall.

Flexibility activities. Reported flexibility activities varied the least with three types of activity reported between all recalls. Reported activities included stretching, Pilates, and yoga. Stretching was the only flexibility activity reported on all eight recalls, and more PETE students reported stretching (eight to 12 PETE students) than any other flexibility activity. Of the flexibility activities, the greatest average time was spent in Pilates (up to 240 minutes per week). However, only one PETE student reported engaging in Pilates.

Muscular strength and endurance activities. Reported muscular strength and endurance activities varied the most with 21 types of activities reported between all recalls. Reported activities included badminton, baseball, basketball, bowling, cheerleading, dodgeball, educational games, flying disc sports, golf, football, kickball, lacrosse, push-ups, racquetball, soccer, softball, tumbling, Ultimate, volleyball, weightlifting, and wrestling. Only three of these activities appeared on every recall, including educational games, golf, and weightlifting. More PETE students reported weightlifting (five to 11 PETE students) than any other muscular strength and endurance activity, and the greatest average time was spent in weightlifting on five of the eight recalls (217 to 340 minutes per week). On three of the recalls, the greatest average time was spent in cheerleading (up to 720 minutes per week). However, only one PETE student reported engaging in cheerleading.

Research Question Three: Does a relationship exist between PETE students' fitness and motor skill levels across the stages of content development in educational gymnastics?

Motor skills test data and fitness test data were compared using a Spearman's rho correlation coefficient. The results of the pre-test comparisons are presented in Table 4.7, and the results of the post-test comparisons are presented in Table 4.8.

Table 4.7 Correlations Between Motor Skills Pre-Test and Fitness Pre-Test Scores

Correlations							
			PACER Pre	Push-Up Pre	Curl-Up Pre	Sit and Reach Pre	Body Comp Pre
Spearman's rho	Rolling Action Pre	Correlation Coefficient	.517*	.370	-.188	-.051	-.481*
		Sig. (2-tailed)	.014	.090	.401	.823	.024
		N	22	22	22	22	22
	Balancing Action Pre	Correlation Coefficient	-.103	-.109	-.287	-.140	-.031
		Sig. (2-tailed)	.647	.629	.196	.533	.890
		N	22	22	22	22	22
	Step-Like Action Pre	Correlation Coefficient	.199	.032	.364	.196	.060
		Sig. (2-tailed)	.374	.889	.095	.383	.790
		N	22	22	22	22	22
	Flight Action Pre	Correlation Coefficient	.598**	.354	.225	-.257	-.451*
		Sig. (2-tailed)	.003	.106	.315	.248	.035
		N	22	22	22	22	22
	Combin-ation Pre	Correlation Coefficient	.480*	.052	.043	.198	-.120
		Sig. (2-tailed)	.024	.819	.848	.376	.596
		N	22	22	22	22	22
	Sequence Pre	Correlation Coefficient	.093	-.132	.142	.112	.065
		Sig. (2-tailed)	.680	.560	.529	.618	.774
		N	22	22	22	22	22
*. Correlation is significant at the 0.05 level (2-tailed).							
**. Correlation is significant at the 0.01 level (2-tailed).							

The results of the Spearman's rho correlation coefficient revealed a significant relationship between pre-test scores on the PACER and three of the selected educational

gymnastics tasks, and between pre-test Body Composition readings and scores on two of the educational gymnastics tasks. A significant positive correlation was found between pre-test scores on the PACER and the rolling action (r = .517), the flight action (r = .598), and the combination of skills (r = 4.80). A significant, negative correlation was found between pre-test readings on the Body Composition test and the rolling action (r = -.481), and the Body Composition test and the flight action (r = -.451).

Table 4.8 Correlations Between Motor Skills Post-Test and Fitness Post-Test Scores

Correlations							
			PACER Post	Push-Up Post	Curl-Up Post	Sit and Reach Post	Body Comp Post
Spearman's rho	Rolling Action Post	Correlation Coefficient	.	.	.	.	.
		Sig. (2-tailed)	.	.	.	.	.
		N	22	22	22	22	22
	Balancing Action Post	Correlation Coefficient	-.154	.037	-.073	.044	-.051
		Sig. (2-tailed)	.494	.872	.746	.846	.822
		N	22	22	22	22	22
	Step-Like Action Post	Correlation Coefficient	.381	.398	.648**	.105	-.168
		Sig. (2-tailed)	.080	.067	.001	.642	.456
		N	22	22	22	22	22
	Flight Action Post	Correlation Coefficient	.667**	.177	.001	-.084	-.254
		Sig. (2-tailed)	.001	.431	.998	.709	.254
		N	22	22	22	22	22
	Combin-ation Post	Correlation Coefficient	-.023	.174	.181	-.172	.172
		Sig. (2-tailed)	.918	.438	.421	.445	.443
		N	22	22	22	22	22
	Sequence Post	Correlation Coefficient	-.497*	-.229	.095	.217	.048
		Sig. (2-tailed)	.019	.304	.674	.332	.833
		N	22	22	22	22	22
*. Correlation is significant at the 0.05 level (2-tailed).							
**. Correlation is significant at the 0.01 level (2-tailed).							

The Spearman's rho correlation coefficient revealed a significant relationship between post-test scores on the PACER and two of the educational gymnastics tasks, and between post-test scores on the Curl-Up and one of the educational gymnastics tasks. A strong, positive correlation was found between the flight action post-test scores and PACER post-test scores (r = .667). A significant negative correlation was found between the sequence post-test scores and PACER post-test scores (r = -.497). A strong, positive correlation was found between the step-like action post-test scores and Curl-Up post-test scores (r = .648). A correlation could not be reported between the rolling action post-test scores and any of the fitness post-test scores due to the fact that 100% of the PETE students performed the rolling action at a Level 3 (the highest level) at post-test.

Research Question Four: What do PETE students consider to be the qualities of a good instructor of educational gymnastics?

The fourth research question was measured at baseline and again at the end of the semester via the administration of a five-question survey (see Appendix E), and resulted in both quantitative and qualitative data.

Quantitative results. Responses to the two Likert Scale survey questions were analyzed using separate, repeated measures ANOVA tests and are presented in Table 4.9 below.

Table 4.9 Likert Scale Survey Results

Test	Pre-Test Mean	Pre-Test SD	Post-Test Mean	Post-Test SD	F	Sig.
Teaching	3.27	1.39	5.73	1.03	101.38	< .001
Performing	4.46	1.60	6.18	1.05	40.11	< .001

The separate, repeated measures ANOVA tests revealed a significant increase in comfort level for both teaching educational gymnastics and performing educational

gymnastics. The mean rating representing comfort level for teaching educational gymnastics was 3.27 at pre-test and 5.73 at post-test. The mean rating representing comfort level for performing educational gymnastics was 4.46 at pre-test and 6.18 at post-test.

Qualitative results. Responses to the three open-ended questions on the pre- and post-surveys were analyzed using constant comparison. Pre-survey and post-survey responses were coded and analyzed separately, resulting in six datasets. Several codes emerged from each dataset, and codes were combined to create themes. The themes and codes, as well as the examples to support them, can be found in Appendix L.

When asked to justify their Likert scale rating for their comfort level with teaching educational gymnastics on the pre-survey, the major theme that emerged from the PETE students' responses was an overall lack of comfort due to either lack of knowledge, experience, or formal training. Six PETE students justified their rating by declaring a lack of knowledge in educational gymnastics. Examples include, "I'm comfortable teaching, but don't know enough about the subject to teach it" (Participant 16) and "The teaching part doesn't bother me, but I don't know anything about gymnastics" (Participant 18). Four PETE students reported a lack of experience in statements such as, "I am not experienced in gymnastics at all" (Participant 6) and "I have no experience in gymnastics" (Participant 14). Four additional PETE students identified a lack of formal training as the reason for their rating. Examples include "I have never been taught gymnastics, so I feel that I am not adequate to teach it" (Participant 2) and "I have never taken Educational Gymnastics before, and I don't know what to expect" (Participant 12).

When it came to justifying their Likert scale rating for their comfort level with teaching educational gymnastics on the post-survey, the major theme that emerged from the data was an increase in comfort level due to gains in knowledge, skills, and/or teaching experience during the semester. Four PETE students justified their rating by reporting a gain in skills. Examples include, "I'm still not 100% proficient at gymnastics but I feel much better than I did when I started" (Participant 3) and "I have learned many basic skills that I feel I have a clear understanding of and could teach to students" (Participant 6). Another four PETE students justified their ratings by specifying gains in knowledge, an example being, "I feel like I have learned a lot just going through this course and I have a better knowledge base" (Participant 8). Finally, four PETE students supported their ratings with teaching experiences that occurred during the semester, including a specific teaching experience within the educational gymnastics course as well as in practicum courses that the PETE students were taking concurrently in which they were required to teach educational gymnastics content. An example of the former is, "Performed almost every task successfully and did well with kids on teaching day" (Participant 20). An example of the latter is, "I taught it to elementary level students. I feel comfortable in my ability to perform and teach," (Participant 19).

When asked to justify their Likert scale rating for their comfort level with performing educational gymnastics on the pre-survey, two themes emerged from the data. The first was a lack of comfort with performing educational gymnastics due to concerns about the perceived physical requirements, particularly the health-related fitness concept of flexibility and the performance of specific skills such as cartwheels, rolls, and flips. Nine PETE students justified their ratings with some type of concern over perceived

physical requirements. Examples include, “I’m all for trying but I’m not the most flexible person” (Participant 4), “I am scared to do a cartwheel and have never been able to do one. Also, rolling and flipping scare me because of neck positioning and landing” (Participant 2), and “Not really big on doing flips and handstands” (Participant 8).

The second theme that emerged from the responses to this pre-survey question was more positive in nature. Four PETE students leaned in the direction of comfort (as opposed to discomfort) with performing educational gymnastics due to having other athletic experience and/or confidence in one’s abilities. Examples include, “Even though I am not experienced in gymnastics, I feel that I am fairly athletic” (Participant 5), “I’ve never done gymnastics, but was a three-sport athlete in high school and played one year of college baseball” (Participant 11), and “Played sports growing up and feel pretty athletic overall” (Participant 20).

When asked to justify their Likert scale rating for their comfort level with performing educational gymnastics on the post-survey, two themes emerged from the data. The first was an overall greater comfort level with performing educational gymnastics due to gaining skills and knowledge. Six PETE students justified their ratings with gains in knowledge and/or skill. Examples include, “I have learned quite a bit and feel more comfortable than I did before” (Participant 4), “I have learned many skills” (Participant 6), and “I feel that I have a good knowledge of each skill” (Participant 15).

The second theme also had to do with greater comfort for performing educational gymnastics, this time due to having experienced success and/or enjoyment in the class. Another six PETE students reported positive feelings toward performing educational gymnastics due to having an easier time than expected, having fun, or experiencing

success in some way. Examples include, “I feel very comfortable with performing educational gymnastics because I found most of the tasks easy and fun to perform” (Participant 5), “I’m really good at Educational Gymnastics!” (Participant 12), and “It was fun and comfortable” (Participant 16).

When asked what they consider to be attributes of a good teacher of educational gymnastics on the pre-survey, three closely-related themes emerged from the data. The first was knowledge of the subject matter, which was identified by eight of the PETE students. Examples include, “Knowing what you are teaching” (Participant 10), “I think you should be knowledgeable” (Participant 16), “Very knowledgeable about the sport/skills” (Participant 20), and “He/she should have knowledge of the content” (Participant 21).

The second theme that emerged had to do with the teacher’s ability to provide clear explanations and demonstrations. Four PETE students made reference to explanations and demonstrations. Examples include, “Someone who is able to explain and show what you’re supposed to do well” (Participant 9) and “Being able to provide good explanations and examples of the moves and sequences” (Participant 18).

Finally, the third theme had to do with the teacher’s ability to physically perform the skills that are being taught. Three PETE students made specific reference to ability to perform skills. Examples include, “I feel that the teacher needs to be well educated and able to perform gymnastics” (Participant 2) and “Ability to accurately perform the skills necessary in gymnastics” (Participant 14).

At post-survey, the three themes from the pre-survey data re-emerged, although they were prioritized differently by the PETE students from pre-survey to post-survey.

The theme of ability to perform skills took precedence on the post-survey, with a total of eight PETE students making reference to a good teacher being able to perform the skills being taught. Examples include, "Be able to perform everything" (Participant 4), "They need to be able to perform each task" (Participant 5), "Someone who can physically perform skills" (Participant 10), and "Skilled in movements" (Participant 21). At pre-survey, three PETE students had identified ability to perform skills as an attribute of a good teacher of educational gymnastics.

The second theme of a good teacher being able to provide clear explanations and demonstrations remained in the middle, with five PETE students making remarks about explanations and demonstrations at post-survey. Examples this time included, "A good teacher explains all the cues thoroughly. Shows students examples as well as demonstrating" (Participant 11), "Good at explaining and giving visual demonstrations" (Participant 14), and "Someone that is able to teach the correct cues and demonstrate the skills" (Participant 15).

Whereas eight PETE students commented on a good teacher of educational gymnastics having knowledge of the subject matter at pre-test, three PETE students commented on subject matter knowledge at post-test. Examples include, "The teacher must first know how to teach gymnastics skills" (Participant 12) and "Knowledge of subject" (Participant 20).

CHAPTER 5

Discussion

The purpose of this study was to examine the impact of an educational gymnastics course on physical education teacher education students' motor skill development and health-related fitness over the course of a semester. The discussion of the results is organized into five main sections. The first four sections will discuss the results related to each of the four respective research questions that guided this study. The last section will contain directions for future study.

Research Question One: Does instruction in an educational gymnastics course improve the motor skill levels of PETE students on selected educational gymnastics tasks?

The results indicated that PETE students' motor skill levels improved significantly on all of the selected educational gymnastics tasks from pre-test to post-test. This includes the rolling action, the balancing action, the step-like action, the flight action, the combination of skills, and the sequence of skills. Based on these results, it appears that an educational gymnastics course structured around the framework proposed by Nilges (1997) can improve the motor skill levels of PETE students.

Although the PETE students improved significantly on all measures of skill at post-test, many performed at less than a Level 3 (the highest level) at post-test. This is particularly true when it came to the combination of skills and the sequence. Only about one-third of the PETE students (36.4%) achieved a score of Level 3 at post-test on the combination of skills. Just over one-quarter (27.3%) achieved Level 3 on the sequence at

post-test. When it came to the individual skills, on the other hand, all of the PETE students performed the rolling action at a Level 3 at post-test. Nearly three-quarters (72.7%) performed the step-like action at a Level 3 at post-test. More than half performed the balancing action (59.1%) and the flight action (54.5%) at a Level 3 at post-test.

One possible explanation for why relatively few of the PETE students performed at the highest level on the combination and sequence at post-test when compared to the individual skills is the level that they performed these two tasks at on the pre-test. Taking the rolling action, for example, nearly three-quarters of the PETE students (72.7%) were already performing at a Level 3 at pre-test. On the combination and the sequence, no PETE students performed the combination or sequence at a Level 3 at pre-test. In fact, no PETE students performed at Level 2 at pre-test.

The method used to score the individual skills tests versus the method used to score the combination and sequence may explain the higher scores on the individual skills both at pre-test and post-test. As described in Chapter 3, scoring of the individual skills was not bound by SCPEAP protocol. When scoring the individual skills tests, the mode of the scores given for individual cues determined the final skill level. For the combination and sequence, the final level was determined by the lowest performance level on any component.

Another possible explanation for why relatively few of the PETE students performed at the highest level on the combination and sequence at post-test when compared to the individual skills has to do with the complexity of the tasks. According to Nilges' (1997) stages of content development in educational gymnastics, individual skills are the first stage and are the least complex in nature. The second stage involves the

combinations of skills and is more complex. Beginning and advanced sequence work (the third and fourth stages, respectively) are the most complex. Developing the skills necessary for the later stages of content development in a group of PETE students with little or no experience takes time. Additionally, the combination of skills and the sequence of skills involved the element of planning at pre-test. It is complex to come up with a combination or a sequence using educational gymnastics terminology in a short period of time, but especially considering the PETE students' lack of content knowledge in educational gymnastics at pre-test. This was not an issue for the individual skills tests, as these tasks were set and no planning was involved on the part of the PETE students.

Discussion in relation to existing literature base. The results of the motor skills tests in this study are significant to teacher education because an increase in motor skill proficiency reflects an increase in content knowledge in educational gymnastics. As discussed in Chapter 2, content knowledge refers to the knowledge and skills that are to be learned by school children, and has been said to be the first source of the knowledge base (Shulman, 1987). Teachers should have a reasonable mastery of the content they will teach to their students (Siedentop, 2002) because they serve as the primary source of student understanding of the subject matter (Shulman, 1987). As a result of their increases in skill in educational gymnastics, the PETE students in this study may be better prepared to present educational gymnastics content to their future students (this idea will be expanded in the Directions for Future Study later in this chapter).

Personal competence in motor skills is an important quality of an effective physical education teacher (Capel & Whitehead, 2010; NASPE, 2009; Mitchell, 2007; Bailey, 2001; Staffo & Stier, 2000; Martens et al., 1976). Standard 2 of the National

Initial Physical Education Teacher Education Standards dictates that physical education teacher candidates should demonstrate personal competence in motor skill performance for a variety of physical activities and movement patterns. Physical education teacher candidates should be able to demonstrate all fundamental movement patterns at the automatic stage in an authentic environment, demonstrate the ability to combine movement patterns into a sequence, demonstrate movement skills at the utilization level across a variety of physical activities, and demonstrate competency in a variety of physical activities (NASPE, 2008). Similarly, according to the South Carolina Physical Education Assessment Program Grade Level Notebooks, the intent of the performance indicators for movement skills is movement competence. SCPEAP defines movement competence as the ability to independently and safely participate in movement skills and to maintain a level of continuity in those skills that would make participation enjoyable (SCPEAP, 2007).

It is difficult to determine whether the PETE students in this study met the criteria for Standard 2, since educational gymnastics represents just one content area of many that PETE students might take. However, it can be said that the PETE students demonstrated the ability to combine movement patterns into a sequence and demonstrated movement skills at the utilization level across a variety of educational gymnastics tasks and in an authentic setting. The PETE students also achieved movement competence in educational gymnastics according to SCPEAP's definition. They were able to independently participate in the educational gymnastics tasks as evidenced by the tasks performed in this study. Additionally, the PETE students maintained a level of continuity in their skills that made it possible to perform combinations and sequence work.

Implications for teacher education. The arguments in favor of educational gymnastics as an essential content area in physical education are plentiful. However, curricular space and time are significant issues in PETE programs. Within the credit hours allotted to the major, content courses must compete with discipline courses and courses in pedagogy/methodology. Participation in the educational gymnastics course in this study appeared to increase students' motor skills, which makes yet another case for the continued inclusion of educational gymnastics in PETE programs. The results of this study warrant broad support for the use of motor skill content courses to increase PETE students' motor skills in various content areas. The study provides evidence that an activity course such as the one delivered in this study may help PETE programs contribute to the motor skill development/content knowledge of PETE students as mandated by NASPE/CAEP.

Limitations. One possible limitation to the findings related to the first research question is that participation in outside activities could have potentially impacted the development of motor skill. However, looking at the physical activities reported on the recalls (see Appendix K), gymnastics was never reported as an activity that the PETE students engaged in outside of class time. Two activities reported are closely related enough to educational gymnastics that they could have impacted motor skills, namely, cheerleading (reported at seven of the recalls) and tumbling (reported at one recall). However, only one of the 22 PETE students reported engaging in these activities, and it was the same PETE student each time. Also, it is worth noting that this PETE student could already perform gymnastic activity at an expert level at baseline.

In addition, one shortcoming of the motor skills testing was that in a few cases, PETE students omitted criteria in planning their combination or sequence. This is likely due to a lack of knowledge and experience in educational gymnastics at pre-test when the planning took place. For example, a balance only showed one change (base of support, level, or shape) instead of required two changes in the combination of skills. This automatically resulted in a lower score on these tests regardless of the PETE students' performance of the skills. This was problematic because they repeated the same combination and sequence at post-test. Even if these PETE students' motor skill levels improved on the combination or sequence from pre-test to post-test, their scores would not change due to them having to repeat a performance that did not meet the criteria for the tasks.

This issue was not discovered until after the Fall 2013 semester. Therefore, one or more of the 10 PETE students who took that class may have been affected. In other words, if PETE students in the Fall 2013 class omitted something in planning their combination and/or sequence at pre-test, it was not possible for them to score any higher on these tasks at post-test. This issue was discovered before the Spring 2014 class took their motor skills post-test. This class was given the opportunity to make corrections if the combination and/or sequence that they planned at pre-test omitted any of the criteria. Therefore, all PETE students in the Spring 2014 class had the opportunity to earn a higher score on these tasks at post-test. This issue would be anticipated if this study were to be repeated. The researcher could attempt to prevent it from happening when giving instructions for these tasks at pre-test by drawing participants' attention to the criteria that were omitted by the PETE students in this study. The researcher could also periodically

remind participants of the criteria for the tasks as they are planning. Finally, the researcher could attempt to check participants' work on the combination and sequence before they perform on camera to be sure that what they planned includes all of the criteria.

Research Question Two: Does participation in an educational gymnastics course improve the health-related fitness of PETE students?

The findings indicate that scores improved from pre-test to post-test on the Curl-Up and Body Composition tests. PETE students had significantly better abdominal strength and endurance and a lower percentage of body fat by the end of the course. Scores on the 90° Push-Up and Back-Saver Sit and Reach tests improved from pre-test to post-test, although not significantly. PETE students' upper body strength and endurance and their flexibility did not improve significantly by the end of the course. Scores on the PACER test decreased significantly from pre-test to post-test. PETE students' cardiovascular endurance was worse by the end of the course.

Participation in the educational gymnastics course may have contributed to the improvement in scores on the Curl-Up and Body Composition tests. Many educational gymnastics tasks required PETE students to utilize their abdominal muscles, which may have favorably impacted Curl-Up test scores. PETE students were engaged in moderate to vigorous physical activity at almost every class meeting, which may have contributed to a lower percentage of body fat by the end of the semester. Participation in physical activities outside of class time during the semester may also have contributed to improved scores on these tests. Activities reported on the physical activity recalls such as weightlifting may have impacted Curl-Up test scores. Any of the 29 reported activities may have impacted body composition. Additionally, PETE students' dietary patterns

(which were not accounted for in this study) could have impacted their body compositions.

When examining why flexibility did not improve significantly as might be expected after participation in an educational gymnastics course, attention should be drawn to the PETE students' scores in relation to Healthy Fitness Zone ranges. Twenty of the 22 scores already fell within the HFZ range on the Back-Saver Sit and Reach at pre-test. Therefore, there may have been a ceiling effect in that the PETE students did not improve much further on this test at post-test. There may have been a similar ceiling effect on the 90° Push-Up test, where 13 PETE students' scores already fell within the HFZ range on the 90° Push-Up at pre-test.

It is important to recognize that the standard deviation for the PACER test was large, meaning that data points (total laps scored) were spread out over a large range and there was a higher than normal amount of variability in the data. Motivation may have been a major factor on this test, particularly at post-test. In terms of the FITNESSGRAM Healthy Fitness Zones, 21 of the 22 PETE students' PACER scores fell below the HFZ range at pre-test. It is possible that this impacted motivation to perform at post-test. When combined with the relatively small sample size in this study, the variability in PACER test scores and motivation may explain the apparent decrease in scores on this test.

For all of the three tests where scores did not improve from pre-test to post-test (Back-Saver Sit and Reach, 90° Push-Up, and PACER), the fact that there was no incentive to perform well on fitness testing days may help to explain the lack of improvement. PETE students' received credit for participating on the fitness testing days regardless of their performance on the tests (i.e., scores did not have an impact on their

grades). The fact that the post-test was administered at the end of the semester may also have impacted performance at post-test. Many PETE students are preoccupied with final exams and projects at this time and may forgo participation in their usual exercise routines, thereby resulting in lower fitness test scores.

Discussion in relation to existing literature base. Being physically fit has been shown to be an important characteristic of an effective physical education teacher (Gold et al., 2012; Kamla et al., 2012; NASPE, 2009; Mitchell, 2007; Cardinal, 2001; Thomson, 1996; Melville & Maddalozzo, 1988). Standard 2 of the National Initial Physical Education Teacher Education Standards indicates that physical education teacher candidates should achieve and maintain a health-enhancing level of fitness throughout their programs. Physical education teacher candidates should meet the age- and gender-specific levels for each of the five components of health-related physical fitness using standards established by national, state or program level testing. Performing below the age- and gender-specific levels for just one of the five components of health-related fitness is considered to be unacceptable (NASPE, 2008).

Based on the PACER post-test scores alone, 21 of the 22 PETE students in this study had unacceptable fitness levels. Several performed below the age- and gender-specific levels for two or more of the five health-related fitness tests. This is concerning because PETE students lacking fitness or skill may not have a sense of professional obligation to improve on their own (Mitchell, 2007), and little can be done to improve the habits of physical educators once they have entered the field (Staffo & Stier, 2000).

Other than establishing fitness standards and using fitness testing to screen or "weed out" unfit PETE majors, practices for ensuring that physical education majors are

physically fit during their undergraduate degree program are relatively few. These include helping students in developing special long-term fitness programs (Melville & Maddalozzo, 1988), wellness/fitness advising, and a conditioning class specifically designed to improve the fitness of students who perform poorly on their fitness test (Staffo & Stier, 2000). Strategies for more directly targeting fitness in PETE programs are needed. One possibility would be attempting to get more out of the content courses that majors take by targeting fitness in one or more of these courses within a PETE program.

Implications for teacher education. Improving motor skills was of primary interest in this study, with an interest in fitness as a by-product. If a more active approach were to be taken toward improving fitness, there are a number of things that could be done as part of the course without losing the integrity of the content. These are organized and discussed below in terms of tasks and experiences that could be used to improve 1) cardiovascular endurance, 2) muscular strength and endurance, and 3) flexibility.

The feasibility of improving cardiovascular endurance within an educational gymnastics setting is questionable given the nature of the tasks and the large amount of time needed to improve cardiovascular fitness. Although there are likely better activity courses in a PETE curriculum to impact cardiovascular fitness (i.e., soccer, swimming, tennis, track), tasks that could potentially build cardiovascular endurance include all of the following: Travelling around mats scattered in the work area, varying locomotor skills, pathways (e.g., straight, curved, zig-zag), and directions (e.g., forward, backward, and sideways) (Baumgarten & Pagnano-Richardson, 2010); running and stopping on different body parts; running with changes in speed, such as running as fast as possible

with bursts of speed and sudden stops; practicing acceleration and deceleration using various methods of travelling; and travelling quickly through the traffic of other moving bodies, avoiding people and apparatuses (Williams, 1987). Another idea for building PETE students' cardiovascular endurance is a travelling warm-up to music for the full duration of the music.

Tasks that could potentially be used to build muscular strength and endurance within an educational gymnastics setting include all of the following: Repetitions of gymnastics skills such as rolling actions between, around, or on mats (Sander & Griffin, 1991); having students use apparatuses such as ladders, planks, climbing frames, ropes, poles, nets, and bars to experiment with hanging, swinging, climbing, and/or traveling (which were not available in the context in which this study was conducted); having students practice receiving and maintaining weight on various body parts for brief or relatively longer periods of time; putting students in partner or group situations where they have to cope with the weight of others, which entails producing comparatively great degrees of strength (Mauldon & Layson, 1979); and timed rope holds showing various shapes (Williams, 1987). Progression for building muscular strength and endurance can come in a variety of ways, including changing exercises, repetitions, intensity, speed, duration, and more (USA Gymnastics, 2014).

Examples of activities for targeting flexibility in an educational gymnastics setting might include the following: A warm-up consisting of static stretching and upright joint rotation (Sander & Griffin, 1991); stretching focusing on body positions in gymnastics (arch, tuck, pike, straddle, and layout) (Donham-Foutch, 2007); stretching and curling while rocking and rolling; stretching in the air during flight actions;

emphasizing stretching free body parts when taking weight on various bases of support; activities where the limbs are spread emphasizing breadth, as in a cartwheel; and alternating stretching and curling actions while traveling up, down, over, or across equipment (Mauldon & Layson, 1979). Static stretching may target shoulders, chest, hip flexors, hamstrings, calves, wrists, and other muscle groups. Static stretches should be held for 20 to 30 seconds (USA Gymnastics, 2014).

Limitations. While participation in an educational gymnastics course may have contributed to the improvement of certain health-related fitness indicators of the PETE students, they also engaged in a wide variety of other physical activities outside of the educational gymnastics course that could have potentially had an impact on their health-related fitness measures (see Appendix K). For example, as many as 11 of the PETE students reported weightlifting as a muscular strength/endurance activity on the recalls. These PETE students could have included abdominal workouts in their weightlifting regimens, which could have contributed to the increase in scores on the Curl-Up from pre-test to post-test.

There are limitations associated with self-reported data such as the physical activity recall. There is always the chance that the PETE students omitted activities that they engaged in that week, reported activities that they did not actually engage in, or overestimated or underestimated the time spent in the reported activities. Being able to remember/recall the activities they did in the past week could have been a challenge, leading the PETE students to arbitrarily check off the option of "Don't Know/Not Sure" when asked about their physical activity participation.

Research Question Three: Does a relationship exist between PETE students' fitness and motor skill levels across the stages of content development in educational gymnastics?

The results of the statistical tests indicate that a relationship may exist between certain fitness indicators and motor skill level across the stages of content development in educational gymnastics. Although significant correlations between the PACER and certain motor skills surfaced, correlations involving the PACER must be interpreted with great caution. It must be remembered that 21 of 22 PACER test results were not in the Healthy Fitness Zone range at pre-test or post-test, meaning that all but one of the PETE students had unacceptable fitness levels based on their cardiovascular endurance scores.

Scores on the PACER pre-test were related to scores on the rolling action, flight action, and combination of motor skills at pre-test. There was a relationship between cardiovascular endurance and being able to perform rolling actions, flight actions, and a combination of skills at pre-test. Scores on the Body Composition pre-test were negatively related to scores on the rolling action and flight action pre-tests. This means that there was a relationship between having a lower (more favorable) percentage of body fat and being able to perform rolling action and flight action at pre-test.

Scores on the PACER post-test were positively related to scores on the flight action and negatively related to scores on the sequence of skills at post-test. There was a relationship between cardiovascular endurance and being able to perform flight actions, and between having worse cardiovascular endurance and being able to perform sequences of skills at post-test. Scores on the Curl-Up post-test were related to scores on the step-like action at post-test. Better abdominal strength was related to being able to perform a step-like action at post-test. The only significant correlation between motor skills and

fitness that was present at both pre-test and post-test was between the flight action and the PACER test.

Overall, the results of this study did not provide overwhelming support for a relationship between motor skill competency and fitness. The relationships found do support Webster et al. (2014), who examined the relationship between pre-service teachers' health-related fitness and movement competency in gymnastics. This study found that skill on a variety of educational gymnastics tasks was significantly correlated with muscular strength/endurance, particularly on the Curl-Up test. The work of Webster et al. (2014) provided initial evidence that pre-service teachers' health-related fitness is related to their movement competency. Taken in combination with the results of this study, the relationships between fitness and skill in educational gymnastics warrant further study.

The relationships found also support Stodden et al. (2009), who examined the relationship between young adults' (ages 18–25) competence in three fundamental motor skills (throwing, kicking, and jumping) and six measures of health-related physical fitness. This study found that motor skill scores explained a significant amount of variance in health-related fitness factors, which included measures of muscular strength (upper and lower extremities), trunk muscular endurance, and cardiovascular endurance. The work of Stodden et al. (2009) provided the strongest evidence to date on the relationship between motor skill competence and health-related aspects of physical fitness.

Research Question Four: What do PETE students consider to be the qualities of a good instructor of educational gymnastics?

PETE students believed that a good teacher of educational gymnastics has knowledge of the subject matter, provides clear explanations and demonstrations, and is able to perform the skills that are being taught. These three themes emerged within both the pre-survey and post-survey. By definition, content knowledge refers to knowledge and skills in a content area. Therefore, two of the three themes that emerged from the data- knowledge of the subject matter and ability to perform skills- can be merged and labeled as content knowledge. The third theme of providing clear explanations and demonstrations falls under what is known as pedagogical content knowledge. Pedagogical content knowledge (PCK) can be described as a blending of content knowledge and pedagogical knowledge, which is defined as the broad principles and strategies of classroom management and organization that appear to transcend subject matter (Shulman, 1987).

As part of research question four, the PETE students were asked to rate and justify their comfort level for teaching and performing educational gymnastics. The results indicate that the educational gymnastics course had a significant impact on PETE students' comfort levels for both teaching and performing educational gymnastics from pre-test to post-test. When it came to justifying their responses, several codes and major themes emerged from the data. The theme for comfort level for teaching educational gymnastics went from a general lack of comfort due to either lack of knowledge, experience, and/or formal training at pre-survey, to a greater comfort level due to gaining skills, knowledge, and/or teaching experience during the semester at post-survey.

The themes for comfort level for performing educational gymnastics at pre-survey were either a lack of comfort due to concerns about the perceived physical requirements associated with gymnastics, or comfort due to having other athletic experience and/or confidence in one's physical abilities. At post-survey, themes included a greater comfort level due to gaining skills and knowledge, and greater comfort due to having experienced success and/or enjoyment in the class.

The reservations about teaching educational gymnastics that the PETE students had at pre-survey are not surprising. Even physical education teachers in K-12 schools express concern about the lack of teaching expertise and training in educational gymnastics (Baumgarten & Pagnano-Richardson, 2010; Coehlo, 2010). For many physical education teachers, gymnastics is one of the most difficult activities to teach (Crutchley, 1985). PETE students in particular often dislike or even fear teaching gymnastics, and graduate from their programs qualified but ill-equipped to teach gymnastics confidently and effectively (Sloan, 2007).

The results of the post- survey responses about teaching educational gymnastics support those of an article by Donham-Foutch (2007), who recognized that teaching gymnastics is challenging for many PETE students. The article described one gymnastics course that prepared future physical educators to teach skill progression through a developmentally appropriate gymnastics program. The results of the reflections completed by the PETE students in this study showed that they felt more skilled and confident in teaching children basic movement and gymnastics skills. Furthermore, they felt more motivated to teach a basic gymnastics unit in their own classes in the K-12 school system.

As for the performance aspect, gymnastics is constantly highlighted as an area in which PETE students possess limited content knowledge (Sloan, 2007). Many have had little or no training or experience in gymnastics prior to entering the PETE program (Sloan, 2007; Crutchley, 1985). Gymnastics is something completely new and PETE students have little experience from which to draw (Sloan, 2007).

The results of the pre-survey responses regarding performing educational gymnastics support those of a study by Sloan (2007), who investigated PETE students' perceived levels of content knowledge and competence towards teaching secondary school gymnastics. The results of questionnaire revealed that 52% did not enjoy gymnastics and were not confident in their own ability to perform to a satisfactory standard within the activity. It was recommended that more emphasis be placed on providing the opportunity for PETE students to develop content knowledge in areas of perceived weakness during practicum experiences in schools. The qualitative results of this study echo the findings of Sloan (2007) and suggest that an educational gymnastics course can impact PETE students' comfort level with a novel content area.

Directions for Future Study

This study demonstrated the impact that one physical activity course in the content area of educational gymnastics can have on the motor skills and health-related fitness components of PETE students. While the results of this study are promising, particularly when it comes to the value of activity courses in developing motor skills, further research is needed.

Studying the impact of physical activity courses on the development of motor skills in PETE students in content areas other than educational gymnastics is warranted.

Specifically, do activity courses in other content areas result in an increase in motor skill levels in those content areas? Participation in the educational gymnastics course in this study appeared to increase PETE students' motor skills in this content area, but can the same be said for a physical activity course in team sports, dual sports, or dance? Expanding out of the area of educational gymnastics is important because different movement forms have the ability to impact fitness in different ways. There are as many possibilities for future studies here as there are content areas in physical education.

Another suggestion for future research involves repeating the study in another educational gymnastics setting with equipment that was not available in this study. Specifically, could instruction in an educational gymnastics course with more equipment result in greater gains in health-related fitness and motor skills than what was observed in this study? While PETE students in the educational gymnastics course in this study had some large equipment available to them (several types of mats, benches), they did not have any apparatuses from which to hang, swing, or climb. Introducing new equipment offers new challenges that may impact skill. An educational gymnastics setting in which PETE students have access to ropes, bars, nets, and other climbing structures and apparatuses offers a greater variety of movement experiences and ways in which students can manipulate their bodies. It follows that PETE students in the latter setting might have more opportunities for gains in motor skills and fitness (particularly muscular strength and endurance) than PETE students who primarily perform floor work on mats.

A third suggestion for future study also involves repeating the study, but with a stronger qualitative component. The qualitative component could involve full interviews with individual PETE in addition to the surveys administered at baseline and post-test.

Conducting full interviews would provide more detailed accounts of PETE students' subjective experience with the content delivered in the context of an educational gymnastics course.

A final suggestion for future study involves examining the relationship between motor skill levels and teaching performance. Specifically, do greater skill levels lead to better teaching performance? As discussed in Chapter 2, the aim of courses in physical activity content is to increase PETE students' content knowledge. However, does being skillful in a content area make one a better teacher in that content area? Addressing this question might involve assessing PETE students' teaching performance in a particular content area, perhaps in field experiences associated with their methodology courses, following assessment of the PETE students' skills in that content area. Whether skills in educational gymnastics or another content area in physical education are examined, connecting motor skill levels with teaching performance is a needed extension of this study.

Conclusion

Based on the findings of the study, at least four conclusions can be drawn. The first conclusion is that instruction in an educational gymnastics course improved the motor skill levels of the PETE students. Scores improved significantly on the rolling action, the balancing action, the step-like action, the flight action, the combination of skills, and the sequence of skills from pre-test to post-test. Scores on the individual skills tests tended to be higher than scores on the combination of skills and the sequence of skills both at pre-test and at post-test.

Second, instruction in an educational gymnastics course did not significantly improve the health-related fitness of the PETE students on most of the fitness tests. At the same time, fitness was not being targeted in the educational gymnastics course, as improving motor skills was of primary interest in this study. It is possible that PETE students' health-related fitness components could be improved by more directly targeting fitness within physical activity content courses such as the educational gymnastics course, rather than fitness being a by-product of the course.

Third, there were several significant relationships between motor skill level and health-related fitness. At pre-test, these included a relationship between the rolling action and the PACER, the flight action and the PACER, the combination of skills and the PACER, the rolling action and Body Composition, and the flight action and Body Composition. At post-test, significant relationships were between the flight action and the PACER, the sequence and the PACER, and the step-like action and Curl-Up. Since the only significant correlation that was present at both pre-test and post-test was between the flight action and the PACER test, the relationship between motor skills and fitness remains unclear.

Finally, comfort level for teaching and performing educational gymnastics improved from pre-test to post-test as a result of participation in the course. At the start of the course, the PETE students believed that a good teacher of educational gymnastics has both content knowledge and skills related to pedagogical content knowledge, and the same themes remained at the end of the course.

The evidence that this study provides could potentially benefit many groups, including PETE programs at colleges and universities, K-12 school physical education

teachers and programs, and students of physical education. The potential impact of content courses on the content knowledge of PETE students, and thus their ability and willingness to teach that content to their future students, is illustrated by the statements made on the surveys in this study. How likely is it that the PETE student who claims "I have never been taught gymnastics, so I feel that I am not adequate to teach it" (Participant 2, pre-survey) will opt to teach this content to his/her future students, compared to the PETE student who has taken a course in this content area and claims "I feel like I could probably teach educational gymnastics at an elementary level, because I've learned a lot from this class" (Participant 12, post-survey)? PETE programs may use the evidence that this study provides to make important decisions regarding the inclusion of educational gymnastics and other content courses in their programs. These decisions will directly impact the content knowledge of physical education teachers as they enter the field, and ultimately the programs and students who they serve.

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APPENDIX A: INDIVIDUAL SKILLS RUBRIC

Stage 1

-Rolling Action: Forward roll
- -Cue #1: C-shape
  - -Level 3: Back was kept curled throughout roll
  - -Level 2: Back was kept curled for most of the roll
  - -Level 1: Back was more flat or arched than curled
  - -Level 0: Skill not attempted
- -Cue #2: Tuck
  - -Level 3: Chin is tucked to chest throughout roll
  - -Level 2: Chin is tucked to chest for part of the roll
  - -Level 1: Chin is not tucked to chest during roll
  - -Level 0: Skill not attempted
- -Cue #3: Feet together
  - -Level 3: Feet are kept tightly together throughout roll
  - -Level 2: Feet start out together, may come apart during roll
  - -Level 1: Feet are apart for entire roll
  - -Level 0: Skill not attempted

-Balance: Standing on one foot
- -Cue #1: T-shape
  - -Level 3: Body clearly forms a "T" shape
  - -Level 2: Body forms a "T" shape, but may be leaning too far or not far enough
  - -Level 1: Body does not at all resemble a "T" shape
  - -Level 0: Skill not attempted
- -Cue #2: Straight legs
  - -Level 3: Both legs straight
  - -Level 2: Slight bend to one or both legs
  - -Level 1: Major bend to one or both legs
  - -Level 0: Skill not attempted
- -Cue #3: Stillness
  - -Level 3: Balance held for at least three seconds
  - -Level 2: Balance held for two seconds
  - -Level 1: Balance held for one second or less
  - -Level 0: Skill not attempted

-Step-Like Action: Cartwheel
- -Cue #1: Hand-hand-foot-foot
  - -Level 3: One hand is placed on the floor at a time, followed by one foot being placed on the floor at a time
  - -Level 2: Hands OR feet placed on the floor at the same time

-Level 1: Hands AND feet placed on the floor at the same time
-Level 0: Skill not attempted

-Cue #2: Strong arms
-Level 3: Arms are kept straight and strong
-Level 2: Some bend to arms
-Level 1: Major bend to arms, or arms collapsed
-Level 0: Skill not attempted

-Cue #3: Straight legs
-Level 3: Both legs straight
-Level 2: Slight bend to legs
-Level 1: Major bend to legs
-Level 0: Skill not attempted

-Flight: Tuck jump from a block

-Cue #1: Swing upward
-Level 3: Arms used to propel the body upward, kept arms close to ears
-Level 2: Arms used to propel body upward, kept above shoulder height
-Level 1: Arms not used to propel body upward, or did not reach shoulder height
-Level 0: Skill not attempted

-Cue #2: Knees to chest
-Level 3: Knees were brought to chest
-Level 2: Knees brought above hip level, but did not reach chest
-Level 1: Knees did not reach hip level
-Level 0: Skill not attempted

-Cue #3: Light landings
-Level 3: Knees were clearly bent ("seat to feet"), resulting in a light landing
-Level 2: Knees were somewhat bent, but landing could have been lighter
-Level 1: Knees were not bent to absorb the landing, landing was heavy
-Level 0: Skill not attempted

APPENDIX B: SCPEAP EDUCATIONAL GYMNASTICS 2ND GRADE ASSESSMENT TASK SCORING RUBRIC

Level 3:
• Show a clear beginning and ending by holding the balances* (3 balances must be held for 3 seconds and the other balance must be held at least 2 seconds)
• Balances show at least 2 of these changes: base of support, level, shape
• Performs rolls** smoothly with proficient technique and control
• Consistently (75% of the time or more) shows smooth transitions
• Repeats the same sequence in the second trial

Level 2:
• Show a clear beginning and ending by holding the balances* (all four balances held for at least 2 seconds)
• Balances show at least 2 of these changes: base of support, level, shape
• Performs rolls** smoothly with good technique and control
• Usually (50%-74% of the time) shows smooth transitions
• Repeats the same sequence in the second trial

Level 1:
• Shows an unclear beginning or ending (any balance* was held for less than 2 seconds)
• Changes one of the characteristics of the beginning and ending balances
• Performs rolls** smoothly with some technique and control
• Sometimes (15%-49% of the time) shows smooth transitions
• Does not repeat the same sequence in the second trial

Level 0:
• Shows an unclear beginning and/or ending (balances* were held for less than 2 seconds)
• Shows no changes in the characteristics of the beginning and ending balances
• Performs rolls** smoothly with poor technique
• Rarely (<15% of the time) shows smooth transitions
• Does not repeat the same sequence in the second trial

*A student using a standing upright position on 2 feet is NOT an acceptable balance.
**The trunk should make contact with the mat during the rolls.

APPENDIX C: SCPEAP EDUCATIONAL GYMNASTICS 5TH GRADE ASSESSMENT TASK SCORING RUBRIC

Level 3:
• Demonstrates a clear and controlled (held for 3 seconds) beginning and different ending balance*
• Good technique in demonstrating 3 of the 4 chosen movements in sequence
• Demonstrates a smooth transition between each of the 4 movements
• Usually (50%-74% of the time or more) demonstrates controlled use of momentum and balance
• The written narrative description (using appropriate gymnastics terminology, code, symbols, or drawings) consistently (75% of the time or more) matches the performance

Level 2:
• Demonstrates a clear and controlled (held for 2-3 seconds) beginning and different ending balance*
• Some technique in demonstrating 2 of the 4 chosen movements in sequence
• Demonstrates a smooth transition between 2 of the 4 movements
• Usually (50%-74% of the time) demonstrates controlled use of momentum and balance
• The written narrative description (using appropriate gymnastics terminology, code, symbols, or drawings) consistently matches the performance

Level 1:
• Demonstrates either a clear and controlled (held for 2-3 seconds) beginning or ending balance*
• Some technique in demonstrating 1 of the 4 movements in sequence
• Demonstrates only 1 smooth transition between any of the 4 movements
• Sometimes (15%-49% of the time) demonstrates controlled use of momentum and balance
• The written narrative description (using appropriate gymnastics terminology, code, symbols, or drawings) usually matches the performance

Level 0:
• Does not demonstrate a clear beginning or ending balance*
• Poor technique in demonstrating 1 of the 4 movements in sequence
• Lacks smooth transitions
• Rarely (<15% of the time) demonstrates controlled use of momentum and balance
• The written narrative description (using appropriate gymnastics terminology, code, symbols, or drawings) sometimes or rarely matches the performance
*A student using a standing upright position on 2 feet is not an acceptable balance.

APPENDIX D: MOTOR SKILLS TESTING WORKSHEET

STAGE 1 INSTRUCTIONS: INDIVIDUAL SKILLS

Name:

Directions: You will be asked to perform four different individual skills representing the four foundational skills of educational gymnastics: A rolling action, a balance, a step-like action, and a flight. You will be assessed for the demonstration of specific cues for each skill. The skills, associated cues, and explanations of the cues can be found below. You will have time to practice each skill, then perform each skill twice in front of the camcorders.

-Rolling Action: Forward roll

-Cue #1: C-shape (Back is kept curled throughout roll)
-Cue #2: Tuck (Chin is tucked to chest throughout roll)
-Cue #3: Feet together (Feet are kept tightly together throughout roll)

-Balance: Standing on one foot

-Cue #1: T-shape (Body clearly forms a "T" shape)
-Cue #2: Straight legs (Both legs are straight)
-Cue #3: Stillness (Balance is held at least 3 seconds)

-Step-Like Action: Cartwheel

-Cue #1: Hand-hand-foot-foot (One hand is placed on the floor at a time, followed by one foot being placed on the floor at a time)
-Cue #2: Strong arms (Arms are kept straight and strong throughout cartwheel)
-Cue #3: Straight legs (Both legs are extended straight throughout cartwheel)

-Flight: Tuck jump from a block

-Cue #1: Swing upward (Arms used to propel the body upward and kept close to ears)
-Cue #2: Knees to chest (Knees brought to the chest to achieve the tuck position)
-Cue #3: Light landings (Knees clearly bent ("seat to feet"), resulting in a light landing)

STAGE 2 WORKSHEET: COMBINATIONS

Directions: You will be asked to show a balance (a shape held still), a roll, and a difference balance. You will write down your combination as well as perform it. Balances must show at least 2 of the following changes: base of support, level, shape. You will be assessed on the clear shapes at the beginning and the end of the combination and your ability to hold these shapes still for 3 seconds each. You will also be assessed on how you perform the roll and the transitions (smoothness) getting into and out of the roll. You will perform the same sequence twice in front of the camcorders.

In the space below, write down your beginning balance, roll, and ending balance. Describe them in enough detail that they could be repeated by someone else.

Balance #1:

Roll:

Balance #2:

STAGE 3 WORKSHEET: SEQUENCE

Directions: You will be asked to perform an educational gymnastics sequence in front of the camcorder. This will be an individual sequence that you write down and perform. Your written sequence and the sequence that you perform should be the same. You may use a mat and a piece of apparatus (block mat, bench). You must include a beginning balance and a different ending balance with a minimum of **four (4)** different movement elements:

__Mount, travel along, dismount apparatus
__Turning or change of direction
__Change in speed
__Inverted or non-inverted balance showing clear shapes and extensions, held for three seconds
__Shape in flight
__A skill requiring some support on hands (handstand, round-off)
__Rolling

In the space below, write down the elements of your sequence, placing a CHECKMARK next to the four movement elements in the list above that you are using. As you did in the combination task, describe your elements in enough detail that they could be repeated by someone else. Wherever possible, use gymnastics terminology (i.e. "cartwheel").

Beginning Balance:

Element #1:

Element #2:

Element #3:

Element #4:

Ending Balance:

APPENDIX E: FITNESS TESTING SCORE SHEET

Name:_____ Sex: M F Age:_____

Fitness Testing Scores

PACER	Number of laps completed:_____
90° Push-Up	Number of push-ups completed:_____
Curl-Up	Number of curl-ups completed: _____
Back-Saver Sit and Reach	Left leg:_____inches Right leg:_____inches
Body Composition	Body fat:_____% BMI:_____

FITNESSGRAM Healthy Fitness Zones
(Females and males age 17+)

	Females	**Males**
PACER	41-72 laps	72-106 laps
90° Push-Up	7-15 push-ups	18-35 push-ups
Curl-Up	18-35 curl-ups	24-47 curl-ups
Back-Saver Sit and Reach	12 inches	8 inches
Body Composition	13-32% body fat BMI of 17.2-27.3	7-25% body fat BMI of 17.8-27.8

APPENDIX F: INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

1. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?
   _____ **days per week**

   ☐ No vigorous physical activities → ***Skip to question 3***

2. How much time did you usually spend doing **vigorous** physical activities on one of those days?
   _____ **hours per day**

   _____ **minutes per day**

   ☐ Don't know/Not sure

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

3. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.
   _____ **days per week**

   ☐ No moderate physical activities → ***Skip to question 5***

4. How much time did you usually spend doing **moderate** physical activities on one of those days?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.

5. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time?

_____ **days per week**

☐ No walking → ***Skip to question 7***

6. How much time did you usually spend **walking** on one of those days?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

The last question is about the time you spent **sitting** on weekdays during the **last 7 days**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7. During the **last 7 days**, how much time did you spend **sitting** on a **week day**?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

This is the end of the questionnaire, thank you for participating.

For the following questions, please think about the **VIGOROUS** and **MODERATE** activities that you performed in the last week. Disregard time spent walking and sitting. Examples of vigorous and moderate activities would include going to the gym, playing sports, physical activity classes, or anything that you do for exercise.

1. Please list all activities that you perform during the week that could be considered *aerobic or "cardio"* activities, including the total amount of time you spend in those activities **for the whole week** (add it up!).

Example: Running- 60 minutes/week, Swimming- 30 min/week, Cycling- 20 min/week

2. Please list all activities that you perform during the week that could be considered *flexibility* activities, including the total amount of time you spend in those activities **for the whole week**.

Example: Yoga- 3 hours/week, Stretching- 10 min/week

3. Please list all activities that you perform during the week that could be considered *muscular strength and/or muscular endurance* activities, including the total amount of time you spend in those activities **for the whole week**.

Example: Weightlifting- 5 hours/week, PEDU 131 (Basketball/Soccer)- 150 min/week

4. If there are any other moderate to vigorous physical activities that you performed this week that you did not list in the questions above, please list them here including the total amount of time you spend in those activities **for the whole week**.

APPENDIX G: SURVEY

The following questions will ask you about your comfort level for teaching and performing educational gymnastics, as well as what you believe to be attributes of a good teacher of educational gymnastics.

1. Overall, how would you describe your comfort level for *teaching* educational gymnastics?

1	**2**	**3**	**4**	**5**	**6**	**7**
Not at all Comfortable			**Neutral**			**Very Comfortable**

2. Please justify your rating in question #1 (explain why you chose that response).

3. Overall, how would you describe your comfort level with *performing* educational gymnastics?

1	**2**	**3**	**4**	**5**	**6**	**7**
Not at all Comfortable			**Neutral**			**Very Comfortable**

4. Please justify your rating in question #3 (explain why you chose that response).

5. In your opinion, what are the attributes of a good teacher of educational gymnastics? Please be as detailed as possible in your response.

APPENDIX H: COURSE OUTLINE

Week 1	
August 23	Course introduction, baseline survey
Week 2	
August 26	Baseline fitness testing
August 28	Baseline motor skills testing
August 30	Traditional vs. educational gymnastics, foundational skills of educational gymnastics, stages of content development, introduce physical activity recall instrument, PA recall #1
Week 3	
September 2	*Labor Day- No class*
September 4*	The BSER Movement Wheel, traveling actions using the feet varying with movement concepts
September 6*	Basic rolling actions
Week 4	
September 9*	Rolling actions continued
September 11*	Rolling actions using equipment
September 13	Introduce Sequence #1: Individual Rolling Sequence, PA recall #2
Week 5	
September 16	Sequence #1 practice
September 18	Sequence #1 with video observation and analysis
September 20	Sequence #1 performance and recording
Week 6	
September 23	Quiz #1
September 25*	Basic step-like actions
September 27*	Advanced step-like actions, PA recall #3
Week 7	
September 30*	Step-like actions with partners, with equipment
October 2	Introduce Sequence #2: Partner Step-Like Action Sequence
October 4	Sequence #2 practice
Week 8	
October 7	Sequence #2 practice with video observation and analysis
October 9	Sequence #2 performance and recording

October 11*	Balancing on points and patches, PA recall # 4
Week 9	
October 14*	Inverted balancing
October 16*	Partner and group balancing, countertension/counterbalance
October 18	*Fall Break- No class*
Week 10	
October 21	Introduce Sequence #3: Small Group Balancing Sequence
October 23	Sequence #3 practice
October 25	Sequence #3 practice with video observation and analysis, PA recall #5
Week 11	
October 28	Sequence #3 performance and recording
October 30	Quiz #2
November 1	Introduce Children's Center assignment
Week 12	
November 4	Small group work on Children's Center assignment
November 6	USC Children's Center lesson
November 8*	Flight (jumping and landing), PA recall #6
Week 13	
November 11*	Flight (vaulting)
November 13*	Flight (vaulting continued)
November 15	*SCAHPERD convention- No class*
Week 14	
November 18	Introduce Sequence #4: Large Group Flight Sequence
November 20	Sequence #4 practice
November 22	Sequence #4 practice with video observation and analysis, PA recall #7
Week 15	
November 25	Sequence #4 performance and recording
November 27	*Thanksgiving Break- No class*
November 29	*Thanksgiving Break- No class*
Week 16	
December 2	Final fitness testing
December 4	Final motor skills testing
December 6	Quiz #3, final survey, PA recall #8, and course wrap-up

*Indicates a class meeting where psychomotor tasks related to the development of gymnastics skills occurred.

APPENDIX I: SUMMARY OF TASKS PRESENTED BY LESSON

Day	Lesson Focus and Task Progression	Foundational Skill	Stage of Content Development
1	Lesson Focus: Traveling actions using the feet varying with movement concepts Task Progression: 1. Travel in general space varying locomotor action 2. Travel in general space, on the signal stop in a still shape (vary locomotor action and shape) 3. Travel in general space varying locomotor action and directions 4. Travel in general space varying locomotor action and levels 5. Travel in general space varying locomotor action and pathways 6. Vary locomotor actions and speed 7. Vary locomotor actions and force 8. Vary locomotor actions and partners 9. Vary locomotor actions and small groups 10. Students work in small groups to come up with their own combinations of the BSER concepts, and the class performs each group's combinations.	N/A	Individual skills
2	Lesson Focus: Basic rolling actions Task Progression: 1. See how many different ways you can roll 2. Back rocker 3. Log roll 4. Safety roll 5. Shoulder roll 6. Teddy bear roll 7. Select a rolling action practiced today and make it different using the BSER concepts (ex: A wide log roll)	Rolling Actions	Individual skills

3	Lesson Focus: Rolling actions continued Task Progression: 1. Forward roll or forward shoulder roll 2. Backward roll or backward shoulder roll 3. Perform two rolls together without stopping 4. Combine two rolling actions using a transitional movement (jump, turn, short period of traveling) 5. With a partner, simultaneously perform the same roll, transitional movement, and another roll.	Rolling Actions	Individual skills, combinations
4	Lesson Focus: Rolling actions using equipment Task Progression: 1. See how many different ways you can roll using equipment 2. See how many ways you can roll across equipment (ex: Shoulder roll across a block mat) 3. See how many ways you can roll onto/off of equipment (ex: Forward roll onto/off of a stacked mat) 4. See how many ways you can roll over equipment (ex: Dive forward roll over a block mat) 5. Combine two rolling actions with equipment 6. With equipment, combine two rolling actions using a transitional movement 7. With a partner and equipment, simultaneously perform the same roll, transition, and another roll	Rolling Actions	Individual skills, combinations
5	Lesson Focus: Basic step-like actions Task Progression: 1. See how many different ways you can travel using your feet and at least one other body part 2. See how many ways you can travel without using your feet at all 3. Crab walk 4. Bear walk 5. Seal walk 6. Inch worm 7. See how many other animal walks you can come up with that count as step-like actions 8. Step-like actions in different pathways 9. Step-like actions at different levels 10. Choose a step-like action and link it smoothly together with a rolling action	Step-Like Actions	Individual skills, combinations
6	Lesson Focus: Advanced step-like actions	Step-Like Actions	Individual skills,

	Task Progression: 1. Using a line on the floor or mat, try putting hands down at the same time and jumping both feet over the line at the same time ("hands-feet") 2. Using line on floor/mat, put one hand down at a time, then jump both feet over the line at the same time ("hand-hand-feet") 3. Using line on floor/mat, put one hand down at a time, then jump one foot at a time ("hand-hand-foot-foot") 4. Mini or "baby" cartwheel 5. Cartwheel 6. Round-off 7. Cartwheel or round-off with hurdle step 8. Combine a beginning step-like action with an advanced (wheeling) action		combinations
7	Lesson Focus: Step-like actions with partners, with equipment Task Progression: 1. Get with a partner and take turns leading and following using step-like actions 2. Meeting and parting with a partner using step-like actions 3. Mirroring and matching with a partner using step-like actions 4. Beginning step-like actions over partner 5. Advanced (wheeling) actions over partner 6. Step-like action over partner, quickly switch places, partner performs step-like action over you 7. See how many ways you can use perform step-like actions using equipment (ex: Beginning step-like actions down the length of a bench, wheeling actions off of the end of a bench)	Step-Like Actions	Individual skills, combinations
8	Lesson Focus: Balancing on points and patches Task Progression: 1. See how many different body parts can be bases of support (patches and/or points) 2. See how many ways you can balance only on patches 3. See how many ways you can balance only on points 4. See how many ways you can balance using five bases of support 5. Take-away balancing from five bases of support	Balancing	Individual skills

	6. See how many ways you can balance using four bases of support 7. Take-away balancing from four bases of support 8. See how many ways you can balance using three bases of support 9. Take-away balancing from three bases of support 10. See how many ways you can balance using two bases of support 11. See how many ways you can balance using one base of support		
9	Lesson Focus: Inverted balancing Task Progression: 1. See how many ways you can balance inverted 2. Tripod putting one knee to elbow 3. Tripod putting both knees to elbows with legs resting on block mat 4. Tripod 5. Headstand 6. Headstand, make a shape in the air with legs 7. Mule kick 8. Mini or "baby" handstand 9. Handstand	Balancing	Individual skills
10	Lesson Focus: Partner and group balancing, countertension/counterbalance Task Progression: 1. Travel in general space using different locomotor actions, on the signal stop and balance 2. Partial support balances with partners 3. Total support balances with partners 4. Partial support balances in small groups 5. Total support balances in small groups 6. Partial support balances in large groups 7. Total support balances in large groups 8. Partner countertension 9. Partner counterbalance 10. Small group countertension 11. Small group counterbalance 12. Large group countertension 13. Large group counterbalance 14. Make small group countertensions rotate or travel 15. Make small group counterbalances rotate or travel 16. Make large group countertensions rotate or travel	Balancing	Individual skills

	17. Make large group counterbalances rotate or travel		
11	Lesson Focus: Flight (jumping and landing) Task Progression: 1. Travel in general space using different locomotor actions, on the signal jump and land in a hoop 2. Travel in general space using different locomotor actions, on the signal jump over a small piece of equipment and land 3. Travel in general space using different locomotor actions, on the signal jump and land in a hoop immediately followed by a balance	Flight	Individual skills, combinations
12	Lesson Focus: Flight (vaulting) Task Progression: 1. Jump on to single block mat, jump off 2. Jump over single block mat 3. Jump onto single block mat, jump off making a shape in flight 4. Squat on to two stacked block mats, jump off 5. Squat on to two stacked block mats, jump off making a shape in flight 6. Straddle on to stacked block mats, jump off 7. Run and squat through, landing on the other side 8. Run and straddle over, landing on the other side	Flight	Individual skills
13	Lesson Focus: Flight (vaulting continued) Task Progression: 1. Review of vaulting actions from previous lesson (squat on, straddle on, squat through, straddle over) 2. Vaulting action followed by a rolling action 3. Vaulting action followed by a step-like action 4. Vaulting action followed by a balance 5. Vaulting action followed by two more actions (ex: A roll then a balance) 6. Vaulting action followed by three more actions (ex: A roll, a step-like action, and a balance)	Flight	Individual skills, Combinations

APPENDIX J: B-ALT-PE INSTRUMENT

B.ALT-PE
(Basic-Academic Learning Time-Physical Education)

ıcher_____ School_____ Grade_____ Date_____

Activity_____ Start_____ Stop_____ In Class_____

Observer_____

Key Behaviors

Management (M) related to class business, unrelated to instructional activity

Transition (T) managerial and organizational activities related to instruction

Waiting (W) completed a task, period of no activity and no movement between activities

Knowledge (K) listening to instructions, watching a demonstration, questioning, discussing

Activity (A) engaged in motor activity, actively responding, actively supporting

Off-Task (O)

General Comments:
(Consider - lesson plan, critical incidents, objectives achieved)

_____

_____

_____

_____

Summary Data

M	Secs.	%	T	Secs.	%	W	Secs.	%
K	Secs.	%	A	Secs.	%	O	Secs.	%

Pupil Names_____

Positive Interactions _____ Negative Interactions _____

Specific Comments: (Directly related to data)

_____

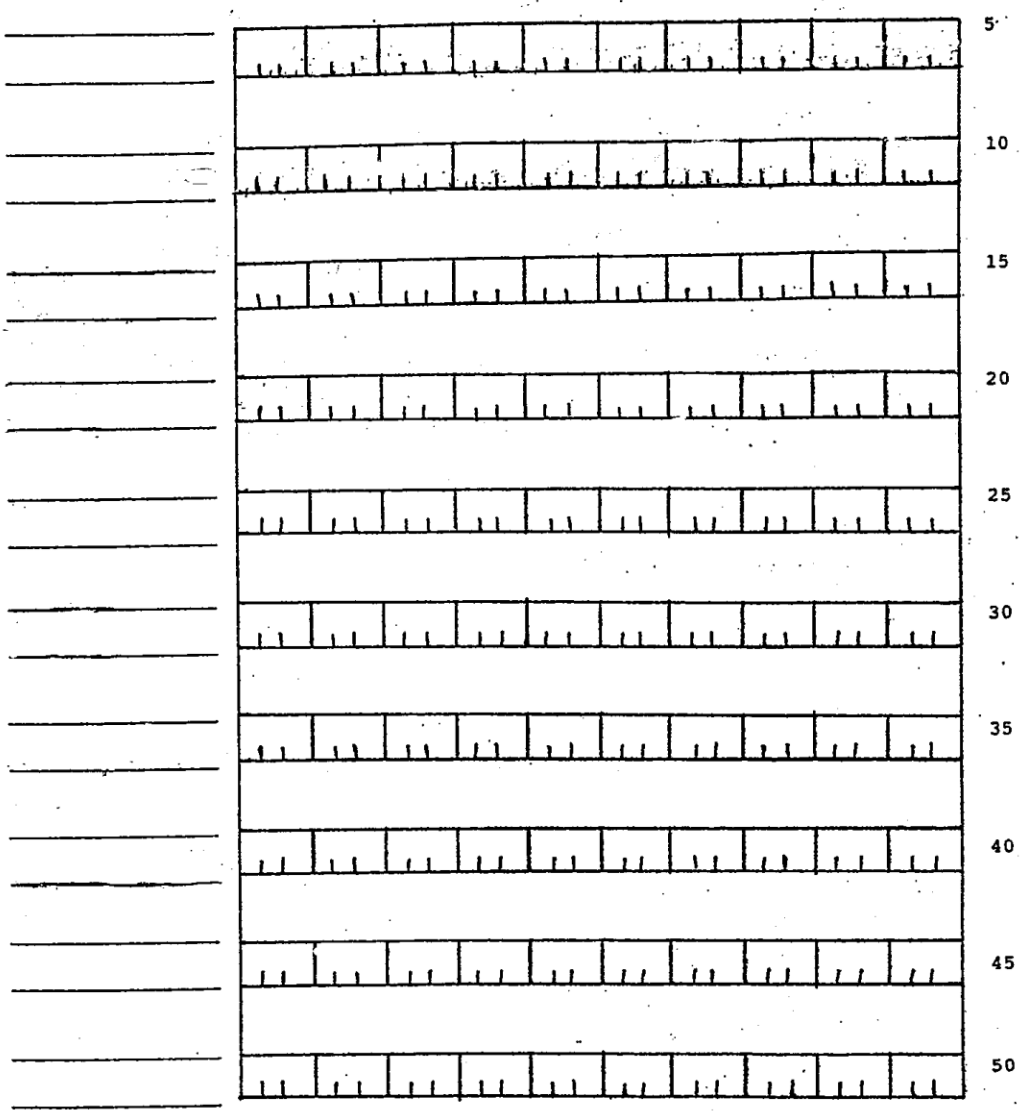
_____

_____

_____

Comments:

Target Pupil:_____



Student Responses	Total	%	Behavioral Interactions	Total
Correct			Positive	
Incorrect			Negative	
Use of student name	Total			

APPENDIX K: SUMMARY OF PHYSICAL ACTIVITY RECALLS

Type of Activity	Recall 1 Activities	Time	#	Recall 2 Activities	Time	#	Recall 3 Activities	Time	#	Recall 4 Activities	Time	#
Cardio-Vascular Endurance	Dance	150	1	Dance	150	6	Dance	138	5	Dance	122	6
	Running	73.7	14	Cycling	90	1	Running	100	10	Cycling	80	1
	Cycling	50	3	Running	65.6	8	Cycling	40	1	Running	69.4	8
	Swimming	30	1				Swimming	30	1	Swimming	30	2
	Tag	20	1									
Flexibility	Yoga	30	1	Pilates	120	1	Stretching	27.7	11	Pilates	60	1
	Stretching	16.3	12	Stretching	20	10	Pilates	20	1	Stretching	19.4	8
Muscular Strength and Endurance	Cheerleading	720	1	Cheerleading	420	1	Cheerleading	720	1	Weightlifting	206	7
	Tumbling	240	1	Weightlifting	299	9	Weightlifting	273	9	Cheerleading	150	1
	Weightlifting	217	11	Basketball	154	9	Basketball	165	6	Educational Games	150	1
	Basketball	184	7	Educational Games	150	3	Racquetball	150	1	Golf	150	1
	Badminton	150	2	Flying disc sports	150	1	Badminton	135	4	Basketball	143	4
	Educational Games	150	5	Golf	150	3	Educational Games	90	2	Volleyball	120	1
	Golf	110	3	Badminton	144	5	Golf	90	1	Football	60	1
	Football	60	1	Volleyball	120	1	Baseball	60	1	Soccer	60	1
	Push-ups	60	1	Football	60	1	Volleyball	60	2	Ultimate	60	1
	Volleyball	60	1				Dodgeball	35	1	Racquetball	45	1
	Wrestling	20	1									

	Recall 5 Activities	Time	#	Recall 6 Activities	Time	#	Recall 7 Activities	Time	#	Recall 8 Activities	Time	#
Cardio-vascular Endurance	Dance	150	4	Dance	138	4	Dance	143	4	Dance	140	3
	Running	76.5	10	Running	108	10	Running	110	6	Running	89.2	6
				Swimming	90	2						
				Cycling	30	2						
Flexibility	Pilates	45	1	Pilates	240	1	Stretching	19	10	Stretching	27.5	10
	Stretching	21	10	Stretching	25	10						
Muscular Strength and Endurance	Weightlifting	285	6	Weightlifting	313	7	Weightlifting	468	5	Weightlifting	340	6
	Golf	160	3	Cheerleading	210	1	Badminton	150	3	Badminton	150	2
	Educational Games	156	5	Badminton	150	1	Golf	150	2	Golf	150	2
	Cheerleading	120	1	Educational Games	150	5	Soccer	150	2	Educational Games	150	3
	Ultimate	120	1	Golf	150	1	Educational Games	127.5	4	Soccer	150	1
	Soccer	115	3	Soccer	150	1	Basketball	105	3	Softball	120	1
	Basketball	80	3	Basketball	120	4				Kickball	90	1
	Football	45	1	Bowling	120	1				Cheerleading	60	1
	Dodgeball	35	1	Lacrosse	120	1				Volleyball	60	1
	Lacrosse	30	1	Ultimate	60	1				Ultimate	45	1
				Volleyball	30	1						

APPENDIX L: RESULTS OF QUALITATIVE SURVEY QUESTIONS

Pre-Survey Justification for Rating of Comfort Level with Teaching Ed. Gymnastics

Theme	Codes	Examples
Lack of comfort for teaching educational gymnastics due to either lack of knowledge, experience, or formal training.	Lack of Knowledge	Participant 3: "I played other sports so I just don't know as much about gymnastics."
		Participant 9: "I don't know too much about gymnastics."
		Participant 13: "I don't know a lot."
		Participant 16: "I'm comfortable teaching, but don't know enough about the subject to teach it."
		Participant 18: "The teaching part doesn't bother me, but I don't know anything about gymnastics."
		Participant 22: "I know nothing."
	Lack of Experience	Participant 1: "I haven't had much experience in gymnastics."
		Participant 6: "I am not experienced in gymnastics at all."
		Participant 14: "I have no experience in gymnastics."
		Participant 15: "I have no experience in gymnastics in my past so this is a learning experience."
	Lack of Formal Training	Participant #2: "I have never been taught gymnastics, so I feel that I am not adequate to teach it."
		Participant #12: "I have never taken Educational Gymnastics before, and I don't know what to expect."
		Participant #20: "Never taken any gymnastics."
		Participant #21: "I have very little gymnastics background."

Post-Survey Justification for Rating of Comfort Level with Teaching Ed. Gymnastics

Theme	Codes	Examples
Greater comfort level for teaching educational gymnastics due to gaining skills, knowledge, and/or teaching experience during the semester.	Gained Skills	Participant 3: "I'm still not 100% proficient at gymnastics but I feel much better than I did when I started."
		Participant 5: "I am pretty confident that I could teach educational gymnastics because I could perform examples and give clear and precise cues."
		Participant 6: "I have learned many basic skills that I feel I have a clear understanding of and could teach to students."
		Participant 21: "I feel as though I am skilled in the movements we went over in class."
	Gained Knowledge	Participant 8: "I feel like I have learned a lot just going through this course and I have a better knowledge base."
		Participant 11: "I know the material and cues now so I feel a lot more comfortable."
		Participant 12: "I feel like I could probably teach educational gymnastics at an elementary level, because I've learned a lot from this class."
		Participant 18: "I understand the concepts and the cues to go along with them."
	Gained Teaching Experience	Participant 17: "I taught educational gymnastics in (other course) to my elementary kids for four lessons."
		Participant 19: "I taught it to elementary level students. I feel comfortable in my ability to perform and teach."
		Participant 20: "Performed almost every task successfully and did well with kids on teaching day."

Pre-Survey Justification for Rating of Comfort Level with Performing Ed. Gymnastics

Theme	Codes	Examples
Lack of comfort for performing educational gymnastics due to concerns about the perceived physical requirements.	Flexibility, Balance	Participant 3: "I'm not flexible."
		Participant 4: "I'm all for trying but I'm not the most flexible person."
		Participant 11: "I feel gymnastics will help me become more flexible."
		Participant 14: "I am not experienced in gymnastics and have little balance."
		Participant 21: "I am not as flexible as others but given time I believe I could improve in performances and exceed the expectations of the course."
	Specific Skills: Cartwheels, Rolls, Flips, Inverted Balances	Participant 1: "The extent of gymnastics experience is a cartwheel, but I'm open to learning."
		Participant 2: "I am scared to do a cartwheel and have never been able to do one. Also, rolling and flipping scare me because of neck positioning and landing."
		Participant 3: "I can do some things, tripods or front rolls. My cartwheel is not great and I cannot do any floor routines."
		Participant 8: "Not really big on doing flips and handstands."
Comfort for performing educational gymnastics due to having other athletic experience and/or confidence in one's abilities.	Other Sport Experience, Confidence in Athletic Ability	Participant 5: "Even though I am not experienced in gymnastics, I feel that I am fairly athletic."
		Participant 11: "I've never done gymnastics, but was a three-sport athlete in high school and played one year of college baseball."
		Participant 13: "I am very athletic and love physical activity."
		Participant 20: "Played sports growing up and feel pretty athletic overall."

Post-Survey Justification for Rating of Comfort Level with Performing Ed. Gymnastics

Theme	Codes	Examples
Greater comfort for performing educational gymnastics due to gaining skills and knowledge.	Gained Skills, Gained Knowledge	Participant 4: "I have learned quite a bit and feel more comfortable than I did before."
		Participant 6: "I have learned many skills."
		Participant 11: "I can perform most of the tasks besides a few step-like actions."
		Participant 15: "I feel that I have a good knowledge of each skill."
		Participant 18: "I recognize cues and have performed multiple tasks."
		Participant 19: "I can properly do a lot of different gymnastics moves adequately, and I feel comfortable doing it."
Greater comfort for performing educational gymnastics due to having experienced success and/or enjoyment in the class.	Easy, Fun, Successful	Participant 1: "The performance aspect is easy."
		Participant 5: "I feel very comfortable with performing educational gymnastics because I found most of the tasks easy and fun to perform."
		Participant 12: "I'm really good at Educational Gymnastics!"
		Participant 16: "It was fun and comfortable."
		Participant 20: "Completed every task and graded out well on all sequences."
		Participant 21: "I feel as though I had an easy time performing educational gymnastics."

Pre-Survey Attributes of a Good Teacher of Educational Gymnastics

Theme	Codes	Examples
A good teacher of educational gymnastics has knowledge of the subject matter.	Knowledge of the Subject Matter	Participant 3: "I feel that knowing the skills and having background knowledge helps."
		Participant 5: "Have knowledge of the sport."
		Participant 10: "Knowing what you are teaching."
		Participant 15: "Someone who likes the sport and has basic knowledge of the sport."
		Participant 16: "I think you should be knowledgeable."
		Participant 17: "Knowledgeable about the skills they are teaching."
		Participant 20: "Very knowledgeable about the sport/skills."
		Participant 21: "He/she should have knowledge of the content."
A good teacher of educational gymnastics provides clear explanations and demonstrations.	Explanations & Demonstrations	Participant 9: "Someone who is able to explain and show what you're supposed to do well."
		Participant 11: "A good teacher will always explain everything thoroughly."
		Participant 12: "A good Ed. Gymnastics teacher has the ability to describe exercises well enough for all students to understand."
		Participant 18: "Being able to provide good explanations and examples of the moves and sequences."
A good teacher of educational gymnastics is able to perform the skills that are being taught.	Ability to Perform Skills	Participant 2: "I feel that the teacher needs to be well educated and able to perform gymnastics."
		Participant 6: "Someone who is in shape and knows proper techniques to perform basic gymnastics."
		Participant 14: "Ability to accurately perform the skills necessary in gymnastics."

Post-Survey Attributes of a Good Teacher of Educational Gymnastics

Theme	Codes	Examples
A good teacher of educational gymnastics is able to perform the skills that are being taught.	Ability to Perform Skills	Participant 3: "Skillful…because the teacher needs to know the material to be efficient."
		Participant 4: "Be able to perform everything."
		Participant 5: "They need to be able to perform each task."
		Participant 10: "Someone who can physically perform skills."
		Participant 12: "They must be able to perform the skills better than their students."
		Participant 16: "A teacher that can perform the skills and translate them to the student."
		Participant 18: "Able to perform skills as examples for the class."
		Participant 21: "Skilled in movements."
A good teacher of educational gymnastics provides clear explanations and demonstrations.	Explanations & Demonstrations	Participant 7: "Demonstrations (multiple)."
		Participant 11: "A good teacher explains all the cues thoroughly. Shows students examples as well as demonstrating."
		Participant 14: "Good at explaining and giving visual demonstrations."
		Participant 15: "Someone that is able to teach the correct cues and demonstrate the skills."
		Participant 22: "Specific in instruction."
A good teacher of educational gymnastics has knowledge of the subject matter.	Knowledge of the Subject Matter	Participant 8: "Knowing the material."
		Participant 12: "The teacher must first know how to teach gymnastics skills."
		Participant 20: "Knowledge of subject."