DEVELOPMENT OF “TEACHERS INTEGRATING PHYSICAL ACTIVITY INTO THE CURRICULUM” (TIPAC) USING A SYSTEMS MODEL APPROACH

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DEVELOPMENT OF “TEACHERS INTEGRATING PHYSICAL ACTIVITY INTO THE CURRICULUM” (TIPAC) USING A SYSTEMS MODEL APPROACH

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ABSTRACT

The purpose of this study was to develop and evaluate the online curriculum titled Teachers Integrating Physical Activity into the Curriculum (TIPAC). TIPAC was developed to be part of a comprehensive online learning center in which teachers can learn about physical activity integration into the classroom, regardless of the subject being taught. TIPAC was built upon sound instructional design using the Dick and Carey Systems Approach Model (2015). TIPAC incorporated best practice of curriculum design by utilizing concepts from the Biological Sciences Curriculum Study (BSCS) 5E Model (Bybee et al., 2006). Finally, factors known to increase teacher change, identified by Fullan (2007), were incorporated into TIPAC development.

This study was guided by the following two research questions: 1. How do the outcomes of the formative evaluations inform the curriculum design process? 2. How can the Dick and Carey Systems Approach Model (2015) be used to design an instructional program that teaches the integration of physical activity into the curriculum?

Dick and Carey embed formative evaluations throughout the development process at each step. Thirteen formative evaluations were performed throughout this study. Five main discoveries were made as a result of this systematic process of curriculum development: (a) the model is recursive, (b) outcomes provide guidance, (c) there is limited functionality with existing rubrics, (d) the selection and number of
experts used in formative evaluations are curriculum dependent, and (d) in-person formative evaluations are essential.

Additionally, three important findings emerged related to the overall functionality of the Dick and Carey Systems Approach Model (2015) in development of TIPAC: (a) formative evaluations are imperative in successful curriculum development, (b) the Dick and Carey Systems Approach Model (2015) remains a viable and informative model in the curriculum development process, and (c) inclusion of teachers in the evaluation process is vital for effective curriculum development leading to greater potential for change.

The Dick and Carey Systems Approach Model (2015) provides a clear blueprint for development of a successful program. However, findings from this study recommend that adjustments to existing rubrics and the formative evaluation process be made to meet the individualized needs of any program.
DEDICATION

I dedicate this work to my family who has been on this journey with me for eight years. I could not have done this without their support.

Throughout this process my children have stood my side, provided unwavering support, made me laugh and kept me sane. They sacrificed time with me so that I could pursue this goal. They quizzed me when I had tests and listened to me practice presentations endless times. This road was so much smoother with them by my side. I am forever grateful for their understanding, love and support. I love you for always and like you forever Lexi, Anthony and Abby.

My father has been my cheerleader throughout this process. He would call me and tell me when he saw a news story about children exercising in school and would send me newspaper clippings in the mail. He even offered to assist me with my literature review, although he is not the most technologically advanced individual. I will always be grateful for his love and support. Thank you Papi.

My mother has been my rock. She has listened to me countless hours through tears, frustration, and joy. Her unconditional love never waned and her encouragement never faded. She was always there for me reaching out to grab my hand. I will always be grateful for her love and support. Thank you Mom.
My husband has been my strength for these last 3 years. He entered my world knowing I was on this journey and continuously provided encouragement and support. He could always lighten the mood, make me laugh, and was never short on supportive hugs. I love you honey.

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CHAPTER I

INTRODUCTION

There is a concerning phenomenon occurring globally. It is estimated that 3.4 million deaths worldwide are related to overweight and obesity (Ng et al., 2014). In the United States, obesity rates are rising to an unparalleled high while physical activity among youth is decreasing. As of 2012, the percentage of 2- to 19-year-old children in the United States considered to be obese is significant at 16.9%, with this percentage remaining unchanged from the 2010 data (Ogden, Carroll, Kit, & Flegal, 2014). According to the 2009-2010 National Health and Nutrition Examination Survey, there are more than 13 million boys and girls identified as obese (Ogden, Carroll, Kit, & Flegal, 2012).

Respected organizations, including the American Heart Association (AHA), Centers for Disease Control and Prevention (CDC), Department of Health and Human Services (HHS) and the National Association for Sport and Physical Education (NASPE), recommend that all children participate in 60 minutes of physical activity daily. However, research conducted over the last few decades indicates that children are not obtaining this recommended amount of physical activity. The National Institute of Child Health and Human Development’s (NICHD) study of Early Child Care and Youth Development (SECCYD) was a longitudinal study of 1,032 children. Data were
collected from children ranging in ages from 9 to 15 during the years 1991-2007. The authors concluded that most children are not meeting this recommended level of physical activity, with physical activity actually decreasing significantly during these ages (Nader, Bradley, Houts, McRitchie, & O’Brian, 2008). Similarly, Troiano, Berrigan, Dodd, Mâsse, Tilert, and McDowell (2008) reported that only 42% of children, ages 6 to 11, and 8% of adolescents, ages 12 to 19, are obtaining the recommended amount of physical activity. National data from the CDC (2015) also illustrates a decrease of daily physical activity among adolescents. Twenty-seven percent of adolescents in Grades 9-12 met the recommended 60 minutes of physical activity daily in 2013, which was a decrease from 28.7% of adolescents meeting that goal in 2011.

The dangers of obesity in children have been well documented with disorders such as obstructive sleep apnea, polycystic ovarian syndrome, hypertension, and slipped capital femoral epiphysis being seen at increased rates within hospitals (Choudhary, Donnelly, Racadio, & Strife, 2007). These dangers were being recognized as early as 2005 with reports of changes in diabetic rates among children. Type 2 diabetes is historically an adult condition related to overweight status, whereas Type 1 diabetes is an autoimmune condition unrelated to weight. Daniels et al. (2005) reported that Type 2 diabetes now more than doubles the prevalence of Type 1 diabetes among children. This is extremely concerning as Type 2 diabetes is a risk factor for cardiovascular disease. Experts at the CDC (2013) explain that obese children are more likely to have high cholesterol and high blood pressure, which are also risk factors of cardiovascular disease. In addition, social and psychological problems, such as poor self-esteem, are noted among children of obese status (CDC, 2013).
There are circumstances occurring within the educational system that are adding to this crisis of childhood obesity. Schools are being held under greater scrutiny because of accreditation standards, and some schools are decreasing physical activity to concentrate on core academics. According to the Center on Education Policy, an average decrease of 50 minutes a week in recess has occurred within 20% of school districts since No Child Left Behind was initiated (Ramstetter, Murray, & Garner, 2010). With the growing trend to reallocate recess time to concentrate on academic core subjects, like literacy and mathematics, the American Academy of Pediatrics (2013) set forth a policy statement concerning the crucial role of recess in school. The policy statement promotes recess as a necessary break in the school day for optimizing social, emotional, physical, and cognitive development in children and should not be withheld for academic purposes. Additionally, recess can serve as a means of obtaining the recommended daily 60 minutes of moderate to vigorous activity (Murray & Ramstetter, 2013).

The School Health Policies and Practices Study (SHPPS), within the CDC, is a national survey administered every 6 years. The purpose of the study is to examine school health policies and practices at the state, district, school, and classroom level as a strategy to improve students’ health and learning. The components surveyed are health education, physical education, health services, mental health and social services, nutrition services, healthy and safe school environment, and faculty and staff health promotion. The 2012 study included 1,048 school districts as participants. The results of the study revealed that although 86% of districts claim that they follow national, state, or district physical education standards, the requirements (e.g., minutes per week, hours
per quarter, or hours per year) are not consistent among the school districts.

Interestingly, only 19 of 50 states have policies regarding the frequency and specific minutes for physical education (PE). Of those 19 states that have policies in place, only five report having these policies for elementary, middle and high school (Kahan & McKenzie, 2015). Although physical education is a class that is considered a public health resource for battling overweight and obesity among youth, it is clear that the frequency and minutes spent in PE are not consistent across the country (Kahan & McKenzie, 2015).

In addition to the lack of standardization, there are also inconsistencies regarding exemptions from physical education class. Exemptions from physical education class are observed for numerous reasons. Some of these exemptions include students getting pulled out of PE to complete remedial work or to receive additional instruction in other courses. Some students are not required to take PE at all because of their participation in certain clubs or sports. In fact, 47% of districts permit these exemptions at the elementary level, 44% at the middle school level, and 47% at the high school. Although nearly half of districts have adopted these policies on physical education exemptions, the SHPPS 2012 report suggests that this is not widely accepted by respected organizations. Both NASPE and the CDC oppose substitutions and waivers/exemptions from required physical education, stating that physical education is an “essential and integral component of a total education” (CDC, 2013, p. 45). These exemptions send out a message regarding the perceived importance, or lack thereof, regarding physical education.
Physical education is not the only inconsistency among schools. Recess and breaks for physical activity was another area in the SHPPS 2012 report that demonstrated a lack of unity among school districts. Slightly more than half (58.9%) of districts required elementary schools to provide regularly scheduled recess and less than one in eight districts required schools at each grade level to provide physical activity breaks for their students (CDC, 2013).

As the dangers of obesity among youth have been well documented in the health professional field, so have the benefits of exercise. Experts at the American Heart Association (2015) describe the benefits of physical activity as reducing the risk of heart disease, stroke and Type 2 diabetes, improving blood cholesterol levels, preventing and managing high blood pressure, improving bone health, boosting energy level, improving sleep, and countering anxiety and depression (Kraus et al., 2015). Researchers at the CDC (2010) explain that the physiological changes that are occurring in the brain with physical activity may result in improved attention, enhanced coping, and enhanced positive affect. In a study published by the CDC (2010), 43 research articles were reviewed that explored the relationship between physical activity and academic performance. The 43 studies were coded for synthesis. Physical activity was categorized by physical education, recess, classroom-based physical activity, and extracurricular physical activities. Academic performance outcomes were categorized as academic achievement, academic behavior, and cognitive skills/attitudes. Within the 43 articles, there were 251 relationships noted between the physical activity categories and academic performance categories. Of these 251 relationships, 50.5% were positive, 48% were not significant, and 1.5% were negative.
The Link Between Physical Activity and Academic Performance

There is a growing body of research that examines the link between physical activity and academic performance, and this research will be explored in detail in Chapter II. Two studies of particular interest, however, have been selected for discussion at this time because of their significance in framing this study.

The Trois-Rivières study in Canada, conducted over 35 years ago, was groundbreaking in recognizing the importance of physical activity and academic performance (Shephard, 1997). The study consisted of 546 urban and rural elementary school children, with approximately equal numbers of boys and girls. The main investigation occurred between 1970 and 1977. The original study consisted of an experimental group and a control group. The students in the experimental group received an additional 5 hours of physical education per week when compared to the control group. The results indicated that although the experimental students received 14% less classroom instruction, they showed better academic performance than the control group. The researchers concluded that decreased classroom time did not result in poorer academic performance. Strengths to this study included the 6-year length of intervention. In addition, the teachers in the study remained unchanged for the 6 years providing consistency. Limitations of this study are characteristic of a longitudinal design. There could have been changes in attitudes towards physical fitness over the 6-year study among the participants and community. In addition, there were changes within the environment in which physical activity was performed, including the addition of a modern swimming pool and modern ice rink for the children in the rural area.
Another limitation is centered on generalizability to the United States since the study was conducted in Canada (Shephard & Trudeau, 2005).

Nearly 30 years after the Trois-Rivières study, researchers continue to investigate the association between physical activity and academic performance. The Physical Activity Across the Curriculum (PAAC) study examined academic achievement among 665 boys and 677 girls beginning in Grades 2 and 3 who progressed to Grades 4 and 5 (Donnelly et al., 2009). The children in the experimental group received at least 75 minutes of PAAC weekly, whereas the control group received less than 75 minutes of PAAC weekly. Academic achievement was measured with use of the Wechsler Individual Achievement Test (2nd ed.) and demonstrated significant improvements from baseline to 3 years for composite, reading, math, and spelling scores when compared with the control group.

**Integrating Physical Activity in the Classroom**

There are programs available like *Take 10!, WISERCISE!, and Energizers* that assist classroom teachers with physical activity integration. These programs have been selected for inclusion in this dissertation because they have been used by various researchers to conduct studies regarding physical activity implementation within the classroom. Specific studies involving these programs will be explored in detail in Chapter II, however, a short overview of each program is provided below.

*Take 10! is a program that integrates 10-minute physical activities into the classroom curriculum to help reduce sedentary behavior, promote life-long healthy behaviors, and improve attention. The goal of *Take 10! is to get students moving without sacrificing time used for academic learning (Kibbe et al., 2011). Strengths to
*Take 10!* include that the activities are clearly described and easily adaptable for teachers in the classroom. A limitation to this program is the cost. This is not a free product and requires the school to purchase the materials. Training is another limitation to the program. Although, the kit that is purchased provides basic directions to implement the activities in the classroom, training via a workshop incurs additional cost (International Life Sciences Institute (ILSI), 2015).

*WISERCISE!* is the physical activity portion of the The OrganWise Guys nutrition and physical activity program. This supplemental classroom component consists of 8- to 10-minute activities to keep kids exercising at a moderate to vigorous level while learning academic objectives in the areas of math, language arts and nutrition/health. Although the *WISERCISE!* kit can be purchased independently, it is part of a much more inclusive program that teaches students the importance of healthy living. The physical activities provided in the *WISERCISE!* program were designed to correlate with The OrganWise Guys healthy living curriculum. Therefore, there are not physical activities to correlate with curriculum focused on topics beyond language arts, math, and nutrition/health. Areas such as social studies and science unrelated to the human body are not offered. As with the *Take 10!* program, *WISERCISE!* is available for purchase and is not a free resource (The OrganWise Guys, 2015).

Energizers are classroom-based physical activities specifically for teachers to use to create active lesson plans. There are 22 *Energizers* for Grades Kindergarten through 2 and 26 *Energizers* for Grades 3 through 5. Each of the *Energizers* includes directions for the activity and variations that can be used (Mahar, Scales, Kenny, Collins, &
Shields, 2006). Strengths with the *Energizers* program are that they are free and easily downloadable (Mahar et al., 2006).

Although these programs have positive features, they also have limitations, specifically cost, training and collaboration. *Take 10!* and *WISERCISE!* are available for purchase which may deter participation from many schools based upon lack of financial resources. Additionally, *WISERCISE!* is part of a much larger curriculum, with a focus on overall health. If the school is interested in purchasing the entire OrganWise Guys program, it will cost upwards of $2,500 (The OrganWise Guys, 2015).

Training and support are considerable limitations noted among all three programs. There is no formal training available for Energizers. Training is offered by a certified staff member for *Take 10!* but it is costly. *WISERCISE!* does offer a brief training video (3 minutes 14 seconds) on their website to provide an overview of the program. The lack of professional training means teachers must be dedicated self-learners.

Regarding collaboration, there is not a specified location where teachers can go to share ideas with other teachers found in any of the programs. Although there is a Blog component associated with The OrganWise Guys program, it does not permit access for discussion among users of the site. The posts are restricted to The OrganWise Guys administration. This lack of support forces the teacher to be self-motivated and innovative to start and continue any of these programs within his/her classroom.

The above mentioned programs were primarily developed by physicians, researchers in exercise and science fields, and university based employees. How will this knowledge transfer across disciplines? How will classroom teachers initiate a new
curriculum or a new method of instruction from researchers across various disciplines? In summary, the literature is sound regarding the benefits of physical activity on academic performance and overall physical and mental health; however, there is no known research regarding the development of a learning site which can provide the necessary training, tools, and support needed to assist teachers in the utilization of physical activity as part of curriculum instruction.

**Purpose of the Study, Research Questions, and Statement of Bias**

The overall purpose of this dissertation was to develop and evaluate the curriculum titled Teachers Integrating Physical Activity into the Curriculum (TIPAC). TIPAC is an online learning center, comprised of modules and self-assessments in which teachers, both pre-service and in-service, can learn about physical activity integration into the classroom, regardless of the subject being taught. The aim of this online training program is to increase teachers’ knowledge of obesity among youth, provide resources to educate them about ways to incorporate physical activity as part of the curriculum, and provide a platform in which teachers can communicate with other educators around the world regarding physical activity in the classroom. TIPAC is ideal for any high stakes teacher dedicated to rigorous standards based teaching as physical activity has demonstrated improved academic achievement.

It is necessary to use a model for instructional design to guide the development of TIPAC so that objectives are made clear at the onset. This model for instructional design will act as a blueprint for designing TIPAC providing a step-by-step approach to ensure completeness. Without this planning guide, the implementation and evaluation process can become muddied and unfocused. An outcomes-based system approach
model provides a clear understanding of the new knowledge and skills that the learners (i.e., teachers) are to acquire through TIPAC. The Dick and Carey Systems Approach Model for designing instruction (2015) will be used to develop TIPAC.

This study, to develop and formatively evaluate the innovative online TIPAC curriculum, rich in evidenced–based research using the Dick and Carey Systems Approach Model (2015), was designed to answer the following two research questions:

1. How do the outcomes of the formative evaluations inform the curriculum design process?

2. How can the Dick and Carey Systems Approach Model (2015) be used to design an instructional program that teaches the integration of physical activity into the curriculum?

**Statement of Bias**

The process of developing TIPAC was subject to bias on my part as the researcher and designer. As the researcher I believe it is important to state my assumptions and beliefs upfront as well as the methods I took to control for bias throughout this development process. As a pediatric nurse practitioner, I am passionate about child health, particularly as it relates to obesity. Additionally, as an instructor in higher education, academic achievement among students is also an area I hold close to my heart. I conceived the idea of TIPAC several years ago and am a true believer in its purpose and need. It is my belief that TIPAC has the potential to provide some tools that could work toward improving the current state of childhood obesity while enriching academic achievement among children. I recognize that I am very passionate about this product and took considerations for controlling my bias. Throughout this development
process I utilized outside experts, from different schools of thought, to perform formative evaluations ensuring fidelity by assessing for blind spots, omissions, interpretations, and examining my judgements. Additionally, teachers that were selected for interviews throughout the process were employed at different schools, grades, and settings (urban vs. suburban) as an attempt to broaden the participant view from the sampling population. Although my bias may still occasionally shine through this work, I believe the formative evaluation process and teacher selection for interviews controlled for bias and enhanced the fidelity of this study.

**Format of this Dissertation**

Traditional dissertations tend to follow a very specific approach, five chapters with similar headings within those chapters; however, our world is changing and therefore dissertations should be allowed more flexibility (Cassuto & Jay, 2015; Duke & Beck, 1999; Torres, 2014). Duke and Beck (1999) argued that dissertations in their traditional format, “a lengthy document (typically 200-400 pages in length) on a single topic presented through separate chapters for the introduction, literature review, methodology, results, and conclusion” (p. 2), does not train doctoral students as originally intended.

It is important to recognize that the dissertation is changing; it is not static. The Council of Graduate Schools is charged with maintaining the high standards of graduate programs within institutions. The 1991 Council of Graduate Schools Policy Statement recognizes that the purpose of the dissertation is to demonstrate the “beginning of one's scholarly work, not its culmination. Dissertation research should provide students with hands-on, directed experience in the primary research methods of the discipline, and
should prepare students for the type of research/scholarship that will be expected of them after they receive the Ph.D. degree” (Hancock, 1991, p. 10). The revised Council of Graduate Schools Policy Statement indicates that a more recent trend in dissertations has been to move away from the long and comprehensive project and move toward a more sharply defined task (2005). In fact, several institutions are following this philosophy. According to Perry and Imig’s work for The Carnegie Project on the Education Doctorate (2010), there are new formats for dissertations being discussed and accepted across the country:

For example, the program at the University of Southern California has introduced thematic dissertations, wherein students conduct individual investigations of field-based problems as part of a group organized around a set of related problems. The University of Houston has put together a candidacy paper task force, which is considering capstone models such as a needs analysis for educational institutions, the development of institutional change plans, and a critical analysis of a district program. Both the University of Missouri Columbia and the University of Florida are considering the role that solving “real world” problems might play in a capstone piece (p. 11).

Torres (2014) conducted her dissertation on the topic of nontraditional dissertations. After analyzing 32 online questionnaire responses, 15 phone interviews, and other relevant documentation, from professors of different graduate institutions, she suggested that students should have the options of alternate formats for a dissertation rather than be bound by aesthetic formatting guidelines. She concluded that the way in which the project would impact the field of study should decide which format is most appropriate for a dissertation.

I was motivated by these philosophies surrounding a utilitarian value of a dissertation. Therefore, it is with great purpose and insight that my Chapter III will follow an alternate format. A traditional format for this dissertation was originally
attempted and it resulted in an unclear, disjointed, and poorly articulated explanation of the methodology. Just as Torres (2014) suggested in her dissertation, I am letting the innovative product of my dissertation, an essential curriculum developed using a systematic approach, rich in formative evaluations, decide the format for Chapter III. It should be noted that, overall, my dissertation very closely resembles a typical dissertation structure, five chapters consisting of an introduction, literature review, methodology, results and conclusions. However, there will be noticeable subheadings atypical of a traditional Chapter III. Additionally, a Chapter VI has been included to illustrate components of the TIPAC product.

My Chapter III will begin with an explanation of the unique format followed by an overview of the Dick and Carey Systems Approach Model (2015). A brief description of the participants that were used in this study will be described next. The remainder of the chapter will follow a logical sequence detailing the nine steps of the Dick and Carey Systems Approach Model (2015) that were used within this study. Each of the nine steps will be identified, concisely described, and applied to this study. Within each step there will be a thorough description of the participants, instrumentation, procedure, and the process for formative evaluation using experts. It is believed that this format will decrease confusion to the reader as there are various participants, multiple forms of data collection and diverse techniques for formative evaluation that differ from step to step of the model. Therefore, the standard criteria found in a traditional Chapter III still exist within this dissertation; it is merely formatted in a different, but logical, presentation.
Dick and Carey Systems Approach Instructional Design Model

The Dick and Carey Systems Approach Model for designing instruction (2015) uses a 10-step process in which the steps are interrelated to determine if the goal has been achieved. The 10 steps include:

1. Identify instructional goals
2. Conduct instructional analysis
3. Analyze learners and contexts
4. Write performance objectives (i.e. learning objectives)
5. Develop assessment instruments
6. Develop instructional strategy
7. Develop and select instructional materials
8. Design and conduct formative evaluation of instruction
9. Revise instruction
10. Design and conduct summative evaluation

The entire process itself uses preparation, implementation, evaluation and revision. Each of the 10 steps receives input from the previous step to provide information for the subsequent steps. A detailed analysis of the Dick and Carey Systems Approach Model for designing instruction (2015) is provided in Chapter II.

Development of the curriculum. The first purpose of this dissertation was to develop the TIPAC curriculum. This process is embedded within the Dick and Carey Systems Approach Model for designing instruction (2015). The first seven steps of this model will formulate the TIPAC curriculum. In depth procedures will be used to
identify and analyze the instructional goals, determine the learning objectives, develop assessment instruments, decide upon an instructional strategy and finally, select the appropriate instructional materials. The Dick and Carey Systems Approach Model for designing instruction (2015) offers a step-by-step guide to ensure that the curriculum is all-inclusive and is developed using sound instructional theory and evidence-based research. Chapter III of this dissertation will outline each of these steps in detail providing a clear and thorough description of the development of TIPAC.

**Determining the online delivery system.** The second purpose of this dissertation was to determine the online delivery system to convey the TIPAC curriculum. TIPAC will be delivered online to better reach a multitude of people without being bound by a geographical barrier. Step six of the Dick and Carey Systems Approach Model for designing instruction (2015) offers guidance for determining the TIPAC delivery system. As part of this sixth step, three online management systems were reviewed. These systems were evaluated for criteria pertaining to user friendliness, cost, and the ability to display various teaching modalities, such as videos, PowerPoints, and blogs. A thorough explanation of the measures taken to develop the TIPAC online delivery system will be provided in depth in Chapter III, step six, of this dissertation.

**Conducting formative evaluations.** Inherent throughout this entire TIPAC curriculum and online delivery system development are continuous formative evaluations. Within each step of the Dick and Carey Systems Approach Model for designing instruction (2015) are guidelines for formatively evaluating the specific process identified in that step. Formative evaluations gather feedback throughout the development process. This provided an opportunity to make changes to TIPAC during
development. Experts were used to assist with formative evaluations at each step. In addition, rubrics provided by Dick, Carey, and Carey (2015) to assist with these formative evaluations were modified to correspond with the goals of the TIPAC program. I did not proceed to the next step without considering the previous step’s formative evaluation. The procedure for formative evaluations will be explained in detail within each step of the model in Chapter III.

**Educational Importance**

The purpose of this dissertation was to develop and formatively evaluate Teachers Integrating Physical Activity into the Curriculum (TIPAC), inclusive of its online delivery system. TIPAC is a program that utilizes best practice methods to educate teachers about incorporating physical activity into their classroom, regardless of the subject being taught. Although there are currently programs available to assist teachers with physical activity incorporation in the classroom, they lack completeness. What is missing is a comprehensive program that provides information about implementing exercise in the classroom regardless of subject focus, accessibility to all of these materials, and support for implementation and continued use. TIPAC will provide teachers with the resources necessary to begin incorporating physical activity into the classroom, as well as a collaboration feature that provides teachers with the opportunity to discuss concerns, benefits, ideas and overcoming barriers with other teachers across the country. Teachers will be a part of a learning community and partake in this educational change together, not in isolation.

Developing this program required more than just following a systematic process. It utilized formative evaluations embedded throughout. This allowed opportunity for
changes to be made prior to the conclusion of the program development. TIPAC was
developed using the Dick and Carey Systems Approach Model for designing instruction
(2015), which provided not only guidelines for using a systematic approach, but also
guidelines for conducting formative evaluations throughout. Therefore, the development
of the TIPAC program is likely to be of great interest to professionals in various fields
who seek to meld curriculum and online delivery whether it is in the classroom or
workplace setting.

The ultimate goal of TIPAC is to have in-service teachers actually implement the
concepts of the program into the classroom. Implementation of the TIPAC concepts has
potential to improve academic performance, improve health outcomes, and decrease the
percentage of obesity in children. With this goal in mind, TIPAC is of importance to a
population greater than just teachers. There is potential for health care workers, such as
school nurses and community health educators, to support and promote TIPAC as it has
the capability to improve overall child health.

Therefore, in conclusion, this dissertation has great educational importance. The
development of TIPAC will assist teachers in their knowledge of methods for
incorporating physical activity in the classroom and promote collaboration among
education professionals. In addition, the TIPAC program has importance to health care
workers as it has the capability to improve children’s overall health. Finally, using the
Dick and Carey Systems Approach Model (2015) for designing instruction is of
importance to researchers and various professionals interested in merging curriculum
into an online structure using a systematic process.
Limitation of this Study

This dissertation is limited to the first nine steps of the Dick and Carey Systems Approach Model (2015). The purpose of the 10th step of this model is to design and conduct a summative evaluation. This would include data collection methods to determine if the TIPAC instruction works as it is intended to in the performance context of the classroom. This would involve time and resources beyond what is practical for this dissertation. Although this step is currently outside the scope of this dissertation, it is my intent to continue research in this area to include summative findings in future studies regarding the TIPAC program.

Definition of Terms

The following terms are defined for use in this study to provide clarification to the reader. Please note, if the term is not followed by a citation it has been defined by me as the researcher.

Attitudinal Learning Domain. This learning domain is used when the learner is expected to choose or make decisions. The task for the learner is to choose to perform an intellectual or psychomotor skill or to state a verbal skill (Dick, Carey, & Carey, 2015).

Body Mass Index (BMI)- BMI is a measure to determine overweight and obesity. BMI is determined by the following equation: weight (kg) / [height (m)]^2 (Centers for Disease Control and Prevention, 2015, “About adult BMI”).

For the purposes of this study, the child’s BMI is being investigated. Children’s BMI needs to be interpreted using age and sex-specific criteria because the amount of
body fat changes with age and differs between boys and girls. Children’s BMI get plotted on a BMI-for Age-growth chart (Appendices A & B) (Centers for Disease Control and Prevention, 2015, “Defining childhood obesity;” Daniels, Arnett, Eckel, Gidding, Hayman, Kumanyika, Robinson, Scott, Jeor, & Williams, 2005).

Dick and Carey Systems Approach Model for designing instruction. A 10-step system oriented approach that provides an orderly manner to properly design and evaluate instructional materials as a system and not a set of isolated components. The entire process itself uses preparation, implementation, evaluation and revision (Dick, Carey, & Carey, 2015).

Elementary teachers. Teachers that teach in grades kindergarten through fifth grade. Elementary teachers are used as the target audience for this dissertation.

Instructional goal. The behaviors that the learner should be able to demonstrate after the TIPAC instruction (Dick, Carey, & Carey, 2015).

Instructional designs. A system of procedures that are used to develop education and training programs. They are used to analyze, design, develop, implement and evaluate educational programs (Akbulut, 2007).

Intellectual learning domain. This learning domain requires the learner to be able to solve a problem using cognitive activity. The task for the learner is to be able to solve a problem with previously unseen information or examples (Dick, Carey, & Carey, 2015).

Learning objective. Specific statements detailing what the learners will be able to do, in a specific environment, at the completion of the TIPAC instruction. It includes information about what resources the teachers will be given in order to identify the
learned skill, a description of the actual skill, and a description what dictates an acceptable display of the new knowledge (Dick, Carey, & Carey, 2015).

**Obesity for children.** Obesity is defined as a BMI at or above the 95th percentile of children of the same age and sex (Centers for Disease Control and Prevention, 2015, “Defining childhood obesity”).

**Overweight for children.** Overweight is defined as a BMI at or above the 85th percentile and below the 95th percentile for children of the same age and sex (Centers for Disease Control and Prevention, 2015, “Defining childhood obesity”).

**Psychomotor learning domain.** This learning domain involves the coordination of mental and physical activity. The task for the learner is to perform new, nontrivial motor skills that are dependent upon competently using a physical skill (Dick, Carey, & Carey, 2015).

**Recess.** A scheduled break during the school day, from the demands of concentrated academics in the classroom, in which children participate in unstructured physical activity and play with peers (Ramstetter, Murray, & Garner, 2010).

**Teachers Integrating Physical Activity into the Curriculum (TIPAC).** TIPAC is an online learning center, comprised of modules and self-assessments in which teachers can learn about physical activity integration into the classroom.

**Verbal learning domain.** This learning domain requires the learner to provide specific responses to specific questions. The questions will usually have the words describe, state, or list as the verb. The learner must remember the information from the TIPAC instruction for a test or use on a related task (Dick, Carey, & Carey, 2015).
CHAPTER II
REVIEW OF LITERATURE

The purpose of this dissertation was to develop and formatively evaluate Teachers Integrating Physical Activity into the Curriculum (TIPAC) and its online delivery system. TIPAC is a comprehensive resource, based on sound instructional design and best practice concepts, which provides teachers with the guidance and support necessary to integrate physical activity in the classroom regardless of the subject matter being taught. The aim of this online training program is to increase teacher’s knowledge of obesity among the youth, provide resources to educate them about ways to incorporate physical activity as part of the curriculum, and provide a platform in which teachers can communicate with other educators around the world regarding physical activity in the classroom.

Researchers have been studying the benefit of physical activity for the body and mind, including academic achievement for decades. However, a recent literature review has found a lack of interprofessional education and training materials regarding the incorporation of physical activity in the classroom. Although there are several resources available for teachers to learn about classroom physical activity, currently no such platform has been developed that pools multiple resources together providing a place where teachers can learn, train and communicate with other educators about classroom
physical activity integration. The review of literature supporting this study examines the following areas: (a) obesity trends in children and adolescents, (b) benefits of physical activity, (c) integrating physical activity in the classroom, (d) instructional design models, and (e) using instructional design to promote educational change.

**Obesity Trends in Children and Adolescents**

The prevalence of overweight and obesity among children has become a global concern (Khang & Park, 2011; Olds, Tomkinson, Ferrar, & Maher, 2010; Raychaudhuri & Sanyal, 2012; Spradlin, Gard, Huang, Kopp, & Malik, 2012; Stamatakis, Zaninotto, Falaschetti, Mindell, & Head, 2010; Wang & Lim, 2012). For children, obesity is defined as a body mass index at or greater than the 95th percentile for age growth charts (Ogden, Carroll, Kit, & Flegal, 2012), whereas overweight is defined as a body mass index between the 85th and 95th percentile (Daniels et al., 2011). The National Health and Nutrition Examination Survey (NHANES) is a program of studies within the Centers for Disease Control and Prevention (CDC) that combine interviews and physical examinations as a means of gathering data about the health and nutrition status of adults and children in the United States (US). Results from NHANES between 1976 and 2008 show the rise in the percentage of children labeled as obese to be troubling. Between 1976 and 1980 the total percentage of children ages six through eleven defined as obese was 6.5%. That figure tripled for this age group by the year 2008, with 19.6% defined as obese. The rate was just as concerning for adolescents ages 12-17. Between 1976 and 1980 the percentage of US adolescents determined obese was 5.0%. However, by 2008 that value had more than tripled with a total of 18.1% of adolescents considered to be obese (Centers for Disease Control and Prevention, 2010). By 2010, the percentage of
all children, ages 2-19, in the United States considered to be obese was 16.9%, which has remained unchanged (Ogden, Carroll, Kit, & Flegal, 2014). This equates to more than thirteen million boys and girls identified as obese. The Healthy People 2010 goal pertaining to limiting obesity among our children to 5% was unmet (Ogden et al., 2012). Obesity continues to be a focus of Healthy People 2020. However, midpoint data has shown no improvement in obesity rates. The obesity rates among youth, aged 2-19 years, show no statistical change (16.1% in 2005–2008 and 17.0% in 2011–2014) (US Department of Health & Human Services, 2017).

Although the rise in obesity among our youth has appeared to level off, the percentage of youth considered obese remains high. The Youth Risk Behavior Surveillance System (YRBSS), a study conducted every two years by the CDC, provides data on adolescent risk behaviors (Grades 9 through 12). The 2013 results, based on over 13,000 participants, shows that the prevalence of students that are obese nationwide increased from 10.6% in 1999 (data first collected on BMI) to 13.7% in 2013. Students nationwide considered being overweight also increased from 14.1% in 1999 to 16.6% in 2013 (Centers for Disease Control and Prevention, 2014).

**Recommended Daily Physical Activity**

It is recommended that all children participate in 60 minutes of physical activity daily (Nader, Bradley, Houts, McRitchie, & O’Brian, 2008). Organizations such as the Centers for Disease Control and Prevention (CDC), American Heart Association (AHA), World Health Organization (WHO), and National Association for Sport and Physical Education (NASPE) support 60 minutes of daily exercise. However, research shows that most children are not participating at this level of daily activity (Pawlowski, Tjornhoj-
Only 42% of children ages 6 to 11 are obtaining the recommended amount of physical activity (Troiano et al., 2008). The 2013 Youth Risk Behavior Surveillance System (YRBSS) results indicate that 73% of adolescents 9th through 12th grade did not meet the recommended daily physical activity and demonstrated a decrease in physical activity with each subsequent grade (Kann et al, 2013). Furthermore, children of minority standing are even less likely to engage in the recommended 60 minutes of daily physical activity. In fact, minority children are at the highest risk for lack of physical activity, with African American and Latino children more likely to be classified as obese and overweight compared to their Asian and White counterparts (Melius, 2013). Mexican American children have the highest prevalence of overweight and obesity status combined at 43% (Annesi, Pierce, Bonaparte, & Smith, 2009).

It has been found that there is an association between time spent doing sedentary activities and decreased levels of physical activity, adverse lipid profiles, increased levels of obesity, and cardiovascular risk factors such as hypertension and insulin resistance (Daniels et al., 2011). A study investigating how exercise and sedentary activities connect to obesity and overweight children ages 6 to 9 used BMI, sociological factors and living habits as evaluation criteria. The sample of 98 children showed that 38.8% of the children were overweight or obese. The study also demonstrated a relationship between physical activity habits and sedentary activities with levels of overweight and obesity. The new reality of our educational system combined with current family structure is resulting in more children remaining at home after school with an increase in television watching and game system usage (Francisco, 2009). In fact,
41.3% of students play video or computer games or use a computer for something that is not school work for three or more hours per day on an average school day and 32.5% of students watch television three or more hours per day on an average school day (Kann et al, 2014). Access to physical activity is a key component in getting children more active. Children that have access to recreational programs were found to be more physically active when compared to children without access (Sallis & Glanz, 2006).

**Benefits of Physical Activity**

The benefits of physical activity have been well documented in the literature. Experts at the American Heart Association (2015) describe the benefits of physical activity as reducing the risk of heart disease, stroke and Type 2 diabetes, improving blood cholesterol levels, preventing and managing high blood pressure, improving bone health, boosting energy level, improving sleep, and countering anxiety and depression (Kraus et al., 2015). In addition to these benefits, it has been suggested that the physiological changes that are occurring in the brain with physical activity may result in improved attention, enhanced coping, and enhanced positive affect (Centers for Disease Control and Prevention, 2010). Increased levels of norepinephrine and epinephrine are found in the blood after physical activity. The amount of these chemicals is dependent upon the type and amount of exercise. Both epinephrine and norepinephrine bring one’s cognitive function to a more alert phase (Tomporowski, 2003). This would potentially place the individual in a more ready-to-learn state.

Further research conducted by Hillman, Erickson, and Kramer (2008) suggested that reading comprehension and mathematics activate the prefrontal cortex, parietal/posterior cingulate cortex, and areas of the intraparietal sulcus. Physical activity has
been shown to activate the front parietal network. Therefore, it can be concluded that physical activity activates the same areas of the brain where learning takes place. Figure 1, which was obtained with permission from Dr. Hillman, provides an image from a brain scan of children taking a test, demonstrating how the brain is activated after 20 minutes of physical activity.

**Scan of Brain after Physical Activity**

![Scan of Brain after Physical Activity](image)

*Figure 1.* Image of a brain scan of children taking the same test. The brain on the left shows brain activation after sitting quietly. The brain on the right shows brain activity after 20 minutes of walking. This image was obtained by permission from Dr. Chuck Hillman.

Additional studies have demonstrated a positive effect of physical activity on academic achievement, many which will be highlighted in the next section (Bass, Brown, Laurson, & Coleman, 2013; Blom, Alvarez, Zhang, & Kolbo, 2011).
**Academic Achievement**

In an era of standards based test driven curriculum, it is no doubt that the one benefit of physical activity that is of particular interest to educators is the link between physical activity and academic achievement (Kwak et al., 2009; Mahar, 2006; Nelson & Gordon-Larsen, 2006; Sallis et al., 1999; Shephard et al., 1984). It is unarguable that any teacher dedicated to the rigorous teaching of a standards based education will seek out methods to increase their students’ academic achievement. Physical activity is one method that teachers can seamlessly incorporate into any curriculum, which has demonstrated that sought after positive effect on student academic achievement.

Haapala (2011) conducted a literature review which investigated the effect of physical exercise and physical training on cognition and academic performance in children and adolescents. Haapala (2011) looked at studies (from 1966 to 2011) that used randomized intervention and control groups. The inclusion criteria were randomized intervention studies with parallel intervention and control groups. Studies concerning single exercise bouts needed to report data about physical exercise, cognitive ability, or academic performance in healthy school-aged children (ages 7-18). Additionally studies using physical training sites needed to provide data about standardized tests scores or academic skills. Children with pathological states were excluded. The final inclusion criterion was that studies needed to report baseline and post intervention measures of the key outcomes. The sample was narrowed to nine total studies with 2,013 participants that met inclusion criteria. Of the nine studies, five indicated positive effects of physical activity on attention, concentration, and working memory, and three demonstrated positive effects on math and language skills. One
study reported no difference between the physical training group and the control group in math and reading scores. Haapala (2011) suggests that previous studies included in this review demonstrate that short bouts of physical activity (10-30 minutes) improve cognitive function immediately. However, physical training was ineffective in enhancing academic performance. This could be attributed to the short intervention time (fewer than 36 weeks) of physical training.

A variety of studies reveal a positive relationship between cardiovascular fitness and academic achievement (Castelli et al., 2007; Eveland-Sayers, et al., 2009; Grissom, 2005; Van Dusen, 2011). Van Dusen et al. (2011) used previously collected data from 13 school districts in Texas, a total of 254,743 elementary, middle and high school students, to examine the association between standardized math and reading academic achievement scores and measures of physical fitness. Physical fitness was measured with use of the FITNESSGRAM test whereas academic performance was measured using the Texas Assessment of Knowledge and Skills (TAKS). Results demonstrate a positive linear association between fitness and academic test scores. Associations were stronger for math scores than reading. The greatest differences noted were in grades seven through ten, with the most significant association for math among ninth grade boys (effect size .44) and math for eighth grade girls (effect size .75). Interestingly the researchers found a positive association for all grade-test-gender combinations except fourth and sixth grade boys for reading. The researchers explain that the weaker associations among the younger elementary children may be explained by the lower test reliability of the FITNESSGRAM for children under the age of 10. However, prior
work did find positive cardiovascular associations with academics among elementary children using other methods (Castelli et al., 2007; Eveland-Sayers et al., 2009).

Similar to Van Dusen’s (2011) work, Joshi, Howat, and Bryan (2011) conducted a study to assess the relationship between physical fitness and academic performance among school children. The sample consisted of 19,695 students from 15 school districts in Louisiana. Fitness assessment was evaluated with the FITNESSGRAM tool and academic performance was measured with math and reading standardized test scores from the Louisiana Education Assessment Program (LEAP). Results from the study demonstrate statistically significant findings with math and language arts scores and fitness level. A Multiple Analysis of Variance (MANCOVA) revealed the strength of relationship of overall fitness scores to be higher for math than language arts.

**Integrating Physical Activity in the Classroom**

As demonstrated above, the association between physical activity and academic achievement has been researched extensively. However, the increased pressure for schools to improve standardized test scores has resulted in schools reducing or even eliminating programs geared at increasing physical activity among children (Erwin, Fedewa, & Ahn, 2012; Rentner et al., 2006; Singh, Uijtdewilligen, Twisk, Mechelen, & Chinapaw, 2012). In a 4-year follow-up report after the initiation of the federal No Child Left Behind Act of 2001, it was found that 14% of schools had somewhat or to a great extent reduced time spent on physical education to allow more time for reading and math (Rentner et al., 2006). Recess has also been decreased, with an average decrease of 50 minutes per week within 20% of school districts nationwide since *No Child Left Behind* was initiated (Ramstetter, Murray, & Garner, 2010).
With a need to alter how children receive physical activity in school, teachers have had to become innovative. In Delaware, an elementary school ordered a magnetized climbing wall to enhance mathematics. The teacher places numbers, letters and other symbols on this wall. The students then climb and solve math problems at the same time, actually solving twenty to thirty problems as they climb across the wall (Vail, 2006). In San Francisco, a teacher uses yoga to teach math. She has the students form into different poses to create various angles of a triangle (Oberthur, 2008). It has been noted that exercise as simple as running can have a positive influence on academic learning. One teacher has her students running while they recite spelling words, claiming that student performance revealed almost a 100% increase in the students’ ability (Morgan & Hansen, 2008).

Science is an area that many physical activities and games can be utilized. One innovative teacher put a twist on the well-known game “sharks and minnows.” For the student to win the game, he or she had to get through the asteroid belt while naming the planets in the solar system (Vail, 2006). In San Francisco, a first grade teacher had children learn about the stages of butterfly development by acting them out. The children began by inching around the room as caterpillars to ultimately, flapping their wings like little butterflies (Oberthur, 2008).

**Programs Available for Physical Activity Integration in the Classroom**

For those teachers that need guidance with creatively getting children active there are some programs available that assist educators in the implementation of physical activity in the classroom, specifically Take 10!, WISERCISE! and energizers. Although these programs can be implemented in various subjects, math and literacy are the
subjects that have been studied utilizing physical activity within the classroom. There have been studies with *Take 10!, WISERCISE!* and energizers that are highlighted below.

**Take 10!** *Take 10!* is a curriculum tool designed to get students moving in the classroom (Kibbe, Hackett, Hurley, McFarland, Schubert, Schultz, & Harris, 2011). *Take 10!* was originally developed in the late 1990s, has been refined over the years, and is available for purchase. It is intended to be used by teachers with the current curriculum to integrate academic learning objectives with 10-minute bouts of physical activity in the areas of language arts, math, social studies, science, nutrition, health, and character education. *Take 10!* has been used by several researchers to study the effects of physical activity integration in the classroom (Donnelly, 2009; Hollar et al., 2010; Kibbe, 2011, s47; Murray et al., 2008; Stewart, Dennison, Kohl, & Doyle, 2004).

The Physical Activity and Student Success (PASS) and Coordinated Approach to Child Health (CATCH) study used a variation of the Take 10! program to study the association between physical activity and academic achievement (Murray, Garza, Diamond, Stigler, Hoelscher, Kelder & Ward, 2008). The PASS and CATCH study consisted of 932 third and fourth grade students. The intervention group performed physical activity in the classroom, using a modified version of Take 10!, and participated in structured recess in order to obtain 60 minutes of physical activity during the school day. The Stanford 10 achievement test was used to assess student achievement in math and reading at three different points over approximately 15 months. Results demonstrated that math scores improved significantly over time among the students in the PASS and CATCH group compared with the control group. Reading scores
increased in both the intervention and control group at similar rates in this study. Interestingly, the greatest improvements were noted among the students that were considered poor adapters and part of the intervention group with reading and math (Kibbe, 2011, s47; Murray et al., 2008).

Take 10! has been modified and studied outside of the United States. Happy 10! is based upon the concepts of Take 10! in which physical activity is implemented in the classroom. Liu et al (2008) conducted a study using Happy 10! in which elementary students, Grades 1 through 5, received at least 10 minutes of physical activity in the classroom daily over 8 months. The sample consisted of two similar schools in Bejing, for a total of 753 students. One school, consisting of 14 classes (328 students) was assigned to the intervention group, whereas the other school, consisting of 12 classes (425 students) was assigned to the control group. The students in the intervention group received at least 10 minutes of physical activity in the classroom daily. Results demonstrate a significant difference in the change of weight and BMI among girls in the intervention and control group (2.4 kg vs. 4.6 kg; 0.47 kg m\(^{-2}\) vs. 0.66 kg m\(^{-2}\)). Additionally, the prevalence of overweight and obesity among girls in the intervention group decreased by 0.4-5.6% whereas it increased from 0.6-4.5% in the control group (Liu et al., 2008). This study demonstrates that incorporating physical activity in the classroom, utilizing components of Happy 10!, can increase physical activity and have a positive effect on health.

**WISERCISE!** The Healthier Options for Public School children (HOPS) initiative utilized a combination of the OrganWise Guys physical activity component, **WISECISE!**, as well as Take 10! concepts to investigate the effect that physical activity
had on academic achievement. In addition to physical activity, this study also incorporated nutrition components. Three schools were used in this study; two were assigned to the intervention group and one to the control group, for a total of 1,197 students. The students in the intervention schools received modified school breakfast/lunches which contained more high fiber, whole grain foods and fewer foods high in sugar. The students in the intervention group also received nutrition education via the OrganWise Guys curriculum. Finally, the intervention group had students engage in 10-15 minute desk side physical activities while learning math and spelling content. The results of this study, in the area of weight management, revealed that more children in the intervention group stayed within the normal BMI range and more obese children in the intervention schools decreased their weight when compared with the control group. Regarding academic achievement, the results of the 10-15 minute increase in physical activity in the classroom combined with structured recess led to significantly higher math scores than the control group on the Florida Comprehensive Achievement Test (FCAT) in the 2004-2005 and 2005-2006 academic year (P < .001) (Hollard et al., 2010). A limitation to this study is that the students in the intervention group received a nutrition and exercise component making it difficult to determine if the results reflect nutrition alone, physical activity alone or a combination of both.

**Energizers.** *Energizers* are classroom-based physical activities that were developed at the East Carolina University Activity Promotion Laboratory Department of Exercise and Sport Science, College of Health and Human Performance. The *Energizers* were designed to be used by classroom teachers to create active lesson plans. It is recommended that the *Energizers* be used two to three times every day. There are 22
Energizers for grades kindergarten (k) through 2 and 26 Energizers for grades 3 through 5. Each of the Energizers includes directions for the activity and variations that can be used. This is a free document and can easily be downloaded (Mahar, Scales, Kenny, Collins, & Shields, 2006).

The Energizers take approximately 10 minutes to perform and are designed to be integrated with academic content. Mahar et al. (2006) conducted a study in which teachers were provided with a 45-minute training session about the use of Energizers and observation of on-task behavior. School day physical activity was assessed for all kindergarten through fourth grade students for a total of 37 subjects and on-task behavior was assessed for two third grade and two fourth grade classes for a total of 25 subjects. Two classes for each grade were randomly selected to be the treatment groups and one class from each grade was left for the control group. The subjects assigned to the treatment group performed the daily teacher led Energizers and recorded steps before and after Energizers on their pedometer daily log card. The control group also recorded their steps on the pedometer daily log card but did not perform the Energizers. Daily, the intervention group took 782 more steps than the control group (5,587 steps compared to 4,805 steps). Over a 180-day school year this can add up to 70 more miles per school year.

During this same study, on-task behavior was observed for 12 weeks. The initial baseline observation lasted for 4 to 8 weeks depending upon the class. Observations lasted 30 minutes and were conducted twice a day for each class. Observation was performed for 5 minutes using six students. The actual observation interval was 10 seconds with an additional five seconds used for recording. The researcher observed the
first student for one minute then moved on to the next student. There were four categories of behaviors that were being observed: on-task; off-task noise; off-task motor; off-task other. For analysis, the three off-task categories were combined into one off-task category resulting in a total of two categories, on-task and off-task behavior. Results indicated that on-task behavior was significantly greater after Energizers when compared to before the activity. In addition, an effect size of 0.62 was noted in on-task behavior after the Energizers compared with an effect size of 0.20 when no Energizers were performed. This large effect size supports the finding that Energizers increased on-task behavior. Interestingly, the students that were the least on-task at baseline were noted to have the greatest effect size after the intervention. The students that needed the intervention the most appear to have benefitted the most from the Energizers.

Although tools such as Take 10!, WISERCISE! and Energizers exist to assist teachers with the incorporation of physical activity in the classroom, they lack a comprehensive nature. Take 10!, WISERCISE!, and the Energizers programs have excellent tips for activity incorporation but lack key components such as an identified way for teachers to collaborate during implementation and continued support for teachers throughout the learning process. Furthermore, Take 10! and WISERCISE! are not free resources, which certainly can impact many school’s ability to incorporate these programs. Overall, these programs act as a great starting point for teachers, but currently, there is no all-inclusive resource available. What is needed is a more comprehensive tool, based upon sound theory, to help educators begin and sustain the task of incorporating physical activity in the classroom.
Instructional Design Models

As previously stated, there are a few programs available to assist teachers with physical activity incorporation in the classroom. Of the available programs, most provide little guidance pedagogically and offer insufficient teacher support. There is not a comprehensive program, based upon sound theory that includes research based information, a variety of resources, a platform for communication, and is readily available to teachers. In an effort to address this deficit of a comprehensive program, Teachers Integrating Physical Activity into the Curriculum (TIPAC) was developed as part of this study. It was necessary to utilize a model for instructional design to develop TIPAC so that objectives were made clear at the onset. Gustafson and Branch (1997) describe instructional development models as “conceptual and communication tools for analyzing, designing, creating, and evaluating guided learning ranging from broad educational environments to narrow training applications. The greater the compatibility between a model of instructional development and its contextual, theoretical, philosophical, and phenomenological origins, the greater the potential for success in constructing effective episodes of guided learning” (p. 13). Without this planning guide, the implementation and evaluation process can become muddied and unfocused. Models such as the ADDIE Model (Armstrong, Denton, & Savage, 1978 as cited in Peterson, 2003), Kemp, Morrison, and Ross Model (Morrison, Ross, & Kemp, 2004) and the Dick and Carey Systems Approach Model (1978) have been utilized by numerous researchers and have been well established in the literature. Based upon the wide use of these three models in the literature, they have been selected to be described in greater detail.
ADDIE Model

The analysis, design, develop, implement and evaluate model, better known as ADDIE, is a generic process and the basis of instructional design (ID). It is a popular ID model that has been used to effectively design numerous programs (Hebebci et al., 2014; Khadimally, 2015; Peterson, 2003). The ADDIE model was developed in the 1960’s as part of a military effort to create technical training programs for new recruits (Allen, 2006). It consists of five phases: (a) analysis, (b) design, (c) development, (d) implementation, and (e) evaluation. A needs assessment is generally the first step used to analyze learners’ training needs. Designing instruction is done next with the writing of measurable goals. The third step is to develop training materials for both the teachers and the learners. This is followed by implementation of the materials. Finally, the last step is evaluation in which the effectiveness of the instruction is completed via formative and summative methods.

Singh (2009) conducted an in-depth study to determine the effect that applying a systematic approach to development had on the creating of a web-based module to educate students in a higher education environment. The study examined how an instructional systematic design process (such as ADDIE), could be used to convert an instructor led course to an online course in higher education. A significant amount of qualitative data was collected through interviews and questionnaires. According to Singh (2009), many of these researchers “believe that quality WBI [web based instruction] is developed by following a process that will analyze, design, develop, implement and evaluate training” (p. 3). The researchers discovered the importance of using a systematic design and concluded that using an in-depth analysis at the beginning
of the process saved on design, time and helped define the elements set forth by the stakeholders. In addition, the importance of relying on expert knowledge and research and the ability to be flexible were notable characteristics of the development process. Although the ADDIE method is systematic, the researcher clearly states that this does not imply rigidity. The researcher also states the importance of integrating formative evaluations throughout the process as it provides critical information within the development of the product. Finally, Singh (2009) describes the importance of establishing “design-evaluate-refine” iterations. This element not only helps to establish effectiveness of the module throughout development but it also helps to establish effectiveness and validity of a web-based module.

In summary, Singh’s (2009) findings suggest that using a systematic approach, such as ADDIE, continues to be an important practice method of developing online modules. This has been demonstrated with the abundance of instructional design models that have been created over the years. In fact, there are over 100 different variations of instructional design models, with almost all of them reflecting the generic ADDIE process (Allen, 2006). The Kemp, Morrison, and Ross model and the Dick and Carey model both follow the ADDIE format with their own unique modifications to this popular model.

Kemp, Morrison, and Ross Model

The Kemp, Morrison, and Ross Instructional Design model was actually a modification made in the mid-1990’s to Kemp’s original model that had been developed a decade prior (Gustafson & Branch, 1997). The Kemp, Morrison, and Ross model is a nine step process that has been used as a guide to create several programs (Faulds &
Mangold, 2014; Moore & Knowlton, 2006; Simms & Knowlton, 2008). It was developed with a goal of providing a holistic approach to instruction development. The Kemp, Morrison, and Ross Model utilizes many of the same ideas as the ADDIE model. Similarities to the ADDIE model include utilizing phases such as the analysis phase, design phase, development phase and evaluation phase. However, one of the biggest differences in comparison to the ADDIE model is that the Kemp, Morrison, and Ross model is nonlinear. Another difference is that the Kemp, Morrison, and Ross model consists of nine elements, rather than five phases as in the ADDIE model, which are interdependent. Therefore, the designer can actually start the design process at any point (Akbulut, 2007).

Interestingly, the Kemp, Morrison, and Ross model is classified as a classroom orientation model according to Gustafson and Branch (1997). This classification method was developed in order to classify Instructional Design (ID) models to describe the underlying assumptions and clarify how the model might be appropriately used. A classroom orientation model makes the basic assumption that the size of the planned instructional event will be small, resources will be small, design will be an individual rather than a team effort, the teacher will not be trained in instructional design, the learning environment will be low-tech and dissemination will not go past the classroom (Gustafson & Branch, 1997). Based upon the complexity of TIPAC which is to include numerous resources, utilize multiple experts in the design process, operate in a high-tech environment and be widely disseminated, the Kemp, Morrison, and Ross Instructional Design model was not chosen for the development of TIPAC.
Dick and Carey Systems Approach Model

In contrast to the classroom orientation perspective, seen with the Kemp, Morrison, and Ross model, a system oriented perspective makes the assumption that a substantial amount of instruction, such as a curriculum, will be developed. In a system oriented approach there will be extensive resources made available to the instructional designer and subject experts. Additionally, dissemination and utilization of the course or curriculum may be very widespread (Gustafson & Branch, 1997).

Dick and Carey developed an instructional design model which follows this system oriented approach. The Dick and Carey Systems Approach Model (Appendix C) provides an orderly manner to properly design and evaluate instructional materials as a system and not a set of isolated components (2015) [1978]. The entire process itself uses preparation, implementation, evaluation and revision. Each of the 10 steps in this approach receives input from the previous step to provide information for the subsequent steps. The process itself is not to be viewed as a linear approach, but rather iteratively and parallel in nature.

Throughout Dick and Carey’s model formative evaluations are greatly stressed. In fact, embedded within each step is a process for the developer to formatively evaluate the step prior to moving onto subsequent steps. The importance of formative evaluations has been well documented in the literature (Berridge, Penney, & Wells, 2012; Clark, 2012; Dixon & Williams, 2001; Stull, Varnum, Ducette, Schiller, & Bernacki, 2011; Vonderwell & Boboc, 2013) and Dick and Carey emphasize the importance of these evaluations throughout the development process.
The Dick and Carey Systems Approach Model was chosen as the model for this dissertation because of its applicability and wide use across disciplines (Bose, 2012; Oyelekan & Olorundare, 2009; Singh, 2009; Thivilojana, Perinpasingam, & Balapumi, 2010). This model reflects a very structured process and relies heavily on what the learners need to know in order to achieve the expected outcomes. It has been used in curriculum development for decades as it was originally developed in 1978. This system method is outcomes-based in which there is a clear understanding of the new knowledge and skills that the learners are to acquire. Another reason for utilizing this systems approach is because it is an “empirical and replicable process” (Dick, Carey & Carey, 2015, p. 9). This provides opportunity for the instruction to be used multiple times with various audiences.

Although Akubult (2007) criticized Dick and Carey’s model by saying it is a rectilinear model suggestive of a lockstep approach that is precisely why I selected it as a framework. Alkubult (2007) claimed that “rectilinear models fail to recognize complexities of the design process” (p. 64). However, to a novice designer its structured format is exactly what makes its ease of use stand above other models.

Contrary to Akubult’s (2007) analysis that the Dick and Carey’s model is too rigid and difficult to adapt to a variety of resources, there are several studies that demonstrate the applicability of this model across various disciplines and learning platforms (Bose, 2012; Thivilojana et al., Balapumi, 2010; Singh, 2009). Bose (2012) evaluated the difference in outcomes between two different training programs for in-service teachers. Additionally, Bose investigated whether the implementation of Dick and Carey’s Systems Approach model would result in a quality and valid online
curriculum. The online curriculum for one of the programs that was evaluated was developed using the guidelines for instructional design described by Dick and Carey. Although findings from this study did not reveal that one program of instruction was better than another, it did reveal that the Dick and Carey Systems Approach Model had been successfully applied in creating of the curriculum. The instructional design experts used in this study evaluated the design, development and implementation of the curriculum. The experts rated the alignment of the online curriculum with the traditional program as strong. Therefore, it demonstrated that the researcher successfully used the Dick and Carey model to develop and design the online program.

Thivilojana et al. (2010) utilized the Dick and Carey model to frame their study of a web-based lesson about internet resources. These researchers set out to answer the question regarding what criteria would be necessary within the designing and evaluating of a web-based lesson to assist with instructing the English language. They used Dick and Carey’s model to design and evaluate the lesson. Formative evaluations were conducted by a total of six experts; three educational technologists and three English lecturers. These experts were used to determine if the material was relevant and appropriate. A summative evaluation was performed using six students. Students were used for this part of evaluation to determine if the learners achieved the expected knowledge, skills and attitudes. Results from this study demonstrate that this online lesson was organized, well-structured and had achievable objectives. The researchers concluded that following the Dick and Carey Systems Approach Model was beneficial in designing and evaluating an online lesson.
Therefore, the Dick and Carey Systems Approach Model (2015) was chosen as the framework for this dissertation because of its applicability, wide use across disciplines, ease of use, and ability to replicate this process in future studies. It contains the major elements from the ADDIE model which is the basis of instructional design. It provides clear steps to guide the developer through this process, including guidelines for formative evaluations throughout. Lastly, it has been widely accepted as a respected approach as demonstrated with its use in the literature for decades.

**Using Instructional Design to Promote Educational Change**

Incorporating a new curriculum concept for teachers is not always an easy task. Asking teachers to change the way they have been teaching for years is often met with fear and resistance. Understandably, developing a curriculum for teachers to incorporate physical activity into the classroom is not sufficient enough to promote teacher change. For true educational change to occur, including a change in an educator’s method of teaching, there are certain concepts that need to be understood. These concepts, such as emotions, support, and collaboration, are associated with the idea of educational reform.

One of the most renowned researchers in the field of educational reform is the Canadian researcher Michael Fullan. Fullan has been researching the idea of educational change for nearly 50 years. Fullan’s work has provided insight and guidance among those researching educational change and sustainability (Datnow, 2006; Noguera, 2006; Stoll, 2006). A simple google scholar search, in February 2014, revealed that Fullan’s 2007 edition of “The New Meaning of Educational Change” has been cited over 11,000 times. Fullan has worked extensively with school districts, research institutes and governments around the world, published dozens of books and written over 70 articles.
related to leadership and educational reform. Fullan’s work identified the concepts associated with teacher change as recognizing the feelings of ambivalence, achieving mastery of concepts, and the necessity for collaboration.

Fullan clearly described educational change as complex and multifaceted. The idea that change is not understood by all in the same manner is often misunderstood and underestimated. Being able to accept the idea that the change process will be different for each individual involved is the foundation of educational change. “The crux of change is how individuals come to grips with this reality” (Fullan, 2007, p. 20). Change requires teachers to alter current ways of thinking and doing, which is known as reculturing. This includes the process of gaining new skills, as well as finding meaning and satisfaction in the new method of teaching. The teacher needs to question and change their beliefs and habits rather than just restructuring, which is generally what happens (Fullan, 2001). Escobar-Arcay (2009) defined reculturing as the need to “examine and uncover those less tangible, implicit and unspoken aspects that guide the beliefs and relationships of students, teachers and principals within schools” (p. 74). Therefore, although restructuring is what ultimately will occur, it has little opportunity for success if teachers are not provided with the opportunity to question their beliefs and values.

A teacher must find moral and intellectual meaning behind the change. This is ultimately known as teacher buy-in. Teachers need to relate how this change is significant to them. This meaning will provide energy and motivation to continue. “Meaning fuels motivation; and know-how feeds on itself to produce on-going problem solving” (Fullan, 2007, pg. 39). As Fullan (2007) pointed out, at the beginning of any
change, ambivalence and uncertainty are generally the overriding emotions. However, if the change is successful, the individual is likely to develop a sense of mastery, accomplishment and professional growth. The anxieties of uncertainty and the need for mastery must be acknowledged. These factors are often neglected when change is being implemented (Fullan, 2007).

Fullan stressed that if change is to be successful, teachers need to be able to collaborate with others. The positive effects of collaboration and detrimental effects of isolation have been studied through the years demonstrating similar findings (McCluskey, Sim, & Johnson, 2011; Rasberry & Mahajan, 2008; Rigelman & Ruben, 2012; Rosenholtz, 1989). Teachers need to collaborate as a way of sharing value, vision, and opportunity which leads to growth and continued improvement. The teachers must be given opportunities for knowledge and skills development, as well as self-understanding. Teachers need to learn new ways of working and interacting with others. “Purposeful and focused collaboration needs to take place” (Escobar-Arcay, 2009, p. 203). Reculturing does not occur on an isolated island, but rather in the community of others. Having a place where teachers can discuss ideas and work thorough concerns is imperative for change to occur.

Stallings (1980, 1981) conducted a four-phase research study examining how the training of secondary teachers influenced the reading skills of students. The training of teachers occurred over 5 weeks while the control group only received training at the end of the intervention. It was found that the trained teachers changed their practice in 25 of the 31 criteria evaluated, whereas the untrained teacher only changed in 3 of the 31 areas. Results also demonstrated that teacher led groups performed just as well as staff
ran training groups, demonstrating the influence and importance of collaboration among peers. Most of the untrained teachers did not get past that initial “difficult” stage (as cited in Fullan, 1985).

These concepts needed for educational change are built into the TIPAC program. TIPAC will be readily available to all interested teachers eliminating concerns of accessibility. TIPAC was designed utilizing the sound instructional design method described by Dick, Carey and Carey (2015). This model guided the development of the TIPAC program with clear objectives and expert knowledge. TIPAC used evidence based literature to develop the information that is to be taught to teachers. TIPAC provides an abundance of resources, such as videos and web links, for teachers to decrease anxieties and increase the opportunity to develop mastery in the incorporation of physical activity in the classroom. This mastery will assist with true educational change and promote long time use of physical activity in the classroom. Finally, TIPAC provides a platform for communication in which teachers can collaborate with other teachers across the globe. They are not bound by the four walls in which they teach. They are free to share ideas, concerns, and thoughts with other educators trying to work toward the same goal.

Summary

In summary, there is no doubt that there is a concerning phenomenon regarding childhood obesity in our country. The research is strong and convincing regarding the benefits of physical activity on the body and mind, including academic achievement. In contrast, there is gap in the literature regarding comprehensive programs available for teachers to incorporate physical activity in the classroom. Although there are stand-
alone programs that exist to provide teachers with ideas about incorporating physical activity in the classroom, there is not an extensive curriculum available. Therefore, developing another physical activity incorporation program is not sufficient. What is needed is an all-inclusive program that is built upon sound instructional design and incorporates the key factors known to increase teacher change.

The purpose of this dissertation was to develop and formatively evaluate Teachers Integrating Physical Activity into the Curriculum (TIPAC) as a means of providing this much needed resource. The Dick and Carey Systems Approach Model (2015) was used as the framework for this study. In addition, Fullan’s key component of educational change, collaboration, was addressed. The online platform used in TIPAC provides an area where teachers can communicate with other educators, across the globe, regarding their experiences with TIPAC. Finally, TIPAC is available to individuals in the field of education, healthcare, or any other discipline looking to increase their knowledge about incorporating physical activity in the classroom.
CHAPTER III

METHODS

The purpose of this study was to develop and evaluate the online curriculum titled Teachers Integrating Physical Activity into the Curriculum (TIPAC). TIPAC was developed to be part of a comprehensive online learning center in which teachers can learn about physical activity integration into the classroom, regardless of the subject being taught. TIPAC was developed using the Dick and Carey Systems Approach Model (2015). This study was guided by the following two primary research questions:

1. How do the outcomes of the formative evaluations inform the curriculum design process?

2. How can the Dick and Carey Systems Approach Model (2015) be used to design an instructional program that teaches the integration of physical activity into the curriculum?

Chapter III provides an overview of the methodology that was used in this study. It should be noted that based upon the nature of this dissertation, this chapter will follow a unique format. The structure of this dissertation was inspired by the works of Torres’ dissertation (2014), in which she concluded that doctoral students should be able to utilize alternate formats for a dissertation rather than be bound by aesthetic formatting.
guidelines. She suggested that the dissertation project itself should decide which format is most appropriate for a dissertation.

This dissertation has a utilitarian value and doesn’t nicely fit in the traditional Chapter III mold. In fact, an attempt to frame this chapter according to the traditional Chapter III headings resulted in a confusing, disjointed and poorly articulated explanation of the methodology. Therefore, I let the actual dissertation project frame itself based upon the Dick and Carey Systems Approach Model (2015) which was used to guide TIPAC development.

This chapter will begin with an overview of the Dick and Carey Systems Approach Model (2015). Following this overview will be a brief explanation of the participants that were used in this study. The remainder of the chapter will follow a logical sequence detailing the nine steps of the Dick and Carey Systems Approach Model (2015) which were used. Each of the nine steps will be individually and thoroughly described in terms of participants that were used, instrumentation that was utilized, procedures that were conducted, and the process followed for formative evaluation using experts. It is believed that this format will decrease confusion to the reader as there are various participants, multiple forms of data collection and diverse techniques for formative evaluation that differ from step to step of the model. It should be noted that the standard criteria found in a traditional Chapter III of a dissertation exist within this section; it is merely formatted in a different, but logical, presentation. Chapter III ends with a summary.
Overview of Systems Approach Model

The benefits of physical activity for the body and mind, including academic performance, have been well established throughout the literature. However, what is missing is a comprehensive curriculum to educate teachers about physical activity integration into the classroom that is based upon sound theory and instructional design. To help address this challenge, the Teachers Integrating Physical Activity into the Curriculum (TIPAC) was developed and formatively evaluated. The major goals of TIPAC are to equip teachers with enhanced education, training, and a platform for collaborating with other teachers regarding the implementation of physical activity in the classroom.

It was necessary to use a model for the instructional design of TIPAC so that objectives were made clear at the onset. Without this planning guide, the implementation and evaluation process could have become muddied and unfocused. The Dick and Carey Systems Approach Model (2015) was used to guide this curriculum development and evaluation process. Although, this systematic approach uses a 10-step method in which the steps are interrelated, it should be noted that only the first nine steps were used within this study as step 10 was beyond the scope of this dissertation. The 10 steps are listed below and a visual diagram (Dick, Carey & Carey, 2015) has been provided in Figure 2. The Dick and Carey Systems Approach Model (2015) figure has also been added as Appendix C for future reference.

1. Identify instructional goals
2. Conduct instructional analysis
3. Analyze learners and contexts
4. Write performance (learning) objectives
5. Develop assessment instruments
6. Develop instructional strategy
7. Develop and select instructional materials
8. Design and conduct formative evaluation of instruction
9. Revise instruction
10. Design and conduct summative evaluation

**Dick and Carey Systems Approach Model**

*Figure 2.* The Dick and Carey Systems Approach Model (2015).

The model uses preparation, implementation, evaluation and revision. Each of the 10 steps receives input from the previous step to provide information for the subsequent steps. The process itself is not to be viewed as a linear approach, but rather iteratively and parallel in nature.

This system method is outcomes-based in which there is a clear understanding of the new knowledge and skills that the learners are to acquire. In addition, this systems approach is an “empirical and replicable process” (Dick, Carey & Carey, 2015, p. 9).
This provides opportunity for the instruction to be used multiple times with various audiences.

It should be noted that although the concepts of the model have remained virtually unchanged since the original 1978 conception, the publications have been adapted throughout the years. The most current 8th edition (2015) is referenced throughout this dissertation. This newest edition provided added attention to such topics as digital devices, the transfer of learning and performance context and theoretical bases of learning in designing and developing curriculum. It provided updated references and recommended readings for additional clarification. Finally, this newest feature provided updated tables to summarize and organize concepts. These updated features modernized the Dick and Carey Systems Approach Model and therefore was selected as the reference throughout this dissertation.

The TIPAC curriculum development and evaluation process will be described in a step by step fashion. Each step of the Dick and Carey Systems Approach Model (2015) will be outlined in detail to provide a clear and comprehensive understanding of the process that was followed. This format acted as a blueprint for the designer during development and will provide clarity for the reader regarding the method that was utilized.

**Participants**

The participants varied throughout this study depending upon the step of the instructional design process. Learners are one source of participants. The learners within this study are teachers. The concepts of TIPAC are aimed to impact all teachers regardless of grade teaching or years in practice. Pre-service teachers are viewed as
valuable as in-service teachers regarding the TIPAC curriculum. However, given the nature of the current educational system, it is the assumption of this researcher that elementary teachers, kindergarten through fifth grade, are most likely to implement the concepts of TIPAC and were therefore selected as the target audience. The sampling of the teachers utilized in this study will be described during its respective step.

Subject matter experts and curriculum design experts were used throughout this study. Criteria for their inclusion, such as years in practice and content knowledge, are provided in each step.

**Breakdown of the Dick and Carey Systems Approach Model**

At this point, the nine steps of the Dick and Carey Systems Approach Model (2015) used in this study will be broken down into individual steps and discussed in detail. This description includes identification and selection of participants, procedure for data collection and the process for formative evaluations.

**Step One: Identify Instructional Goals**

Identify instructional goals is the first step of the Dick and Carey Systems Approach Model (2015). The purpose of this step was to develop clear statements of behaviors, known as instructional goals, which the learners (teachers in grades kindergarten through 5), should be able to demonstrate after the TIPAC instruction. This is considered the most critical event of the design process because it serves as the groundwork to plan instructional solutions based upon the teachers’ needs. The outcome of this step was clearly written goals that provide the foundation for the remaining instructional design activities.
**Procedures for identifying instructional goals.** This step involved examining and synthesizing various sources of information that address the instructional needs of teachers. There were four sources of information that I examined during the development of the TIPAC instructional goals step. The sources I examined were (a) government agencies and professional organizations for standards and recommendations, (b) research literature, (c) manuals and publications associated with already-existing exercise programs, and (d) experts in the exercise field.

The first set of sources I examined were standards and recommendations provided by government agencies and professional organizations. Recommendations exist regarding type and amount of physical activity that children should be achieving daily. In addition, state standards exist as a way to promote high quality instruction to ultimately prepare students to become productive citizens. Teachers should be aware of both the recommendations and physical education state standards in order to provide high quality, meaningful instruction for their students. To gain a better understanding of these recommendations and standards, various documents within government and professional agencies were reviewed. These agencies included, but were not limited to, the Centers for Disease Control and Prevention (CDC), American Academy of Pediatrics (AAP), American Heart Association (AHA), National Association of Sport and Physical Education (NASPE), and the Ohio Department of Education (ODE). These sites provide recommendations regarding daily physical activity requirements, physical activity recommendations for schools, and the physical education standards that children in grades kindergarten through 12 should achieve as part of a comprehensive school education.
The second set of sources that I reviewed included scholarly research. The literature consisted of information regarding the link between physical activity and academic achievement, obesity implications among school aged children, educational strategies for physical activity implementation in the classroom, and barriers for educators in implementing a new program. To acquire this literature, I reviewed a wide range of databases including ERIC, Education Full Text, Education Research Complete, Proquest Dissertation & Theses, Health Source: Nursing/Academic Edition, SPORTDiscus, Academic Search Complete, MEDLINE, Ovid Nursing & Health Profession Journals, and CINAHL PLUS. Keywords that were used within these databases included childhood obesity, academic achievement, physical activities, academic integration, teacher role, program implementation, classroom techniques, classroom environment, intervention, training methods, educational strategies, program effectiveness, and barriers. This comprehensive review compiled a rich foundation of content knowledge regarding trends in obesity, physical activity opportunities, and barriers that teachers face regarding physical activity implementation in the classroom. In turn, this material was used in identifying the instructional goals for TIPAC as it provided current information that the teachers will need to know.

The third set of sources I reviewed were manuals and publications from already existing exercise programs. I compared and contrasted existing exercise programs, such as Energizers, Take 10!, WISERCISE, and Let’s Move! I evaluated these programs for instructional goals, information regarding the teachers, skills the teacher will acquire with training, tools required for program implementation, and training support.
Finally, the fourth set of sources I utilized included experts in this field. I contacted three researchers in higher education that had conducted research on physical activity implementation in the classroom. E-mails were sent to these three individuals requesting an informal phone interview to discuss their research and recommendations for inclusion of content within the TIPAC program. Two of the three individuals e-mailed me back within 12 hours agreeing to a phone interview. The third researcher never communicated back with me. The phone interviews were conducted with the two researchers within one week of the initial contact. The phone interviews answered questions regarding what their experience was with training of teachers to implement physical activity into the curriculum, if any resistance was met among the teachers, the barriers faced with implementing physical activity in the classroom, and what appeared as motivating factors for the teachers. These researchers provided rich and insightful information, based upon their work in the field, that was used to identify instructional goals.

After examining these four sources, I evaluated, synthesized, and summarized the material to generate goal areas. From these goal areas, I was then able to create instructional goals. Each goal includes a description of the learners, what the learners will be able to do, the performance context in which the skills are to be applied, and the tools that will be available to the learners in the performance context. These key components were included in the goal statement so it was clear who the training was for, what tools are needed to complete the training, and where the training will take place.

**Formative evaluation for identifying instructional goals.** To formatively evaluate step one, I asked three content area experts to review my goals to ensure that
each goal was clear and comprehensive regarding content. The three experts were
selected from my network of professional contacts. The experts were e-mailed
directions regarding the formative evaluation process and the rubric for Evaluating
Instructional Goals (Appendix D). This is a modified version of the Rubric for
Evaluating Instructional Goals (Dick, Carey, & Carey, 2015) which was altered to
coincide with the requirements of the TIPAC program. This rubric provided the experts
with a checklist of criteria to assess if the TIPAC instructional goals were congruent
with the teachers’ needs, feasible, and clear.

Two experts were faculty from The University of Akron, School of Sport Science
and Wellness Education. These experts are knowledgeable about physical activity
methods and resources needed for implementation. A third expert, who is proficient
with curriculum and instruction development, was utilized. This expert was chosen
because of her extensive experience with curriculum development. All three experts
provided feedback that was used to revise the goals resulting in clear, concise
instructional goals that acted as the foundation for the TIPAC program.

Step Two: Conduct Instructional Analysis

The second step of this design model was to conduct an instructional analysis.
The purpose of this step was to determine what skills and knowledge were to be included
within the TIPAC instruction. There were two tasks involved in step two. The first task
in this step was to conduct a goal analysis. The purpose of the goal analysis was
twofold: (a) to classify the TIPAC instructional goals into one of the four learning
domains (verbal, intellectual, psychomotor, attitude), and (b) to identify the major and
subordinate skills that the teachers must demonstrate to meet each goal. The second task
of this step was to identify entry level skills. Entry level skills are the skills that are already possessed by the teachers and will not be taught. The final product of the instructional analysis included the instructional goal, the main steps required to complete the goal, the subordinate skills required at each step, and the necessary entry skills.

**Task #1: conduct goal analysis.** The goal analysis identified the content and skills needed to achieve the instructional goal. The goal analysis provided information regarding the amount of instruction that is needed for each goal. The complexity of the goal impacts the amount of instruction. More complex goals require more instruction. The first part of conducting the goal analysis was to classify goal statements according to learning domains. Once the learning domain was identified the second part of the goal analysis, identifying the major steps needed to accomplish the goal, was conducted.

**Classifying goal statements.** The first activity of goal analysis was to classify the TIPAC goal statements according to one of the four learning domains: verbal, intellectual, psychomotor, and attitude. Classification of the TIPAC goal statements was conducted by reviewing what the teacher is expected to achieve. Table 1 provides an explanation of the four learning domains and a sample goal statement for each domain. All of the goal statements will be provided in chapter four as part of the result section.

Table 1 provides an explanation and example of the four learning domains. The first column in the table provides the learning domain label. The middle column provides an explanation of the corresponding learning domain. The third column provides an example of a goal statement using the specified learning domain.

**Identifying major and subordinate skills step.** Identifying the major steps occurred after all of the goal statements were classified according to their learning
domain. This process was used to describe what the teachers will need to do in order to achieve the TIPAC goal. Identification of major steps generally occurs for all goal

Table 1. Explanation and sample goal statement for each learning domain

<table>
<thead>
<tr>
<th>Learning Domain</th>
<th>Explanation</th>
<th>Sample Goal Statement</th>
</tr>
</thead>
</table>
| Verbal Information | • Require the learner (i.e. teacher) to provide specific responses to specific questions.  
  • Usually have the words describe, state, or list as the verb.  
  • Learner (i.e. teacher) must remember the information from the TIPAC instruction for a test or to use on a related task. | Describe current trends in childhood obesity, recommendations for physical activity among youth, and benefits of physical activity. |
| Intellectual Information | • Require the learner (i.e. teacher) to be able to solve a problem using cognitive activity.  
  • The task for the learner (i.e. teacher) is to be able to solve a problem with previously unseen information or examples. | Provided with a barrier to implementing physical activity in the classroom, determine a solution to overcome that barrier. |
| Psychomotor       | • Involve the coordination of mental and physical activity.  
  • The task for the learner (i.e. teacher) is to perform new, nontrivial motor skills that are dependent upon competently using a physical skill. | Develop and implement a lesson plan that utilizes physical activity during instruction. |
| Attitude          | • Learner (i.e. teacher) is expected to choose or make decisions.  
  • The task for the learner (i.e. teacher) is to choose to perform an intellectual or psychomotor skill or to state a verbal skill. | Choose to implement physical activity as part of the curriculum. |
statements, regardless of the learning domain. However, for purposes of this dissertation study, I only identified major steps for verbal, intellectual, and psychomotor information goal statements. Attitude domains require extensive evaluation techniques. Due to the time constraints and practicality of this dissertation, the attitude domains were not evaluated. Therefore, identification of major steps associated with this domain was not conducted. It is a future recommendation that this study continue post-dissertation defense to include the attitude domains.

The two methods I used to conduct the identification of the subordinate skills in accordance with the major steps were (a) conducting a cluster analysis and (b) designing a hierarchical visual diagram.

**Conducting a cluster analysis.** To analyze the verbal information goals, I designed a cluster analysis. First, I identified the chief classifications of information that were inferred by the goal. Then I determined if there was a way the information could be clustered. Figure 3 illustrates a sample cluster analysis for a verbal information goal. All of the cluster analyses that were developed can be found in chapter four, the results section.

Figure 3 illustrates a sample cluster analysis. The TIPAC goal used in this example is presented at the top of the figure. The six boxes in the figure represent the main classifications of that goal. The information that is to be learned as part of that goal is listed under the corresponding classification.
Cluster Analysis
Goal: Describe current trends in childhood obesity, recommendations for physical activity among youth, and benefits of physical activity.
Learning domain: Verbal

Figure 3. A cluster analysis is used for a verbal information goal. Each of the boxes represents a main classification of the TIPAC goal. The information to be learned as part of that goal is grouped under the corresponding classification.

Designing a hierarchical visual diagram. To analyze goals for intellectual and psychomotor information a hierarchical visual diagram was used. At each step of the goal it was necessary to determine what skills were needed to achieve that step. The skill continues to get divided into subordinate skills until no additional skills are needed to reach the higher level skill. The outcome of this step resulted in a completed diagram of what the teacher will need to know in order to achieve each step within the goal. Figure 4 illustrates a hierarchical visual diagram for an intellectual goal.

Figure 4 illustrates a sample hierarchical diagram. The TIPAC goal is listed in narrative form at the top of the figure. This goal is shown as the uppermost box in the
Figure 4. The hierarchical diagram is used to identify the main steps of an intellectual information goal. The TIPAC goal is stated in the top box of this figure. The main steps to be accomplished as part of this goal are listed in boxes connected to the box with the stated goal. The boxes listed below the main steps are all the substeps that are needed to achieve the main step. The arrows represent the progression from the simplest substep up through the main step.
figure. The main steps needed to meet this goal are viewed in the boxes immediately connected to the goal by arrows. The boxes connected with arrows leading to the main steps are all of the substeps needed to achieve the main steps and ultimately the stated TIPAC goal. The arrows represent the progression from the simplest substep up through the main step.

The diagram illustrates in a step-by-step fashion what must be done by the teacher in order to meet the identified goal. The learner must advance from one step to the next as demonstrated by the arrows. Once all of the instructional goals were identified according to the learning domains and the major steps that the learner needs to achieve the goal were determined, I proceeded to the identification of entry skills task.

**Task #2: identify entry skills.** The second task of conducting the instructional analysis was identification of entry skills needed to achieve the goal. Entry skills are discovered through the hierarchical process described previously. The bottom of the hierarchy is considered the lowest level skills. By moving up the hierarchy the skills become more complex. There is a point on that hierarchy where most teachers will already possess those skills prior to the TIPAC instruction. Note the horizontal dotted line on Figure 5. All the skills above the dotted line will be included in the instruction and the skills below the dotted line are prerequisite skills. See Figure 5 for an illustration of identification of entry skills. Notice how Figure 5 takes the original hierarchical visual diagram (Figure 4) and merely adds the dotted line to dictate the entry level skills.
Figure 5. The hierarchical diagram is used to identify the steps of an intellectual information goal. The TIPAC goal is stated in the upper most box of this figure. The main steps to be accomplished as part of this goal are listed in boxes connected to the box with the stated goal. The boxes listed below the main steps are all the substeps that are needed to achieve the main steps. The arrows represent the progression from the simplest substep up through the main steps. The horizontal line depicts where the entry level skills are. All skills below the dotted line are considered entry level and will not be taught as part of TIPAC. It is assumed ALL teachers are equipped with that basic knowledge.
Figure 5 states the sample TIPAC intellectual goal in the uppermost box. The adjoining boxes are all the steps that need to be achieved in order to meet the expected goal. The horizontal dotted line seen near the bottom of the figure depicts the entry level skill divider. All of the skills below that dotted line are considered entry skills, skills that the teacher will already know prior to the TIPAC program. Those skills will not be taught.

**Formative evaluation for instructional analysis.** To formatively evaluate this step, I asked three subject-matter experts to review my instructional analysis. I provided detailed process via e-mail. Additionally, I supplied the experts with the classified learning objectives, cluster analysis diagrams, hierarchical diagrams, the rubric for Evaluating a Goal Analysis (Appendix E) and the rubric for Evaluating Subordinate and Entry Level Skills (Appendix F). These are the modified versions of the *Rubric for Evaluating a Goal Analysis* and the *Rubric for Evaluating Subordinate and Entry Skills* (Dick, Carey, & Carey, 2015) which were altered to coincide with the requirements of the TIPAC program. These rubrics provided a thorough checklist to evaluate intellectual, verbal and entry level skills for inclusiveness and clarity.

The same three experts that evaluated step one were asked to evaluate this step. These experts were selected since they already had some basic knowledge about TIPAC that was revealed during step one. One expert was a faculty member within the LeBron James Family Foundation College of Education at The University of Akron, experienced in curriculum development. This expert was chosen because of her extensive knowledge of the curriculum development process. The other two experts were selected from the College of Health Professions at The University of Akron, with research expertise in
obesity and exercise. These experts were selected because they would be able to assist with identification of subordinate level skills as it relates to achieving the physical activity instructional goals. All three experts provided feedback which was later used to develop instructional materials for TIPAC.

**Step Three: Analyze Learners and Contexts**

Steps one and two of the Dick and Carey Systems Approach Model (2015) have a focus of identifying the skills of teachers and the knowledge that is to be taught as part of the TIPAC program. The third step of this model changes the focus to the learners and contexts. For this study, the learners were elementary school teachers, grades kindergarten through fifth, and the learning context was the online learning environment in which the teachers learned the TIPAC curriculum. There were three tasks that were performed during this step: (a) analyze learners, (b) analyze performance context, and (c) analyze learning context. I used this step as a guide to examine the characteristics of the teachers, the context in which the newly learned TIPAC skills of the teachers will eventually be utilized, and the context in which the TIPAC instruction will be given. The outcome of this step provided information regarding teacher characteristics, including motivational information, relevance of the TIPAC information and skills to the work setting, personal time of the teachers, teachers’ needs, and feasibility of transferring information learned from TIPAC to the workplace. This information was essential in developing relevant instruction for this population of teachers.

**Task #1: analyze learners.** The learners in this study were elementary teachers, grades kindergarten through fifth. Based upon the school structure, elementary teachers
are more likely to implement physical activity into the curriculum and were therefore the target audience used in this dissertation.

The first task completed was a learner analysis, which was used to identify general characteristics of the teachers and verify the skills they already possess. I recruited a group of “tryout learners” to gain deeper insight into these characteristics. Tryout learners, as described by Dick, Carey, and Carey (2015), are those learners available to the designer during curriculum development that represent individuals from the target population. I purposefully selected three elementary teachers from my professional contacts to act as my tryout learners to assist in this process. I selected a teacher from Grade 5, one from Grade 3 and one from Grade 1, all from different elementary schools, to represent diversity among grade levels and population taught. The third grade teacher was employed in a suburban elementary school where 46% of children are on the free and reduced lunch program. This teacher is a male and has been teaching for over 20 years. The fifth grade teacher is employed at an urban elementary school where 100% of children are on the free and reduced lunch program. This teacher is a male and has been teaching 17 years. The first grade teacher is employed at a different urban elementary where 100% of children are on the free and reduced lunch program. This teacher is a female and has been teaching for over 20 years. These teachers were selected because I believed their voice would be valuable and provide insight into the views of elementary teachers at various grade levels.

I met with the third and fifth grade teachers separately at a mutually agreed upon location and conducted the one-to-one informal interview. I spoke with the first grade teacher on the phone to conduct the interview as this was more convenient for her.
Information gathered during the informal interviews were related to: (a) entry level skills (skills the learner already possesses), (b) prior knowledge of the trends in childhood obesity and physical activity, recommendations for daily physical activity among children, implementing physical activity in the classroom, and resources available to assist with physical activity implementation, (c) attitudes toward this TIPAC content and the online delivery system, (d) motivation to learn this information, and (e) attitudes about their workplace and support provided within their workplace. Each interview lasted between one and two hours and I took copious notes throughout.

The informal interview questions are provided in Appendix G. Note how Appendix G has been divided into three main categories: (a) questions to analyze the learner, (b) questions to analyze the performance context, and (c) questions to analyze the learning context. The first category regarding analyzing the learner is discussed here, whereas the second and third category will be addressed in tasks #2 and #3 within this step.

The interview questions in Appendix G were arranged to coordinate with the five areas of the learners that were being analyzed. The first segment of questions focused on learning about entry level skills. These are the skills the teacher already possesses and will not need to be taught as part of the TIPAC program. The second set of questions was separated into four subsections (B1-B4). These questions focused on analyzing the teachers’ knowledge regarding trends in childhood obesity and physical activity, physical activity recommendations for children, implementing physical activity in the classroom, and resources available to assist with physical activity implementation. The questions were used as a way to gain insight into what teachers already know about
childhood obesity and how to incorporate physical activity in the classroom, which could provide guidance as to the depth of information needed for the TIPAC curriculum. The third set of questions focused on attitudes the teachers have about the TIPAC program. These questions were asked in order to help describe the current teacher buy-in regarding TIPAC for this group of tryout learners, as well as attitudes toward learning new information online. The fourth set of questions revolved around motivating factors for teachers to learn more about the TIPAC program. The final set of questions under analyzing the learner context is related to finding out more about attitudes toward support that is provided within the teacher’s workplace. These questions were asked as a way to gain feedback about barriers that these teachers face and the current level of support provided by colleagues when implementing a new program.

**Task #2: Analyze performance context.** The second task that was completed during this step was to perform a context analysis. In this study, the performance context is the classrooms where teachers will implement the TIPAC curriculum. Therefore, performing an accurate analysis of teacher classrooms enabled me to make the learning experience more authentic, which ultimately will aid in the transfer of new TIPAC knowledge to the teacher work setting.

This task was completed in conjunction with the first task of the informal interview. In addition to having personal background knowledge of classroom layout from years of experience performing health education in multiple elementary classrooms, I also asked questions about classroom space and configuration as part of the informal interview (see Appendix G). Note how the questions to analyze the performance context in Appendix G focused on identifying typical classroom space and
identified if the teacher would be willing to rearrange the classroom to permit physical activity if needed.

**Task #3: Analyze learning context.** The third and final task that was completed in step three was to analyze the learning context. The learning context is the setting in which the TIPAC instruction is to take place. The TIPAC instruction is conducted online and can therefore be performed in virtually any setting for the teacher. To assess this environment as well as identify the basic online operating system requirements, I asked questions during the informal interview specific to the learning context (see Appendix G). Note how the questions in Appendix G, section 3 (questions to analyze the learning context), inquired about locations the teacher is most likely to conduct the online TIPAC learning and what type of computer will be used. In addition, items such as access to WIFI, headphones, and ample space were questioned as these answers provide guidance for choosing the TIPAC delivery system. Furthermore, this information provides insight as to what directions should be provided to the teachers as part of the TIPAC instructions.

**Formative evaluation for analyzing learners and contexts.** After the interviews were completed, it was decided that only one expert would be used for formative evaluation. It was evident that the interview questions clearly addressed the items listed on the Rubric for Evaluating Analysis of Learners and Contexts (Appendix H) and therefore, it was not necessary to ask more individuals to review this information. However, since I am not an information technology (IT) expert, it was thought to be beneficial to have the Coordinator of Online Learning at a local university complete the Rubric for Evaluating Analysis of Learners and Contexts (Appendix H). This rubric is a
modified version of the *Rubric for Evaluating Analysis of Learners and Contexts* (Dick, Carey, & Carey, 2015) which was altered to coincide with the requirements of the TIPAC program. This rubric was used to provide the IT expert performing the formative evaluation with a checklist of key descriptive elements specific to the characteristics of the learners, the classroom which is the eventual performance context, and requirements necessary for the learning context.

I met with the Coordinator of Online Learning for an in-person meeting. As she completed the rubric and offered recommendations verbally, I documented her suggestions on the rubric myself. Our in-person interview lasted 45 minutes. This individual was chosen to perform the evaluation as she was a teacher for greater than 5 years in the schools and is now employed as an information technology expert in a higher education institute. Therefore, she has knowledge that crosses both aspects of this step, teacher insight and technology expertise.

**Step Four: Write Learning Objectives**

The information obtained from the previous three steps was used to complete the fourth step of writing learning objectives. Learning objectives are specific statements detailing what the learners will be able to do, in the online learning environment, at the completion of the TIPAC instruction. It includes information about what resources the teachers will be given in order to identify the TIPAC skill, a description of the actual TIPAC skill, and a description of what dictates an acceptable display of the TIPAC knowledge. It was necessary to write the learning objectives clearly and concisely so that development of the TIPAC content and assessment instruments could be devised in subsequent steps.
**Procedure for writing learning objectives.** Learning objectives consist of three components: (a) condition, (b) behavior, and (c) criteria. It was necessary to include all three of these components to clarify what the learner should be able to do at the completion of the TIPAC instruction. The condition includes information about what resources the teachers will be given in order to identify the TIPAC skill. The behavior identifies the actual TIPAC skill and the criteria describes what is needed for acceptable performance by the learners to demonstrate the knowledge of the TIPAC concepts. Development of quality multiple-choice questions that are to be used in the assessment of TIPAC knowledge is dependent upon the clarity of these three components. A definition and example of the components of a learning objective are presented in Table 2.

**Table 2.** Definition and example of the components of a learning objective

| Sample Learning Objective: Given a time constraint barrier to physical activity integration in the classroom, identify two possible solutions to overcome the barrier and ultimately perform the physical activity during curriculum instruction. |
|---|---|---|
| **Condition (C)** | **Behavior (B)** | **Criteria (Cr)** |
| Definition | Resources and tools that will be available to the teachers when performing the TIPAC skill | The actions, content, and concepts of the TIPAC skill | What is needed for acceptable performance of the TIPAC skill |
| Example | Given a time constraint barrier to physical activity integration in the classroom, | identify two possible solutions | to overcome the barrier and ultimately perform the physical activity during curriculum instruction. |
Table 2 provides a definition and example of the components of a learning objective. To further help explain this method, I provided a sample learning objective at the top of Table 2. In the first row of the table, a definition of condition, behavior, and criteria are provided. The second row of Table 2 breaks down the sample learning objective into its respective components.

The Dick and Carey Systems Approach Model (2015) consists of a six task process for developing learning objectives. I modified the original six-task process to become a three task process, eliminating task one, five and six of the original model. In the original model, task one includes developing learning objectives for the performance context. It is expected that mastery of the TIPAC concepts will be demonstrated by the teachers in the performance context of their classroom. However, due to the nature of this dissertation, the performance context has been eliminated and the learning objectives reflect only the online TIPAC learning context environment. Additionally, task five and six of the process explore development of learning objectives for subordinate and entry level skills. After interviewing the teachers as part of step three, it was decided that only the main goal and substeps needed learning objectives developed. It was viewed that developing learning objectives for subordinate and entry level skills was an unnecessary component of this step and would not aid in further knowledge obtained by the teachers.

I wrote learning objectives for the instructional goals and substeps identified within the TIPAC program by following the modified three task process. Table 3 presents the three tasks, an explanation of the three tasks, an example of each task, and a sample learning objective.
Table 3 presents the three tasks that were used to write the learning objectives. An explanation of the tasks, example of each task and a sample learning objective are provided in the table. Row 1 of Table 3 identifies the first task in column 1, followed by an explanation of that task in column 2. After the explanation is provided an example is given in column 3, which was then used to produce the learning objective displayed in column 4. This was done for each task in chronological order in the succeeding rows.

**Formative evaluation for writing learning objectives.** To formatively evaluate step four, I used the rubric for Evaluating Learning Objectives (Appendix I). This is a modified version of the *Rubric for Evaluating Performance Objectives* (Dick, Carey, & Carey, 2015), which was altered to coincide with the requirements of the TIPAC program. The rubric provides a detailed checklist to ensure that components within the learning objectives have been met, such as if the condition, behavior and criteria are clear and observable.

First, I personally used the rubric to review all learning objectives for inclusiveness. I made any necessary revisions to the learning objectives based upon my review. Second, I reached out to three experts to act as reviewers. One expert was a curriculum and assessment expert within the LeBron James Family Foundation, College of Education at The University of Akron. The other two experts were faculty members in the College of Health Professions at The University of Akron. These three experts were requested because they had prior knowledge of his TIPAC program as they performed formative evaluations for steps one and two of this study. Additionally, these three experts view the learning objectives through different professional lenses.
<table>
<thead>
<tr>
<th>Task</th>
<th>Explanation</th>
<th>Example</th>
<th>Learning Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Edit the instructional goals to reflect the learning objective</td>
<td>• Learning objectives will reflect the TIPAC online learning environment</td>
<td><strong>Instructional Goal:</strong> Provided with a barrier to implementing physical activity in the classroom, determine a solution to overcome the barrier. Provide a scenario consisting of a time constraint barrier to physical activity integration in the classroom, in an online learning environment (C), identify a possible solution to overcome the barrier (B) that would enable performance of the physical activity during classroom instruction (Cr).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Original instructional goal is rewritten to include condition (C), behavior (B), criteria (Cr)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Write objectives for each step of the goal analysis for which there are no substeps shown.</td>
<td>• Learning objectives are written for each substep of the goal analysis.</td>
<td><strong>Substep:</strong> Choose physical activity that does not require extra explanation or guidance for students. Provided with a scenario in an online testing environment (C), identify one activity that can quickly be used (B) to implement physical activity during desired lesson plan (Cr).</td>
<td></td>
</tr>
<tr>
<td>3. Write an objective for each grouping of the substeps under a major step of the goal analysis, or write objectives for each substep.</td>
<td>• This task is a continuation of task two. • Continue down the goal analysis writing learning objectives for each substep.</td>
<td><strong>Substep:</strong> Utilize resources in TIPAC to identify what exercises would be appropriate. Provided with examples of various physical activities, in an online learning environment (C), identify three activities that can be used (B) to implement physical activity during various lessons (Cr).</td>
<td></td>
</tr>
</tbody>
</table>
I e-mailed all three experts the rubric for Evaluating Learning Objectives (Appendix I), a list of the learning objectives to be evaluated, and clear directions. The two experts from the College of Health Professions e-mailed me back stating they would conduct the formative evaluation. The one expert conducted the evaluation in her own time and sent back the rubric and comments via e-mail. The other expert requested an in-person meeting which was used to review the objectives. At that meeting, I had the rubric in front of me and asked each question on the rubric as the expert proceeded to evaluate each objective based upon the rubric criteria. That in-person interview lasted approximately 15 minutes.

After a few weeks of not receiving feedback from the third expert, I released her from performing an evaluation. Since the first two experts provided minimal and similar comments regarding the objectives, it was believed that the third expert’s evaluation would be comparable to the first two. Therefore, there was no need to continue to pursue her for an evaluation of this step. Based upon feedback from the two reviewers, slight modifications were made to the learning objectives before moving on to step five.

**Step Five: Develop Assessment Instruments**

For the TIPAC program, I developed multiple-choice post-tests to be completed at the end of two TIPAC modules to assess if the learner has met the expected TIPAC learning objectives. Although I wrote learning objectives to coincide with all of the instructional goals, it was decided that only two TIPAC modules would be completely developed related to time constraints and complexity of this dissertation. Multiple-choice assessments were developed to evaluate the degree to which teachers have mastered the learning objectives of the TIPAC concepts. Multiple-choice test items
were chosen because they can be performed online and scored immediately, which provides the learners with immediate feedback. The post-tests were set up so that the learners have an unlimited opportunity to go back, review the modules and retake the post-tests to enhance understanding of the TIPAC information. A limitation to this study is that online, computerized post-tests will be used which evaluate verbal and intellectual domains. It is a future recommendation to continue this study, post dissertation defense, to implement and evaluate other forms of assessments, such as observation, that will evaluate the psychomotor and attitude domains.

Step five of the Dick and Carey Systems Approach Model (2015) was used to develop the multiple-choice post-tests for use in the TIPAC training. The rationale for developing tests at this step is because the test item must correspond one to one with the learning objective constructed during step four. Every step leading up to the multiple-choice post-test development will build upon itself. The quality of the multiple-choice questions depends upon the quality of the learning objectives, which depend upon both the quality of the instructional analysis and the goal statement. Consequently, step five feeds into subsequent steps. In fact, it is the nature of the multiple-choice test questions that will serve as a key to the development of the instructional strategy, which will be described in step six.

**Procedure for developing assessment instruments.** I followed six tasks as outlined by Dick, Carey, and Carey (2015), to develop the multiple-choice post-tests. The six tasks are:

1. Match learning domain with the assessment task

2. Determine number of questions needed to define mastery
3. Determine how learner achieves mastery

4. Develop test questions

5. Sequence questions in order of content

6. Write post-test directions

Task one required matching the assessment task with the learning domain. For the purpose of this study only verbal and intellectual learning domains were assessed. Therefore, the assessments are multiple-choice questions. This method was chosen for two logical reasons: (a) the simplicity and ease for learner completion and (b) the ability for automatic scoring of the post-test, via computer, providing immediate feedback.

For the second task, I determined the proper number of test questions needed to define mastery of the TIPAC content. According to Dick, Carey, and Carey (2015), one question is generally sufficient to demonstrate mastery of a verbal domain objective. If the objective is for the intellectual domain then three questions should be developed. I developed a test blueprint to aid in this process.

In the third task, the number of test items the learner must get correct to demonstrate mastery was determined. For the TIPAC program, the learner must obtain an 80% on all of the post-tests. This percentage was chosen to demonstrate mastery to align with continuing education unit criteria.

Task four was the development of the multiple-choice test questions. During this task, I considered the four criteria components that are crucial when writing quality test questions: (a) goal-centered criteria, (b) learner-centered criteria, (c) context-centered criteria, and (d) assessment-centered criteria. I decided which of these four criteria best corresponded with the TIPAC learning objective and developed a test question from this
information. Explanations and examples of each of these four criteria are provided in Table 4.

Table 4 illustrates the four criteria that were considered in order to write quality test questions. Row 1 identifies the four criteria. Row 2 provides an explanation of the characteristics of each of the four criteria. Row 3 uses a learning objective as an example and provides a sample test question that corresponds to that learning objective. Row 4 provides an extended explanation to help clarify how the sample test item matches the learning objective and meets the characteristics of the specific criteria that were considered for development of the test question.

In addition, to assist with the completion of tasks one through four, I developed a test blueprint. The results of the test blueprint are further described in Chapter IV. The order of questions naturally aligned themselves with the content, which was identified during task five. Finally, clear directions were written for each question as the final task of this process.

**Formative evaluation for developing assessment instruments.** To formatively evaluate step five, I enlisted two experts of assessment. I e-mailed both experts clear instructions for evaluation and a document containing all of the multiple-choice questions that had been developed. In addition to the questions, I also emailed the rubric for Evaluating Multiple Choice Questions (Appendix J). This is a modified version of the *Rubric for Evaluating Criterion-Referenced Assessments* (Dick, Carey, & Carey, 2015), which was altered to coincide with the multiple-choice post-tests that will be used as part of the TIPAC curriculum. This rubric provided a thorough checklist to identify if each multiple-choice question considers the four categories of quality test questions.
Table 4. Four criteria used to develop test questions

<table>
<thead>
<tr>
<th>Explanation</th>
<th>Goal-centered criteria</th>
<th>Learner-centered criteria</th>
<th>Context-centered criteria</th>
<th>Assessment-centered criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Test item and task should correspond with the learning objective</td>
<td>• Test questions must meet the characteristics of the learners</td>
<td>• Test items must be realistic for the context in which the skill will be utilized</td>
<td>• Test items should be written clearly, spelled correctly, use proper punctuation and have well-written directions</td>
</tr>
<tr>
<td></td>
<td>• Test item must match exact behavior described in the learning objective</td>
<td>• Language, vocabulary, and experience must be consistent with learners</td>
<td></td>
<td>• Items used to “trick” the learners should not be used because they don’t assess the knowledge/skill being tested</td>
</tr>
</tbody>
</table>

Example Using a Learning Objective to Develop a Sample Test Question

<table>
<thead>
<tr>
<th>Learning Objective:</th>
<th>Learning Objective:</th>
<th>Learning Objective:</th>
<th>Learning Objective:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without being given any examples (C), identify one activity that can quickly be used (B) to implement physical activity during desired lesson plan (Cr).</td>
<td>Without being given any examples (C), identify three benefits of physical activity (B) for children ages 2-19.</td>
<td>Provided with a scenario consisting of a time constraint barrier to physical activity integration in the classroom, in an online learning environment (C), identify a possible solution to overcome the barrier (B) that would enable performance of the physical activity during classroom instruction (Cr).</td>
<td>From the information provided in Module 2 (Trends, Recommendations, and Benefits of Physical Activity) (C), identify current trends of obesity among youth in the United States. Correctly identify three notable trends (Cr.).</td>
</tr>
</tbody>
</table>

(table continues)
Table 4. Four criteria used to develop test questions (continued)

<table>
<thead>
<tr>
<th>Goal-centered criteria</th>
<th>Learner-centered criteria</th>
<th>Context-centered criteria</th>
<th>Assessment-centered criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Test Question:</td>
<td>Sample Test Question:</td>
<td>Sample Test Question:</td>
<td>Sample Test Question:</td>
</tr>
<tr>
<td>Based upon what you</td>
<td>Based upon what you</td>
<td>You are having an</td>
<td>What notable trends can be</td>
</tr>
<tr>
<td>learned in Module 3,</td>
<td>learned in Module 2,</td>
<td>assembly today and your</td>
<td>observed regarding obesity</td>
</tr>
<tr>
<td>which of the following</td>
<td>select all of the</td>
<td>math lesson will</td>
<td>among youth in the United</td>
</tr>
<tr>
<td>physical activities</td>
<td>following that are</td>
<td>be cut short. You want</td>
<td>States? Select all that</td>
</tr>
<tr>
<td>would be most</td>
<td>demonstrated</td>
<td>to incorporate physical</td>
<td>apply.</td>
</tr>
<tr>
<td>beneficial to</td>
<td>benefits of physical</td>
<td>activity during your</td>
<td>a) Childhood obesity rates</td>
</tr>
<tr>
<td>implement in a time</td>
<td>activity in children</td>
<td>math lesson but you</td>
<td>have been rising for more</td>
</tr>
<tr>
<td>crunch?</td>
<td>2-19 years of age</td>
<td>do not have time to</td>
<td>than three decades.</td>
</tr>
<tr>
<td>a) Jumping jacks</td>
<td>Select all that apply.</td>
<td>waste. Which of the</td>
<td>b) Girls are twice as</td>
</tr>
<tr>
<td>b) Sharks and minnows</td>
<td></td>
<td>following activities</td>
<td>likely as boys (ages 2-17)</td>
</tr>
<tr>
<td>c) Burpee-mountain</td>
<td></td>
<td>would meet your needs</td>
<td>to become obese.</td>
</tr>
<tr>
<td>mountain-climber-</td>
<td></td>
<td>in this situation?</td>
<td>c) The prevalence of</td>
</tr>
<tr>
<td>burpee sequence</td>
<td></td>
<td>Select all that apply.</td>
<td>obesity is highest among</td>
</tr>
<tr>
<td>d) Four corners</td>
<td></td>
<td></td>
<td>the Hispanic population.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a) Sky numbers</td>
<td>d) There is an association</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) Air rope skip</td>
<td>between childhood obesity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c) Across the room</td>
<td>rates and level of education</td>
</tr>
<tr>
<td></td>
<td></td>
<td>lunges</td>
<td>among the head of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>d) Partner Do-Si-Do</td>
<td>households.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>e) There are no options</td>
<td>e) The group with the lowest</td>
</tr>
<tr>
<td></td>
<td></td>
<td>for this scenario</td>
<td>percentage of childhood</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>obesity are school aged</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(ages 6-11)</td>
</tr>
</tbody>
</table>

Extended Explanation

Note how in the example provided, the test question matches the exact behavior (identify one behavior that can quickly be used) described in the learning objective.

Note that vocabulary in example is consistent with teachers and not health care providers. The words "lowers blood pressure" was used instead of the medical terminology of decreasing hypertension.

This example clearly considers the performance context being used in the TIPAC program for an intellectual domain question. It takes into account the desired performance objective of a classroom through use of a scenario, but applies it to the online learning context.

This example provides a clearly written test question. Spelling and punctuation are accurate. It tells the learner where the material can be found. In addition it states "Select all that apply" to indicate there may be more than one correct answer.
(goal-centered criteria, learner-centered criteria, context-centered criteria, and assessment-centered criteria) and if the test directions provided are clear and concise.

Both experts were chosen from my list of professional contacts. One expert that participated in this evaluation was a curriculum and assessment expert from the LeBron James Family Foundation College of Education at The University of Akron, with experience in curriculum and test development. The second expert is from the College of Health Professions at The University of Akron and has extensive knowledge in test development. Their expertise as educators and knowledge of curriculum development made them ideal candidates for review of the TIPAC multiple-choice post-tests. After I e-mailed each expert, I scheduled an in-person meeting to discuss their recommendations. Each meeting lasted approximately 45 minutes. After the meetings were complete and recommendations stated, I revised the test questions that correlated with the two TIPAC modules being developed in this study.

**Step #6: Develop Instructional Strategy**

Steps one through five have examined questions about what to teach for the TIPAC curriculum. In this sixth step of developing an instructional strategy, the focus shifts to explore how to teach the TIPAC curriculum. There are three main tasks that were completed during this step: (a) identify a theoretically based strategy, (b) determine the instructional delivery system, and (c) sequence clusters of content. The first task was identifying a theoretically based strategy. The theoretically based strategy is used as a way of achieving the TIPAC identified goals and exploring how the instruction engages the learners. According to Dick, Carey, and Carey (2015) the instructional strategy should include a variety of teaching/learning activities, such as independent reading,
case studies, and computer simulations. These various strategies will take the learners from a motivational introduction to the topic to mastery of the objectives.

The second task that was completed during this step was to determine the instructional delivery system. This task involved the process of identifying how TIPAC will be delivered to the learner. The third and final task of this step was to determine the sequence of content within TIPAC. To maintain a clear understanding of these three concepts, I will discuss them as separate entities, including formative evaluations for each task.

**Task #1: identifying a theoretically based strategy.** Based upon research I have conducted thus far, I have decided to use the Biological Sciences Curriculum Study (BSCS) 5 E model as the theoretically based strategy for TIPAC. This instructional model has been used extensively to develop new curriculum materials and professional development programs across the nation and across disciplines (Boddy 2003; Maidon, 2001; Sadi & Cakiroglu, 2010; Watson & Aubusson, 2003; Wilson, Taylor, Kowalski, & Carlson, 2010). The purpose of the BSCS 5E model is to help individuals redefine, reorganize, elaborate and change their initial ideas through interactions with their environment, other people, or both (Bybee et al., 2006). This process is interactive in nature. The learner has his own interpretation of phenomena. In order to change that interpretation, the learner’s ideas must be challenged and shown to be incomplete. If the original ideas are challenged, the learner must be given time and experiences to develop a more accurate awareness.

The BSCS 5E model consists of five phases: engagement, exploration, explanation, elaboration, and evaluation. Each phase builds upon each other to provide a
better understanding of scientific and technological knowledge, attitudes and skills. It helps to frame and sequence programs and lessons (Bybee et al, 2006). In essence, the BSCS 5 E model acted as a blueprint providing the necessary guidance to advance to step seven which is the development and selection of instructional materials. Table 5 provides an explanation, description of the learner role, description of the teacher role and example for each phase of the BSCS 5 E model as it is used in the TIPAC curriculum.

The first column in Table 5 identifies the phase of the BSCS 5 E model. The second column of this table provides an explanation of what each phase entails. The third column of Table 5 provides roles specific to the learner, whereas the fourth column provides roles specific to the teacher. The fifth and final column provides an example of each phase specific to the TIPAC curriculum.

**Formative evaluation for identifying a theoretically based strategy.** As I had already decided that the BSCS 5 E model would be used as the instructional strategy I did not conduct a formative evaluation of this task.

**Task #2: determine instructional delivery system and sequence clusters of content.** For this task, I used the TIPAC goals, teacher characteristics, learning and performance contexts, objectives, and assessment requirements as criteria to determine the best delivery system. Based upon the preliminary exploration that I have already conducted, it was determined that an online format will be used to deliver TIPAC so that a greater number of teachers can be reached. Therefore, the product of this task was the actual selection of the most appropriate online delivery system to host TIPAC. It was
Table 5. Explanation, role of the student, role of the teacher, and example for each phase of the BSCS 5 E Model

<table>
<thead>
<tr>
<th>Phase</th>
<th>Explanation</th>
<th>Student Role</th>
<th>Teacher Role</th>
<th>Example</th>
</tr>
</thead>
</table>
| Engagement| - Teacher assess’ s learner’s prior knowledge  
- Learner becomes engaged in new concept through use of short activities, promoting curiosity and eliciting prior knowledge  
- Activity should make connections between past and present learning experiences  
- Activity should expose prior conceptions  
- Activity should organize learners’ thinking toward the learning outcomes | - Shows interest in topic  
- Calls upon previous knowledge  
- Asks questions such as: “What do I know? What can I find out? Why did this happen?” | - Creates interest  
- Raises questions  
- Generates curiosity in the learner  
- Assesses previous knowledge | Consider a statement made on February 9, 2010 by First Lady Michelle Obama at the Let’s Move! Launch: “The physical and emotional health of an entire generation and the economic health and security of our nation is at stake.”  
1) What are your beliefs regarding this statement? Do you believe this to still be true, why or why not?  
2) What trends in obesity among youth have you noticed in your Classroom? Family? Community? Nation?  
3) What do you believe contributes to these trends? |
| Exploration| - Provides learner with a common base of activities within which current concepts, processes, and skills are identified and conceptual change is assisted.  
- Learners complete activities that use prior knowledge to generate new ideas, explore questions and possibilities, and design/ conduct a preliminary investigation | - Think freely  
- Explores resources  
- Test predictions/Hypotheses  
- Forms new predictions/ hypotheses  
- Looks for other possibilities  
- Asks more questions  
- Reserves making judgment | - Asks probing questions  
- Makes open suggestions  
- Provides resources | Click on this link and view the video: https://www.youtube.com/watch?v=Hit8K36c9T1  
Dr. Kohl’s second point in the video you just observed revolved around the idea that when schools make decisions, whether it is regarding new schools, renovations, or the curricula, physical activity needs to be interwoven throughout every one of those decisions.  
1) Do you agree or disagree with this statement? Why or why not? |
Table 5. Explanation, role of the student, role of the teacher, and example for each phase of the BSCS 5 E Model

<table>
<thead>
<tr>
<th>Phase</th>
<th>Explanation</th>
<th>Student Role</th>
<th>Teacher Role</th>
<th>Example</th>
</tr>
</thead>
</table>
| Explanation    | * Focuses learners’ attention on their engagement and exploration experiences  
* Provides opportunities for learners to demonstrate conceptual understanding, process skills, or behaviors  
* Provides opportunities for teachers to directly introduce a concept, process, or skill  
* Learners explain their understanding of the concept  
* Explanation from the teacher or curriculum may guide learner toward a deeper understanding, which is crucial.                                                | * Explains possible solutions/answers  
* Lists and tries to comprehend explanation provided by teacher  
* Refers to previous activities  
* Assesses understanding                                                                                                                                 | * Encourages learner to explain concept  
* Formally clarifies definitions, explanations, and new terms  
* Offers alternative explanations  
* Asks questions  

BMI Defined:  
Obesity is defined as a body mass index (BMI) at or greater than the 95th percentile for age growth charts  
Overweight is defined as a body mass index between the 85th and 95th percentile  
BMI is calculated mathematically by using the following equation:  
weight (kg) / [height (m)]² |
| Elaboration    | * Teachers challenge learner’s conceptual understanding and skills.  
* Through new experiences, the learner develops deeper and broader understanding, more information, and adequate skills.  
* Learner applies understanding of the concept by conducting additional activities.                                                   | * Applies new labels and definitions  
* Use previous information to ask questions and propose solutions  
* Draw reasonable conclusions from the evidence  

Let’s revisit initial question:  
1) What role, if any, do you believe teachers have in providing daily physical opportunities to children during the school day?  
2) Has this changed from your original view? |
| Evaluations     | * Encourages learners to assess their understanding and abilities  
* Provides opportunities for evaluation of learner’s progress toward achieving the educational objectives.                           | * Demonstrates understanding of knowledge or skill  
* Evaluates progress/knowledge  
* Asks related question requiring further exploration  

Present the learner with the post-test assessment at the end of each module  
Assess learner’s knowledge and skills  
Does not introduce new ideas or concepts here  
Does not create ambiguity |
also during this second task that the teaching sequence and size of the cluster of materials (modules) in the TIPAC curriculum were determined.

To decide which online delivery system would be most appropriate to host the TIPAC curriculum, I consulted with three experts in the field of web design. The first expert I met with was a professor in the Department of Curricular and Instructional Studies at The University of Akron. The second expert was a Senior Instructional Designer within the Department of Design and Development Services at The University of Akron. Finally, the third expert was the Coordinator of Online Learning within the College of Health Professions at The University of Akron. These experts were selected because of their extensive knowledge and experience with information technology and design.

All three experts were e-mailed requesting an in-person meeting to discuss online platforms that could host TIPAC. All three experts replied to the e-mail quickly and meetings were arranged. At each meeting the experts spoke specifically to the online platform of their choice; Schoology, Blackboard Course Sites, and Google Sites respectively.

I then evaluated each of the experts’ recommended sites using the rubric for Evaluating an Online Delivery System (Appendix K). This rubric was developed to evaluate various online platforms using a 3-point Likert scale. The right column of the rubric provides specific criteria being assessed. These criteria include items such as, usability, site capabilities, management options, interaction ability and cost. The left column displays a 3-point Likert scale with 1 indicating a “poor” capability and “3” indicating “very good” capability. Each criterion was rated on this 3-point scale for the
three sites that were being investigated. The online delivery system with the highest rating was chosen as the platform for the TIPAC curriculum.

**Formative evaluation for determining delivery system.** After discussion with the three experts in instructional design, I formatively evaluated each platform myself according to the rubric for Evaluating an Online Delivery System (Appendix J). Therefore, no outside experts were used to formatively evaluate the chosen platform.

**Task #3: sequence clusters of content.** After the online delivery system was chosen, the content of TIPAC was sequenced into manageable groupings. The instructional goals virtually arranged themselves into a logical sequence without difficulty. Lower level skills were presented first followed by more advanced skills. This produced a logical way of sequencing the TIPAC content.

Once I sequenced the content, I determined the amount of information to be presented as part of the cluster. The clusters were already determined according to the BSCS 5 E model. Cluster one was the engagement phase. Cluster two was the exploratory phase. Cluster three was the explanation phase. Cluster four was the elaboration phase followed by cluster five, which was the evaluation phase. This is consistent for each module within TIPAC. Criteria I used to decide the amount of information to be presented within each cluster was determined by the complexity of the material and the type of learning that was to take place. For clarity, Table 6 was developed to provide an example of the sequence of content and clusters for an instructional goal.

In Table 6 the goal used in this example was to identify trends in obesity among youth and the teacher’s role. The first column labels the cluster that is being described.
The clusters have been determined by the step in the BSCS 5 E model. The second column describes the strategy that is to take place as part of that cluster. The third row describes an activity that will be conducted during each cluster. The fourth column provides an example of an activity to be used during that cluster. Finally, the fifth column indicates an approximate number of minutes that is expected for the learner to complete that cluster.

Formative evaluation for sequencing clusters of content. As I proceeded through this step, it was clear that the content naturally aligned itself into clusters according to the BSCS 5 E model and therefore did not need a formative evaluation performed by experts. It was my belief that my expertise with the content and the Dick and Carey Systems Approach Model (2015) was substantial for my own review of this step.

Step Seven: Develop and Select Instructional Materials

The seventh step of this model involved developing and selecting the instructional materials. Dick, Carey, and Carey (2015) indicate that various forms of instruction may include case studies, PowerPoint presentations, videos, student reading lists, computer-based multimedia formats, and web pages. It is recommended that motivation, content, practice, and feedback be built into the instructional materials. The outcome of this step resulted in teaching materials for two modules that brought the TIPAC instruction to life.
Table 6. Sequence and cluster of content for an instructional goal

### Instructional Goal: Identify Trends in Obesity among Youth and the Teacher’s Role

<table>
<thead>
<tr>
<th>Strategies</th>
<th>Activities</th>
<th>Example</th>
<th>Length of cluster (time)</th>
</tr>
</thead>
</table>
| **Cluster 1 Engagement**  
• Introduce the topic  
• Generate curiosity  
• Engage the learner | 1. Have learner (i.e., teacher) use previous knowledge to answer questions.  
2. Have learner question ideas about their current belief system. | Consider a statement made on February 9, 2010 by First Lady Michelle Obama at the Let’s Move! Launch: “The physical and emotional health of an entire generation and the economic health and security of our nation is at stake.”  
1) What are your beliefs regarding this statement? Do you believe this to still be true, why or why not?  
2) What trends in obesity among youth have you noticed in your Classroom? Family? Community? Nation?  
3) What do you believe contributes to these trends? | 5 minutes |
| **Cluster 2 Exploration**  
• Provide resources to explore trends in obesity and the teacher’s role  
• Engage the learner in deeper thinking and reflection | 1. Provide a link to view a video regarding introducing new curricula and the role of physical activity within any new curricula.  
2. Have learner (i.e., teacher) reflect and answer questions about their perceptions of the video. | Click on this link and view the video: https://www.youtube.com/watch?v=HhT8K56c9TI  
Dr. Kohl’s second point in the video you just observed revolved around the idea that when schools make decisions, whether it is regarding new schools, renovations, or the curricula, physical activity needs to be interwoven throughout every one of these decisions.  
Do you agree or disagree with this statement? Why or why not? | 5 minutes |
| **Cluster 3 Explanation**  
• Clarify definitions and terms  
• Offer alternative explanation | 1. Define BMI as it relates to children  
2. Define how BMI is measured in children  
3. Provide statistical data regarding trends in obesity | BMI Defined:  
• Obesity is defined as a body mass index (BMI) at or greater than the 95th percentile for age growth charts  
• Overweight is defined as a body mass index between the 85th and 95th percentile  
• BMI is calculated mathematically by using the following equation: weight (kg) / [height (m)]² | 5 minutes |
Table 6. Sequence and cluster of content for an instructional goal (continued)

<table>
<thead>
<tr>
<th>Instructional Goal: Identify Trends in Obesity among Youth and the Teacher’s Role</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategies</strong></td>
</tr>
<tr>
<td><strong>Cluster 4 Elaboration</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Cluster 5 Evaluation</strong></td>
</tr>
</tbody>
</table>
| | • Encourages the learner to assess his own understanding of new concepts | 2. Post-test will be graded immediately upon submission so that learner receives prompt feedback. | a) Childhood obesity rates have been rising for more than three decades.  
b) Girls are twice as likely as boys (ages 2-17) to become obese.  
c) The prevalence of obesity is highest among the Hispanic population.  
d) There is an association between childhood obesity rates and level of education among the head of households.  
e) The group with the lowest percentage of childhood obesity is school aged (ages 6-11). |
| | | | 10 minutes |
Procedure for developing and selecting instructional materials. Based upon the nature of this online delivery system, the materials chosen for the TIPAC curriculum were self-instructional. Therefore, the learner is to acquire the information without intervention from an instructor. In order to develop and select the instructional materials, I followed a modified six task process for the development of instruction as outlined by Dick, Carey, and Carey (2015).

In the first task, I reviewed the TIPAC instructional strategy for each objective in each lesson. The instructional strategy was performed during step six and acted as the blueprint for the selection of instructional materials. The second task was to determine if there were existing materials that coincided with the TIPAC objectives. These materials were found by performing extensive internet searches specific to the TIPAC lesson. This included, but was not limited to, searching government agencies and professional organizations, such as the CDC and NAPSE sites for documents and case studies to be used in the TIPAC instruction. In addition, government sites, professional organizations and YouTube were reviewed to find videos that were applicable to the TIPAC instruction. Once I discovered the existing materials, I completed the third task, which was the evaluation of the existing materials. To aid in this planning process, I considered five categories of criteria for evaluating existing materials: (a) goal-centered criteria, (b) learner-centered criteria, (c) learning-centered criteria, (d) context-centered criteria, and (e) technical criteria. I then evaluated the materials according to their corresponding category as described in Table 7.
Column one of Table 7 identifies the category of criteria for evaluating existing materials. The middle column provides an explanation of the category and the third column lists specific criteria that are used to judge the existing criteria for each category.

After existing materials were assessed and evaluated, I completed the fourth task which was to write a rough draft containing the instructional materials based upon the instructional strategy that was developed in step six. The fifth task was to review the rough draft for clarity and flow. Finally, the sixth and final task was to write instructions for each completed unit of instruction.

This step also required me to interact with instructional design experts. Although, I could easily find the content and cluster it to meet TIPAC objectives, I needed assistance with presenting the materials in the online format. I contacted a Professor of Instructional Design at a local university to request assistance with placing TIPAC online. He connected me with a team of three instructional design students. I arranged a meeting with the students to discuss TIPAC and its online needs. We worked closely over several weeks adjusting the PowerPoint presentations and converting videos to MP4 files.

**Formative evaluation for developing and selecting instructional materials.**

After completion of this step, it became clear that it was not necessary to have outside experts conduct a formative evaluation. Three instructional design students worked diligently on revising the PowerPoint slides to provide the information in a clear, concise format. In addition, the files were converted to MP4 as instructed. Understanding that the content would be evaluated in great depth as part of one-to-one evaluations in step 8,
I felt my knowledge as a content expert for TIPAC was sufficient to perform the initial formative evaluation of this step.

Table 7. Criteria for evaluating existing material

<table>
<thead>
<tr>
<th>Goal-Centered Criteria</th>
<th>Explanation</th>
<th>Criteria being Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Focuses on the content of instruction</td>
<td>Congruence between the content in the materials and learning objectives</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adequacy of content coverage and inclusiveness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Authority</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accuracy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Currency</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Objectivity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Learner-Centered Criteria</th>
<th>Uses the information gained from the learner analysis conducted in step three</th>
<th>Vocabulary and language levels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Motivation and interest levels</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Learning-Centered Criteria</th>
<th>Determine whether materials are adequate as is or if they need to be adapted for TIPAC</th>
<th>Do the existing materials include:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Correct content sequencing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Presentation that is complete and current</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Practice exercises</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Appropriate assessments</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Context-Centered Criteria</th>
<th>Uses the previous context analysis conducted in step three to determine if the materials can be adopted or adapted to the online learning context</th>
<th>Authenticity of materials for the online learning context</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Feasibility for online environment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cost</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technical Criteria</th>
<th>Materials will be judged for their technical adequacy</th>
<th>Media formats</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Graphic design</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Legibility</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Audio and video quality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Interface design, navigation, and functionality</td>
</tr>
</tbody>
</table>

Therefore, I personally conducted a formative evaluation of the PowerPoint slides after the revisions had been concluded by the instructional design students using the rubric for evaluating instructional materials (Appendix L). This is a modified
version of the *Rubric for Evaluating Instructional Materials* (Dick, Carey, & Carey, 2015) which has been altered to coincide with the requirements of the TIPAC program. This rubric provided a thorough checklist to evaluate the completeness and accuracy of instructional materials being used for the TIPAC curriculum.

**Step Eight: Design and Conduct Formative Evaluations**

The eighth step of the Dick and Carey Systems Approach Model (2015) is to design and conduct formative evaluations. Dick, Carey and Carey (2015) describe this step using a three-step process which aides in determining any problems and provides opportunity to make the instruction better. The three steps include: (a) one-to-one evaluations, (b) small group evaluation, and (c) field trial evaluation. However, based upon the nature of the TIPAC curriculum development and time constraint of a dissertation, this step has been adapted. This eighth step was used as a mid-point evaluation. Since only two TIPAC modules were completed, this step was modified from the original Dick and Carey Systems Approach Model (2015). This adaption includes using the first step of one-to-one evaluations only. It is a belief of this researcher that based upon the online nature of TIPAC, focus groups will not provide much more in-depth knowledge than the one-to-one evaluations and therefore will not be performed. In addition, this study focuses on TIPAC in the learning context, which is online and not the ultimate performance context of the classroom. For this reason, the field trial, which would evaluate TIPAC in the classroom, has been eliminated from this step as well.

Since TIPAC is such an extensive program it was decided that these two modules would be reviewed now, prior to the entire program being developed. For TIPAC,
having teachers evaluate more than two modules had potential to be overwhelming in both time and content for them. As part of step seven, a design specialist who is also a high school teacher, worked with two other teachers to alter the modules for effectiveness and style. Therefore, only two additional teachers were selected to be used in the one-to-one evaluations so that changes could be made to TIPAC prior to developing the entire program.

Procedure for designing and conducting formative evaluations. To complete this formative evaluation step, I purposefully selected two teachers from two different local schools teaching in two separate grades from my professional contacts to provide feedback about the TIPAC program. These two teachers were selected because they were used as part of step three, which were the informal interviews. Therefore, both of these teachers were knowledgeable of TIPAC and its main objectives. In addition, both teachers had stated during the informal interviews that they would be willing to review TIPAC at its completion. One of the teachers utilized during this step teaches fifth grade at a local elementary school in Akron, OH. One-hundred percent of children at this school are on the free and reduced lunch program. This teacher is a male and has been teaching 17 years. The other teacher selected for this step teaches first grade at a different local elementary school in Akron, OH. One-hundred percent of children at this school are on the free and reduced lunch program. This teacher is a female and has been teaching for over 20 years.

Multiple data gathering strategies were used for formative evaluations throughout this step including: (a) learners providing narrative feedback after they completed the
TIPAC modules, (b) learners completed a rubric following the TIPAC instruction, and (c) written notes were taken by the teachers while they were reviewing TIPAC.

First, I e-mailed both teachers clear instructions on how to access TIPAC and expectations of their review. These expectations included taking notes throughout their review of the modules to provide feedback on clarity, impact and feasibility of the program. After a few weeks, I contacted both reviewers again to set up an in-person meeting for the one-to-one evaluation. I met with both teachers separately to discuss their findings and recommendations regarding TIPAC. To further assess completeness and clarity of TIPAC, I asked them questions from the Rubric for Evaluating TIPAC (Appendix M). This rubric provided an opportunity for the teacher to rate TIPAC criteria using a 5-point Likert scale. The left column of the rubric provides statements concerning the TIPAC instruction with regards to clarity, impact, feasibility, and likelihood of implementation. The right column provides an area for the teachers to document their rating.

Lastly, I reviewed the two TIPAC post-tests with each teacher. At the conclusion of these one-to-one evaluations, revisions to the TIPAC modules were made.

**Formative evaluation for designing and conducting formative evaluations.**

This entire step is a means of formatively evaluating the TIPAC program. Therefore, it was found to be an unnecessary step to request formative evaluations from additional outside experts. Consequently, I personally evaluated this step myself utilizing the rubric for evaluating formative evaluation procedures (Appendix N) as a self-check.
Step Nine: Revise TIPAC Instruction

The ninth step of this model was to revise the TIPAC instruction. The purpose of this step was to review the instructional strategy and reexamine the entry skills and characteristics of the learners. Although Dick, Carey, and Carey (2015) defined the revision of instruction as a separate step, in reality, this revision step is occurring throughout the entire instructional design process.

Revisions were made at the conclusion of each step based upon findings from formative evaluations. Additionally, minor revisions to TIPAC were made after meeting with two teachers as part of step eight. Since only the one-to-one evaluations were used as part of step eight, no further evaluations were needed at this time. Therefore, this step was not actually utilized during the TIPAC development of two modules.

Summary for the Development of TIPAC via a Systematic Approach

The purpose of this study was to develop and evaluate the online curriculum titled Teachers Integrating Physical Activity into the Curriculum (TIPAC). TIPAC was developed to be part of a comprehensive online learning center in which teachers can learn about physical activity integration into the classroom, regardless of the subject being taught. TIPAC is a means of providing a much needed resource for teachers to obtain the knowledge and techniques for physical activity incorporation in the classroom, as well as provide an opportunity to collaborate, via the online delivery system, with other educators around the world. In an era of standards based test driven curriculum, TIPAC has potential value to any high stakes teacher that is searching for methods to increase the academic achievement and overall health of students.
Two modules within TIPAC were developed using the Dick and Carey Systems Approach Model (2015). This model acted as a blueprint, providing clear and comprehensive guidelines for TIPAC development. Formative evaluations were conducted during the majority of steps throughout this process, which acted as a form of checks and balances along the way. It allowed changes to be made before moving on to the subsequent step. Embedded within this development process, are best practice models and concepts. The Biological Sciences Curriculum Study (BSCS) 5E model was used as TIPAC’s theoretically based strategy. The BSCS 5E model helps the TIPAC learners redefine, reorganize, elaborate and change their initial ideas through online interactions, encouraging learning and change. In addition, incorporating a blog component for collaboration within the online delivery system, based upon Fullan’s theory of educational change, heightens the potential for teachers to ultimately bring TIPAC into their classroom. Furthermore, due to the online nature of TIPAC teachers across the nation will have access to the research based TIPAC curriculum detailing how physical activity can be incorporated in the classroom.

The results and answers to the following two research questions that guided this study are addressed in Chapter IV:

1. How do the outcomes of the formative evaluations inform the curriculum design process?

2. How can the Dick and Carey Systems Approach Model (2015) be used to design an instructional program that teaches the integration of physical activity into the curriculum?
CHAPTER IV

RESULTS

The purpose of this study was to develop and evaluate the online curriculum titled Teachers Integrating Physical Activity into the Curriculum (TIPAC). TIPAC was developed to be part of a comprehensive online learning center in which teachers can learn about physical activity integration into the classroom, regardless of the subject being taught. TIPAC was developed using the Dick and Carey Systems Approach Model (2015). This study was guided by the following two primary research questions:

1. How do the outcomes of the formative evaluations inform the curriculum design process?

2. How can the Dick and Carey Systems Approach Model (2015) be used to design an instructional program that teaches the integration of physical activity into the curriculum?

The first major section is the most lengthy. In this section each of the nine steps of the Dick and Carey Systems Approach Model (2015) are discussed in detail, and headings for each of the nine subsections align explicitly with the nine steps of the model. The formative evaluation outcomes and challenges encountered are discussed within each of the nine subsections. Each subsection concludes with a description and evaluation of how the results of the current step inform the subsequent step. Chapter IV
concludes with a summary in which the results of the nine-step curriculum development process are summarized and synthesized to answer the research questions.

**Outcomes of the TIPAC Development Process**

Formative evaluations as outlined in the Dick and Carey Systems Approach Model (2015) were utilized at nearly every step of the TIPAC design process. A total of 13 formative evaluations were conducted by external evaluators throughout the process. Based upon these evaluations, revisions to the TIPAC program were made at each step of development. Modifications to grammar, content to be covered, incorporation of videos, decision for the final learning management system (LMS), clear, concise assessment questions, and alterations in materials used for delivery of content were all made as a result of formative evaluations.

There were a total of nine steps identified within the Dick and Carey Systems Approach Model (2015) that were used to develop TIPAC. For each of these nine steps a brief summary of the purpose of the step will be identified and the outcomes will be discussed in detail. In addition to the overall outcomes associated with each step, an extensive description of the formative evaluation outcomes and challenges encountered will be discussed. Finally, a thorough explanation will be provided that identifies how each step is used to inform the subsequent step.

**Outcomes of Step One: Identification of Instructional Goals**

The purpose of step one of the Dick and Carey Systems Approach Model (2015) was to develop clear statements of behaviors, known as instructional goals, which the learners (teachers in grades kindergarten through 5), should be able to demonstrate after they complete the TIPAC instruction. Information gathered from (a) government
agencies, (b) standards and recommendations from professional organizations, (c) research literature, (d) manuals and publications associated with already-existing exercise programs and (e) expert researchers were examined and synthesized to determine the instructional needs of the teachers.

Table 8 provides the original instructional goals that were developed for TIPAC. These are the goals that were sent to three experts for formative evaluation. The instructional goals were revised after three experts provided formative evaluation feedback and the outcome of the evaluation is reported in the next section. This step resulted in 18 revised instructional goals that were used to guide the TIPAC curriculum, which are displayed in Table 9.

**Formative evaluation outcomes and challenges encountered.** Three experts, two content experts and one curriculum assessment expert, conducted a formative evaluation of the TIPAC instructional goals for clarity and completeness. The feedback from three different individuals provided various perspectives and was vital to refining the instructional goals, not only regarding content of those goals, but also regarding format. The responses from the two formative evaluations that were conducted by experts in the field of exercise science primarily focused on content and language that spoke to the science of exercise. Suggestions such as using the term cognitive rather than “for the mind” were provided. In addition, these two experts recommended content that should be added such as educating about bone health. In contrast, the third expert was skilled in curriculum and assessment and supplied feedback from a completely different lens. Her comments focused more on the structure of the instructional goals.
and the confusion regarding the formative evaluation rubric (Appendix D). Her comments implied that the rubric language did not clearly assess the instructional goal.

Table 8. Original TIPAC Instructional Goals

<table>
<thead>
<tr>
<th>TIPAC Goal Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1:</td>
</tr>
<tr>
<td>Goal areas:</td>
</tr>
<tr>
<td>1. Introduction to TIPAC</td>
</tr>
<tr>
<td>2. Safety</td>
</tr>
<tr>
<td>3. Time recommended for PA</td>
</tr>
<tr>
<td>- define aerobic vs. muscle strength vs. bone strength</td>
</tr>
<tr>
<td>4. Barriers</td>
</tr>
<tr>
<td>5. How to..</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Original TIPAC Instructional Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructional Goals: include description of learner, what learners will be able to do, performance context skills will be applied, tools that will be available to the learners in the performance context:</td>
</tr>
</tbody>
</table>

1. After completion of the online TIPAC curriculum, the learner (i.e. teacher) will describe the purpose of TIPAC in the classroom via the online post-test.
   1.1 After completion of the online TIPAC tutorial, the learner (i.e. teacher) will demonstrate how to navigate the TIPAC website.
   1.2 After completion of the online TIPAC curriculum, the learner (i.e. teacher) will describe the current global state of obesity via the online post-test.
   1.3 After completion of the online TIPAC curriculum, the learner (i.e. teacher) will differentiate between overweight and obesity status via the online post-test.
   1.4 After completion of the online TIPAC curriculum, the learner (i.e. teacher) will identify trends in the educational system related to physical activity within schools via the online post-test.

2. After completion of the online TIPAC curriculum, the learner (i.e. teacher) will identify safety measures to be taken into account when having students perform exercises in the classroom via the online post-test.
   2.1 Provided with a scenario online, the learner (i.e. teacher) will identify the correct safety measures to be taken into account when performing that exercise.

3. After completion of the online TIPAC curriculum, the learner (i.e. teacher) will identify 3 benefits of physical activity for the body via the online post-test.
   3.1 After completion of the online TIPAC curriculum, the learner (i.e. teacher) will identify 3 benefits of physical activity for the mind via the online post-test.
   3.2 After completion of the online TIPAC curriculum the learner (i.e. teacher) will identify 3 benefits of physical activity psychosocially via the online post-test.

*(table continues)*
Table 8. Original TIPAC Instructional Goals  (continued)

**Original TIPAC Instructional Goals**

3.3 After completion of the online TIPAC curriculum, the learner (i.e. teacher) will identify the association between physical activity and academic performance via the online post-test.

4. After completion of the online TIPAC curriculum, the learner (i.e. teacher) will identify the recommended time spent on daily physical activity for all ages via the online post-test.
   4.1 After completion of the online TIPAC curriculum, the learner (i.e. teacher) will differentiate between aerobic, muscle strengthening and bone strengthening exercises via the online post-test.
   4.2 After completion of the online TIPAC curriculum, the learner (i.e. teacher) will describe examples of aerobic, muscle strengthening and bone strengthening exercises via the online post-test.
   4.3 After completion of the online TIPAC curriculum, the learners (i.e. teachers) will identify how much time should be spent weekly on aerobic, muscle strengthening and bone strengthening exercises via the online post-test.

5. After completion of the online TIPAC curriculum, the learners (i.e. teachers) will define potential barriers to activity implementation in the classroom via the online post-test.
   5.1 Provided with a physical barrier, the learners (i.e. teachers) will determine a solution to overcome that barrier for activity implementation in the classroom via the online post-test.
   5.2 Provided with a time constraint barrier, the learners (i.e. teachers) will determine a solution to overcome that barrier for activity implementation in the classroom via the online post-test.
   5.3 Provided with an institutional support barrier, the learners (i.e. teachers) will determine a solution to overcome that barrier for activity implementation in the classroom via the online post-test.

6. Provided with a sample lesson, the learners (i.e. teachers) will determine a physical activity that can be performed while teaching in the classroom.
   6.1 After completion of the online TIPAC curriculum, learners (i.e. teachers) will identify 3 possible resources to utilize while developing physically active lesson plans for use in the classroom.
   6.2 After completion of the online TIPAC curriculum, the learner (i.e. teacher) will demonstrate how to incorporate physical activity into the curriculum using a current lesson plan while teaching in the classroom.
   6.3 After completion of the online TIPAC curriculum, the learner (i.e. teacher) will demonstrate at least one variation to a physically active lesson that can be done for children with disabilities while incorporating physical activity in the classroom.
Table 9. Outcome of Step One: Revised TIPAC Instructional Goals

<table>
<thead>
<tr>
<th>TIPAC Instructional Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. After completion of the online TIPAC curriculum, the teacher will identify the purpose of TIPAC in the classroom via the online post-test.</td>
</tr>
<tr>
<td>2. After completion of the online TIPAC tutorial, the teacher will demonstrate how to navigate the TIPAC website.</td>
</tr>
<tr>
<td>3. After completion of the online TIPAC curriculum, the teacher will differentiate between the terms overweight and obesity via the online post-test.</td>
</tr>
<tr>
<td>4. After completion of the online TIPAC curriculum, the teacher will identify the current state of obesity in Ohio, nationally and globally, via the online post-test.</td>
</tr>
<tr>
<td>5. After completion of the online TIPAC curriculum, the teacher will identify trends in the educational system related to physical activity within schools nationally via the online post-test.</td>
</tr>
<tr>
<td>6. After completion of the online TIPAC curriculum, the teacher will identify safety precautions to be considered when having students perform exercises in the classroom via the online post-test.</td>
</tr>
<tr>
<td>7. Provided with a scenario, the teacher will identify the correct safety precautions to be considered when performing that exercise.</td>
</tr>
<tr>
<td>8. After completion of the online TIPAC curriculum, the teacher will identify 3 benefits of physical activity in the areas of physical, cognitive, and psychosocial.</td>
</tr>
<tr>
<td>9. After completion of the online TIPAC curriculum, the teacher will identify the association between physical activity and academic performance via the online post-test.</td>
</tr>
<tr>
<td>10. After completion of the online TIPAC curriculum, the teacher will identify the recommended daily/weekly dose (frequency and duration) of aerobic exercises, muscle strengthening exercises, and flexibility exercises via the online post-test.</td>
</tr>
<tr>
<td>11. After completion of the online TIPAC curriculum, the teacher will identify examples of aerobic, muscle strengthening, and flexibility exercises via the online post-test.</td>
</tr>
<tr>
<td>12. Provided with a scenario, the teachers will differentiate between aerobic, muscle strengthening, and flexibility exercises.</td>
</tr>
<tr>
<td>13. After completion of the online TIPAC curriculum, the teacher will identify the association between type of exercise and bone health.</td>
</tr>
<tr>
<td>14. After completion of the online TIPAC curriculum, the teachers will identify potential barriers to activity implementation in the classroom.</td>
</tr>
<tr>
<td>15. Provided with an example of a barrier (physical, time, institutional support, personal), the teachers will determine a solution to overcome that barrier for activity implementation in the classroom.</td>
</tr>
<tr>
<td>16. After completion of the online TIPAC curriculum, teachers will identify 3 possible resources to utilize while developing physically active lesson plans for use in the classroom.</td>
</tr>
<tr>
<td>17. Provided with a sample lesson, the teachers will identify a physical activity that can be performed while teaching that lesson.</td>
</tr>
<tr>
<td>18. Provided with a sample lesson, the teacher will identify at least one variation to a physically active lesson that can be performed for children with disabilities.</td>
</tr>
</tbody>
</table>
making her evaluation difficult, resulting in several comments stating “I don’t know what you mean.”

Figure 6 displays an excerpt from an e-mail correspondence from an expert performing the formative evaluation for step one. Note how she stated she adjusted the rubric so that she could evaluate each instructional goal according to the guidelines and not just an overall view. This demonstrates that the rubric was confusing as is for this expert.

Additionally, Figure 7 displays the completed rubric for instructional goals submitted by the same expert stating confusion. Note how questions 4 and 5 regarding the performance context were left blank. Although this information was not completed as instructed, the three experts provided substantial feedback regarding language and content via narrative notes that enabled valuable changes to be made to the instructional goals resulting in clear and concise goals.

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**E-mail Correspondence from an Expert Performing Formative Evaluation of Instructional Goals**

![E-mail Correspondence](attachment:correspondence.png)

Here you go.

You’ll see that I created individual rating forms for each objective. I did not think I could evaluate all of the objectives using a single rating scale. I did not know what you meant by “performance context” or “tools”, so I had to leave these ratings blank.

Hope this helps.

*Figure 6.* E-mail correspondence from an expert performing formative evaluation of this step. Not how she adjusted the rubric in order to perform an individual evaluation for each instructional goal rather than an overall evaluation as the rubric was originally designed.
Figure 7. Completed rubric for evaluating instructional goals submitted by one of the experts. Note how her comments indicate confusion with the rubric wording.

There were two challenges that were confronted during this step: (a) obtaining expert feedback and (b) utility of the rubric.

**Obtaining expert feedback.** The first challenge encountered pertained to contacting experts in the field of physical activity integration in the classroom. Three experts associated with universities were contacted during mid-June 2016. Of the three experts contacted, two replied. It is possible that the third researcher was already on summer break, making the time of year that data was being collected a challenge. Both the researchers that did reply back did so within 12 hours and had agreed to an informal phone interview, which was conducted within one week of the initial e-mail contact. Although this challenge did not reflect difficulty with the Dick and Carey Systems Approach Model (2015) itself, the challenge encountered was in the process as outlined by Dick, Carey, and Carey (2015). Dick, Carey, and Carey (2015) suggested contacting
individuals who could provide practical experience with the curriculum that is being developed. However, Dick, Carey, and Carey (2015) did not discuss the possible obstacles that could impact data collection. For the development of TIPAC, the challenge was finding experts specific to physical activity implementation in the classroom available to discuss the subject matter. It could be concluded that if subject matter experts are employed in higher institutions than it is wise to conduct interviews during the typical fall and spring semester time frame when these individuals would potentially be more available. Therefore, it is suggested that the developer identify potential obstacles that may be encountered in utilizing various resources to identify instructional goals and plan accordingly, such as not contacting researchers during standard educational breaks.

Utility of the rubric. The second challenge was regarding the rubric used for formative evaluation. All three of the individuals conducting formative evaluations are considered experts in their respective fields, but none of the individuals are experts with the Dick and Carey Systems Approach Model (2015). Although several comments from the experts were insightful regarding content and structure, an understanding of the model would clarify that some of their questions would be answered in later steps.

Figure 8 provides narrative feedback that was submitted by one of the experts that conducted the formative evaluation for instructional goals. Note how her comments ask questions about how it will be tested. Knowledge of the model would indicate this information would be revealed in step 5: Develop Assessment Instruments of this process.
Evaluation Feedback of Instructional Goals Submitted By Expert

1. After completion of the online TIPAC curriculum, the learner (i.e. teacher) will describe the purpose of TIPAC in the classroom via the online post-test.
2. After completion of the online TIPAC curriculum, the learner (i.e. teacher) will identify safety measures to be taken into account when having students perform exercises in the classroom via the online post-test.
3. After completion of the online TIPAC curriculum, the learner (i.e. teacher) will differentiate between overweight and obesity status via the online post-test.
4. Provided with a scenario online, the learner (i.e. teacher) will identify the correct safety measures to be taken into account when performing that exercise.

Comment [2A3]: How will this be accomplished?
Comment [2A4]: How will this be accomplished?

Figure 8. Evaluation feedback of instructional goals submitted by one of the experts. Note how her comments regarding how the goal will be accomplished suggests limited knowledge of the Dick and Carey Systems Approach Model (2015), as this would be answered in a later step.

In addition, since the rubrics were e-mailed, there was not an opportunity to discuss comments or concerns as they arose. Questions about what the rubric was asking the expert performing the evaluation to identify could not be discussed at that time and required e-mails to go back and forth, actually increasing the time it took to get feedback. This did not hinder my movement to step two however, because although not all of the experts completed the rubric entirely, there were enough written, narrative comments to revise the instructional goals.

Similar to the first challenge, this second challenge can be viewed as a procedural difficulty rather than a problem with the Dick and Carey model itself. It is undoubtedly beneficial to gain feedback from experts in the field regarding clarity and content of the instructional goals. However, lack of understanding of the model from
content experts and wording of rubrics demonstrated confusion with the formative evaluation process. Although an attempt was made to revise Dick and Carey’s rubric to meet the needs of TIPAC, it was discovered that this had not been done as clearly as originally desired. Although this could be the result of being a novice developer, it displayed a challenge none-the-less. A recommendation that has emerged from this study is that developers take ideas from the Dick and Carey rubric and make a specific, simple questionnaire for the individuals that will be performing the formative evaluation. I found that I kept the wording in the rubric too similar to the Dick and Carey original rubric and this demonstrated confusion for individuals not experienced with their model. Additionally, meeting with the experts and conducting a formative evaluation in person could also address any confusion as it arises. If the rubrics are simplified substantially then it is possible to conduct this formative evaluation via e-mail with a set of clear, concise directions. It is understood that perfecting the rubric and providing clear instructions may be very difficult for a novice designer; and therefore, it is highly recommended that the formative evaluation be conducted in-person, via video conferencing, or at the very least via telephone.

**How step 1 is used to inform step 2.** The purpose of the next step in the model (Step 2) is to determine the skills and knowledge that are to be included within the TIPAC instruction. The intent of step 1 was to develop clear statements of behaviors, known as instructional goals, which the learners should be able to demonstrate after they complete the TIPAC instruction. Review of the above sources demonstrated this step to be an essential first step of the process. The expert researchers from various universities provided critical information regarding development of the TIPAC instructional goals.
Expert one stressed the importance of including the effect that physical activity has on cognitive functioning and academic performance as this speaks the teacher’s language. Additionally, both experts discussed the significance of practicing physical activity integration as this helps the teachers with perceived confidence. Lastly, expert one pointed out that the comment section component of TIPAC is essential, remarking that this will help the teachers feel a part of something bigger than themselves.

Utilizing experts to conduct formative evaluations for this step was crucial for developing clear, concise goals that were necessary to advance to step two of the Dick and Carey Systems Approach Model (2015). The second step of this model was to identify the skills and knowledge that should be included within the TIPAC training. Without instructional goals there was no way to know the exact focus of TIPAC. The experts that performed the formative evaluations helped to refine the instructional goals based upon their expertise and identified questions and concerns that were not recognized in the first draft of the TIPAC instructional goals.

**Outcomes of Step Two: Conduct Instructional Analysis**

The purpose of step two of the Dick and Carey Systems Approach Model (2015) was to determine what skills and knowledge were to be included within the TIPAC instruction. There were three outcomes of this step: (a) domain identification, (b) hierarchical diagrams, and (c) cluster analysis diagrams.

**Domain identification.** This step resulted in the identification of the learning domain associated with each goal statement. Identification of the learning domains was important because it is vital to understand what type of learning is expected so that the skills and content being taught appropriately reflect the identified domain. For example,
skills and content reflecting the verbal domain will often include information taught, such as facts or statistics, to be retrieved on a knowledge test. However, the intellectual learning domain will require a deeper understanding of content which will enable the teacher to apply the knowledge learned to specific situations. A thorough description of the four learning domains is provided in Chapter III as Table 1.

Table 10 lists the revised instructional goals that were developed as part of step one and identifies the learning domain that is associated with each instructional goal statement. In Table 10, the first column lists the goal statement whereas the second column classifies the learning domain as verbal, intellectual or psychomotor.

**Hierarchical diagrams.** To assess the skills associated with the intellectual domain that will be taught during TIPAC, six hierarchical diagrams were developed. Hierarchical diagrams are used for information that is to be taught for the intellectual learning domain. A hierarchical diagram displays various steps that determine what skills are needed to achieve that goal. The skill continues to get divided into subordinate skills until no additional skills are needed to reach the higher level skill. Additionally, at the simplest level of the diagram the entry-level skills are displayed which are the skills that will not be taught as part of the TIPAC curriculum. An example of a hierarchical diagram that was straightforward, clear and easy to follow during the formative evaluation process is exhibited as Figure 9. Figure 9 displays the hierarchical diagram that was developed for instructional goal 17: Provided with a sample lesson, the teachers will identify a physical activity that can be performed while teaching that lesson.
Table 10. Identification of the learning domain for each instructional goal statement

<table>
<thead>
<tr>
<th>Instructional Goal</th>
<th>Learning Domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. After completion of the online TIPAC curriculum, the teacher will identify</td>
<td>Verbal Identification of the learning domain for each instructional goal statement.</td>
</tr>
<tr>
<td>the purpose of TIPAC in the classroom via the online post-test.</td>
<td></td>
</tr>
<tr>
<td>2. After completion of the online TIPAC tutorial, the teacher will demonstrate</td>
<td>Psychomotor</td>
</tr>
<tr>
<td>how to navigate the TIPAC website.</td>
<td></td>
</tr>
<tr>
<td>3. After completion of the online TIPAC curriculum, the teacher will</td>
<td>Verbal Identification of the learning domain for each instructional goal statement.</td>
</tr>
<tr>
<td>differentiate between the terms overweight and obesity via the online post-test.</td>
<td></td>
</tr>
<tr>
<td>4. After completion of the online TIPAC curriculum, the teacher will identify</td>
<td>Verbal Identification of the learning domain for each instructional goal statement.</td>
</tr>
<tr>
<td>the current state of obesity in Ohio, nationally and globally, via the online</td>
<td></td>
</tr>
<tr>
<td>post-test.</td>
<td></td>
</tr>
<tr>
<td>5. After completion of the online TIPAC curriculum, the teacher will identify</td>
<td>Verbal Identification of the learning domain for each instructional goal statement.</td>
</tr>
<tr>
<td>trends in the educational system related to physical activity within schools</td>
<td></td>
</tr>
<tr>
<td>nationally via the online post-test.</td>
<td></td>
</tr>
<tr>
<td>6. After completion of the online TIPAC curriculum, the teacher will identify</td>
<td>Verbal Identification of the learning domain for each instructional goal statement.</td>
</tr>
<tr>
<td>safety precautions to be considered when having students perform</td>
<td></td>
</tr>
<tr>
<td>exercises in the classroom via the online post-test.</td>
<td></td>
</tr>
<tr>
<td>7. Provided with a scenario, the teacher will identify the correct safety</td>
<td>Intellectual</td>
</tr>
<tr>
<td>precautions to be considered when performing that exercise.</td>
<td></td>
</tr>
<tr>
<td>8. After completion of the online TIPAC curriculum, the teacher will identify</td>
<td>Verbal Identification of the learning domain for each instructional goal statement.</td>
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<tr>
<td>3 benefits of physical activity in the areas of physical, cognitive, and</td>
<td></td>
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<tr>
<td>psychosocial.</td>
<td></td>
</tr>
<tr>
<td>9. After completion of the online TIPAC curriculum, the teacher will identify</td>
<td>Verbal Identification of the learning domain for each instructional goal statement.</td>
</tr>
<tr>
<td>the association between physical activity and academic performance via</td>
<td></td>
</tr>
<tr>
<td>the online post-test.</td>
<td></td>
</tr>
<tr>
<td>10. After completion of the online TIPAC curriculum, teacher will identify</td>
<td>Verbal Identification of the learning domain for each instructional goal statement.</td>
</tr>
<tr>
<td>the recommended daily/weekly dose (frequency and duration) of aerobic exercises,</td>
<td></td>
</tr>
<tr>
<td>muscle strengthening exercises, and flexibility exercises via the online</td>
<td></td>
</tr>
<tr>
<td>post-test.</td>
<td></td>
</tr>
<tr>
<td>11. After completion of the online TIPAC curriculum, the teacher will identify</td>
<td>Verbal Identification of the learning domain for each instructional goal statement.</td>
</tr>
<tr>
<td>examples of aerobic, muscle strengthening, and flexibility exercises via the</td>
<td></td>
</tr>
<tr>
<td>online post-test.</td>
<td></td>
</tr>
<tr>
<td>12. Provided with a scenario, the teachers will differentiate between aerobic,</td>
<td>Intellectual</td>
</tr>
<tr>
<td>muscle strengthening, and flexibility exercises.</td>
<td></td>
</tr>
<tr>
<td>13. After completion of the online TIPAC curriculum, the teacher will identify</td>
<td>Verbal Identification of the learning domain for each instructional goal statement.</td>
</tr>
<tr>
<td>the association between type of exercise and bone health.</td>
<td></td>
</tr>
<tr>
<td>14. After completion of the online TIPAC curriculum, the teachers will identify</td>
<td>Verbal Identification of the learning domain for each instructional goal statement.</td>
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<tr>
<td>potential barriers to activity implementation in the classroom.</td>
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<tr>
<td>15. Provided with an example of a barrier (physical, time, institutional support,</td>
<td></td>
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<tr>
<td>personal), the teachers will determine a solution to overcome that barrier</td>
<td>Intellectual</td>
</tr>
<tr>
<td>for activity implementation in the classroom.</td>
<td></td>
</tr>
<tr>
<td>16. After completion of the online TIPAC curriculum, teachers will identify 3</td>
<td>Verbal Identification of the learning domain for each instructional goal statement.</td>
</tr>
<tr>
<td>possible resources to utilize while developing physically active lesson plans for</td>
<td></td>
</tr>
<tr>
<td>use in the classroom.</td>
<td></td>
</tr>
<tr>
<td>17. Provided with a sample lesson, the teachers will identify a physical activity</td>
<td>Intellectual</td>
</tr>
<tr>
<td>that can be performed while teaching that lesson.</td>
<td></td>
</tr>
<tr>
<td>18. Provided with a sample lesson, the teacher will identify at least one</td>
<td>Intellectual</td>
</tr>
<tr>
<td>variation to a physically active lesson that can be performed for children with</td>
<td></td>
</tr>
<tr>
<td>disabilities.</td>
<td></td>
</tr>
</tbody>
</table>
Figure 9, (see below), provides the TIPAC goal in narrative form at the top of the figure as well as the uppermost box in the figure. The main steps needed to meet this goal are viewed in the boxes immediately connected to the goal by arrows. The boxes connected with arrows leading to the main steps are all of the substeps needed to achieve the main steps. The arrows represent the progression from the simplest substep up through the main step.

However, not all of the hierarchical diagrams were as clear and straightforward as Figure 9. More complex goals demonstrated a more complicated diagram. Figure 10, (see below), provides a hierarchical diagram for instructional goal 15: Provided with an example of a barrier (physical, time, institutional support, personal), the teacher will determine a solution to overcome that barrier for activity implementation in the classroom.

As in Figure 9, Figure 10 provides the TIPAC goal in narrative form at the top of the figure as well as the uppermost box in the figure. The main steps needed to meet this goal are viewed in the boxes immediately connected to the goal by arrows. The boxes connected with arrows leading to the main steps are all of the substeps needed to achieve the main steps. The arrows represent the progression from the simplest substep up through the main step.

The remaining four hierarchical diagrams have been provided in Appendices O-R.

**Cluster analysis diagrams.** In addition, 12 cluster analysis diagrams were developed which were used to identify the information that is to be taught for the verbal learning domain instructional goals. The outcome of each cluster analysis diagram
Figure 9. The hierarchical diagram is used to identify the main steps of an intellectual information goal. The TIPAC goal is stated in the top box of this figure. The main steps to be accomplished as part of this goal are listed in boxes connected to the box with the stated goal. The boxes listed below the main steps are all the substeps that are needed to achieve the main step. The arrows represent the progression from the simplest substep up through the main step.
Figure 10: The hierarchical diagram is used to identify the main steps of an intellectual information goal. The TIPAC goal is stated in the top box of this figure. The main steps to be accomplished as part of this goal are listed in boxes connected to the box with the stated goal. The boxes listed below the main steps are all the substeps that are needed to achieve the main step.

Barrier Hierarchical Visual Diagram

Goal 15: Provided with an example of a barrier (physical, time, institutional support, personal), the teacher will determine a solution to overcome that barrier for activity implementation in the classroom.
Learning domain: Intellectual
identifies TIPAC information that can be grouped together to meet the instructional goal.

Figure 11 illustrates the cluster analysis that was developed for instructional goal 4:

After completion of the online TIPAC curriculum, the teacher will identify the current state of obesity in Ohio, nationally and globally, via the online post-test.

Figure 11 identifies the TIPAC goal at the top of the figure. The three boxes in the figure represent the main classifications of that goal which were used to develop the learning content associated with that goal.

<table>
<thead>
<tr>
<th>Cluster Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal 4: After completion of the online TIPAC curriculum, the teacher will identify the current state of obesity in Ohio, nationally and globally, via the online post-test. Learning domain: Verbal</td>
</tr>
</tbody>
</table>

1. Identify the current state of obesity in Ohio.
2. Identify the trend and current rate of childhood obesity over the last 40 years nationally.
3. Identify the trend and current rate of childhood obesity over the last 40 years internationally.

*Figure 11.* A cluster analysis is used for a verbal information goal. Each of the boxes represent a main classification of the TIPAC goal. [Note. The information to be learned as part of that goal is grouped under the corresponding classification.]

The remaining 11 cluster analysis diagrams are provided as Appendix S.

**Formative evaluation outcomes and challenges encountered.** Step two of the Dick and Carey Systems Approach Model (2015) brought extensive challenges during the formative evaluation process. Three experts were asked to formatively evaluate the learning domains, hierarchical diagrams and the cluster analysis diagrams that were developed as part of step two. Initially, I emailed three experts the domain classification
table, the cluster analysis and hierarchical diagrams, and both rubrics: (a) Rubric for Evaluating a Goal Analysis (Appendix E) and the (b) Rubric for Evaluating Subordinate and Entry Level Skills (Appendix F). Additionally, in the e-mail, I included what I believed to be a clear set of instructions for this evaluation process.

There were three challenges that were confronted during this step: (a) obtaining expert feedback, (b) complexity of hierarchical diagrams, and (c) utility of the rubric.

**Obtaining expert feedback.** It became evident that this step was significantly more complex and e-mail was not the most effective method to relay information. Of the three experts, one e-mailed me back with comments on each diagram but only a partially completed rubric. A second expert requested a phone conversation to go over this step and rubrics in greater detail. Figure 12 provides an excerpt of the e-mail that was sent from this expert requesting a phone conversation. Note how her rationale for the meeting was due to the overwhelming process of the formative evaluation of this step. The third expert did not reply to the e-mail. I reached out again to the third expert and requested an in-person meeting, which was then set.

<table>
<thead>
<tr>
<th>E-mail Correspondence Excerpt from Expert Performing Formative Evaluation Requesting Phone Conversation Due to Overwhelming Process of Step Two</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thank you for patiently awaiting my reply to your request. I'm happy to participate in this step of the analysis, but I'd like to schedule a time when we can talk by phone so you can explain the process to me. There are so many attachments and explanations that I'm a bit bewildered. I'm sure a phone conversation will straighten things out, and I'll be able to complete this task in a timely manner. My schedule on Tuesday and Wednesday is wide open, Thursday late morning to early afternoon ok, but meeting all day on Friday.</td>
</tr>
</tbody>
</table>

*Figure 12.* E-mail correspondence that was sent from an expert performing a formative evaluation for step two. Note how she requests a phone conversation due to the overwhelming process of this step.
Outcomes of the three methods used to collect the data (e-mail, phone, and in-person meetings) resulted in some interesting and dissimilar findings. Although one expert did send her formative evaluation back via e-mail, the rubrics were not completed appropriately as requested. Instead, this expert wrote comments off to the side of the diagram suggesting content that should be placed in that topic. Since her narrative comments were specific and informative there was no further need to follow-up regarding the incomplete rubrics.

The in-person interview went extremely well. It took approximately 15 minutes to run through the diagrams and clearly complete the rubric. I was available to answer any questions that were confusing which provided clarification and supplied excellent feedback.

The phone interview proved more effective than e-mail alone, however not nearly as effective as the in-person interview. The phone interview took 90 minutes and two diagrams were so complex that it was difficult to explain over the phone. The arrows in the diagrams were confusing and not visually appealing. Therefore, feedback was not provided for two of the six hierarchical diagrams during this phone interview.

Although all three experts provided invaluable feedback, the in-person formative evaluation was the easiest to conduct and supplied the least amount of confusion. However, this is very time consuming. In this day and age of technology, e-mail is most efficient, but the format of the diagrams provided confusion with no way to immediately provide clarification.

**Complexity of hierarchical diagrams.** Reflection of this step concluded that the arrangement of the more complex diagrams provided great confusion for both me as the
developer and the experts that were performing the evaluations. The challenge itself may demonstrate a procedural difficulty and not necessarily a problem with the Dick and Carey model. The diagrams that were designed were done so in a word document with an attempt to keep content on a standard 8.5” by 11” document so that the information could be viewed on one paper and not spread out among multiple papers. However, the more complex steps, such as the barrier hierarchical visual diagram displayed in Figure 10, resulted in a confusing and not visually appealing document. It was difficult for me to develop this diagram with the multiple arrows and boxes and it proved just as difficult for the experts to review. Results of this step support the concept that a hierarchical diagram format is truly curriculum dependent and for the material that is being developed in TIPAC, a simple chronological list would have been easier to follow, while still providing the necessary feedback.

**Utility of the rubric.** Regarding the rubrics themselves, there was also some confusion despite an effort make the rubrics specific for TIPAC. It was easier to interview the experts during the formative evaluation process with the rubrics in my hand rather than supplying it to experts via e-mail. This allowed me to adjust the wording or provide an explanation of the information that was being gathered. As in step one, the curriculum and assessment expert explicitly stated that she would have preferred one individual rubric for each goal so that she could record comments specific to that goal. Although the rubric listed the classification “some” as an option to select if the criterion was met; the expert stated this did not provide an ample opportunity to complete the rubric thoroughly.
As in step one of this model, the rubrics themselves provided some confusion and were not ultimately used as originally designed. This too lends itself to a procedural challenge with the model but not an overall problem with the model itself. The importance of discussing the skills necessary for content development of TIPAC was supported through this process, however use of the rubrics are curriculum dependent. The rubrics could be used by the developer to act as a checklist that all criteria have been assessed and accounted for prior to talking with experts as part of a formative evaluation. As in step one, developing a questionnaire specific to assess the TIPAC skills to be taught and having a face-to-face interview would have provided just as rich of feedback and most likely with significantly less frustration.

**How step 2 is used to inform step 3.** The purpose of the next step in the model (Step 3) is to examine the characteristics of the teachers, the context in which the newly learned TIPAC skills of the teachers will be utilized, and the context in which the TIPAC instruction will be given. The intent of step 2 was to determine the skills and knowledge that are to be included within the TIPAC instruction. This step was not as informative as I had anticipated for the development of TIPAC at its current second step placement in the model. The one aspect in which step two was valued as a precursor to step three was regarding the identification of teacher entry level skills. These skills were identified during the development of the hierarchical visual diagrams for the intellectual learning domains. Step three of this TIPAC development process involved interviewing currently practicing teachers regarding their knowledge of obesity, physical activity implementation into the classroom, motivating factors, perceived barriers and technology expertise. With the determination of these entry level skills, which are
technology driven, questions could be asked to establish if the assumptions made about teacher computer knowledge were accurate. Aside from the entry level skills, the information obtained during this step was not used to guide the interview questions during step three. The interview questions were determined from the actual instructional goals (step one) rather than the steps that led to completion of the instructional goals (step two).

This is not to say that this step was not informative for the overall TIPAC development. In fact, this step provided necessary information for both the assessment step (step five) and the curriculum development step (step seven). Ultimately this step resulted in identifying how to cluster the information that would be taught and determined what skills needed to be taught as part TIPAC. This information is necessary for development of the curriculum which occurs during step seven of the Dick and Carey Systems Approach Model (2015). Additionally, this information is also helpful for development of the multiple choice tests that were developed during step five. The information helped to identify what type of question could be used to meet the goal. For example, simple recall multiple choice questions could be used to meet verbal domain goals whereas application questions were needed for the intellectual domain goals. Therefore, the information gained during this step had minimal impact for steps three and four identified in the Dick and Carey Systems Approach Model (2015). In reality, this step could be moved from step two to step four of the development process.

**Outcomes of Step Three: Analyze Learners and Contexts**

The purpose of step three of the Dick and Carey Systems Approach Model (2015) was to: (a) analyze learners, (b) analyze performance context, and (c) analyze
learning context. This step examined the characteristics of the teachers, the context in which the newly learned TIPAC skills of the teachers will be utilized, and the context in which the TIPAC instruction will be given. Three different teachers, from three different schools, teaching in three different grades were selected from a list of my professional contacts for in-person or phone informal interviews.

Teacher one teaches third grade at a local elementary school in Brookpark, Ohio. Forty-six percent of children in this school are on the free and reduced lunch program. Teacher one is a male and has been teaching for over 20 years. Teacher two teaches fifth grade at a local elementary school in Akron, OH. One-hundred percent of children at this school are on the free and reduced lunch program. Teacher two is a male and has been teaching 17 years. Teacher three teaches first grade at a different local elementary school in Akron, OH. One-hundred percent of children at this school are on the free and reduced lunch program. Teacher three is a female and has been teaching for over 20 years. The responses to the interview questions from these three teachers are provided in Appendix T.

**Formative evaluation outcomes and challenges encountered.** One expert of technology was used to provide formative evaluation feedback. As expected, the expert completed the rubric (Appendix T) indicating that all information was present. However, her verbal comments would prove extremely beneficial for step seven (curriculum development) of this development process. She commented that if the teachers are trying to complete the TIPAC training within their respective schools, it is possible that the links to videos will be blocked. Therefore, she recommended that all of
the links be converted to MP4 files. This conversion actually took place during step seven.

Although step three of the Dick and Carey Systems Approach Model (2015) is very important to gain insight into what teachers know, believe and how they are motivated to learn TIPAC, the formative evaluation step was not important for this curriculum development. The information gained from the expert used to formatively evaluate this step will not be used until four steps later. Therefore, the formative evaluation had little importance moving forward to step four and was not a necessary component this early in the process for the development of TIPAC.

Overall, there were no challenges encountered during this step. The three teachers agreed to an interview and all interviews occurred within two weeks from the initial contact with the interviewees.

**Significant findings from teacher interviews.** Although it is difficult to generalize the input of three teachers to an entire population of teachers, the information collected was thought-provoking and beneficial. When all three teachers were interviewed about their initial thoughts regarding TIPAC they replied with enthusiasm and revealed interest in learning more about TIPAC. Teacher one stated “Great idea; especially if it can be done in short increments”. Teacher two stated “Excited” and teacher three replied with “Fabulous.” Their comments support the need for TIPAC and that there are teachers excited to learn more about it.

Two areas that provided significant findings from the teachers interviewed included: (a) motivation and (b) barriers.
Motivation. The three teachers interviewed, all from different schools and grades, answered the motivational questions similar. When the teachers were asked, “What would motivate you to learn more about incorporating physical activity into the curriculum?” they supplied the following information. Teacher one stated his motivation was seeing an academic increase in his kids. Teacher two stated, “To me and many the results is what matters. If there is a shred of evidence student performance improves I'm in. (As a side note I would be willing to try as a pilot program because I KNOW the results will be there!” (personal communication, June 30th, 2016). Teacher three commented that she would do anything to help her kids. She stated that she sees where it [obesity] is trending and she does not like it. She commented that she wants to help kids more than just teaching them ABC’s and 123’s. “If there is success with academics than this is even more of a motivation” (personal communication, July 7th, 2016).

When the three teachers were asked, “To what extent would offering continuing education credits for this program motivate you to learn more about TIPAC?” they answered with the following comments. Teacher one stated that he needs 6 hours of academic credit or 90 CEUs (he thinks). If this TIPAC training can meet some of those criteria it would be helpful. Teacher two stated, “The CEU (u is for units, I think) is a great idea. We have to do it and if there is a proven student improvement piece then sign me up. Most of our CEU programs are either redundant or just scheduled at a convenient time” (personal communication, June 30th, 2016). Teacher three stated that CE’s would highly motivate her.
From the three teachers that were interviewed, it appears motivation revolves around helping their students improve academically. In addition, offering continuing education credit provides an added benefit, but is not the only motivating factor for completion of TIPAC.

**Barriers.** Regarding barriers, the three teachers interviewed provided feedback about considerations to take into account. Two of the three teachers commented that time was a barrier. In addition to time, one teacher commented that doing something new is a barrier, as well as the layout/location of the classroom. One last barrier identified was student buy-in. Although, this teacher commented that this was probably only a barrier in older children. All three teachers commented that they had great support from the principal and administration and that was not a barrier. This information will specifically be used when designing the overcoming barrier section of TIPAC.

**How step 3 is used to inform step 4.** The purpose of the next step in the model (Step 4) is to write the TIPAC learning objectives which will detail what the teachers will be able to do, in the online learning environment, at the completion of the TIPAC instruction. The intent of step 3 was is to examine the characteristics of the teachers, the context in which the newly learned TIPAC skills of the teachers will be utilized, and the context in which the TIPAC instruction will be given. Although it is difficult to generalize input from three teachers to an entire population of teachers, the information gained from the interviews was crucial in moving onto step four. The teachers were very similar in their answers to nearly every question that was asked. This information is significant because it identified what the teachers know, what they need to learn, what
motivates them and what skills are considered entry level that do not need to be taught. Therefore, this interview process refined the learning objectives to a greater extent and determined which of the original instructional goals should be deleted or altered.

**Outcomes of Step Four: Write Learning Objectives**

The purpose of step four of the Dick and Carey Systems Approach Model (2015) was to write the TIPAC learning objectives. Learning objectives are specific statements detailing what the teachers will be able to do, in the online learning environment, at the completion of the TIPAC instruction. It includes information about what resources the teachers will be given in order to identify the TIPAC skill, a description of the actual TIPAC skill, and a description of what dictates an acceptable display of the TIPAC knowledge. The result of this step was a table consisting of 22 learning objectives that were devised from the 18 instructional goals developed during step one.

Table 11 provides the revised instructional goal from step one in the column on the left. The column on the right provides the learning objective broken up into its respective counterparts consisting of the condition (C), behavior (B) and criteria (Cr). The condition includes information about what resources the teachers will be given in order to identify the TIPAC skill. The behavior identifies the actual TIPAC skill and the criteria describes what is needed for acceptable performance by the teachers to demonstrate the knowledge of the TIPAC concepts.
Table 11. Transition of instructional goal into learning objective

<table>
<thead>
<tr>
<th>Instructional Goal</th>
<th>Learning Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. After completion of the online TIPAC curriculum, the teacher will identify the purpose of TIPAC in the classroom via the online post-test.</td>
<td>1. From memory (C), the learner will identify the goals of TIPAC (B). The learner will correctly identify 80% of the goals on the multiple choice/matching post-test (Cr).</td>
</tr>
<tr>
<td>1.1. After completion of the online TIPAC tutorial, the teacher will demonstrate how to navigate the TIPAC website.</td>
<td>1.1 Provided with instructions to navigate the TIPAC website (C), the learner will demonstrate navigation of the website via computer mouse clicks (B), to locate appropriate resources/links included within the TIPAC website.</td>
</tr>
<tr>
<td>1.2. After completion of the online TIPAC curriculum, the teacher will differentiate between the terms overweight and obesity via the online post-test.</td>
<td>1.2 Provided with a list of defining characteristics of overweight and obesity (C), the learner will match the characteristic with the correct term (B). The learner will match at least 80% correctly via an online post-test. (Cr.)</td>
</tr>
<tr>
<td>1.3. After completion of the online TIPAC curriculum, the teacher will identify the current state of obesity in Ohio, nationally and globally, via the online post-test.</td>
<td>1.3 Provided with current obesity statistics (C), the learner will match the characteristic with Ohio, national or global statistics (B). The learner will match at least 80% correctly via an online post-test (Cr).</td>
</tr>
<tr>
<td>1.4. After completion of the online TIPAC curriculum, the teacher will identify trends in the educational system related to physical activity within schools nationally via the online post-test.</td>
<td>1.4 Provided with a list of statements (C), the learner will determine if the statements reflect current physical activity trends in the national educational system (B). The learner must identify 80% of the statements correctly via an online post-test. (Cr.)</td>
</tr>
<tr>
<td>2. After completion of the online TIPAC curriculum, the teacher will identify safety precautions to be considered when having students perform exercises in the classroom via the online post-test.</td>
<td>2. Provided with exercise safety statements (C), the learner will determine if it is a myth or fact (B). The learner must identify 80% of the statements correctly via an online post-test. (Cr.)</td>
</tr>
<tr>
<td>2.1. Provided with a scenario, the teacher will identify the correct safety precautions to be considered when performing that exercise.</td>
<td>2.1 Provided with a scenario that describes an exercise (C), the learner will identify the correct safety precautions (B) to be considered when performing that exercise via an online post-test (Cr).</td>
</tr>
<tr>
<td>3. After completion of the online TIPAC curriculum, the teacher will identify 3 benefits of physical activity in the areas of physical, cognitive, and psychosocial.</td>
<td>3. Provided with various health statements (C), the learner will identify if the benefits of physical activity in each of the following domains: physical, cognitive, and psychological (B). The learner must identify 80% of the statements correctly in each category via an online post-test. (Cr.)</td>
</tr>
<tr>
<td>3.1. After completion of the online TIPAC curriculum, the teacher will identify the association between physical activity and academic performance via the online post-test.</td>
<td>3.1 Provided with various statements (C) the learner will identify the benefits of physical activity on academic performance (B). The learner must identify 80% of the statements correctly via an online post-test. (Cr.)</td>
</tr>
</tbody>
</table>

*table continues*
Table 11. Transition of instructional goal into learning objective (continued)

<table>
<thead>
<tr>
<th>Instructional Goal</th>
<th>Learning Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. After completion of the online TIPAC curriculum, the teacher will identify the recommended daily/weekly dose (frequency and duration) of aerobic exercises, muscle strengthening exercises, and flexibility exercises via the online post-test.</td>
<td>4. (a). Provided with a list of definitions, (C), the learner will correctly define aerobic, muscle strengthening and flexibility as they relate to exercise (B). The learner must define all 3 correctly via an online multiple choice/ matching post-test. (Cr.) (b). From memory (C), the learner will correctly match the recommendations for time spent (frequency and duration) in each of the following physical activity categories: aerobic, muscle strengthening and flexibility exercises. The learner must match all of the recommendations correctly via an online post-test. (Cr.)</td>
</tr>
<tr>
<td>4.1. After completion of the online TIPAC curriculum, the teacher will identify examples of aerobic, muscle strengthening, and flexibility exercises via the online post-test.</td>
<td>4.1. Provided with statements about aerobic, muscle strengthening, and flexibility exercises (C), the learner will match the statement to the correct exercise category (B). The learner must match 80% of the statements correctly via an online post-test (Cr.).</td>
</tr>
<tr>
<td>4.2. Provided with a scenario, the teacher will differentiate between aerobic, muscle strengthening, and flexibility exercises.</td>
<td>4.2. Provided with a scenario in an online testing environment (C), the learner will distinguish between aerobic, muscle strengthening, and flexibility exercises. The learner must correctly distinguish the exercise identified in the scenario. (Cr.)</td>
</tr>
<tr>
<td>4.3. After completion of the online TIPAC curriculum, the teacher will identify the association between type of exercise and bone health.</td>
<td>4.3. (a). From memory (C), the learner will correctly identify the significance of bone health (B), via an online multiple choice/ matching post-test. (Cr.) (b). Provided with a list of exercises (C), the learner will identify which exercises promote positive bone health (B). The learner must identify 80% of the bone health promoting exercises correctly via an online post-test.</td>
</tr>
<tr>
<td>5. After completion of the online TIPAC curriculum, the teacher will identify potential barriers to activity implementation in the classroom.</td>
<td>5. From memory (C), the learner will identify potential barriers to implementing physical activity in the classroom (B), via an online matching/ multiple choice post-test (Cr.).</td>
</tr>
<tr>
<td>5.1. Provided with an example of a barrier (physical, time, or institutional support), the teacher will determine a solution to overcome that barrier for activity implementation in the classroom.</td>
<td>5.1. Provided with an example of a barrier (physical, time, institutional support, student resistance) in an online multiple choice/ matching post-test (C), the learner will choose a solution to overcome that barrier (B) for activity implementation in the classroom. (Cr.)</td>
</tr>
<tr>
<td>6. After completion of the online TIPAC curriculum, teachers will identify 3 possible resources to utilize while developing physically active lesson plans for use in the classroom.</td>
<td>6. From memory (C), the learner will identify possibly resources to utilize for physical activity implementation in the classroom (B). The learner must correctly identify at least 3 resources via an online multiple choice/ matching post-test (Cr.).</td>
</tr>
</tbody>
</table>

(table continues)
Table 11. Transition of instructional goal into learning objective (continued)

<table>
<thead>
<tr>
<th>Instructional Goal</th>
<th>Learning Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1 Provided with a sample lesson, the teachers will identify a physical activity</td>
<td>6.1 Provided with a sample lesson plan, via an online post-test (C), the learner</td>
</tr>
<tr>
<td>that can be performed while teaching that lesson.</td>
<td>will identify a physical activity (B), that would best be used to incorporate</td>
</tr>
<tr>
<td></td>
<td>physical activity into that lesson (Cr).</td>
</tr>
<tr>
<td>6.2 Provided with a sample lesson, the teachers will identify at least one</td>
<td>6.2 (a). From memory, (C), the learner will identify most commonly seen disabilities</td>
</tr>
<tr>
<td>variation to a physically active lesson that can be performed for children with</td>
<td>in the classroom (B). The learner will correctly identify 80% of the most commonly</td>
</tr>
<tr>
<td>disabilities.</td>
<td>seen disabilities provided on the online multiple choice/matching post-test. (Cr.)</td>
</tr>
<tr>
<td></td>
<td>(b). Provided with a list of accommodations (C), the learner will match the</td>
</tr>
<tr>
<td></td>
<td>accommodation to the disability (B). The learner must match 80% of the accommodations</td>
</tr>
<tr>
<td></td>
<td>correctly (Cr.).</td>
</tr>
<tr>
<td></td>
<td>(c) Provided with a sample lesson in an online post-test (B), the learner will</td>
</tr>
<tr>
<td></td>
<td>identify a physical activity (C) that can be performed for children with disabilities</td>
</tr>
<tr>
<td></td>
<td>during that lesson. (Cr.)</td>
</tr>
</tbody>
</table>

**Formative evaluation outcomes and challenges encountered.** This was a relatively simple formative evaluation process with minor challenges encountered. Originally three experts were asked to conduct formative evaluations of the learning objectives via e-mail. Table 11 and the rubric for evaluation (Appendix I) were provided in the e-mail. One expert provided a completed rubric with the comments inserted in the original table. The comments included minor grammatical corrections. The second expert took a few weeks to contact me and then agreed to an in-person meeting. Her comments also reflected two minor grammatical corrections. The rubric was fully completed by both experts. One rubric indicated that all criteria being evaluated were completely met, and the other evaluator commented that the majority of learning objectives were clear and met all criteria. After a few weeks, I reached out to the third expert again and released her from this step. Since I had received feedback that was
comparable from two of the three experts I did not feel it was necessary to utilize more time from the third expert.

Aside from the wait time affiliated with gaining feedback from the experts conducting the formative evaluation, this step posed no real challenges with either the procedure or the Dick and Carey Systems Approach Model (2015). It was clear and easily completed. The grammatical revisions recommended by the two experts resulted in clear and complete learning objectives.

**How step 4 is used to inform step 5.** The purpose of the next step in the model (Step 5) is to develop a test blueprint and assessments. The intent of step 4 was to develop the TIPAC learning objectives which will detail what the teachers will be able to do, in the online learning environment, at the completion of the TIPAC instruction. Although this step is simple, it certainly does not lack value. Each of the learning objectives was used to formulate the self-assessment tests that were developed in step five. The learning objective states the key points that the teachers are to learn, the condition in which that learning is to be done and the criteria which dictates how the learner demonstrates acceptable learning of material. It made the original instructional goals more concrete, providing a clear focus of what the test question content should be and the conditions that need to be included within the question. In a sense, it provided an outline making test development focused and more simplified. Therefore, this step was appropriately placed in the model as the step preceding the assessment development step.
Outcomes of Step Five: Develop Assessment Instruments

The purpose of step five of the Dick and Carey Systems Approach Model (2015) was to develop self-assessment tools for Module 2: Trends in Obesity and Module 5: Resources to assist with Physical Activity Integration into the Curriculum. These modules were chosen for development because of their dissimilar learning objectives. Module 2: Trends in Obesity is descriptive and informative in nature. The assessment questions focus more on the verbal learning domain. In contrast, Module 5: Resources to assist with Physical Activity Integration into the Curriculum provides instruction regarding physical activity incorporation techniques. This module focuses more on the intellectual learning domain. Developing two modules for this study with different concentrations allows feedback from teachers regarding different domains of learning. The teachers will learn material and be assessed on the verbal learning domain as well as learn and be assessed on a higher intellectual learning domain. This contrast provides richer data than selecting two modules assessing the same learning domains. There were two outcomes of this step: (a) a test blueprint and (b) the self-assessments.

Test blueprint  One outcome of this step resulted in a test blueprint for the TIPAC curriculum and completed multiple choice/matching self-assessment tests for both of these modules. A test blueprint (Table 12) was completed to determine the total number of questions to be developed for each module and identify which cognitive domain level the question should address. This helped determine the importance of the category being tested during the instructional phase of TIPAC.

Table 12 details the TIPAC test blueprint. Row 1 of Table 12 labels each module within the TIPAC curriculum. The first column of the table identifies the learning
category that the test question will assess. Each of the consecutive columns label the
total number of test questions associated with the learning category according to each module.
For instance, there is one knowledge question and one application question for Module 1. The last row indicates how many total questions will be asked at each module.
Finally, the last column identifies how many total questions are associated with each learning category.

**Self-assessments.** Additionally, the actual self-assessment tests were developed for both module 2 and module 5. Figure 13 provides the self-assessment for module 2 of the TIPAC curriculum. As identified in the test blueprint (Table 12), there are three knowledge questions that were developed. Question one is comprised of four matching statements, question two is associated with three matching statements, and question three contains one multiple choice question.

Figure 14 provides the self-assessment for module 5 of the TIPAC curriculum. Note that there are two knowledge questions and two application questions provided in this figure, consistent with the test blueprint (Table 12). Question one is comprised of 10 matching statements and questions two, three and four are single multiple choice questions.

**Formative evaluation outcomes and challenges encountered.** Two experts in assessment were asked to conduct formative evaluations for this step five of the Dick and Carey Systems Approach Model (2015) which was to develop assessment instruments. The meetings with both exerts occurred in-person and the Rubric
<table>
<thead>
<tr>
<th>Module</th>
<th>Knowledge</th>
<th>Comprehension</th>
<th>Application</th>
<th>Analysis</th>
<th>Synthesis</th>
<th>Evaluation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module 1</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>Module 2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>Module 3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>Module 4</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>Module 5</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>Module 6</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>Module 7</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>16</td>
</tr>
</tbody>
</table>

Table 1.2 Test blueprint
Module 2: Self-Assessment

Directions: Select the correct weight status category from column B that best describes the statement in column A.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Defines a child with a BMI at or above the 85&lt;sup&gt;th&lt;/sup&gt; percentile and below the 95&lt;sup&gt;th&lt;/sup&gt; percentile</td>
<td>A. Overweight</td>
</tr>
<tr>
<td>2. Describes more than one-third of U.S. adults</td>
<td>B. Obesity</td>
</tr>
<tr>
<td>3. Classifies 20.5% of 12- to 19-year-old</td>
<td></td>
</tr>
<tr>
<td>4. Defines an adult over 20 years of age with a BMI of 25.0 – 29.9</td>
<td></td>
</tr>
</tbody>
</table>

Directions: Select the correct location from column B that best describes the statement regarding OVERWEIGHT and OBESITY status in column A.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Nearly 30% of adults are defined as obese.</td>
<td>A. Worldwide</td>
</tr>
<tr>
<td>6. Overweight and obesity kills more people than underweight.</td>
<td>B. Nationally (United States)</td>
</tr>
<tr>
<td>7. Thirteen percent of students in grades 9-12 are defined as obese.</td>
<td>C. Ohio</td>
</tr>
</tbody>
</table>

8. Of the following statements, which does NOT demonstrate a trend regarding physical activity in schools?

A. Twenty percent of elementary schools across the United States have decreased recess to concentrate on core subjects.
B. Nine percent of elementary schools have decreased physical education to concentrate on core subjects.
C. Ten percent of schools nationwide have eliminated physical education requirements for students.
D. Five percent of school districts nationwide have a wellness policy that requires the recommended amount of daily physical education.

Figure 13. There are three knowledge questions posed in this table. Question one is comprised of four matching statements, question two is associated with three matching statements, and question three is one multiple choice question.
Module 5: Self-Assessment

Directions: Match the exercise in the column on the left with the correct classification on the right.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Planks</td>
<td>A. Aerobic</td>
</tr>
<tr>
<td>2. Forward lunges</td>
<td>B. Muscle Strengthening</td>
</tr>
<tr>
<td>3. Jogging</td>
<td>C. Flexibility.</td>
</tr>
<tr>
<td>4. Air boxing</td>
<td></td>
</tr>
<tr>
<td>5. Squats</td>
<td></td>
</tr>
<tr>
<td>6. Side lunges</td>
<td></td>
</tr>
<tr>
<td>7. Jumping jacks</td>
<td></td>
</tr>
<tr>
<td>8. Seat side straddle</td>
<td></td>
</tr>
<tr>
<td>9. Push-ups</td>
<td></td>
</tr>
<tr>
<td>10. Dancing</td>
<td></td>
</tr>
</tbody>
</table>

___11. It is a Wednesday and you are getting ready to incorporate 15 minutes of physical activity as part of a math lesson. You decide to use muscle strengthening exercises during the lesson. Which activity would best fit your plan?
A. Air jump rope. Each jump rope rotation equates to digits in the answer.
B. Air boxing. Punch right for multiples of even numbers. Punch left for multiples of odd numbers.
C. Plank. Hold plank for the number of seconds equivalent to the answer.
D. Paper plates. Students march around the room finding the correct answer to the math problem located under paper plates scattered throughout the room.

___12. From the following list of resources, select those resources that a teacher may use to get ideas for incorporating activities in the classroom. Select all that apply.
A. YouTube
B. Take 10!
C. Movin’ and Groovin’
D. Teachers Rock the Room

___13. Today you will be working on multiplication tables 0 through 10. You have 8 minutes to work on this part of the lesson. Which of the following activities would best work for this lesson? Select all that apply.
A. Active Problem Solver
B. 52 Pickup
C. Chicken dance
D. Five finger fling

Figure 14. There are two knowledge questions and two application questions provided in this figure. Question one is comprised of ten matching statements and questions two, three and four are multiple choice.
for Evaluating Multiple-Choice Questions (Appendix J) was provided for each expert. The first expert suggested changes to questions based upon the information being tested. This expert suggested that there was a lot of statistics being asked to memorize for module 2. Based upon that feedback, the questions were reduced with less statistical information being assessed. She verbally completed the rubric and stated that all criteria on the rubric had been met. The second expert made suggestions regarding good test development strategies and suggested resources to aid in the development of appropriate test questions. It became clear that these suggestions were associated with a lack of utility of the rubric.

**Utility of the rubric.** The challenge with the utility of the rubric was most noted with the second expert during the formative evaluation process. The second formative evaluation, which was also performed by an assessment expert, provided feedback that was extremely thorough and beneficial. Although the expert stated that all of the criteria were met on the rubric, she suggested resources for test development and recommended development of a test blueprint. This suggested another procedural challenge with the Dick and Carey Systems Approach Model (2015) but not necessarily a challenge with the model itself. The rubric demonstrated to not be all inclusive regarding good test development strategies but rather spoke specifically to questions aligning with the learning objectives, appropriate learner language and clearly written questions. Although the content may have all been there as demonstrated by the completed rubric, the questions did not follow best practice for assessment technique. Therefore, revisions were made to questions accordingly. Dick, Carey, and Carey (2015) discuss the importance of determining the number of assessment questions necessary to define
mastery specific to learning domains, but they do not truly speak to the necessity of developing a test blueprint. It is recommended that developers take this extra step to help identify the total number of questions to be developed for each module, identify which cognitive domain level the question should address, and determine the level of instruction that should be supplied during the curriculum development step (step 7).

**How step 5 is used to inform step 6.** The purpose of the next step in the model (Step 6) is to identify a theoretically based strategy, determine the instructional delivery system and sequence clusters of content. The intent of step 5 was to develop a test blueprint and self-assessments. This step was not as informative at this point in the development process as originally thought. It was found that although the importance of developing assessment questions can be noted for a variety of programs, there is flexibility for placement of this step in the model. Actually, it could have been delayed by one step. Step six of this process is to determine the instructional strategy, which had already been determined prior to the start of the study as being the Biological Sciences Curriculum Study (BSCS) 5 E model. The other component of step six was determination of the Learning Management System (LMS) which will be used to host TIPAC. Although it can be argued that identifying the format of the assessment tools can help to choose a LMS that provides the appropriate platform for each type of assessment question, this is not truly necessary. In reality, if no such platform could provide this test layout, the assessment questions could be revised into a different format that is supported by the chosen LMS.
Outcomes of Step Six: Develop Instructional Strategy

The purpose of step six of the Dick and Carey Systems Approach Model (2015) was to determine how to teach the TIPAC curriculum. There were three main outcomes of this step: (a) identification of a theoretically based strategy, (b) determination of the instructional delivery system, and (c) sequencing clusters of content.

Theoretically based strategy. Based upon previous research, it had been decided that the Biological Sciences Curriculum Study (BSCS) 5 E model would be used as the theoretically based strategy for the development of TIPAC. Use of the BSCS 5E model is interactive in nature which is essential for TIPAC. The BSCS 5E model consists of five phases: engagement, exploration, explanation, elaboration, and evaluation. Since each phase builds upon each other to provide a better understanding of TIPAC knowledge, attitudes and skills, it provided a platform for the learners to gain deeper insight into physical activity implementation into their curriculum. A more thorough description of the BSCS 5E Model can be found in Table 5 located in Chapter III.

Instructional delivery system. After consulting with three experts regarding LMSs that could host TIPAC and performing an evaluation of each LMS using the rubric for evaluating an online delivery system (Appendix K), it was decided that Schoology would act as the learning management system. An in-depth description of the three Learning Management Systems that were evaluated and decision for selection of Schoology are provided in the following section.
Sequencing clusters of content. Use of the BSCS 5E model helped to structure and sequence the TIPAC content. The content was clustered according to the following modules:

1. Module 1: Introduction: Navigating this Website
2. Module 2: Trends in Obesity
3. Module 3: Benefits of Physical Activity
4. Module 4: Physical Activity Recommendations
5. Module 5: Resources to assist with Physical Activity Integration into the Curriculum
6. Module 6: Overcoming Barriers to Integrating Physical Activity into the Curriculum
7. Module 7: Safety
8. Module 8: Physical Activity Adaptations

Formative evaluation outcomes and challenges encountered. There were few to no challenges encountered during this step. Since there were no challenges encountered regarding the selection of the theoretically based strategy there is no further discussion regarding that section. The findings from the instructional delivery system and sequencing of clusters of content are highlighted below.

Instructional delivery system. The three experts contacted to discuss instructional delivery systems were readily available to meet and were extremely knowledgeable about Learning Management Systems (LMSs). A profile of each expert is provided in Chapter III. One interesting outcome noted among the three experts interviewed was that none mentioned the same LMS. It appeared that expertise in LMSs
among the experts is a result of previous experience and personal preference. All three experts walked me through the LMS of choice discussing strengths among each of them. The first researcher recommended Google Sites as a LMS based upon the availability of this resource to virtually all users since the only criterion for usability is possession of a Google account. The second expert recommended Schoology based upon its ease of use. Finally, the third expert recommended Blackboard Course Sites as it is known as a leader within the LMS world.

Personally I went through each LMS and evaluated them based upon the rubric for evaluating an online delivery system (Appendix K). All three sites were cost effective and required no charge for me to access and develop TIPAC on their site. Schoology and Blackboard Course Sites permitted text, audio, graphics and videos. Both sites allowed interactivity among users and the interface could be easily managed by me, the developer. Both also contained an area for communication among users, which is an essential component of TIPAC. On the contrary, Google Sites had no place for self-assessments. It would have required an additional program download to permit this TIPAC component. In addition, although it did provide interactivity among the users and my ability to manage the interface, it was more confusing and difficult to manipulate in comparison to Schoology and Blackboard Course Sites.

The decision to use Schoology over Blackboard Course Sites came with evaluation of user-friendliness for me as the developer and the learners of TIPAC. Schoology was extremely user friendly. It was easy to access for the development of modules and content, provided a communication area for the users and permitted the incorporation of self-assessment tools. Blackboard Course sites was much more
confusing for me to maneuver. Blackboard required a significant learning curve for me, and I suspect my users also. Blackboard came equipped with a lot of resources and tabs to permit tests and grades; however, I believe it was too advanced for the purposes of TIPAC. As TIPAC will be used as a resource for teachers to find out information about integrating physical activity into the curriculum and potentially gain continuing education credit, the interface must be easy to maneuver. Therefore, Schoology met all requirements needed for TIPAC with a very good rating.

**Sequencing clusters of content.** Regarding, sequencing of modules, there were also no challenges encountered. The learning objectives naturally align the content information. Therefore, it did not require a great deal of insight to group them into clusters. Based upon the practicality of the modules I decided it was not necessary to have them formatively evaluated by additional experts. Step eight of this process will have learners evaluate the TIPAC website. At that time, I will be able to obtain in-depth evaluations of the content, clusters and learning management system. Therefore, the only formative evaluation that was conducted was by me as the developer. I used the rubric for evaluating an online delivery system (Appendix K) to evaluate the three LMSs and determine their usefulness.

**How step 6 is used to inform step 7.** The purpose of the next step in the model (Step 7) is the development of teaching materials to be used in TIPAC. The intent of step 6 was to identify a theoretically based strategy, determine the instructional delivery system and sequence clusters of content. Step six was crucial to complete prior to moving forward with TIPAC content development. Having the modules clustered helped to develop the materials into a logical format. Utilizing the BSCS 5 E model
guided each module development so that the learner could work his way through the module in a clear, comprehensible manner, deepening the level of understanding with progression through the module. Finally, deciding upon the LMS was essential so that it was known what material could be supported at this site. This step was appropriately placed and found to be an essential step within the Dick and Carey Systems Approach Model (2015).

**Outcomes of Step Seven: Develop and Select Instructional Materials**

The purpose of step seven of the Dick and Carey Systems Approach Model (2015) was to develop and select the instructional materials to be used in TIPAC. The outcome of this step resulted in the complete development of Module 2: Trends in Obesity and Module 5: Resources to assist with Physical Activity Integration into the Curriculum. As explained during step five, these two modules were selected for development because of their differing learning domains. Module 2 focuses on the verbal learning domain whereas module 5 is more intellectual in nature. Developing two contrasting modules would result in richer data. The modules were uploaded to the Schoology website with the integration of the self-assessment tool and communication link for each module. A review of the TIPAC website can be found in Chapter VI.

**Formative evaluation outcomes and challenges encountered.** There were few challenges encountered in determining the content that was to be incorporated into the modules. Content was readily available and the extent of research I had conducted prior to this step provided numerous resources for TIPAC. All material was already in existence and therefore did not need to be developed from scratch. I had an extensive library of resource videos and websites available to be incorporated into the modules.
The greatest challenge during this step came with the development of the PowerPoint slides.

**PowerPoint modification.** Although I would consider myself an expert in the TIPAC content, I am not an expert in technology. Based upon feedback from previous steps it was determined that I would convert the YouTube videos to MP4 files so that they could be accessed without internet. I utilized a group of instructional design students, which are further described in Chapter III, to assist with the PowerPoint modifications. The PowerPoint presentations were provided to the instructional design students for their assistance in the MP4 file conversion. It took approximately five weeks to receive the revised PowerPoints from the group of instructional design students. This delayed the next step from occurring since the following step is an evaluation of the TIPAC curriculum from potential TIPAC users. This challenge was not one directly related to the Dick and Carey Systems Approach Model (2015) but rather procedural in nature. The time-consuming challenge associated with this step was unavoidable since the procedure I chose to follow was in utilizing outside technology experts to assist with PowerPoint review and revisions.

I did not find it necessary to use additional experts to formatively evaluate this step. There were three instructional design students that worked diligently on revising the PowerPoint slides to provide the information in a clear, concise format. In addition, the files were converted to MP4 as instructed. Therefore, I conducted a formative evaluation of the PowerPoint slides after the revisions had been concluded by the instructional design students. According to my formative evaluation the revised PowerPoints met all the conditions outlined within the rubric for evaluating instructional
materials (Appendix L). In addition, the entire curriculum will be formatively evaluated as part of step eight.

**How step 7 is used to inform step 8.** The purpose of the next step in the model (Step 8) is formative evaluations by learners. The intent of step 7 was to develop the instructional materials for TIPAC. It is clear that this step of selecting instructional materials was appropriately placed as the step preceding the formative evaluation step eight within the Dick and Carey Systems Approach Model (2015). Step eight requires TIPAC learners to evaluate all of the materials, including the PowerPoint presentations, self-assessment components, communication area, and overall usability of the TIPAC website. Therefore, this step was used to guide the one-to-one evaluations that were performed during step eight.

**Outcomes of Step Eight: Design and Conduct Formative Evaluations**

The purpose of step eight of the Dick and Carey Systems Approach Model (2015) was to conduct one-to-one evaluations of the components of TIPAC evaluating for overall effectiveness of the program. I met with two teachers separately to conduct an in-depth one-to-one evaluation. A profile of the teachers utilized in this step is provided in Chapter III. I verbally asked questions from the rubric for evaluating instructional materials and for evaluating TIPAC (appendices L & M respectively). After both of the one-to-one evaluations were performed, revisions to Module 2 and Module 5 of the TIPAC program were completed. The most significant outcomes from step eight were revisions to the content and considerations for changes to the self-assessment tools within both modules based upon feedback from the teachers. Personal
preferences and comments regarding implementation were also discovered during this step.

**Content findings.** The majority of the feedback received from teachers during the one-to-one evaluations revolved around personal preferences regarding the PowerPoint slides; however, some very noteworthy findings were reported regarding accessibility of TIPAC and the necessity of the self-assessment tools. Positive feedback obtained during the evaluations indicated that the objectives for each module were easily met, the content was clear, thought-provoking and was written in terminology appropriate for teachers, and the website was easy to navigate. Both reviewers also commented that the videos and resource links supported the content and aided in the learning process. Additionally, both teachers were excited to see that there were multiple resources available for all subjects at all grade levels. Since the teachers interviewed only teach certain subjects at a specific grade level they stated that they could focus on resources for their individual subjects and skip over the other subjects and grades that were irrelevant.

The most concerning finding was that the website was not secure. Both of the teachers had capabilities of changing the PowerPoint presentations and information within the modules. Aside from that major concern, the other most significant finding was in relation to the self-assessments within each module.

**Self-assessment findings.** Both reviewers commented that the self-assessment tools were neither significant nor necessary. The post-tests brought anxiety to both reviewers and took away from the overall goal of the TIPAC program. The first reviewer was unable to provide an alternate means of assessment; however, the second
reviewer provided a different source of data collection. She suggested using an evaluation only in place of a post-test. This evaluation could gather data regarding the overall program, the likelihood of implementation of the concepts learned within the program, and provide suggestions for change. The view expressed by both teachers is that they learned a great deal about the trends in obesity and found the resources to be extremely helpful but could not understand the significance of being tested at the conclusion of the modules.

This feedback brought the consideration of two paths to the forefront. The thought is that the self-assessment tools could be used for pre-service teachers and those acquiring continuing education as both possibilities need to demonstrate mastery. However, more information needs to be attained regarding the requirements of awarding CEUs to educators to determine exactly how that mastery can be achieved.

Additionally, the program could be made available to other educators as a means of information. The self-assessments would not need to be graded in those situations and would merely act as a learning tool for the teachers. Although, the feedback from only two teachers cannot be used to accurately speak to the views of the entire population of teachers, the similar comments from each teacher certainly warrants the need for additional information. It is a future recommendation to perform these one-to-one evaluations on a larger pool of teachers and gain more insight into the requirements of continuing education units.

**Personal preferences.** Other recommendations from the reviewers primarily focused on personal preferences. The first teacher commented on the need to click for each bullet point during the PowerPoint presentations, stating that he would prefer the
information to just appear on the slide without the need to click continuously. Additionally, it was suggested that just one video be placed on one slide which would allow the images to be displayed larger. Currently, there is one slide that has two videos displayed.

**Implementation.** The most exciting information obtained during this step was the admission from the second teacher that she has already begun implementing physical activity into her curriculum based upon her completion of the TIPAC program. She was excited about the newly learned resources and indicated that she would continue to alter her curriculum to include physical activity while teaching.

**Formative evaluation outcomes and challenges encountered.** As this entire eighth step of the Dick and Carey Systems Approach Model (2015) was a formative evaluation step, I did not utilize outside experts to conduct formative evaluations. However, I did complete the rubric for evaluating formative evaluation procedures (Appendix N) myself as a self-check. This did not result in any significant findings and was determined to not be a necessary component of this step.

**Time.** The greatest challenge encountered during this step was time. Two teachers that were utilized during step three of this process agreed to the one-to-one evaluations. Information was sent to both evaluators regarding how to access TIPAC and guidelines for documenting findings as they worked their way through the TIPAC site. I e-mailed both evaluators a minimum of three times asking for progress in the program evaluation so that we could arrange an in-person interview to discuss the findings. It took over one month to actually meet with the individuals to discuss the
findings. This is certainly not a problem with the Dick and Carey Systems Approach Model (2015) or procedure itself, just a factor worthy of considering for any developer.

**How step 8 is used to inform step 9.** The purpose of the next step in the model (Step 9) is revision. The intent of step 8 was to gain feedback from potential users of TIPAC information allowing revisions to be made to the program. Since the small group evaluation and field trial were not conducted during this step, the revisions were made to the program immediately after interviewing the teachers. Therefore, step eight was not used at all to inform step nine for the development of TIPAC.

**Outcomes of Step Nine: Revise TIPAC Instruction**

Step nine is considered the revision step of this model. It should be noted that for this study, there were no small group or field trial evaluations conducted as defined in this step of the Dick and Carey Systems Approach model (2015). Because of the nature of this study, formative evaluations have been limited to one-to-one evaluations of two learners. Since all revisions were made after the formative evaluations were conducted for each step throughout TIPAC development it negated the need for this separate step for more revisions. Therefore, this step produced no change in the outcome from step eight and no formative evaluations were conducted during this ninth step.

**Summary**

Throughout the TIPAC design process, formative evaluations as outlined in the Dick and Carey Systems Approach Model (2015) were utilized at nearly every step in order to gain insight and perform revisions to the curriculum. The data collected as a result of the formative evaluations will be summarized and synthesized to answer the two primary research questions.
Primary Research Questions

1. How do the outcomes of the formative evaluations inform the curriculum design process?

Dick and Carey embed formative evaluations throughout the development process at each step. The outcomes of the formative evaluations were essential in developing the TIPAC curriculum. Five main discoveries were made as a result of this systematic process of curriculum development: (a) model is recursive, (b) outcomes provide guidance, (c) limited functionality with existing rubrics, (d) selection and number of experts used in formative evaluations are curriculum dependent, and (d) in-person formative evaluations are essential.

Recursive model. This systematic approach provides an opportunity to conduct multiple revisions to the curriculum at various points of development as a result of feedback obtained from formative evaluations. Although one works through the model in a linear manner, the model itself is actually recursive. After each formative evaluation there is opportunity to revise the steps numerous times providing the information necessary for succeeding steps. The findings that emerge within each step guide changes throughout development. The model is designed as a step by step process, however ideas and content began to be compiled at the onset, not as one complete individual step as dictated by the model. The notion that curriculum development be performed at a later step is appreciated because the previous steps help guide the content. However, in truth, the TIPAC curriculum was being designed from
the onset and altered throughout. Therefore, although the model provides a clear set of
guidelines, the development process appears to be more recursive in nature.

**Outcomes provide guidance.** The outcomes of the formative evaluations direct
one through the curriculum design process, providing the necessary information needed
to make decisions as to what the next step will be. Those decisions may be to go back
and revise a previous step, proceed to the next step as dictated in the model, or alter the
succeeding steps in accordance with the curriculum that is being developed. The model
is designed to follow a systematic approach; however, throughout TIPAC development it
was discovered that the steps do not always need to be followed in the suggested
chronological order or in the same format. It was concluded that only steps one
(development of instructional goals) and step eight (conduct formative evaluation) of the
model need to be followed in that order, while the other steps have some fluidity and do
not need to follow such a rigorous path.

**Limited functionality with existing rubrics.** Although the rubrics offered a
general guideline for experts to use while providing feedback during formative
evaluations, they were found to not be as helpful as originally anticipated. In fact, the
rubrics became the biggest impediment to the evaluation process. Findings throughout
TIPAC development suggest that the rubrics be used by the developer to review for
inclusiveness but not necessarily be used by external experts at each step of the process.
For TIPAC, it was discovered that even after an attempt to individualize the rubrics at
each step for formative evaluation, some rubrics continued to cause great confusion
related to concepts being assessed and language being used. Because the language used
is unfamiliar to many individuals not versed in the Dick and Carey Systems Approach
Model (2015), it was discovered that the formative evaluations were better conducted in person. In this manner, any questions that arose about the rubric could be answered immediately. Ideally the rubrics could have been refined and resent to experts performing the evaluations but narrative information supplied by the experts provided adequate feedback. In addition, since rubrics should be altered to meet the needs of each unique program being developed, it would most likely not be beneficial to spend a great deal of effort revising rubrics multiple times. Rather the recommendation would be to provide a place on the rubric for narrative feedback and conduct the evaluations in-person to address questions as they arise.

**Selection and number of experts used in formative evaluations.** During the development of TIPAC, it was essential to use a variety of experts from different disciplines to perform formative evaluations in order to gain insight from various lenses. This was particularly important for step one, which established the instructional goals. Content experts provided invaluable recommendations regarding material to be taught as part of TIPAC, whereas the curriculum and assessment expert provided excellent feedback regarding structure and language used as part of each goal. Multiple perspectives were vital in developing clear, concise, inclusive TIPAC goals; and therefore the use of diverse experts is certainly recommended for future developers.

The number of experts used is curriculum dependent and may differ according to each step in the process. It was discovered that for some steps three outside experts were needed for formative evaluations whereas none were needed in other steps. Likewise, it was noted that myself as the developer was found to be effective as the only individual performing a formative evaluation for steps six, seven, and eight. One recommendation
is that the decision to utilize experts for formative evaluations should be based upon the experience and content knowledge of the developer.

**In-person formative evaluations.** The most significant finding regarding the formative evaluation process is that it should be conducted as in-person interviews. Throughout this study, evaluations were conducted via e-mail, phone interviews and in-person meetings. Although the individuals that performed the formative evaluations were experts in their respective fields, none were experts with the Dick and Carey Systems Approach Model (2015). Therefore, when suggestions were made by the experts they often included items that would be developed in subsequent steps of the process. In addition, the language and formatting of the rubric was confusing to the experts and needed multiple explanations via e-mail. Although, it took more time to meet with the experts conducting the formative evaluations in relation to travel time and scheduling, ultimately the in-person evaluations demonstrated significantly fewer frustrations and in essence took less time because e-mails were not being sent back and forth increasing wait time for feedback.

Overall, the formative evaluations proved essential for movement through the development process of TIPAC resulting in revisions at each step ultimately strengthening the TIPAC program. However, the rubrics, selection of experts for formative evaluations, and method of conducting formative evaluations may be dependent upon the curriculum being developed. For TIPAC, it was discovered that the rubrics were ineffective with outside experts and should be used as a checklist for the designer only. Finally, conducting in-person formative evaluations provided the richest data.
2. How can the Dick and Carey Systems Approach Model (2015) be used to design an instructional program that teaches the integration of physical activity into the curriculum?

Two main findings were a result of this study. Utilizing the Dick and Carey Systems Approach Model (2015) to develop TIPAC demonstrated that (a) this model provides a viable approach for curriculum development and (b) adjustments to the model should be conducted to meet the individual needs of the program.

Viable approach. The Dick and Carey Systems Approach Model (2015) remains a viable approach for development of curriculum. This model provided a clear blueprint that guided the development of TIPAC. The design process resulted in the identification of 18 instructional TIPAC goals, development of 12 cluster analysis diagrams and 6 hierarchical diagrams, insight into the views of three teachers regarding TIPAC, development of 22 TIPAC learning objectives, development of six self-assessment questions, identification of the TIPAC LMS, identification of eight TIPAC modules, development of the entire content associated with two TIPAC modules, including videos and document links, and development of a communication site associated with each module of TIPAC. The Dick and Carey Systems Approach Model (2015) provides a valuable blueprint for developers, especially novice designers, to follow.

Adjustments to the model. Although this model provides excellent guidelines, the designer must take the liberty to adjust the model to meet the specific needs of the program. Trying to follow this model like a menu can make the process too rigid for program development. The outcomes of each step will dictate what needs to be done
next. In the case of TIPAC, the outcomes demonstrated a need to talk to additional experts regarding PowerPoint design and indicated that further interviews are needed to gain insight from additional learners. Furthermore, depending upon the curriculum being developed some steps could be eliminated. For TIPAC, the theoretically based strategy step could have been eliminated. Overall, the developer needs to have confidence to adjust the steps as needed to design an individualized program. Using the Dick and Carey Systems Approach Model (2015) as a guide, altering steps to meet individualized needs of a program, can result in a sound, well-designed program.
CHAPTER V

FINDINGS, INTERPRETATIONS, IMPLICATIONS, AND RECOMMENDATIONS

The purpose of this study was to develop and evaluate the online curriculum titled Teachers Integrating Physical Activity into the Curriculum (TIPAC). TIPAC was developed to be part of a comprehensive online learning center in which teachers can learn about physical activity integration into the classroom, regardless of the subject being taught.

There is extensive research concerning the phenomenon of childhood obesity and resources available to assist teachers with integrating physical activity into the classroom (Centers for Disease Control and Prevention, 2014; Donnelly, 2009; Finn & McInnis, 2014; Kibbe et al., 2011; Mahar, Scales, Kenny, Collins, & Shields, 2006; Ng et al., 2014; Ogden, Carroll, Kit, & Flegal, 2014). There is also existing research that supports the benefits of physical activity for the body and mind, including academic achievement (Haapala, 2011; Kraus, 2015; Kwak et al., 2009; Van Dusen, 2011). On the contrary, there is a gap in the literature regarding comprehensive programs available for teachers to incorporate physical activity in the classroom.

There are multiple stand-alone programs that provide teachers with ideas and even lesson plans to assist with incorporating physical activity in the classroom; however, there is not a comprehensive program available. The Energizers developed by
Mahar and colleagues (2006) and *Take 10!* developed by the International Life Sciences Institute are two such stand-alone programs. Both offer great ideas about how to incorporate physical activity into the classroom as either activity breaks or while teaching, however neither offers a platform where teachers can talk with other teachers or provides an opportunity for building confidence through education. Therefore, development of another stand-alone classroom physical activity integration program was not sufficient or necessary. Rather, it was necessary to develop the all-inclusive TIPAC curriculum, which is described in greater detail below.

The outcome of this study resulted in the preliminary components of the much needed all-inclusive program TIPAC, which was built upon sound instructional and curriculum design and incorporated the key factors known to increase teacher change. TIPAC consists of interactive modules providing information regarding obesity trends among youth, benefits and recommendations of physical activity including the positive impact on academic achievement, resources to assist with physical activity integration in the classroom, guidance for overcoming barriers, as well as safety and physical activity adaptations to consider. I designed the TIPAC modules using the BSCS 5E model so that teachers can redefine, reorganize, elaborate and change their initial ideas through interactions with their environment, other people, or both (Bybee et al., 2006). In addition, the online modules include thought-provoking questions to encourage growth and increase confidence. Lastly, the concept of collaboration, as Fullan (2007) stresses as a necessary condition for educational change, was addressed via a communication link embedded within each module.
I developed TIPAC using best practice of instructional design as outlined in the Dick and Carey Systems Approach Model (2015). This study was guided by the following two primary research questions:

1. How do the outcomes of the formative evaluations inform the curriculum design process?
2. How can the Dick and Carey Systems Approach Model (2015) be used to design an instructional program that teaches the integration of physical activity into the curriculum?

**Findings and Interpretations**

Based upon a thorough review of the research, TIPAC is the first program developed using the Dick and Carey Systems Approach Model (2015) to educate teachers about the incorporation of physical activity into the curriculum. Dick, Carey and Carey (2015) embed formative evaluations throughout the development process. The outcome of this study revealed three important findings: (a) formative evaluations are imperative in successful curriculum development, (b) the Dick and Carey Systems Approach Model (2015) remains a viable and informative model in the curriculum development process, and (c) inclusion of teachers in the evaluation process is vital for effective curriculum development leading to greater potential for change.

**Formative evaluations are imperative in successful curriculum development.**

The importance of formative evaluations has been cited extensively in research and was verified as beneficial during the TIPAC development process as well. Regarding formative evaluations in this study, it should be noted that there were two variations of formative evaluations that occurred: (a) formative evaluation as an independent step
formative evaluations at each step of the design process. Much of the literature describes the aspect of formative evaluations as a single step and few discuss it at each step of the development process. Although the outcomes are similar in both, I will discuss them as separate entities to highlight the individual conclusions. Additionally, regardless of the point at which the formative evaluation was performed, it was found that the method of conducting formative evaluations is curriculum dependent. This conclusion will also be discussed in this section.

Formative evaluation as an independent step. Similar to previous research, it was concluded that formative evaluations are an essential component of instructional design (Singh, 2009; Vonderwell & Bobic, 2013; Yoshida, 2010). Formative evaluations conducted as a single step using multiple methods provides significant information regarding changes that should be made to the curriculum prior to the program being completely implemented. The evaluations specify what learners from the target population describe as still missing from the curriculum, needing more detail or needing changed altogether. It provides an opportunity to see the program as it would be used by the target population and not just from the eyes of the designer. This aspect of formative evaluation is not a new finding within the research world and reiterates the same essential necessity within this study.

Formative evaluations at each step of the design process. On the contrary, little information was found in the literature that emphasizes the importance of formative evaluations in regards to the step-by-step process of curriculum development. However, this was a significant finding with the development of TIPAC. This study demonstrated a more holistic approach to formative evaluations by embedding them within each step
of development rather than just as an isolated step. As a result of multiple formative evaluations it was found that not only were basic revisions needed regarding content and objectives, but in some situations it necessitated interviewing additional participants for more data.

Formative evaluations were conducted at nearly every step of the TIPAC development process. Experts either in content or curriculum and assessment were utilized in providing feedback at each step of development to ensure the step outcome was clear, concise and accurate. The feedback from formative evaluations resulted in revisions in the objectives or curriculum needs ensuring that sound instructional design was occurring and eliminated multiple revisions at the completion of TIPAC program development. Similar to Singh’s (2009) findings, formative evaluations were found to be essential in gathering data throughout the design process to ultimately refine the program prior to implementation. The formative evaluations occurring at each step of the process prevented working too far into the program in the wrong direction. The findings of this study suggest that formative evaluations embedded throughout ultimately save on design time and define the direction early on eliminating the need for drastic revisions after implementation. The formative evaluations helped to clarify objectives, develop precise assessment questions and accurately incorporate instructional materials into the curriculum so that the curriculum was in its truest form prior to collecting formative evaluations from learners representing the target population.

**Method of conducting formative evaluations is curriculum dependent.** The research is not ambiguous about the necessity for formative evaluations; however, there is little data describing the best method for conducting formative evaluations. There has
been research conducted that discusses formative evaluation as its own entity, which is
similar to Dick, Carey, and Carey’s (2015) eighth step of this process (Makri, Blandford,
Cox, Attfield, & Warwick, 2011; Odendaal, Atkins, & Lewin, 2016). Odendaal, Atkins,
and Lewin (2016) examined the use of multiple methods when collecting formative
evaluations as part of an isolated step. Their work discovered that it is not how many
evaluation methods are utilized, but rather that the correct method of evaluation be
performed. This TIPAC study has further enhanced this concept. The development of
TIPAC not only echoed a similar finding as to the importance of the correct method of
evaluation being performed as an isolated step, but it further displayed evidence of the
importance of the correct evaluation method being performed at each step of
development.

For TIPAC, the independent formative evaluation step used mixed methods
consisting of note keeping, in-person interviews and rubric completion which were
found to be effective for development of TIPAC. In contrast, the methods for
conducting formative evaluations at each step of development, from designing learning
objectives to developing content were more ambiguous. It was concluded that the
curriculum being developed will determine the method of formative evaluation that will
work best. For curriculum that is straightforward and easy to follow it may be
appropriate to gain feedback from experts electronically with a set of clear instructions.
However, some programs, such as TIPAC, have complex steps which require more in-
depth formative evaluations. Throughout this study, evaluations were conducted via e-
mail, phone interviews and in-person meetings. Although the experts selected for the
formative evaluation process were experts in their respective fields, none were experts
with the Dick and Carey Systems Approach Model (2015). Therefore, the suggestions made by the experts often included items that would be developed in subsequent steps of the process. In this case, in-person interviews provided the best outcome as this method offered an opportunity to explain what was being evaluated and the purpose. The in-person interviews demonstrated the least amount of confusion and frustration.

**Formative evaluation recommendations for future developers.** It is recommended that developers of any curriculum utilize a comprehensive formative evaluation system, in which evaluations are conducted at each step of program development as well as an isolated step near the end of development. Additionally, it is recommended that evaluations be conducted while in direct contact with the experts, whether it is in-person, teleconferencing or phone conversation to decrease confusion and frustration. The number of experts utilized in formative evaluations is dependent upon the expertise of the developer. Although it is recommended that multiple evaluations occur throughout development, it may not be essential to have experts review each step.

**Dick and Carey Systems Approach Model (2015) remains a viable and informative model in the curriculum development process.** The Dick and Carey Systems approach model has been used to successfully create curriculum in several areas including science and English (Balta, 2015; Oyelekan & Olorundare, 2009; Thivilojana, Perinpasingam, & Balapumi, 2010). Similar to those studies, the findings from this study indicate that the Dick and Carey model remains a viable resource for curriculum development and can be used to develop a program that educates teachers about incorporating physical activity into the classroom. It provides a systematic approach
detailing each step of the development process. There were two key findings within this study regarding the usability of the model that will be highlighted: (a) model can be used by novice designers and (b) weakness of the rubrics.

**Model can be used by novice designers.** This model is especially useful for novice designers. An inexperienced designer may struggle with understanding where to begin. This model is inclusive and dictates exactly where to start. It provides instruction at each step to describe what needs to occur in order to develop a clear, concise program. The model also comes complete with rubrics for formative evaluations. Although the strength of this model is its inclusive set of guidelines, that is also what acts as its weakness. The model should be adjusted specific to the curriculum being developed. These adjustments may consist of altering the process working through the steps or altering the rubrics to make them more specific. However, as a novice designer, one often lacks the confidence and knowhow to alter the model to fit one’s needs.

Although this study found success in designing a program following this model, limitations were noted similar to those found in the literature. The model has been criticized for being too cumbersome and rigid (Akubult, 2007). Within the first few steps of development, this trend was what appeared to be emerging. However, as development proceeded and adjustments were made to the development process, specifically regarding method of formative evaluations and chronological order of steps, the model was found to be effective and flexible. These adjustments permitted the model to be followed as more of a guideline and less of a step-by-step recipe. In such case, it was acceptable to eliminate an “ingredient” from the model so that it made sense for the curriculum being developed. For instance, it was not worthwhile to perform step
nine (revision of TIPAC) since step eight (formative evaluation of the entire program) had been adjusted. The developer must have the confidence to adjust this recipe to meet the needs of the program. If the model is followed exactly as written, then it certainly runs the risk of being rigid and cumbersome. However, the model should be adapted to the specific needs of the curriculum being developed so that it is fluid and manageable.

**Weakness of the rubrics.** The rubrics provided by Dick, Carey and Carey (2015) were revealed as the greatest limitation of this model. Although the rubrics were an appropriate initial start, they needed a great deal of adaptations to meet the program’s unique objectives. Important findings throughout TIPAC development suggest that the rubrics be used by the developer to review for inclusiveness but not necessarily be used by external experts as a formative evaluation tool at each step of the process. For TIPAC it was discovered that even after an attempt was made to individualize the rubrics, some rubrics continued to cause great confusion related to concepts being assessed and language being used. Ideally the rubrics could have been refined and resent to the experts performing the formative evaluations, but narrative information provided by the experts resulted in acceptable feedback. In addition, since rubrics should be altered to meet the needs of each unique program being developed, it would most likely not be beneficial to spend a great deal of effort revising rubrics multiple times. Rather the recommendation would be to provide a place on the rubric for narrative feedback and conduct the evaluations in-person to address questions as they arise.

Overall, the Dick and Carey Systems Approach Model (2015) provided excellent guidelines to consider when developing a new program. It offered an inclusive systematic design to be used by any developer, particularly beneficial to a novice
program designer. Nonetheless it was concluded that the model should be adjusted to meet the developer’s needs. The format of the steps to be followed, the order in which the steps are to occur, and the format of formative evaluations are curriculum dependent. The model should be used as a blueprint but adapted according to the developer’s needs.

**Inclusion of teachers in the evaluation process is vital for effective curriculum development leading to greater potential for change** Although this is definitely a preliminary finding, the role that teachers play in incorporating physical activity in the classroom was an encouraging outcome. Results of this study indicate that the teachers interviewed throughout the development process demonstrated enthusiasm about the TIPAC program and expressed interest in learning more. Additionally, one of the learners utilized in the formative evaluation process began using the concepts learned from TIPAC in her classroom. She stated she had intention of continuing to incorporate physical activity as part of her teaching methods. Although a limited number of teachers were utilized within this study and cannot truly display the views of the entire target population, it suggests that some teachers are willing to learn more about this technique and will attempt to incorporate physical activity into their classroom. Therefore, as this finding suggests, it is important to bring teachers into the process of curriculum development. Inclusion of teachers during the development process not only results in a better product but also has an impact on teacher attitude. The teachers that participated in this study showed promise in using these learnings in their classrooms to ultimately “be the change”.

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Limitations

There were two general limitations of this study: (a) formative evaluation from learners consisted of only one-to-one evaluations and (b) only two modules of TIPAC were developed.

**Formative evaluation from learners consisted of only one-to-one evaluations.**

One limitation to this study was that formative evaluations from the target population were limited to one-to-one evaluations only. According to the Dick and Carey Systems Approach Model (2015), formative evaluations should have also included focus groups and a field trial. However, due to the nature of this study both focus groups and the field trial were not performed. The one-to-one formative evaluations were used as a mid-point evaluation. It was the belief of this researcher that based upon the online nature of TIPAC; focus groups would not provide much more in-depth knowledge than the one-to-one evaluations and therefore were not performed. Additionally, since only two modules were developed, only a portion of TIPAC was truly evaluated.

**Two modules of TIPAC were developed.** The second limitation of this study was that only two modules of the projected eight TIPAC modules were fully developed. Although the TIPAC platform was established with all eight available modules outlined, only two modules complete with content, post-tests, and communication links were finalized for review.

Originally, two modules were selected for development because of their opposing learning domains. Module two focuses on the verbal learning domain whereas module five is more intellectual in nature. Additionally, since TIPAC is such an extensive program it was decided that these two modules would be reviewed now, prior
to the entire program being developed. For TIPAC, having teachers evaluate more than two modules had potential to be overwhelming in both time and content for them. While conclusions can be drawn that minimal interpretations would be added to this analysis with the completion of all of the TIPAC modules, it is impossible to know that for certain.

One belief of this researcher is that two modules, module three: benefits of physical activity and module six: overcoming barriers to integrating physical activity into the curriculum have likely implications for this study. The nature of these two modules have potential to motivate teachers based on improving academic performance of their students as well as decrease some anxieties of attempting a new method of teaching by learning how to overcome barriers. By eliminating these two modules from review at this time restricts the true power of these modules to speculation.

Implications and Future Research

There are two implications of this research: (a) a systematic approach to curriculum development is useful for any educational domain and (b) TIPAC will be a beneficial tool for teachers. Additionally, there are two recommendations for future research. The two recommendations include: (a) completion of the TIPAC program and (b) the inclusion of the two additional steps for formative evaluation from learners.

A systematic approach to curriculum development is useful for any educational domain. One implication that emerged from this research demonstrates that educators in any domain can utilize a systematic approach to develop a professional curriculum. The Dick and Carey Systems Approach Model (2015) provides easy to follow guidelines to design an educational program regardless of designer experience. A
first-time developer can follow the guidelines to develop a sound instructional program. The process should be adapted for the curriculum being developed but the guide book exists within this model.

Additionally, there are multiple LMSs that are in existence and can host programs free of charge. The three such systems that were identified as part of this study include Schoology, Blackboard Course Sites, and Google Sites. The LMS that would best fit the needs of any curriculum would be evaluated as part of the systematic approach.

**Completion of the TIPAC program.** It is a recommendation for future research that TIPAC be completed in its entirety. This includes performing formative evaluations on the newly developed content and revising it based upon those evaluations. Additionally, only the first nine steps of the Dick and Carey Systems Approach Model (2015) were utilized in this primary study. A second recommendation is that the tenth step of this model be completed which is summative evaluations of the program. This step would provide a great deal of feedback as to if TIPAC is providing the education and resources necessary to promote change in the classroom.

**Inclusion of the two additional steps for formative evaluation from learners.** It is also a recommendation for future research that the eighth step of the Dick and Carey Systems Approach Model (2015) be completed as it was originally designed. After TIPAC has been completed in its entirety it is recommended that learners from the target population evaluate the program. The evaluation will include one-to-one evaluations, a focus group, and a field trial. Incorporating all of these means of formative evaluation will provide richer data in relation to TIPAC’s completeness. This information from
multiple learners will sound the voice of many providing a more generalizable view to the population of teachers.

**TIPAC will be a beneficial tool for teachers.** TIPAC can provide teachers with the resources necessary to begin incorporating physical activity into the classroom, as well as provide an opportunity to collaborate with other educators across the world regarding concerns, benefits, ideas and methods for overcoming barriers. It can provide teachers the opportunity to be a part of a learning community and partake in this educational change together, not in isolation. Furthermore, TIPAC can be utilized by other professionals interested in combatting childhood obesity, such as health educators and community nurses. Ultimately TIPAC can be used to inform others about the benefits of physical activity implementation in the classroom as one step toward improving the health of children worldwide.
CHAPTER VI

PROCESS TO PRODUCT

As stated at the beginning of Chapter III, this dissertation follows a unique, nontraditional format. The addition of this sixth chapter is another example of that unique format. Although the primary focus of this dissertation was the analysis of the process for development of Teachers Integrating Physical Activity into the Curriculum (TIPAC) using the Dick and Carey Systems Approach Model (2015), a product was developed as a secondary outcome. Components affiliated with the TIPAC program, including two completed modules, self-assessment tests, communication links and identification of the learning management system, were a result of this process. Although it has not been completed in its entirety, results of TIPAC are being displayed in this chapter for a better understanding of how the Dick and Carey Systems Approach Model(2015), the Biological Sciences Curriculum Study 5E Model and Fullan’s concept of educational change have all been integrated into this product.

Chapter VI is organized to simulate a journey through the TIPAC website. The chapter begins with an overview of the TIPAC learning center and a preview of the first page of the website. The journey will continue through TIPAC by displaying some of the module content. Following the content section, the self-assessment tests will be highlighted. The journey will end with a discussion of the TIPAC communication link
as it relates to Fullan’s (2007) concept of collaboration in educational change. Finally, Chapter VI will conclude with a summary of the TIPAC product.

**Teachers Integrating Physical Activity into the Curriculum (TIPAC) Learning Center**

TIPAC is an online comprehensive learning center where teachers can learn about physical activity integration into the curriculum, regardless of the subject being taught. It is comprised of modules, self-assessment tests, and communication links where educators can speak with other educators across the globe. As part of the curriculum development process, *Step Six: Develop Instructional Strategy* of the Dick and Carey Systems Approach Model (2015), the learning management system used to host TIPAC was determined. The process used to complete this step resulted in the selection of Schoology as the learning management system. Additionally, this step clustered TIPAC content into logical modules.

Figure 15 shows the main page of the TIPAC website hosted on Schoology. Note that there are eight TIPAC learning modules displayed. The teacher would simply click on each module and the materials contained within that module will appear.

**TIPAC Module Content**

Each module within TIPAC contains a PowerPoint presentation, self-assessment test, and communication link. Figure 16 displays the content associated with Module 5: Resources to Assist with Physical Activity Integration into the Curriculum. The first link within this module is the Resources to Assist with Physical Activity Integration into the Curriculum PowerPoint presentation. The second link is the self-assessment test for
this module which is to be completed after viewing the PowerPoint. Finally, the third component listed within this module is the link for communicating with other educators.

**Main Page of TIPAC Website**

![Main page of the TIPAC website, with identification of eight modules, is hosted on the Schoology Learning Management System.](image)

*Figure 15.* Main page of the TIPAC website, with identification of eight modules, is hosted on the Schoology Learning Management System.

**TIPAC Module 5: Resources to Assist with Physical Activity Integration Into the Curriculum Content**

![Content included in Module 5: Resources to Assist with Physical Activity Integration into the Curriculum. The PowerPoint presentation, self-assessment post-test and communication link are embedded within this module.](image)

*Figure 16.* Content included in Module 5: Resources to Assist with Physical Activity Integration into the Curriculum. The PowerPoint presentation, self-assessment post-test and communication link are embedded within this module.
**PowerPoint presentation.** The content contained within each PowerPoint presentation was developed according to *Step Seven: Develop and Select Instructional Materials* of the Dick and Carey Systems Approach Model (2015). However, the instructional design for the presentation was decided during *Step Six: Develop Instructional Strategy* of the model. It was decided that the theoretically based strategy, Biological Sciences Curriculum Study (BSCS) 5 E Model (Bybee et al., 2006), would be used for TIPAC because of extensive research demonstrating effectiveness in developing new curriculum materials and professional development programs across the nation and across disciplines (Boddy, 2003; Maidon, 2001; Sadi & Cakiroglu, 2010; Watson & Aubusson, 2003; Wilson, Taylor, Kowalski, & Carlson, 2010).

The purpose of the BSCS 5E model is to help individuals redefine, reorganize, elaborate and change their initial ideas through interactions with their environment, other people, or both (Bybee et al., 2006). This process is completed by working through five phases associated with this model: engagement, exploration, explanation, elaboration and evaluation. As the learner works through each of the phases, he will gain a deeper understanding of the lesson to be learned. At the onset of the lesson the learner comes with his own interpretation of phenomena. In order to change that interpretation, the learner’s ideas must be challenged and shown to be incomplete. If the original ideas are challenged, the learner must be given time and experiences to develop a more accurate awareness (Bybee et al., 2006). Each phase within the TIPAC PowerPoint presentation builds upon itself to provide a better understanding of the skills, knowledge and attitudes associated with the lesson.
Figure 17 through Figure 20 display some of the content that is included within the PowerPoint Presentation of Module 5: Resources to Assist with Physical Activity Integration into the Curriculum. These slides that are displayed include the first four phases of the BSCS 5E Model. The fifth phase, evaluation, is discussed in the next section.

Figure 17 displays the BSCS 5E phase of engagement. This is the initial phase in which the learner begins to ask questions about what is known about the topic. These slides engage the learner with a short activity to start thinking about incorporating physical activity in the classroom.

**Figure 17.** PowerPoint slides from Module 5: Resources to Assist with Physical Activity Integration into the Curriculum that correspond with the BSCS 5E Model Engagement Phase.
Figure 18 displays the next phase of this model: Exploration. It is during this phase that the learner uses prior knowledge to complete an activity and begins to explore some new ideas for how to make a physically active lesson plan.

The next phase of the 5 E model is Explanation. It is during this phase that the information provided will guide the learner to a deeper understanding of the module content. Figure 19 displays PowerPoint slides related to the explanation phase from Module 5: Resources to Assist with Physical Activity Integration into the Curriculum. Notice how several resources are provided for the learner in these slides. This
information provides the learner with the opportunity to access multiple resources to build the knowledge base of physical activity integration into the curriculum.

**BSCS 5E Model Explanation Phase of TIPAC Module 5: Resources to Assist with Physical Activity Integration into the Curriculum**

- **EXPLAIN**
  - Think about starting a new lesson plan.
  - What new strategies do you plan to implement to ensure student engagement?
  - Set clear expectations and guidelines for student behavior.
  - Ask students to share their ideas and strategies for integrating physical activity into the lesson.
  - Encourage peer-to-peer interaction and group discussion.

- **EXPLAIN**
  - **Explain**
    - The purpose of this phase is to deepen understanding and connect new knowledge to prior knowledge.
    - Provide opportunities for students to apply new concepts in practical scenarios.
    - Encourage students to reflect on their learning experiences and identify connections to real-world situations.

- **RESOURCES**
  - **Resources**
    - Provide access to a variety of resources, such as videos, articles, and interactive tools.
    - Encourage students to explore these resources independently or in small groups.
    - Facilitate discussions to share insights and insights from the resources.

- **RESOURCES ACTIVE ACADEMICS**
  - **Active Academics**
    - Integrate physical activity into academic content to enhance learning and engagement.
    - Provide opportunities for students to apply academic concepts through physical activity.
    - Encourage creative and collaborative problem-solving activities.

- **PE CENTRAL**
  - **P.E. Central**
    - Integrate physical education activities into the curriculum to promote overall health and well-being.
    - Encourage students to participate in physical activities outside of school hours.
    - Provide resources and guidelines for teachers to incorporate physical education activities into their lesson plans.

- **YOUTUBE AS A RESOURCE**
  - **YouTube as a Resource**
    - Use YouTube videos as a tool to demonstrate physical activity integration techniques.
    - Encourage students to watch and analyze videos to identify effective strategies.
    - Facilitate discussions to share insights and applications.

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**Figure 19.** PowerPoint slides from Module 5: Resources to Assist with Physical Activity Integration into the Curriculum that correspond with the BSCS 5E Model Explanation Phase.

The fourth phase of the BSCS 5E model is Elaboration. It is during this phase that the learner can reflect upon the new knowledge gained. Figure 20 displays a slide in Module 5: Resources to Assist with Physical Activity Integration into the Curriculum demonstrating this elaboration phase. Notice how it provides more guidance about getting started with integrating physical activity into the curriculum.
**Self-assessment test.** The fifth and final phase of the BSCS 5E Model is the Evaluation phase. This phase is used to assess the learner’s understanding and abilities gained as a result of the TIPAC module presentation. This permits the learner to evaluate their progress and return to the content slides if additional information is needed.

Figure 21 displays three questions from the self-assessment test in Module 5: Resources to Assist with Physical Activity Integration into the Curriculum. It is expected that the learner would be able to answer these three questions correctly after reviewing the PowerPoint presentation.

**Communication link.** The final component within each TIPAC module is a communication link, which is open to all TIPAC users where ideas, thoughts, questions and solutions can be communicated. This communication link component addresses the concept of collaboration which Fullan (2007) stresses as essential for educational change to occur. Fullan (2007) explains that ambivalence and uncertainty are feelings often
accompanied with change. In order to address these emotions and work toward successful change, Fullan stresses the necessity for collaboration (2007). Escobar-Arcay (2009) further explains this concept with an appreciation that teachers need to collaborate as a way of sharing value, vision, and opportunity which leads to growth and
continued improvement. If a change is to occur, it is imperative that teachers can discuss ideas and work through their concerns. The communication component embedded within each module provides this opportunity.

Figure 22 displays the opened communication link within Module 5: Resources to Assist with Physical Activity Integration into the Curriculum. Note how there is space provided for the user to comment. The date is also provided at the top so that other users know when the comment was presented. All users have access to this comment section.

![Communication Link Embedded within TIPAC Module 5: Resources to Assist with Physical Activity Integration into the Curriculum](image)

*Figure 22.* Communication link embedded within TIPAC Module 5: Resources to Assist with Physical Activity Integration into the Curriculum. Comment section is open to all users. The date is provided at the top of the comment so users can identify when the comment was posted.
Summary of the TIPAC Product

TIPAC was developed using the Dick and Carey Systems Approach Model (2015) with formative evaluations embedded within each step of the development process. This permitted a system of checks and balances to assess for inclusiveness as well as a control measure for my own personal bias. Additionally, the curriculum in TIPAC was formatted according to best practice instructional strategy, BSCS 5E Model, to assist learners in gaining a deeper understanding of the TIPAC concepts using five phases: engagement, exploration, explanation, elaboration, and evaluation. Finally, Fullan’s (2007) concept of collaboration, which is needed for educational change, was embedded within each module via a communication link. It is a future recommendation that TIPAC be completed in its entirety and made available to teachers and health care providers interested in physical activity integration into the classroom. It is with an optimistic view that the completion of TIPAC and dissemination of this resource has the potential to move one step closer to improvement of the health and academic performance of children regardless of institutional structure.
REFERENCES


Wilson, C., Taylor, J., Kowalski, S., & Carlson, J. (2010). The relative effects and equity of inquiry-based and commonplace science teaching on students'

APPENDIX A

BODY MASS INDEX FOR BOYS

Source: CDC, 2000
APPENDIX B

BODY MASS INDEX FOR GIRLS

Source: CDC, 2000
APPENDIX C

THE DICK AND CAREY SYSTEMS APPROACH MODEL*

Source: Dick, Carey and Carey, 2015
APPENDIX D

RUBRIC FOR EVALUATING INSTRUCTIONAL GOALS*

Directions: Use the following rubric to evaluate the instructional goals. Space is provided in left column to mark your conclusions and the assessment criteria are provided in the right column. Space has been provided at the bottom of the page for any additional comments.

<table>
<thead>
<tr>
<th>Congruence with Teacher Needs:</th>
<th>Are the instructional goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>Some</td>
</tr>
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<td>No</td>
<td>Some</td>
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<td>No</td>
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<td>No</td>
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<table>
<thead>
<tr>
<th>Feasibility</th>
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<tbody>
<tr>
<td>No</td>
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<td>No</td>
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<td>No</td>
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<td>No</td>
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<table>
<thead>
<tr>
<th>Clarity</th>
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<tbody>
<tr>
<td>No</td>
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<td>No</td>
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<td>No</td>
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<td>No</td>
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<table>
<thead>
<tr>
<th>Clarity</th>
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<tbody>
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<td>No</td>
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<table>
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<tr>
<th>Clarity</th>
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<table>
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<tr>
<th>Clarity</th>
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<td>No</td>
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<td>No</td>
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<table>
<thead>
<tr>
<th>Clarity</th>
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<tr>
<td>No</td>
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<tr>
<td>No</td>
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Comments:

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*Adapted from the *Rubric for Evaluating Instructional Goals* (Dick, Carey, & Carey, 2015)
APPENDIX E

RUBRIC FOR EVALUATING A GOAL ANALYSIS*

Directions: Use the following rubric to evaluate the quality of the instructional goal analysis. Space is provided in left column to mark your conclusions and the assessment criteria are provided in the right column. Space has been provided at the bottom of the page for any additional comments.

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>No</td>
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<tr>
<td>Some</td>
<td>□</td>
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<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Yes</td>
<td>□</td>
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</tr>
</tbody>
</table>

Comments:
_____________________________________________________________________________
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*Adapted from the *Rubric for Evaluating a Goal Analysis* (Dick, Carey, & Carey, 2015)
APPENDIX F

RUBRIC FOR EVALUATING SUBORDINATE AND ENTRY LEVEL SKILLS*

Directions: Use the following rubric to evaluate the subordinate and entry level skills. Space is provided in left column to mark your conclusions and the assessment criteria are provided in the right column. Space has been provided at the bottom of the page for any additional comments.

<table>
<thead>
<tr>
<th>Intellectual Skills</th>
<th>Intellectual Skills Analysis- Does the analysis…</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Illustrate the hierarchical relationship among skills by:</td>
</tr>
<tr>
<td>No</td>
<td>Some</td>
</tr>
<tr>
<td>No</td>
<td>Some</td>
</tr>
<tr>
<td>No</td>
<td>Some</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Verbal Skills</th>
<th>Verbal Skills Analysis- Does the analysis…</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Use main areas of content as headings?</td>
</tr>
<tr>
<td>No</td>
<td>Some</td>
</tr>
<tr>
<td>No</td>
<td>Some</td>
</tr>
<tr>
<td>No</td>
<td>Some</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Entry Level Skills</th>
<th>Entry Level Skills- is/are the identified entry level skills:</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>Some</td>
</tr>
<tr>
<td>No</td>
<td>Some</td>
</tr>
</tbody>
</table>

Comments:

_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________

*Adapted from the Rubric for Evaluating Subordinate and Entry Skills (Dick, Carey, & Carey, 2015)
## APPENDIX G

### INFORMAL INTERVIEW QUESTIONS

1. **Questions to ANALYZE the LEARNER**

   **A) Entry Level Skills (Skills that teachers already possess)**

   1. How would you describe your computer skills?
   2. Have you ever taken an on-line course before?

   **B1) Knowledge of the trends in childhood obesity**

   1. Can you tell me any personal or professional experiences you have had with childhood obesity?
   2. Can you describe any trends in childhood obesity within your school?
   3. Do believe the trends in childhood obesity are comparable to other local schools or specific to just your school? Please elaborate.
   4. Can you describe any trends in childhood obesity locally, state-wide, nationally, globally?

   **B2) Knowledge of physical activity trends and physical activity recommendations for children**

   1. Within your school, can you describe any changes that have occurred regarding time allotted for physical activity (such as recess or physical education class)?
   2. Do believe the changes or lack of changes in time allotted for physical activity is comparable to other local schools or specific to just your school? Please elaborate
   3. Can you describe any trends in time allotted for physical activity in schools locally, state-wide, or nationally?
   4. Can you tell me the current recommendations for daily physical activity for children?
   5. In your opinion, do you believe your students are meeting the recommended daily amount of physical activity?
   6. Can you describe some benefits associated with daily physical activity for children?

   **B3) Knowledge of Implementing Physical Activity in the Classroom**

   1. Can you please describe your typical school day; including time spent teaching each subject?
2. Have you ever considered incorporating physical activity within the classroom- please explain why or why not.

3. Do you believe you have the skills to incorporate exercise into the classroom? If yes, please describe those skills, If no, please describe what you believe is missing.

B4) Knowledge of Resources available for Physical Activity Implementation

1. What is your current knowledge of methods for incorporating physical activity in the classroom?

2. Can you describe any resources or programs available to help you incorporate physical activity while you are teaching?

C) Attitudes toward TIPAC content and the online delivery system

1. Based upon what I have shared with you regarding the objectives of TIPAC, what are your initial thoughts about this program?

2. What are your initial thoughts regarding learning the TIPAC program via an online delivery system?

D) Motivation to learn this information

1. If provided with education and resources about implementing physical activity while you are teaching, would you be interested in learning more? Why or why not?

2. What would motivate you to learn more about incorporating physical activity into the curriculum?

3. To what extent would offering continuing education credits for this program motivate you to learn more about TIPAC?

E) Attitudes about workplace and support provided within the workplace

1. Do you work as a team (i.e. co-teach) or do you work autonomously?

2. Can you describe the support you usually have from administration or other teachers when implementing a new teaching method or program within the school?

3. What does your network of professional teachers look like (do you have individuals you can collaborate with to discuss classroom teaching strategies? (within this building, local schools, state-wide, nation-wide)?

4. What barriers to you anticipate with altering a teaching method?

2. Questions to Analyze the PERFORMANCE CONTEXT

1. Is this the room you typically teach in?

2. Throughout your years of teaching, have ALL of your classrooms been similar to this? Please describe if the answer is no.

3. Do you believe there is enough room to get kids moving (performing physical activity) within this classroom? Why or why not?
4. Would you consider changing the layout of the classroom to allow for more movement if needed? Why or why not?

### 3. Questions to Analyze the LEARNING CONTEXT

1. Where would you most likely complete the TIPAC online training program?

2. What type of computer will you most likely be using to conduct the TIPAC online training (personal computer, iPad, work computer).

3. Do you have access to WIFI?

4. Do you have access to headphones?

5. Will the location you will most likely complete the TIPAC online training program have space to move around?
APPENDIX H

RUBRIC FOR EVALUATING ANALYSIS OF LEARNERS AND CONTEXTS*

Directions: Use the following rubric to evaluate the analysis of learners and contexts. Space is provided in left column to mark your conclusions and the assessment criteria are provided in the right column. Space has been provided at the bottom of the page for any additional comments.

<table>
<thead>
<tr>
<th>Characteristics of Learners</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Does the description include a summary of the:</td>
</tr>
<tr>
<td>No □ Some □ Yes □</td>
</tr>
<tr>
<td>a. entry level skills?</td>
</tr>
<tr>
<td>No □ Some □ Yes □</td>
</tr>
<tr>
<td>b. prior knowledge of the childhood obesity, physical activity recommendations, and implementing physical activity in the classroom?</td>
</tr>
<tr>
<td>No □ Some □ Yes □</td>
</tr>
<tr>
<td>c. prior knowledge of resources available for implementing physical activity in the classroom?</td>
</tr>
<tr>
<td>2. Does the description include a summary of attitudes regarding:</td>
</tr>
<tr>
<td>No □ Some □ Yes □</td>
</tr>
<tr>
<td>a. the TIPAC program?</td>
</tr>
<tr>
<td>No □ Some □ Yes □</td>
</tr>
<tr>
<td>b. online delivery system for learning new information?</td>
</tr>
<tr>
<td>No □ Some □ Yes □</td>
</tr>
<tr>
<td>c. support in the workplace?</td>
</tr>
<tr>
<td>No □ Some □ Yes □</td>
</tr>
<tr>
<td>3. Does the description include a summary of motivating factors for learning about TIPAC?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Performance Context Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Does the performance context description provide information about</td>
</tr>
<tr>
<td>No □ Some □ Yes □</td>
</tr>
<tr>
<td>a. typical classroom layout (size and configuration)</td>
</tr>
<tr>
<td>No □ Some □ Yes □</td>
</tr>
<tr>
<td>b. teacher willingness to reconfigure classroom if necessary to implement physical activity.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Learning Context Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Does the learning context description provide information about</td>
</tr>
<tr>
<td>No □ Some □ Yes □</td>
</tr>
<tr>
<td>a. the basic online operating requirements?</td>
</tr>
<tr>
<td>No □ Some □ Yes □</td>
</tr>
<tr>
<td>b. location teacher is most likely to conduct the TIPAC learning</td>
</tr>
</tbody>
</table>

206
Comments:

_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________

*Adapted from the Rubric for Evaluating Analysis of Learners and Contexts Rubric (Dick, Carey, & Carey, 2015)
APPENDIX I

RUBRIC FOR EVALUATING LEARNING OBJECTIVES*

Directions: Use the following rubric to evaluate learning objectives. Space is provided in left column to mark your conclusions and the assessment criteria are provided in the right column. Space has been provided at the bottom of the page for any additional comments.

<table>
<thead>
<tr>
<th>Learning Objective:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Learning Objective Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
</tr>
<tr>
<td>1. Does it specify the cue/stimulus/resource needed for the learner?</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>2. Is the learning environment made clear?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Learning Objective Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
</tr>
<tr>
<td>1. Does it describe the actual behavior rather than describe how the learner will respond (i.e. “identify” rather than “circle”)?</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>2. Is the behavior clear and observable rather than vague?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Learning Objective Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
</tr>
<tr>
<td>1. Does it include the purpose/function characteristics?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Learning Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
</tr>
<tr>
<td>1. Does the learning objective state the learning context?</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>2. Is the learning objective realistic?</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>3. Is it clear (can you construct a test item for the objective)?</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>4. Is it feasible in the learning context (time, resources)?</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>5. Is it meaningful to the goal and purpose for instruction (not insignificant)?</td>
</tr>
</tbody>
</table>
Comments:

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*Adapted from the *Rubric for Evaluating Performance Objectives* (Dick, Carey, & Carey, 2015)
APPENDIX J

RUBRIC FOR EVALUATING MULTIPLE-CHOICE QUESTIONS*

Directions: Use the following rubric to evaluate the multiple-choice questions. Compare the TIPAC post-tests with this rubric during evaluation. Space is provided in left column to mark your conclusions and the assessment criteria are provided in the right column. Space has been provided at the bottom of the page for any additional comments.

| Assessment Criteria: criteria considerations used in test question development |
|---------------------------------|--------------------------------------------------|
| **Goal-Centered Criteria**- are the test questions congruent with the learning objectives? |
| No      | Some | Yes |
| □       | □    | □   | 1. Condition? |
| □       | □    | □   | 2. Behavior?  |
| □       | □    | □   | 3. Criteria?  |
| **Learner-Centered Criteria**- are the test questions congruent with the target audience of teachers? |
| No      | Some | Yes |
| □       | □    | □   | 1. Vocabulary, language level? |
| □       | □    | □   | 2. Developmental level (complexity, guidance)? |
| □       | □    | □   | 3. Background and experience? |
| □       | □    | □   | 4. Experience with testing format? |
| □       | □    | □   | 5. Cultural, racial, and gender needs (lacks bias)? |
| **Context-Centered Criteria**-is/are the: |
| No      | Some | Yes |
| □       | □    | □   | 1. Items and directions feasible for the online learning context? |
| **Assessment-Centered Criteria**-is/are: |
| No      | Some | Yes |
| □       | □    | □   | 1. All information required to answer the question provided? |
| □       | □    | □   | 2. Language clear? |
| □       | □    | □   | 3. Grammar, spelling and punctuation correct? |
| □       | □    | □   | 4. Professional looking? |
### Post-Test Directions

**Directions:** do the directions clearly indicate:

<table>
<thead>
<tr>
<th>No</th>
<th>Some</th>
<th>Yes</th>
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<tbody>
<tr>
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</table>

1. What is to be done?

<table>
<thead>
<tr>
<th>No</th>
<th>Some</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>

2. How it is to be done?

<table>
<thead>
<tr>
<th>No</th>
<th>Some</th>
<th>Yes</th>
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</thead>
<tbody>
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</table>

3. Appropriate guidance for learners?

<table>
<thead>
<tr>
<th>No</th>
<th>Some</th>
<th>Yes</th>
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<tbody>
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</table>

4. What is needed for successful completion (number of questions needed to answer correctly, any time constraints)?

<table>
<thead>
<tr>
<th>No</th>
<th>Some</th>
<th>Yes</th>
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<tbody>
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</tbody>
</table>

Comments:

*Adapted from *Evaluating Criterion-Referenced Assessments* rubric (Dick, Carey, and Carey, 2015)
APPENDIX K

RUBRIC FOR EVALUATING AN ONLINE DELIVERY SYSTEM

Directions: Use the following rubric to evaluate online delivery systems. A 3-point Likert scale is provided in left column to mark your conclusions and the assessment criteria are provided in the right column. Check the box by the number that best describes the assessment criteria: 1 represents “poor”; 2 represents “adequate” and 3 represents “very good”. Space has been provided at the bottom of the page for any additional comments.

<table>
<thead>
<tr>
<th>Online Delivery System #1: (document system name)</th>
<th>Does/ Is this online delivery system:</th>
</tr>
</thead>
<tbody>
<tr>
<td>POOR</td>
<td>ADEQUATE</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
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<td>1</td>
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<td>2</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Online Delivery System #2: (document system name)</th>
<th>Does/ Is this online delivery system:</th>
</tr>
</thead>
<tbody>
<tr>
<td>POOR</td>
<td>ADEQUATE</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
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<tr>
<td>1</td>
<td>2</td>
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<td>1</td>
<td>2</td>
</tr>
<tr>
<td>POOR</td>
<td>ADEQUATE</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

6. Contain a blog site where the learners (i.e. teachers) can consult with other learners?

<table>
<thead>
<tr>
<th>POOR</th>
<th>ADEQUATE</th>
<th>VERY GOOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

7. Cost-effective (minimal to no cost for use)?

**Online Delivery System #3**: (document system name)

**Does/ Is this online delivery system:**

<table>
<thead>
<tr>
<th>PROPERTIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. User-friendly for me, as the designer?</td>
</tr>
<tr>
<td>2. User-friendly for the learners (i.e. teachers)</td>
</tr>
<tr>
<td>3. Permit delivery of text, audio, graphics and videos?</td>
</tr>
<tr>
<td>4. Enable interactivity for the users?</td>
</tr>
<tr>
<td>5. Provide the ability for me, as the developer, to monitor and manage this interface?</td>
</tr>
<tr>
<td>6. Contain a blog site where the learners (i.e. teachers) can consult with other learners?</td>
</tr>
<tr>
<td>7. Cost-effective (minimal to no cost for use)?</td>
</tr>
</tbody>
</table>

**Comments:**

___________________________________________________________________________________
___________________________________________________________________________________
___________________________________________________________________________________
APPENDIX L

RUBRIC FOR EVALUATING INSTRUCTIONAL MATERIALS*

Directions: Use the following rubric to evaluate the instructional materials to be used for the TIPAC curriculum. Space is provided in left column to mark your conclusions and the assessment criteria are provided in the right column. Space has been provided at the bottom of the page for any additional comments.

<table>
<thead>
<tr>
<th>Goal-Centered Criteria: Are the instructional material:</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
</tr>
<tr>
<td>1. Congruent with the learning objectives?</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>2. Adequate in content coverage and completeness/</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>3. Authoritative?</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>4. Accurate?</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>5. Current?</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>6. Objective?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Learner-Centered Criteria: Are the instructional materials appropriate for learners’:</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
</tr>
<tr>
<td>1. Vocabulary?</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>2. Motivation and interest?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Learning-Centered Criteria: Do the materials include:</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
</tr>
<tr>
<td>1. Appropriate content sequencing/</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>2. Presentations are complete and current?</td>
</tr>
<tr>
<td>No</td>
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<td>3. Practice exercises are congruent with the goal?</td>
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<td>No</td>
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<tr>
<td>4. Appropriate assessments?</td>
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<table>
<thead>
<tr>
<th>Context-Centered Criteria: Are/ do the instructional materials:</th>
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<tr>
<td>No</td>
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<tr>
<td>1. Authentic for the online learning site?</td>
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<tr>
<td>No</td>
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<tr>
<td>2. Feasible for the online learning site?</td>
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<tr>
<td>No</td>
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<td>3. Require additional tools?</td>
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### Technical Criteria: Do the instructional materials have appropriate:

<table>
<thead>
<tr>
<th>No</th>
<th>Some</th>
<th>Yes</th>
<th>1. Delivery system and media for nature of objectives?</th>
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<td>No</td>
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<td>2. Graphic design?</td>
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<td>3. Legibility?</td>
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<td>No</td>
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<td>4. Audio and video quality?</td>
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<td>No</td>
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<td>6. Navigation?</td>
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<td>No</td>
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<td>7. Functionality?</td>
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</tbody>
</table>

Comments (Please document comment on back side)

*Adapted from the *Rubric for Evaluating Instructional Materials* (Dick, Carey, & Carey, 2015)*
APPENDIX M

RUBRIC FOR EVALUATING TIPAC

Directions: Use the following rubric to evaluate the TIPAC program. Please rate how much you personally agree or disagree with each of these statements. Use the following scale:

(1) strongly disagree
(2) disagree
(3) undecided
(4) agree
(5) strongly agree

Space has been provided at the bottom of the page for any additional comments.

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<tr>
<th>Clarity:</th>
<th>STRONGLY DISAGREE</th>
<th>DISAGREE</th>
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<th>STRONGLY AGREE</th>
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<tbody>
<tr>
<td>1. Overall, the TIPAC</td>
<td></td>
<td>1</td>
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<tr>
<td>curriculum clear.</td>
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<td>2. Overall, the TIPAC</td>
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<td>website clear?</td>
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<td>3. Overall, the TIPAC</td>
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<td>delivery system user</td>
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<td>friendly.</td>
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<td>4. Is it clear what you were</td>
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<td>supposed to learn from the</td>
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<td>TIPAC curriculum?</td>
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<td>5. The TIPAC materials</td>
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<td>directly related to the</td>
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<td>objectives.</td>
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<td>6. Sufficient practice</td>
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<td>1</td>
<td>2</td>
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<td>exercises were included in</td>
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<tr>
<td>the TIPAC instruction.</td>
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<tr>
<td>7. The TIPAC practice</td>
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<td>2</td>
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<td>4</td>
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<tr>
<td>exercises were relevant.</td>
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### IMPACT

<table>
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<tr>
<th>Objective</th>
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<th>STRONGLY AGREE</th>
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</thead>
<tbody>
<tr>
<td>1. Objective 1 of the TIPAC program was met.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. Objective 2 of the TIPAC program was met.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. Objective 3 of the TIPAC program was met.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. Objective 4 of the TIPAC program was met.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. Objective 5 of the TIPAC program was met.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. The TIPAC instruction was interesting.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. You are satisfied with the skills learned during the TIPAC instruction.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8. You are confident in your ability to incorporate physical activity during classroom instruction.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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</tbody>
</table>

### FEASIBILITY

<table>
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<th>Objective</th>
<th>STRONGLY DISAGREE</th>
<th>DISAGREE</th>
<th>UNDECIDED</th>
<th>AGREE</th>
<th>STRONGLY AGREE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. You believe you can set up your classroom in a manner to incorporate physical activity during classroom instruction.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. You believe you can adjust your time teaching to incorporate physical activity as part of classroom instruction.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. You have gained knowledge into the process of incorporating physical activity during classroom instruction.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
4. You are motivated to incorporate physical activity as part of classroom instruction.  | 1 | 2 | 3 | 4 | 5

**LIKELIHOOD:**
For this question, please use the following scale to identify your response:
(1) definitely Not
(2) not Very Likely
(3) unsure
(4) likely
(5) definitely will

<table>
<thead>
<tr>
<th>DEFINITELY NOT</th>
<th>NOT VERY LIKELY</th>
<th>UNSURE</th>
<th>LIKELY</th>
<th>DEFINITELY WILL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
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</table>

1. How likely are you to incorporate physical activity during classroom instruction?

Comments: Please comment on aspects of this program that were strengths or problems for you personally.

_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________
APPENDIX N

RUBRIC FOR EVALUATING FORMATIVE EVALUATION PROCEDURES*

Directions: Use the following rubric to evaluate the processes used during the formative evaluation of the TIPAC program. Space is provided in left column to mark your conclusions and the assessment criteria are provided in the right column. Space has been provided at the bottom of the page for any additional comments.

| Overall Formative Evaluation Design (one-to-one evaluation): Is/ does the design: |
|---------------------------------|-------------------------------------------------|
| No                              | Some                                            |
| □                               | □                                               |
| □                               | □                                               |
| Yes                             | □                                               |
| □                               | □                                               |
| □                               | □                                               |
| 1. Use multiple data-gathering strategies? |
| 2. Include summaries of the learners (i.e. teacher) comments to locate strengths and problems? |
| 3. Provide for adjusting/ refining materials and procedures prior to making TIPAC live? |

| Target Learners (five teachers selected to formatively evaluate TIPAC): Did learners: |
|------------------------------------------------|------------------------------------------------|
| No                              | Some                                            |
| □                               | □                                               |
| □                               | □                                               |
| □                               | □                                               |
| □                               | □                                               |
| □                               | □                                               |
| 1. Represent the target group? |
| 2. Receive an orientation to provide instruction? |
| 3. Complete and comment on post-tests? |
| 4. Mark unclear areas in their notepad? |
| 5. Question unfamiliar examples and suggest alternatives? |

| Evaluators: Did evaluators: |
|----------------------------|------------------------------------------------|
| No                          | Some                                            |
| □                           | □                                               |
| □                           | □                                               |
| □                           | □                                               |
| 1. Summarize the learners’ comments and responses? |
| 2. Identify strengths and pinpoint problems? |
| 3. Revise materials for obvious errors based on one-to-one evaluations? |

Comments:
_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________

*Adapted from the Rubric for Evaluating Formative Evaluation Procedures (Dick, Carey, & Carey, 2015)
APPENDIX O

NAVIGATE TIPAC HIERARCHICAL DIAGRAM

Navigate TIPAC Hierarchical Visual Diagram
Goal: After completion of the online TIPAC tutorial, the teacher will demonstrate how to navigate the TIPAC website.

Learning Domain: Psychomotor
Goal 12: Provided with a scenario, the teachers will differentiate between aerobic, muscle strengthening, and flexibility exercises.

Learning domain: Intellectual
Goal 7: Provided with a scenario, the teacher will identify the correct safety precautions to be considered when performing that exercise.

Learning domain: Intellectual
APPENDIX R

DETERMINE MODIFICATIONS FOR PHYSICAL ACTIVITY

HIERARCHICAL DIAGRAM

Determine modifications for PA Hierarchical Visual Diagram

Goal 18: Provided with a sample lesson, the teacher will identify at least one variation to a physically active lesson that can be performed for children with disabilities.

Learning domain: Intellectual
The learner (i.e., teacher) will identify at least one variation to an activity that can be performed for children with disabilities.

Identify time allotted for teaching specific concept.

Identify a room layout that will work for proposed physical activity.

Rearrange chairs/desks to allow room to perform physical activity if necessary.

Utilize resources in TIPAC to identify what exercises with modifications would be appropriate.

Choose any exercise with appropriate modification that works for the chosen lesson.

Review TIPAC modification module for modification examples.

Decide what directions need to be provided to the students.

Access TIPAC online.

Navigate website via links and documents.

Areas below dotted line are entry level skills and will not be taught.

Power up computer.
APPENDIX S

CLUSTER ANALYSIS DIAGRAMS FOR TIPAC CURRICULUM

1. After completion of the online TIPAC curriculum, the teacher will identify the purpose of TIPAC in the classroom via the online post-test.

- Define TIPAC
- Identify what led to the development of TIPAC.
- Identify the goal of TIPAC.
- Identify the components of the TIPAC website.

2. After completion of the online TIPAC curriculum, the teacher will differentiate between the terms overweight and obesity via the online post-test.

- Define the term overweight.
- Define the term obese.
5. After completion of the online TIPAC curriculum, the teacher will identify trends in the educational system related to physical activity within schools nationally via the online post-test.

- Describe the No Child Left behind Act
  1.
- Define recess.
  2.
- Identify national trend in schools related to time spent in recess

- Define Physical Education
  4.
- Identify national trends in schools related to Physical Education
- Identify exemptions to physical education class.

- Identify state Physical Education state standards specific to states (There will be a link to each state’s Department of Education)
  7

6. After completion of the online TIPAC curriculum, the teacher will identify safety precautions to be considered when having students perform exercises in the classroom via the online post-test.

- Identify proper technique for certain exercises (i.e. squats)
  1.
- Recognize importance of stretching
  2.
- Recognize importance of hydration
  3.
8. After completion of the online TIPAC curriculum, the teacher will identify 3 benefits of physical activity in the areas of physical, cognitive, and psychosocial.

1. List benefits of physical activity for the body.
2. List the cognitive benefits of physical activity.
3. List the psychosocial benefits of physical activity.

9. After completion of the online TIPAC curriculum, the teacher will identify the association between physical activity and academic performance via the online post-test.

1. Describe association of physical activity on academic performance.
2. Describe association of physical activity and on-task behavior/concentration.
3. Describe association of physical activity and how it affects brain chemistry.
10. After completion of the online TIPAC curriculum, teacher will identify the recommended daily/weekly dose (frequency and duration) of aerobic exercises, muscle strengthening exercises, and flexibility exercises via the online post-test.

Define aerobic exercises and their purpose
1.

Define muscle strengthening exercises and their purpose
2.

Define flexibility exercises and their purpose
3.

Identify the amount of time to be spent daily/weekly performing aerobic, muscle strengthening and flexibility exercises.
4.

11. After completion of the online TIPAC curriculum, the teacher will identify examples of aerobic, muscle strengthening, and flexibility exercises via the online post-test.

Describe specific aerobic exercises
1.

Describe specific muscle strengthening exercises
2.

Describe specific flexibility exercises
3.

13. After completion of the online TIPAC curriculum, the teacher will identify the association between type of exercise and bone health.

Define bone health
1.

Identify how aerobic and strength training exercises together impact bone health.
2.

Identify specific exercises that impact bone health.
3.
14. After completion of the online TIPAC curriculum, the teachers will identify potential barriers to activity implementation in the classroom.

Identify physical barriers to activity implementation in the classroom. 1.

Identify time constraint barriers to activity implementation in the classroom. 2.

Identify institutional support barriers to activity implementation in the classroom. 3.

Identify personal barriers (i.e. fear, change) to activity implementation in the classroom. 4.

16. After completion of the online TIPAC curriculum, teachers will identify 3 possible resources to utilize while developing physically active lesson plans for use in the classroom.

Define Energizers 1.

Define Let’s Move 2.

Define Take 10! 3.

Define Wisercise 4.

Identify how to utilize YouTube 5.

Identify TIPAC blog 6.
APPENDIX T

RESULTS OF INFORMAL INTERVIEW QUESTIONS

Three teachers from 3 different schools were interviewed. Teachers were selected from a list of my professional contacts.

Teacher 1 (T1)- teaches 3rd grade at local elementary in Brookpark, Ohio. Forty-six percent of children are on free and reduced lunch program. Teacher 1 is a male and has been teaching 20+ years.

Teacher 2 (T2)- teaches fifth grade at local elementary school in Akron, OH. One-hundred percent of children are on free and reduced lunch program. Teacher 2 is a male and has been teaching 17 years.

Teacher 3 (T3)- teaches first grade at a different local elementary school in Akron, OH. One-hundred percent of children are on free and reduced lunch program. Teacher 3 is a female and has been teaching 20+ years.

1. Questions to ANALYZE the LEARNER

A) Entry Level Skills (Skills that teachers already possess)

1. How would you describe your computer skills?

   T1- skills are intermediate. Has taught computer lessons to staff. Has taken a lot of online staff development courses. Is considered a “smart board guru”.

   T2- Proficient

   T3- Fairly good- can navigate clear links

2. Have you ever taken an on-line course before?

   T1- Has taken on-line safety courses 3x/ year for several years. It includes watching videos, reading slides, and completing post-tests.

   T2- yes

   T3- yes
Knowledge of the trends in childhood obesity

1. Can you tell me any personal or professional experiences you have had with childhood obesity?

T1.- No personal experience. Just remembers growing up and the kids that were overweight were not the athletes.

T2.- Yes- personal- when he was working on his PhD his focus was obese students. This brought awareness to self that an obvious problem is bullying, which leads to learner confidence/ self-worth. This continues to spiral negatively and the obese student must try to overcome this. There is no middle of the road- the obese student either thrives or withdraws. It is a whole lifestyle- multifaceted- with a sedentary life consisting of video games and lack of stimulation.

T3.- kids are getting bigger and bigger as years ago on. Has taught for 23 years- “It mortifies me that 1st graders weigh more than me”. She had a 1st grader that wore a size 16 and a few of her students weighed more than her. The food pantry at the school is full of processed foods- it is a vicious circle- the link needs to be broken.

2. Can you describe any trends in childhood obesity within your school?

T1.- At his school, 1 in 4 kids is overweight or obese. He sees this to be the percentage in every grade in his school. States that over the years this has gotten worse with much younger kids being heavier now.

T2.- increasing over the years. There are no schoolwide programs to combat it. Kids come in to school daily with soda and hot fries. While there is “talk” out there, there is nothing in practice.

T3.- Obesity has become an epidemic. Kids are getting bigger and bigger. Also it is scary on playground duty because kids that are bigger can knock over the smaller kids.

3. Do believe the trends in childhood obesity are comparable to other local schools or specific to just your school? Please elaborate.

T1.- describes this as covering both ends of the spectrum. Some kids go to the rec for after school care where they are in physical activity programs and some kids use technology as a babysitter.

T2.- Not sure- but guesses it is more prevalent at his school because of low socioeconomic status.

T3.- Not just an Akron problem. Some places are worse than others. Poverty areas are worse.

4. Can you describe any trends in childhood obesity locally, state-wide, nationally, globally?
**T1-** States he believes in Ohio the percentage of kids obese is 1 in 3 but is unaware of any statistics outside of Ohio.

**T2-** Not sure of facts. Believes there are some cultures that have it under control. ‘America is in a bad place right now’.

**T3-** At least a national problem. Global is unknown.

### B3) Knowledge of physical activity trends and physical activity recommendations for children

1. **Within your school, can you describe any changes that have occurred regarding time allotted for physical activity (such as recess or physical education class)?**

   **T1-** Nothing has changed as far as time except for less time being spent outside if weather does not hit 20 degrees. Recess is 30 minutes every day. PE is 30 minutes twice a week taught by a PE teacher. He believes there is actually more aerobics being done in PE class.

   **T2-** Losing time - cut back on recess from 30 minutes to 15 minutes. Losing time probably started 10 years ago. It is 100% linked to testing. PE remains 1 period for 45 minutes per week. This has not changed.

   **T3-** Recess was shortened again last year from 15 minutes to 10 minutes a day. 18 years ago they used to have 2 recesses - one was 30 minutes and one was 15 minutes. PE has not changed - still one 45 minute period a week.

2. **Do believe the changes or lack of changes in time allotted for physical activity is comparable to other local schools or specific to just your school? Please elaborate**

   **T1-** He says his school has not made changes in 25 years. The PE philosophy has changed though because they are now responsible for testing.

   **T2-** yes

   **T3-** yes- trend is lessening physical activity time and increasing academic time

3. **Can you describe any trends in time allotted for physical activity in schools locally, state-wide, or nationally?**

   **T1-** Unable to describe trends for other schools. States he believes more schools are increasing physical activity programs.

   **T2-** Time taken away

   **T3-** trend is lessening physical activity time and increasing academic time

4. **Can you tell me the current recommendations for daily physical activity for children?**
5. In your opinion, do you believe your students are meeting the recommended daily amount of physical activity?

T1- Not all kids. States that he believes half of kids are because they are involved in sports outside of school.

T2- No

T3- PA is related to culture- at some places it is not safe to go outside. Would rather be on game systems and watching movies. Kids don’t need to be inventive or creative!

6. Can you describe some benefits associated with daily physical activity for children?

T1- healthier, weight decrease, BP good

T2- healthy body; healthy mind. It is a “release”. Active student is more aware and alert. When lethargic, mind is lethargic.

T3- mental health- focus better, retain better. Physically healthier. Everything is affected in a positive way. (although “sometimes get stinky”-smiles)

B3) Knowledge of Implementing Physical Activity in the Classroom

1. Can you please describe your typical school day, including time spent teaching each subject?

T1- Beginning of day- has kids move from one point of room to the other to complete 2-3 tasks.
Bell work- 20 min
LA- 1.5 hrs.
Math- 1hr
Special- 30 min
Lunch/recess- 1 hr. 10 min (lunch 30 min/ recess 30 min- transition- 10 min)
Social studies- 40 min
Science- 40 min
Spelling/ Title 1/ Reading/ Enrichment- 30 minutes
Handwriting- whatever time is left- 2nd and 3rd grade only

T2- Bell work- sitting 10-15 min
Transition to other 5th grade room
1 hr. in class- science, health, S.S.
1 hr. math in morning plus about 30 min F/U math in afternoon
(S.S. and health is not tested in 5th grade- so there is a lot more attention on science and math)

**T3**-
- Unpack and get ready
- Bell rings at 8:00
- 8:30 specials start
- 9:20- go to bathroom as a class
- 9:30- switch classes- writing taught –
- someone else teaches reading
- Science/ social studies/ health/ phonics
- 30 minute blocks times 1.5 hours. Kids move class to class.
- 11-12- centers/reading groups- every 20 minutes kids move station to station. She has them move in different ways- crawl, hop, jump, etc…)
- 12 noon- bathroom break as a class
- 12:10-12:20- recess
- 12:20-12:50- lunch
- Afternoon is math and intervention
- 2:30 day ends

2. Have you ever considered incorporating physical activity within the classroom- please explain why or why not.

**T1**- used to start morning with jumping jacks, sit-ups, push-ups and squat thrusts. If kids are dragging during mid-day then he gets them up moving. Takes bathroom breaks as a class so they all have to get up and moving. A lot of kids in his class are very competitive with fit tracking (i.e. use of Fitbit)

**T2**- yes- more awareness of movement. Gets kids up not so much with physical activity but for a break of getting them out of their seat. Takes a few minutes every day to get kids moving- sometimes they walk to corner of the room. About 2 minutes total.

**T3**- uses PAX behavior program. It is the best in-service she has attended. It is scientifically based- medically based- looks at brain functioning. Calls class to attention with a harmonica because there is no brain association with that (clapping your hands may sound like gun fire)
When you laugh and act silly- it focuses you and calms you down
The way I works is that you have to be quiet for a certain period of time- start low. If class quiet for 2 minutes without demonstrating more than 4 negative behaviors then they are rewarded with a prize. This prize may be 30 seconds of acting goofy or a 15 second drumroll using their fingers. The kids absolutely loved it. Her class of 6 year olds actually got up to 15 minutes of being quiet and 95% of the time they earned their reward. Using this method this year (1st year she used it- she saw a 100% growth in math and reading!!) She implemented it about 3 times a day.
Saw a huge improvement with the kids!

3. Do you believe you have the skills to incorporate exercise into the classroom? If yes, please describe those skills, If no, please describe what you believe is missing.
| T1 | limited skills- can do jumping jacks and basic exercises. Sometimes uses extra recess that his kids earn. |
| T2 | No. Has awareness only. Is fascinated by the pedal floor bikes. |
| T3 | knows a lot about the PAX program |

### B3) Knowledge of Resources available for Physical Activity Implementation

1. **What is your current knowledge of methods for incorporating physical activity in the classroom?**

   - **T1**: very basic. Jumping jacks and calisthenics.
   - **T2**: Low- non-proficient. It is difficult because anything his class does active affects the kindergarten room below them on the first floor. (The kindergarteners will hear the pounding of them jumping).
   - **T3**: PAX program only and getting kids to go to bathroom as a class to get them out of their seat and moving

2. **Can you describe any resources or programs available to help you incorporate physical activity while you are teaching?**

   - **T1**: has heard of “Go Noodle”. He does not use it but other teachers do. It is mostly songs.
   - **T2**: No
   - **T3**: not officially. Does stuff on own and uses the PAX program. Knows of Go Noodle as well. Knows there are websites out there with info though.

### C) Attitudes toward TIPAC content and the online delivery system

1. **Based upon what I have shared with you regarding the objectives of TIPAC, what are your initial thoughts about this program?**

   - **T1**: Great idea! Especially if it can be done in short increments.
   - **T2**: Excited
   - **T3**: Thinks it is “fabulous”. If you do things the same way you will not get different results. Need to learn new things and change it up.

2. **What are your initial thoughts regarding learning the TIPAC program via an online delivery system?**

   - **T1**: On-line is the best way to do it.
   - **T2**: Way to go- would definitely try it
**T3-** Likes it because you can do it on your own time. No time to go to an in-service. The downfall is human access- the blog is a good idea and allows for continuity.

**D) Motivation to learn this information**

1. **If provided with education and resources about implementing physical activity while you are teaching, would you be interested in learning more? Why or why not?**

   **T1-** yes- especially if there is an academic benefit for his kids.

   **T2-** yes- It is needed. It is a vital component to education that is not getting addressed.

   **T3-** yes

2. **What would motivate you to learn more about incorporating physical activity into the curriculum?**

   **T1-** Seeing an academic increase in his kids

   **T2-** “To me and many the results are what matters. If there is a shred of evidence student performance improves I'm in. (As a side note I would be willing to try as a pilot program because I KNOW the results will be there!)”

   **T3-** Anything to help her kids. Sees where it is trending and does not like it. Wants to help kids more than just teaching them ABC’s and 123’s. If there is success with academics than this is even more of a motivation.

3. **To what extent would offering continuing education credits for this program motivate you to learn more about TIPAC?**

   **T1-** He needs 6 hrs. of academic credit or 90 CEU’s (he thinks). If it can meet some of that criterion it would be helpful.

   **T2-** “The ceu (u is for units I think) it's a great idea. We have to do it and if there is a proven student improvement piece then sign me up. Most of our ceu programs are either redundant or just scheduled at a convenient time”.

   **T3-** Would highly motivate!

**E) Attitudes about workplace and support provided within the workplace**

1. **Do you work as a team (i.e. co-teach) or do you work autonomously?**

   **T1-** Currently co-teaches with a student teacher. He does plan lessons with another 3rd grade teacher but does not truly team teach.

   **T2-** He teaches the science, S.S., health and math. Other teacher teaches language arts and reading.

   **T3-** yes
2. Can you describe the support you usually have from administration or other teachers when implementing a new teaching method or program within the school?

T1 - Great support! If there is a benefit for the kids then administration is very supportive.

T2 - Principal is outstanding! “Don’t care about support from other teachers”.

T3 - Principal is fabulous - very supportive. Other teachers not as supportive. If the principal buys in then it is easier to get other teachers on board.

3. What does your network of professional teachers look like (do you have individuals you can collaborate with to discuss classroom teaching strategies? (within this building, local schools, state-wide, nation-wide)?

T1 - Occasionally gets together with other teachers at an in-service. Does share things with other teachers in other districts through Google drive.

T2 - Good network of collaboration

T3 - Primarily with others in the same school. Does have friends and personal contacts that are teachers

4. What barriers to you anticipate with altering a teaching method?

T1 - Time! And Something New - It is - a change!

T2 - Time, Physical setup (i.e. kindergarten room is right below his classroom)

T3 - Staff buy in - also kid buy in - but that is not as difficult with younger kids

2. Questions to Analyze the PERFORMANCE CONTEXT

1. Is this the room you typically teach in?

T1 - low ceiling. Does have AC. No open space. 26 desks. Storage and cabinets surround walls. Sink in room. Table for reading groups. Is able to use hallways for PA since room is located at end of hall away from other rooms.

T2 - yes. Typical room layout

T3 - Typical classroom- lockers, shelves, counters, smartboard, a few tables

2. Throughout your years of teaching, have ALL of your classrooms been similar to this? Please describe if the answer is no.

T1 - In the past has had larger classrooms
2. No- the old building was 2x the size.

3. similar

3. Do you believe there is enough room to get kids moving (performing physical activity) within this classroom? Why or why not?

T1- could move desks to make some room. Maybe zigzag through desks. Can use courtyard if warm.

T2- yes (but with hesitation). It depends on how much movement and how loud the kids are. 10 jumping jacks cannot be done because of the class below.

T3- No- never big enough. But moves desks and sometimes gets on the floor for activities

4. Would you consider changing the layout of the classroom to allow for more movement if needed? Why or why not?

T1- yes. But does like kids in pods of 4 because it is harder to manage them that way.

T2- sure

T3- If a better layout could be found

3. Questions to Analyze the LEARNING CONTEXT

1. Where would you most likely complete the TIPAC online training program?

T1- at home. Some people may choose to stay at school though. He owns a Laptop and IPad that the school supplies.

T2- at home on personal IPad

T3- Most likely at home but possibly at school

2. What type of computer will you most likely be using to conduct the TIPAC online training (personal computer, IPad, work computer).

T1- Laptop- has MAC at home but school gives them a Dell.

T2- IPad- will not use personal computer at home

T3- home or work computer- laptop

3. Do you have access to WIFI?

T1- yes- at school and home. The school blocks some sites though making it trickier to access things.
4. Do you have access to headphones?

T1- yes
T2- yes
T3- yes

5. Will the location you will most likely complete the TIPAC online training program have space to move around?

T1- yes
T2- yes
T3- yes