School based intervention for promotion of fitness and academic performance in third grade children

Kami L. Fox
The University of Toledo

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School Based Intervention for Promotion of Fitness and Academic Performance

in Third Grade Children

An evidence-based project submitted in partial fulfillment of the requirements for the
degree of Doctor of Nursing Practice

By

Kami L. Fox

2014
University of Toledo
Abstract

Fox, Kami Lyn. D.N.P., Department of Nursing, University of Toledo, 2014.
School Based Intervention for Promotion of Fitness and Academic Performance in Third Grade Children

**Purpose:** This evidence-based project explored the effect of a school-based activity program, Activity Bursts in the Classroom, on Fitnessgram outcomes and academic measures. Activity Bursts in the Classroom was developed by David Katz, MD and was implemented in a Missouri school system with reported improvements in upper body strength and trunk flexibility measurement on Fitnessgram. The PICOT question was: in third graders, how does a school-based physical activity program affect fitness levels and academic performance over a nine-week period within a school year?

**Theoretical Rational:** The revised Pender’s health promotion model provided the framework for influencing biological, psychological and sociocultural factors that lead to health promoting behavior. Gardner’s theory of multiple intelligences and incorporation of kinesthetic learning principles were included. A new conceptual model, Fox’s Cradle of Impact, was developed to illustrate the effect that a nurse practitioner can have on health behavior and Larrabee’s model for evidence based practice change guided the project.

**Current Evidence:** Analysis of the literature supported that increased physical activity can improve fitness levels and promote movement of BMI to a healthy level below the 85th percentile. One program was not singled out as the “best”. Different programs showed improved levels of fitness in different populations.

**Participants:** Fifty-five third graders in a rural Midwest public school system.

**Methods:** Teachers implemented ABC for Fitness in the Classroom for nine weeks. Fitnessgram measured aerobic capacity, muscle strength, endurance, flexibility and BMI at baseline and completion of the program. Aggregate academic measures included math timed tests during the program, pre and post-program AIMS web testing, and STAR testing. The teachers were given an ABC for Fitness in the Classroom questionnaire at the end of the program for evaluation.

**Outcomes:** Significant finding were reported in the curl-up portion of Fitnessgram measures, but not in the mile run, push-ups, back-saver reaches or body mass index (BMI). AIMSweb testing showed significant changes in reading comprehension and math concepts. No significant findings were reported using the math timed tests. Teacher surveys reported ease of the instructions and implementation of the program, but the most common barrier reported was lack of time in the classroom to incorporate five minutes of exercise per learning period to reach the 30-minute goal each day.
Conclusion: This project was practical, and affordable in implementation. Daily recess and twice a week physical education classes were part of the children’s activity and may explain teacher perceptions that incorporating 30 minutes additional was difficult and considered a negative aspect of the program. The teachers did support the philosophy of kinesthetic learning and planned to keep some of the activities ongoing, but no plans were made to measure and meet the 30-minute daily goal. In the future, implementing the program for longer periods and comparing third grade classes over three to five years could provide more information. Activity Bursts in the Classroom is a feasible and free program that could also be used in kindergarten through fifth grade which could be an entire elementary school program. Routine academic testing provides a valued measure for teachers and including them as measurement outcomes adds information to support or negate the mind-body connection. Ultimately, implementation of Activity Bursts in the Classroom will be challenging when teachers view inclusion of the program as taking increased time away from instruction rather than improving delivery and engagement with material.
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School Based Interventions for Promotion of Fitness and Academic Performance in Third Grade Children

Problem

The evidence-based practice project evolved from clinical experience, national initiatives, and a belief in primary prevention. While working in a pediatrician’s private practice, some school-age children in our practice were greater than the 85th percentile for body mass index (BMI) measurements. Children below the 85th percentile met guidelines for a healthy weight, but questions remained regarding levels of fitness. The private practice served a rural population, and hospital-based obesity programs were available at children’s hospitals, but required more than an hour of travel and only served children that met criteria of obesity. An office-based program was developed for children with a BMI greater than the 85th percentile, but it was not successful because of poor reimbursement and parental commitment to out-of-pocket expenses for the visits.

Barriers to care and problems with fitness are not unique to the office setting. Nationwide problems exist. Physical inactivity contributes to approximately 191,000 deaths in the United States and 1.9 million deaths worldwide. Worldwide estimates indicate that 60% of people are not meeting the minimum requirements of physical activity to achieve health benefits. Evidence links physical inactivity to coronary artery disease, obesity, Type 2 diabetes, and some cancers. It is estimated that 31.7% of youth ages 2-19 years of age are overweight (Racette, Cade, & Beckmann, 2010, p. 1214). National costs for diabetes complications in 2001 were estimated at 3.8 billion dollars yearly (Agency for Healthcare Research and Quality, 2005). In 2008, obesity cost approximately 147 billion dollars (Centers for Disease Control and Prevention, 2011). The cost to our national healthcare budget is great whether analyzing obesity
independently or in relation to affiliated diseases. The current economic climate demands health care reform, and interventions to promote fitness in children and prevent obesity have global implications. Healthy People 2020 identified the need to promote physical activity and identified objectives for Educational and Community-Based Programs (ECBP). Interventions are encouraged for pre-schoolers (ECBP1.7), students in K-12 (ECBP 2.9) and population-based primary prevention (ECBP 10.9). Nutrition and weight status objectives were aimed at reducing the proportion of children and adolescents who are obese (NWS 10) and preventing inappropriate weight gain in children 6-11 years of age (NWS 11.2) (2012). In addition, the National Association of Pediatric Nurse Practitioners (NAPNAP) established an initiative to combat pediatric obesity and developed a program Healthy Eating and Activity Together (HEAT) to assist practitioners with evidence-based recommendations to meet the needs of the pediatric population (National Association of Pediatric Nurse Practitioners, 2010).

When considering the statistical findings regarding the impact of obesity and the development of professional initiatives, the problem is evident. In a rural Midwest private practice, interventions were not financially lucrative and few patients followed thru with programming. School age children spend a large portion of their time in school, not in a practitioner’s office. Consequently, the time has come to expand nurse practitioner services beyond the office and into the community, where children and families are spending their time. The evidence-based project assessed the effectiveness of a physical fitness program designed to increase activity and fitness in school-age children. The PICOT question was, in third graders, how does a school-based physical activity program affect fitness levels and academic performance over a nine-week period within a school year?
The following operational definitions were used for the PICOT question. Third graders included boys and girls currently enrolled in the third grade at the participating elementary school. School-based physical activity program was defined as a program that incorporated gross motor movement during the scheduled school day. Academic performance was defined as student performance on math and reading tests and were measured with AIMSweb, STAR, and math timed tests.

**Conceptual Frameworks**

The PICOT question guided the program selection forward in an effort to choose a program that was based on current evidence published in the literature and supported by appropriate theoretical models. The PICOT question established measurable outcomes that contributed to the current body of knowledge and established the value of the program. Multiple conceptual models were used. Nursing models from Pender explained health promotion, and Larrabee’s model guided evidence-based practice change. Fox’s cradle of impact was a new model developed to compliment Pender’s health promotion model by adding in the element of energy and movement to demonstrate impact and pattern of change. Gardner’s theory of multiple intelligences supported the mind-body connection and kinesthetic learning. Each model or theory is detailed in the following sections.

**Nola Pender’s Revised Health Promotion Model**

The idea of promoting health in an effort to improve the quantity and quality of life is not new. Nola Pender first advocated a focus on health promotion in the seventies. The first version of the health promotion model (HPM) was presented in 1982 and the HPM revised was published in 1987 (Sakraida, 2002). Pender clearly explains that health promotion is not disease prevention.
Health promotion is behavior motivated by the desire to increase well-being and actualize human health potential. Disease prevention, also called health protection, is behavior motivated by a desire to actively avoid illness, detect it early or maintain functioning within the constraints of illness. (Pender, Murdaugh, & Parsons, 2011, p. 5)

The framework recognizes the direct relationship between promoting physical activity and promoting health across the lifespan. Pender, Murdaugh and Parsons write, “… origins of chronic diseases can be found in childhood, pointing to the critical need to focus health-promoting approaches on young children as well as adults “ (2011, p. 9). “Longitudinal studies are needed to identify changing activity patterns and successful strategies to promote physical activity across childhood and adolescence” (Pender et al., 2011, p. 147). Pender, Murdaugh and Parsons support the recommendations of the Department of Health and Human Services for 60 minutes or more of moderate physical activity daily and stipulate that activities should be aerobic, muscle strengthening and bone strengthening activities that are age appropriate, varied and enjoyable (2011).

Pender, Murdaugh and Parsons expand the model from an individual perspective to one of community. By engaging the community and working on change at that level, the ability to make population changes exists. The assumption is that by influencing the community as a whole, values and norms can be established and this leads to change in individual behaviors as well (2011).

The framework is applicable for this project because of recognition that physical activity should be promoted in the community schools. Pender writes that schools can play a large role in promoting health and fitness for our children. Promoting fitness in the school environment can lead to a more active generation that chooses a more active lifestyle. Pender felt that schools
could provide a healthy environment to promote activity during the school day or after school (2011).

As evidenced above, Pender’s revised health promotion model fits well with a school-based intervention project. The model recognizes the individual’s characteristics and experiences as well as the influences of the community. It proposes that an individual then chooses to commit to a behavioral change for promotion of health based on influences of perceived benefits, costs, ability to be successful (self-efficacy), activity related affect, interpersonal influences and situational influences (2011).

School-based intervention affects the Interpersonal Influences part of the model that is created by family, peers, health care providers and in this setting, teachers. The model proposes, “given sufficient motivation, individuals are likely to undertake behaviors that will be socially reinforced” (Pender et al., 2011, p. 48). Pender, Murdaugh and Parsons discuss the role of physical activity in health promotion and the benefits of physical activity to improve “cardiovascular fitness, increases in bone mass, and enhances well-being…” (2011, p. 147).

The framework not only recognizes the influences of the school and staff, but that health promotional activities must radiate to the family, community, and society if we are to turn the tide and improve health in the United States. Pender, Murdaugh, and Parsons suggested assessing physical fitness by more than one indicator: cardio-respiratory endurance, muscular endurance, body composition, and flexibility (2011, p. 94-98).

**Fox’s Cradle of Impact**

After studying and contemplating the health promotion model, a new model was created to illustrate the impact that a nurse practitioner can have in promoting healthy behaviors.
The model is based on the desk toy, Newton’s Cradle. The new model is Fox’s cradle of impact and is illustrated in figure 1. Newton’s Cradle can be considered a toy, but it demonstrates the three principles of physics: conservation of energy, conservation of momentum and friction (Schultz, n.d.). The balls are of equal size and density in order for the momentum to transfer to the next ball. Theoretically, this symbolizes that all factors are equal partners in affecting change. When the balls are still, they represent potential energy. In this state, no movement or action occurs.

The doctorate of nursing practice (DNP) practitioner has the power to pull back the first ball, then release. Now the potential energy has created kinetic energy with the pull of gravity and it is released through the system. The momentum and energy of the first ball is transferred through all others until an equal reaction is seen in the student. Once the student receives the energy, that ball then rises and falls back to send energy through the others ultimately affecting the DNP. The DNP can then catch the energy and swing back and away to gain a broader view.
of factors affecting health promotion. The DNP can see policies in need of development and revision then advocate for evidence-based change at the local, state, and national levels. The more elastic that the balls are (which could equate to adaptability and resilience), the longer that the balls move back and forth. If forces of friction are present (which could equate to barriers and resistance to change) the balls slow and stop. This model completes Pender’s model as it initiates the energy for the health promotion model to occur.

**Gardner’s Theory of Multiple Intelligence**

Howard Gardner developed the theory of multiple intelligences. The basic idea of the theory is that humans do not learn in one way, but in many. Individuals may have preferred ways of learning that work well for them. The theory explored seven different types of intelligences: linguistic, musical, logical-mathematical, spatial, bodily-kinesthetic, interpersonal and intrapersonal (2011). When considering physical fitness and body movement in learning, this evidence-based program supports the bodily-kinesthetic intelligence. Bodily-kinesthetic intelligence can be demonstrated in a couple of different ways. First, it can be evident in controlling one’s body motions (as in the ability to perform both gross and fine motor movements) and the ability to handle objects skillfully. It is a balance or harmony between a “mind trained to use the body properly, and the body trained to respond to the expressive powers of the mind” (Gardner, 2011, p. 219). Most segments of the body and nervous system participate in motor actions. The motor axis of the nervous system controls skeletal muscle contraction and the sensory receptors relay information from the body back to the brain so adjustments can be made (Guyton, 1991). This type of intelligence is evident in the dancer, actor, athlete, and inventor.
When children exercise, they use their minds to control their body movements. Even though not every child may develop into an excellent athlete, the mind is still controlling body movements and the more that the mind repeats the command, the more that the muscles of the body learn to respond and adjust to the desired movement. As our bodies move and the speed and pace increase, the need for oxygen increases resulting in an elevation of the respiratory and heart rate to meet the physiological demands of the physical activity. This feedback mechanism intricately connects the mind to the body.

The Mind-Body Connection

Expanding on the physiology of the human body and the connection to cognition, consider the general functions of the nervous system. “Sensory detection, information processing (memory, learning, perception, planning and implementation of motor commands, and emotions), and behavior” (Berne & Levy, 1993, p. 98). When our bodies are moving and exercising, proteins (insulin-like growth factor and vascular endothelial growth factor) circulate through the body and “play pivotal roles in the mechanisms of our highest thought processes” (Ratey & Hagerman, 2008, p. 5). One can think of exercise as way to set the stage for improved learning of new content. The connections of the brain improve and wear a path of memory resulting in increased learning and recall.

Ratey and Hagerman demonstrated the connections with a school-based program called Zero Hour in Naperville, Illinois. Students begin the Zero Hour at 7:00 AM before school starts. The students run a mile and monitor their time and heart rate. The physical education teachers supervise the program. The most exciting findings reported that the students improved their fitness (3% of sophomores were overweight) and the eighth grade students completed the Trends in International Mathematics and Science Study (TIMSS) and scored sixth in math and first in
the world in science. Students that needed remediation in reading volunteered to work harder than other students and maintained 80-90% of their maximum heart rate. The rationale is to send them into the classroom with heightened awareness and proteins circulating that will increase their focus and maximize their learning. The students improved in literacy 17 percent as compared with 10.7 percent improvement in students that did not participate in the program. Guidance counselors recommended that students take their most difficult classes after the gym time (Ratey & Hagerman, 2008).

Lengel and Kuczala propose bringing the physical activity to the classroom. They report that the physical activity in the classroom creates a more fun environment that has led school districts to report increased spelling assessment in second graders, increased benchmark scores, and increased levels of student attention, participation, and engagement (2010).

**Larrabee’s Model for Evidence-Based Practice Change**

The evidence-based model used to guide the project was Larabee’s model for evidence-based practice change (Ciliska et al., 2011, p. 255). This model includes six steps that guide a practitioner from the beginning of problem identification to the end of integrating and maintaining a change in practice. The model is based on principles that supported quality improvement and the use of teamwork tools, fitting the purpose of this project. Implementation of a school-based program hinges on the buy-in of the stakeholders. The local school districts have limited employment of school nurses. No area school districts have school-based clinics. Consequently, school personnel delivered the program.

Step 1 of the model discusses the need for a change in practice. Clinical experience in a local pediatrician’s office identified barriers to care that led to poor compliance with an office-based educational offering. The educational offering addressed lifestyle changes to promote
fitness in children and their families. It was difficult for families to travel to the office weekly, and avoid conflicts with work and school schedules. Evening clinical appointments were available one night a week and the office was not open on Saturdays. In considering another setting that would be more convenient for families and a place where children already traveled, the local school seemed like a logical setting. Only school-based programs were researched for implementation.

Discussions with a family member who was a seventh grade student at the local school lead to the discovery that Fitnessgram was currently being used in physical education classes. The investigator was familiar with Fitnessgram because it was used in published articles as an objective measurement of fitness outcomes.

The Cooper Institute created Fitnessgram in 1982. Kenneth H. Cooper, MD, MPH founded the Cooper Institute in 1970 and the organization is dedicated to research in preventative medicine and providing evidence regarding the effects of physical activity on health. Fitnessgram is a licensed program that measures physical performance through aerobic capacity, muscle strength, endurance and flexibility, body composition and student activity (Fitnessgram, 2011). Each fitness test within the program is scored and falls into a Healthy Fitness Zone (indicated in green) or a Needs Improvement Zone (indicated in red). The plan is for the battery of fitness tests in Fitnessgram to be completed at the beginning of the school year as a baseline and then to have the measures repeated after nine weeks at the end of the program (pre-test, post-test design). Morrow, Martin, and Jackson reported reliability and validity as good for Fitnessgram and not effected by confounding student or school characteristics (2010). The reliability and validity were estimated from contingency tables. The modified kappa coefficients indicated substantial agreement, and phi and chi square results were significant. Logistic
regression suggested agreement between testers demonstrating acceptable validity (Morrow, Martin, & Jackson, 2010).

Initially, the investigator met with the physical education teacher at the local school district. During this meeting, the physical education teacher discussed his use of a CD on a computer to implement Fitnessgram for elementary and junior high students. The physical education teacher was satisfied with the use of Fitnessgram since it measured several areas of fitness, but measurements of student height and weight for BMI calculation were not performed. The physical education class provided time to administer the battery of tests, but no other staff members were available to perform height and weight measurements. He shared the performance results with the students during physical education classes. The physical education teacher only used the CD on one laptop and the process was time consuming. Students viewed his or her results on the laptop that had the CD loaded. The physical education teacher wanted to expand the program to a web-based version of Fitnessgram. Transitioning to the web-based version would allow students and families’ access to the information from any computer with the student’s identification number and password.

The physical education teacher agreed to discuss an evidence-based program aimed at increasing physical activity and promoting fitness. The physical education teacher agreed to serve as a consultant for the project and assist with presentation of the intervention to the principals, superintendent, and school board if necessary.

Step 2 of Larrabee’s model addresses locating the best evidence and identifying the types and sources of the evidence. The literature review was conducted after consideration of concepts and consultations with a research librarian. Details are discussed in the next section.
Step 3 of the model encompasses critically analyzing the evidence. The appraisal included high-level evidence articles from various databases and provided information regarding interventions that had significant relationships with fitness and/or academic performance. Proposed interventions posed minimal risk to healthy students and were feasible. Participation in the studies by students was voluntary. All interventions required implementation and recording of data by teachers. Obtaining teacher buy-in was critical in implementing the program at the school.

After the school-based programs were critically analyzed, the doctor of nursing practice (DNP) student selected the Activity Bursts in the Classroom program to present to the school district administrators and faculty. After discussing the program with the superintendent, selection of a practice change team occurred. Key members of the school system (stakeholders and facilitators) were invited: the physical education teachers, the school nurse, superintendent, and principal. Since the teachers are unionized, the principal spoke with teachers in private and received approval before allowing the DNP student to attend a meeting. Second thru fifth grade teachers were invited, but only third-grade teachers agreed to hear more information.

Activity Bursts in the Classroom was explained and discussion of kinesthetic learning principles occurred. The following potential barriers were addressed: cost, teacher buy-in, retention, and failure to consistently implement or record interventions and/or outcomes throughout the program period. Based on initial inquiry and follow-up conversations, the administration, third-grade teachers, physical education teachers and the school nurse supported the implementation of the program for only a nine-week period of time. The program was offered for one academic year, but the teachers chose not to commit to the entire school year. The recommendation for the nine-week program was made to the superintendent and received
approval as dictated by school policy. The school board did not need to approve the program. The teachers agreed to implement the program in the classroom; The school nurse agreed to perform the height, and weight measurements and the physical education teacher agreed to administer Fitnessgram as usual, but report on the new web-based version provided by the DNP student. Step 4 of Larrabee’s model, program implementation, and Step 5, evaluation of outcomes, are discussed in more detail in a later sections.

Collecting internal and external data and identifying a problem are actions included in Step 1 of the model. The problem links to interventions and outcomes with the development of the PICOT question. The PICOT question that emerged was: In third graders how does a school-based physical activity program affect fitness levels and academic performance over a nine-week period within a school year?

**Step two of Larrabee’s model: locating the best evidence.**

Identification of relevant literature began by performing a literature search for the years 2001-2011 in Cumulative Index to Nursing and Allied Health (CINAHL), Cochrane Library, Education Resources Information Center (ERIC), MEDLINE, PubMed and guidelines.gov. Subject headings (MeSH terms) searched included: obesity, physical fitness, childhood obesity. Key words searched: Fitnessgram. Limits included: 6-12 year olds, academic journals and obesity prevention or health promotion when available in the database. Inclusion articles reported school-based interventions and significant academic and/or fitness outcomes (BMI, percentage of body fat, endurance, strength, flexibility, or aerobic capacity). Eight articles met the inclusion criteria: six from CINAHL, one from the Cochrane Library, and one from ERIC. Table 1 provides a summary of the search.
### Table 1: Summary of Literature Search

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<th>Date of Search</th>
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<th>(MH) Terms Used</th>
<th># of Hits Listed</th>
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<th>Used</th>
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<td>3/20/11</td>
<td>CINAHL</td>
<td>Fitnessgram (Key word)</td>
<td>Limit: 2001-2011: 18</td>
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Hierarchies of evidence (Fineout-Overholt, Melnyk, Stillwell, & Williamson, 2010, p. 48) and a rapid critical appraisal tool (O’Mathuna, Fineout-Overholt, & Johnston, 2011, p. 99) guided the selection of pertinent articles. The hierarchy of evidence ranged from one to eight with level I indicating the highest level of evidence. Level I, II, III, VI, and VII articles were
located in the literature search. The Agree Appraisal Instrument was used to evaluate the two
guidelines identified in the literature search (Agree Collaboration, 2004). The Agree
collaboration tool recommended that four independent reviewers use the tool and independently
assess the guideline. One evaluation was performed on each guideline. The instrument assessed
at six different areas: scope and purpose, stakeholder involvement, rigor of development, clarity
and presentation, applicability, and editorial independence. The guideline from the Endocrine
Society (based on data and expert opinion) included: prevention, office-based screening, and
first line treatment prescribing healthy diet, increased physical activity and behavioral
modification (2008). The Endocrine Society’s guideline scored strongly in all, but the following
categories: stakeholder involvement (8/16), and applicability (4/12).

Recommendations from the National Association of Pediatric Nurse Practitioners
(NAPNAP) guideline included a toolkit for clinical practice, healthy eating, increased physical
activity and decreased sedentary behavior (2006). NAPNAP’s guideline scored
similar to the one developed by the Endocrine Society, but there was an additional weakness
noted in the Editorial Independence category (2/8). This rating occurred because there was no
discussion of an external review board and the project was funded in part by NAPNAP.
NAPNAP developed and published the guideline, which was consistent with position statements
published by the American Heart Association (AHA), and the American Academy of Pediatrics
(AAP). NAPNAP’s guidelines addressed recommendations for the office setting as well as
identifying the need for advocacy and collaboration with the schools and community at large.
Use of rapid critical appraisal tools insured the validity and reliability of the studies (O’Mathuna,
Fineout-Overhold, & Johnston, 201, pp. 99, 114, & 123). The systematic reviews were included.
All studies reported effective interventions and recommendations: increase physical activity (particularly during the school day), and improve nutrition (decrease fat and increase fruit and vegetables) Budd & Volpe, 2006; Dobbins, DeCorby, Robeson, Husson, & Tirilis, 2009; Jimenez-Pavon, Kelly, & Reilly, 2010. In the systematic reviews, a single intervention was not used, but interventions were generally categorized (i.e. increase in physical activity). For example, increasing physical activity during the school day showed improvements in BMI, but different types of physical activities were used.

In appraising Level II and Level III studies, one randomized control study linked increased fitness to decreased levels of fatness during the intervention period over the school year, but results were not maintained over the summer months (Gutin, Yin, Johnson, & Barbeau, 2008). A second study, even though it included a control group, the sample was not a randomized sample and was categorized as a Level III study (Katz et al., 2010). The study had a large number of subjects (N=1,124) and was conducted in a single school district in the Midwest. The study reported significant relationships between increased physical activity during the school day and increased abdominal strength, improved trunk extensor movement (flexibility) and decreased BMI. Other articles were reviewed and were found to have lower levels of evidence, even though they matched the inclusion criteria. Appendix A summarizes the included studies and reports the level of evidence for each.

**Step three of Larrabee’s model: analyze the evidence.**

Synthesis of the evidence was conducted. Systematic reviews, guidelines, and research studies all described the effect of increasing physical activity as a way of promoting health and fitness (Gutin, Yin, Johnson, & Barbeau, 2008; Katz et al., 2010; Racette et al., 2010). Methods to increase physical activity were different in all included studies. One intervention was an after-
school program (adult supervision) that included an initial forty-minute session for a healthy
snack and academic enrichment activities followed by 80 minutes of physical activity. The
program reported significant decrease in BMI, but results were not sustained in the summer
months. Participation was voluntary (Gutin et al., 2008).

An intervention that occurred during the school day was Activity Bursts in the Classroom
(ABC). The program was implemented during the academic day (for students 6-12 years of age)
and required teacher training. The proposed hypothesis was that increasing physical activity
would decrease restlessness in the classroom and improve fitness. Teachers incorporated 30
minutes of activity bursts per day. Activities included: warm ups, stretches, arm circles, jumping
jacks, hopscotch etc. The ABC curriculum and teacher manual was available online at no cost
(David L. Katz, 2011). This study reported an increase in upper body strength and improved
trunk extensor movement. The ABC program was implemented in a Missouri school district and
required no extension of the school day. The program incorporates bursts of activity during
transition times in the classroom (Katz et al., 2010).

The last study included in the review (Racette et al., 2010) involved multi-faceted
interventions including: WittFitt training and exercise balls in the classrooms instead of chairs, a
walking school bus, and a cross-curricular program that encouraged children to walk to a chosen
world destination. Children used pedometers (provided at no cost). Approximately 2000 steps
equated to a mile. This study included 23 Midwest schools and included a sample of 12,000.
Each child developed a “Fit for Life” portfolio that shared information with parents and
documented the child’s progress. Two Zumba classes were conducted at the school in
collaboration with the local YMCA. Table 2 summarizes synthesis of the articles.
Table 2

Synthesis Table of School-Based Health Promotion Programs’ Outcomes

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Intervention</th>
<th>Decrease BMI</th>
<th>Increase Strength</th>
<th>Increase of Flexibility</th>
<th>Increase Endurance</th>
<th>Increase Aerobic Capacity</th>
<th>Increase in Academic Achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gutin, B. et al.</td>
<td>Planet Health Dance for Health</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The systematic reviews evaluated outcomes, but not cost. Cost and teacher training are considerations when choosing an intervention. The public schools were financially burdened. The investigator anticipated and received no funding from the school district. All schools in the rural Auglaize County filed waivers offered by the state to avoid BMI measurements that were mandated in Senate Bill 210.

Of the three programs evaluated, only two programs were implemented during the school day. After consideration of feasibility, availability of volunteers after school for supervision and lack of transportation home for an after-school program, two programs were further evaluated that were delivered during the school day. Table 3 summarizes the two programs’ interventions presented in the literature and considers cost and teacher training.

**Step four of Larrabee’s model: design a practice change.**

Step four of Larrabee’s model defines the proposed change, identifies resources, and designs the evidence-based program and develops the plan. Based on the evidence and cost, Activity Bursts in the Classroom for Fitness was chosen as the intervention. The program had been trialed in another Midwest school district with students in second, third and fourth graders and significant results were reported. The curriculum for the program was free and available
Table 3

Summary of Interventions for Selected School-Based Health Promotion Programs

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Rationale</th>
<th>Expected Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Implement an intervention to promote increased physical activity.</strong></td>
<td>All guidelines, systematic reviews and descriptive studies support that increased physical activity is associated with increased fitness.</td>
<td>Improved fitness measures as evidenced by Fitnessgram testing done at baseline and at the end of the year. Improved Standardized Test Performance</td>
</tr>
<tr>
<td><strong>Option 1: ABC for Fitness</strong></td>
<td>Curriculum available in PDF format online for free. Content: incorporating short bursts of activity into the normal school day (Goal: 30 min./day) Cost: Free Teacher training: Yes</td>
<td>Improved fitness measures as evidenced by Fitnessgram testing done at baseline and at the end of the year. Improved Standardized Test Performance</td>
</tr>
<tr>
<td><strong>Option 2: Walk around the World</strong></td>
<td>Not a copyrighted program. Plan and implementation strategy would need to be developed. Content: to be determined Cost: Pedometers approximately $3.50 each Teacher Input: Yes</td>
<td>Improved fitness measures as evidenced by Fitnessgram testing done at baseline and at the end of the year. Improved Standardized Test Performance</td>
</tr>
</tbody>
</table>

online. The online curriculum is designed for teachers to incorporate fitness into the classroom. The teacher’s manual included possible seating plans, sample warm up exercises, core exercises and cool down activities along with pictures and descriptions of age appropriate exercises. The program addressed possible problems and listed strategies to overcome the problems. The program also includes an evaluative survey. Physical fitness outcomes were measured with Fitnessgram’s battery of physical fitness tests that provided measurements of body composition, BMI, muscle strength, endurance and flexibility & aerobic endurance.

When the battery of tests in Fitnessgram were administered by teachers in Texas, the reliability and validity of Fitnessgram was reported as good and acceptable (Morrow, Martin, &
Jackson, 2010). Investigators recommended continued use of Fitnessgram as a valid and reliable measure. Logistic regression and repeated tests were performed on 1,010 students twice.

Another reason to record the BMI readings into the Fitnessgram outcomes was Ohio Senate Bill 210. Ohio Senate Bill 210 was introduced on 11/17/2009 and passed in the house and the senate by 6/3/10. The bill mandated: restrictions of high sugar beverages, restrictions for vending machines, curriculum on physical activity and nutrition taught by a licensed physical education teacher, measuring of BMI, and establishment of a clearinghouse for best practices regarding physical activity, nutrition and BMI. Nutrition standards were in effect for the 2011-2012 school year and an option for waiver of BMI was offered for the past two years (Ohio Legislative Service Commission, 2011; Ohio Department of Education [ODE], 2012)). In 2013, Senate Bill 316 made BMI measurements in the schools optional (Ohio Department of Education [ODE], 2013. No waivers need to be filed. Even though schools are not mandated, a school could still volunteer to perform the BMI measurements.

For this project, the school nurse agreed to perform height and weight measurements in accordance to guidelines provided by the Ohio Department of Health for accurate height and weight measurements developed for schools (Ohio Department of Health [ODH], 2010). Proposed interventions posed minimal risk to healthy students and were feasible. Student participation was voluntary. Activity Bursts in the classroom required implementation and recording of data by teachers. Consequently, obtaining consent and cooperation from participating teachers was necessary.

Fitnessgram measurements are recorded before and after the program, ABC for Fitness, (Dinapoli & Lewis, 2008). The superintendent, elementary principal, the physical education teachers, the school nurse and the DNP student attended an informational meeting. ABC for
Fitness was presented to the staff. After discussion, the elementary principal agreed to present the program to teachers in grades 2-5. The third grade teachers were the only grade level to agree and a second meeting occurred that allowed them to ask questions before committing to the project. In an effort to gain cooperation and collaboration, the DNP student agreed to include academic testing outcomes into the program. The teachers requested that AIMSweb testing for reading and writing, STAR testing for reading and timed math tests be included outcomes for pre-program and post-program comparison.

After this meeting, the teachers agreed to implement during the fall of the 2012-2013 school year. Projected enrollment for third grade in the 2012-2013 school year was 65 and the actual third grade enrollment was 70. The principal signed a letter of commitment and it is included in Appendix B. A change to actual estimated timeline is provided in Table 4.

Fitness outcome measurements were recorded through the web-based Fitnessgram software. Transitioning to the web-based program involved a cost of $650.00 plus a $50.00 technical assistance service. The DNP student donated the money for the upgrade. It is a one-time expense with a $50.00 technical support fee yearly that the school can elect to purchase.

**Step five of Larrabee’s model: implement and evaluate.**

The school completed the necessary scheduled hardware upgrade and was able to support the program in August of 2012. The doctoral student provided training and a PDF copy of the Activity Bursts in the Classroom program to the third grade teachers. A copy of *The Kinesthetic Classroom* by Traci Lengel and Mike Kuczala was given to the third grade teachers, physical education teachers and the elementary principal (2010). *The Kinesthetic Classroom* explained the brain-body connection and offered many examples of activities that could be incorporated into the classroom.
Table 4

*Timeline of Evidence-Based Project*

<table>
<thead>
<tr>
<th>Month/Year</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>March/2012</td>
<td>Letter of Support</td>
</tr>
<tr>
<td>May/2012</td>
<td>ABC Curriculum available to participating teachers - meeting</td>
</tr>
<tr>
<td>June/2012</td>
<td>Defense of Proposal</td>
</tr>
<tr>
<td>July-August/2012</td>
<td>IRB review</td>
</tr>
<tr>
<td>July/2012</td>
<td>Computer upgrades finished at the school to allow the purchase and uploading of Fitnessgram</td>
</tr>
<tr>
<td>October, 2012</td>
<td>Provide consent forms to children in school to be taken home to parents</td>
</tr>
<tr>
<td>October-December, 2012</td>
<td>Data collection: Baseline Fitnessgram measurements, AIMS web testing, math timed tests Implement the 9 week ABC for Fitness program</td>
</tr>
<tr>
<td>January 2013</td>
<td>End of data collection: ABC for fitness program completed. Post-program Fitnessgram measurements, AIMS web testing and math timed tests Celebration</td>
</tr>
<tr>
<td>February-November 2013</td>
<td>Data analysis and preparation of evidence-based practice paper</td>
</tr>
<tr>
<td>December 2013 – February 2014</td>
<td>Committee revisions and defense preparation</td>
</tr>
<tr>
<td>March 2014</td>
<td>Disseminate results to school website and present to the board of education Final defense</td>
</tr>
</tbody>
</table>

Participating teachers were provided desk pad calendars to serve as a daily log to record time spent on physical activity in the classroom. Stickers were provided to each teacher and when the daily time allotment for his or her class was met, a sticker was placed on the calendar. If the 30-minute goal was not reached, the teachers recorded the time spent on the physical activity on the calendar. At the end of the program, the calendar sheets were collected for data and the teachers kept the desk calendars.
Table 5 provides a summary of the estimated program costs. The doctoral student covered the cost of the project. The anticipated outcomes are an improvement in Fitnessgram baseline scores, which are anticipated to have a direct relationship with physical fitness. A copy of a Fitnessgram sample report is provided in the Appendix C.

Table 5

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Kinesthetic Classroom text for participating teachers $27.48 X 5</td>
<td>$137.40</td>
</tr>
<tr>
<td>Fitnessgram web-based version 9 plus technical support package</td>
<td>$650.00</td>
</tr>
<tr>
<td>Activity Bursts in the Classroom program</td>
<td>Free</td>
</tr>
<tr>
<td>Desk pad calendar @ $4.99 X 6</td>
<td>$29.94</td>
</tr>
<tr>
<td>Stickers to place on calendar when activity is completed 70 for .99cents X 4</td>
<td>$3.96</td>
</tr>
<tr>
<td>Celebration snack</td>
<td>$60.00</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>$881.30</strong></td>
</tr>
</tbody>
</table>

As requested by the third-grade teachers, inclusion of AIMSweb reading and math testing were performed at baseline and after the program. The test was already a part of the third grade curriculum and was scheduled for the beginning of the school year and at the end of each nine weeks. The test assessed student academic progression and measured students at benchmark or identified students at risk so added interventions are carried out to maximize their learning and help them show expected growth during the school year (AIMSweb website, 2010). Only aggregate data were reported and no individual scores were analyzed.
AIMSweb has several published articles that have reported reliability and validity information. The articles are included in a training workbook and report reliability when using the test-retest procedure that would be performed for this program and third grade students were included in the studies. In first through sixth graders, reliability measurements were greater than .91 which indicates acceptable reliability. Research regarding the validity has reported consistent measurements when compared to the Stanford Achievement Tests (AIMSweb, 2002).

The STAR reading test was administered as scheduled and a growth report showing advancement or decline was available in January of 2013 (Renaissance Learning, Inc., 2007). Generic reliability estimates for the STAR were reported between 0.89 and 0.92 and the test, re-test reliability was reported at 0.94. These values are high and suggest that the STAR is a reliable too. The validity for the STAR was measured with correlation estimates. Values reflected well on the STAR’s ability to measure reading achievement (Renaissance Learning, Inc., 2007). Lastly, the third grade teachers wanted to follow performance trends on math timed tests. Only aggregate data regarding math-timed tests was collected.

**Ethical and Legal Considerations**

Regarding ethical and legal considerations, this intervention was not high risk, but because children were involved, parent consent and child assent were obtained. Children participated on a voluntary basis and only children that were physically able to participate in physical education class were included. A sample parental consent letter for inclusion in the program is included in Appendix D. A sample student assent form is included in Appendix E. In accordance with IRB recommendations, teacher consent was obtained as well. A sample teacher consent form is included in Appendix F. All signed consents were secured at the University of Toledo. No invasive procedures were required, but measurements of students’
individual height and weight were obtained while providing privacy as recommended by the Ohio Department of Health. The physical education teacher entered the height and weight measures into the Fitnessgram program and Fitnessgram calculated the students’ BMIs. The proposed AIMSweb, STAR testing, math-timed tests and Fitnessgram measurements are all a routine part of third grade curriculum and no special allowances or changes occurred because of the program. Only aggregate data were reported and students’ identities were protected.

Implementation of the program was tracked by having the teachers log time performing physical activity in the classroom for the nine-week period using stickers on the provided desk calendars. The third graders also continued their usual and customary daily 30-minute recess, but this time was not logged because not all students were physically active during recess. Third-graders actively participated in a 45-minute gym period two days a week. The physical education teacher reported that he consistently had the kids moving for 30 minutes of time during the gym class. The 30 minutes of physical activity twice a week in gym class counted toward the 30-minute goal for the day.

**Outcomes of the implementation included physical and academic performance.** Fitnessgram measures recorded aerobic capacity, muscle strength, endurance and flexibility, and body composition. Appendix G provides a sample score sheet with specific tests performed (walk time, curl-up, trunk lift, etc.). The physical education teachers used the mile run time (aerobic capacity), push-ups (upper body strength and endurance), curl-ups (abdominal strength and endurance), back-saver reaches to the right and left (flexibility), and BMI (body composition) as outcome measurements of fitness. Fitnessgram measures were entered into the web-based program by students or the physical education teacher and the DNP student was given
a temporary ID and password to gain access to reports of performance for the pre and post program measures.

As the teachers requested, AIMSweb pre and post program scores and success on math timed test scores were collected. STAR reading tests were administered pre and post program and recorded as gains or losses in expected reading levels. After the program was completed, the ABC for Fitness program evaluation form was given to the teachers who had the responsibility of classroom implementation and it is included in Appendix G. The ABC evaluation form provided Likert types of responses and had available space for free-text responses.

Outcomes of Program Implementation

The project completed as scheduled in January of 2013. Findings are discussed in four areas: Fitnessgram, AIMS web, math timed tests, and teacher evaluations. Consent letters were sent home with 70 students and consent was obtained for 55 third-grade students. Fifty-five students signed assent forms and completed the program.

Fitnessgram Results

Student results for Fitnessgram were analyzed using a paired t-test. In an effort to decrease the risk of Type 1 error because of multiple tests (6), a Bonferroni correction was calculated (normal significance level (0.05/6) to establish a new level of significance at 0.0083. When applying the new level of significance of 0.0083, only the curl-up performance on Fitnessgram was statistically significant (0.000) for improvement. Table 6 summarizes the paired t-test findings for all Fitnessgram outcomes.

After the nine-week program, no statistically significant changes were noted for the mile-run, push-up, back-saver reaches to the right and left and BMI. When analyzing BMI values, 10/55 (18.1%) students were over the 85th percentile meeting the overweight description and
5/55 (.09%) were over the 95th percentile and met the description of obese. An analysis of the scores of a subgroup of participants of those categorized as obese was conducted. An improvement in performance was noted for the mile run, and back-saver reaches (right and left), but improvements were not significant for this subgroup. The push-up average decreased indicating a decline in performance, but the findings were not significant. Lastly, the BMI average increased, but the finding was insignificant. It should be taken into consideration that the baseline Fitnessgram testing was performed outdoors in the beginning of the school year and the post-testing was completed inside the gym during the winter. The pre-test and post-test environments were different. Nine weeks is a short period.

### Table 6
Paired Samples Test for Fitnessgram Outcomes

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Pretest August</th>
<th>Posttest December</th>
<th>n</th>
<th>95% CI for Mean Difference</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mile Run</td>
<td>10.92</td>
<td>10.48</td>
<td>47</td>
<td>0.07, 0.79</td>
<td>2.42</td>
<td>46</td>
<td>0.19</td>
</tr>
<tr>
<td>Push-ups</td>
<td>16.11</td>
<td>14.48</td>
<td>54</td>
<td>0.13, 3.12</td>
<td>2.19</td>
<td>53</td>
<td>0.03</td>
</tr>
<tr>
<td>Curl-ups</td>
<td>29.67</td>
<td>34.28</td>
<td>49</td>
<td>-6.36, -2.86</td>
<td>-5.30</td>
<td>48</td>
<td>0.00*</td>
</tr>
<tr>
<td>Back-saver reach right</td>
<td>7.55</td>
<td>7.97</td>
<td>49</td>
<td>-0.82, -0.03</td>
<td>-2.16</td>
<td>48</td>
<td>0.03</td>
</tr>
<tr>
<td>Back-saver reach left</td>
<td>7.55</td>
<td>7.97</td>
<td>49</td>
<td>-0.082, -0.03</td>
<td>-2.16</td>
<td>48</td>
<td>0.03</td>
</tr>
<tr>
<td>BMI</td>
<td>17.68</td>
<td>17.76</td>
<td>55</td>
<td>-0.22, 0.05</td>
<td>-1.15</td>
<td>54</td>
<td>0.25</td>
</tr>
</tbody>
</table>
AIMSweb Testing

The AIMSweb tests measure reading concepts, reading comprehension, math concepts and math computations. Each child is categorized as green (on target for learning), yellow (cautionary – further assess and consider more intense instruction), or red (begin immediate problem solving). Figure 2 summarizes the number of students who were identified as “green”, “yellow” and “red” for Fall testing (August) and shows changes that occurred with the Winter testing (January) for reading. The greatest movement was for six students who moved from “green” to “yellow”. Figure 3 summarizes the number of students who were identified as “green”, “yellow” and “red” for Fall testing (August) and shows changes that occurred with the Winter testing (January) for reading comprehension. The greatest movement for reading comprehension was also for six students who moved from “green” to “yellow”. Figure 4 summarizes the number of students who were identified as “green”, “yellow” and “red” for Fall testing (August) and shows changes that occurred with the Winter testing (January) for math concepts. The greatest movement in this test was for nine “green” students who moved to “yellow” and three students who moved to “red”. Figure 5 summarizes the number of students who were identified as “green”, “yellow” and “red” for Fall testing (August) and shows changes that occurred with the Winter testing (January) for math computations. The greatest movement was for five “green” students who moved to “yellow”. The teachers use the testing as formative evaluations to identify areas of weakness for students and guide remediation in the four content areas. AIMSweb testing was planned for the 3rd nine weeks and at the end of the year. The number of students who were identified as “on target” declined in each category, but students are learning new content throughout the year and the test increases in difficulty and benchmarks
Figure 2. Comparison of the number of students who are on target (OT) (green), cautionary (yellow) and needing immediate interventions (red) for August and January AIMSweb reading scores.
Figure 3. Comparison of the number of students who are on target (OT) (green), cautionary (yellow) and needing immediate interventions (red) for August and January AIMSweb reading comprehension scores.
Figure 4. Comparison of the number of students who are on target (OT) (green), cautionary (yellow) and needing immediate interventions (red) for August and January AIMSweb math concept scores.
Figure 5. Comparison of the number of students who are on target (OT) (green), cautionary (yellow) and needing immediate interventions (red) for August and January AIMSweb math computation scores.
change based on months. AIMSweb is not a true pre-test, post-test design, but is meant to move with the students as they gain knowledge and advance through the school year.

Further analysis of testing for this class throughout the third grade would be helpful and comparing data over several years for third graders would increase knowledge and strengthen conclusions that could be drawn.

Using McNemar’s statistic, the students were analyzed for movement between their first AIMSweb (Fall) in all areas and their second AIMSweb (Winter) in all areas. When looking at students movement toward improvement in the four areas, significant changes were identified for reading comprehension and for math concepts. The calculations are summarized in Table 7. One cannot contribute changes in these areas to the implementation of the program alone because academic curriculum is designed explicitly for improved academic student performance. Students are engaging with teachers every day in an effort to gain knowledge during the school year. A longitudinal comparison of third-graders and comparisons to third-graders that did not participate would be needed to draw further conclusion.

Table 7

McNemar’s Statistic Comparing Fall to Winter AIMSweb Categories

<table>
<thead>
<tr>
<th>Measure</th>
<th>n</th>
<th>McNemar’s Statistic</th>
<th>df</th>
<th>Significance (2-sided)</th>
<th>Significant (p &lt; .05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall compared to Winter Reading</td>
<td>55</td>
<td>4.571</td>
<td>2</td>
<td>.102</td>
<td>No</td>
</tr>
<tr>
<td>Fall compared to Winter Reading Comprehension</td>
<td>54</td>
<td>6.000</td>
<td>1</td>
<td>.014</td>
<td>Yes</td>
</tr>
<tr>
<td>Fall compared to Winter Math Concepts</td>
<td>55</td>
<td>13.000</td>
<td>3</td>
<td>.005</td>
<td>Yes</td>
</tr>
<tr>
<td>Fall compared to Winter Math Computation</td>
<td>55</td>
<td>2.667</td>
<td>1</td>
<td>.102</td>
<td>No</td>
</tr>
</tbody>
</table>
STAR Reading

The star reading assessment was assessed in August and again in January. The number is recorded as a positive or negative to indicate increase or decrease in ability reported in years and months. The sample had 54 matched results and the average gain for the students was 0.1481. This number indicates that as a whole, the class progressed in reading ability. In performing a t-test, comparing the mean to zero, the gain was not statistically significant (p=.219). The STAR reading assessment was given to students at the end of the year, but the data was not collected during the 9-week Activity Burst in the Classroom program.

Math Timed Tests

Math timed tests were given throughout the program time, but not all students had achieved the minimum goal of 95 correct in 3 minutes for addition and progressed to meeting the goal in subtraction. Teachers noted that subtraction is often more difficult and takes longer for students to obtain the goal. During the program time, 23/55 (41.8%) met the 3 minute goal for addition and 12/46 (26.0%) met the goal for subtraction. Students continued work on the skill after the program ended and final data at the end of the year was not collected.

Fidelity of Implementation

Students participated in 30 minutes of classroom activity 22 of days or 55% of the possible days. Nine hundred and twenty minutes of activity were recorded for an average of 23 minutes per day.

Teacher Evaluation

The teachers reported that the Activity Bursts in the Classroom was a program that was easy to use and understand. Three of the four teachers reported that their least favorite part of the program was implementing it during classroom time. Table 8 summarizes the Likert type
responses from the teachers. Teachers made the following comments as to what they liked the most about the program: “The activity was easy to use.”, “It was engaging.”, “The kids seemed to enjoy the exercises and being able to move around the classroom and hallways in a fun way.”, “Kids like it – they like leading.”, and “The kids really seemed to enjoy exercising…in fact, we are continuing to do so to this day.” Overall, the evaluation of the program was positive and the most difficult part of the program identified by the teachers was including the activity during classroom time.

Table 8 *Summary of Teacher Evaluation Responses*

<table>
<thead>
<tr>
<th>Question</th>
<th>Strongly Disagree</th>
<th>Disagree a Little</th>
<th>Agree a Little</th>
<th>Strongly Agree</th>
<th>Not Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy to Integrate in the schedule?</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Materials were engaging and appealing?</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Materials were easy to understand?</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Materials were useful?</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Materials were comprehensive?</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

**Discussion**

Compared to the previous program findings in Missouri, the outcomes of implementation in the selected setting of this project were different. In Missouri, significant improvements in upper-body strength (push-ups) and trunk extensor movements (back-saver) reaches were reported (Katz, et al., 2010). In this program, only the curl-up outcome significantly improved. It is possible that since the program only ran for nine weeks as compared to an academic year in Missouri that more measurements may have reached significant levels if the program had run
The comparisons in the Missouri study were fitness levels at the beginning of the year and at the end of the year. Racette, Cade, and Beckmann (2010) reported significant changes in five Fitnessgram measurements, but the study was conducted over a three-year period of time.

The BMI measurements did not change significantly and this is expected since the program only ran for nine weeks. If the program time was extended, annual measurements of BMI would be more likely to identify change. Ten out of 55 (18%) of students had a BMI over the 85th percentile (overweight) and five students out of 55 (0.09%) were over the 95th percentile (obese). Racette, Cade, and Beckmann (2010) reported that 31.7% of youth ages 2-19 years were overweight. In this program, 15 out of 55 students (27.27%) were over the 85th percentile. This was lower than previously reported statistics, but it is still concerning that over 25% of third graders included in the program were overweight. Current recommendations would warrant that these children be evaluated further for lifestyle choices in nutrition and activity. The study in Missouri did not include any academic outcomes and initial plans for this study did not include these outcomes, but were added upon the request of the teachers.

The program in its entirety with commitment to 30 minutes of activity a day was not continued. The teachers stated that they would continue to use activity burst activities in the classroom, but had no plans to continue tracking time or aspiring to the 30 minute goal. The teachers were satisfied with the web-based version of Fitnessgram and continued to use it to record children’s outcomes and communicate progress with parents through a link on the school’s web page. The program might have increased value in a school district that does not have daily recess.

If the teachers are concerned with loss of class time, the district could consider an active recess model. Currently, the children do have recess, but their participation in activity is
voluntary. Children can choose to sit and talk during recess time. Encouraging all children to participate in the activities may take more adult supervision on the playground which could be more costly unless volunteers were trained. If the program ran for a longer period of time, interval visits from the investigator would be recommended to follow-up with any concerns, answer questions, and observe classrooms. To increase student involvement and participation, students could take turns leading activities. The class could use computer time to search for new exercises to try in the classroom.

Regarding cost, Fitnessgram is not free. If a district does not have funds for a fitness-based software, it is possible that the measurements could be entered and tracked on an excel spreadsheet. This would be more cost effective, but would limit the ability to share outcomes as easily with parents at home. Individual results could be recorded in excel and then given to children to take home or sent individually to parents. Using excel would require more time from physical education teachers in collecting and sharing results.

In the future, it would be recommended to implement the program over an entire school year. Nine weeks is not a long time and seasonal changes prevented the pre and post Fitnessgram measures performed in the same environments (outdoor versus indoor). Missouri and Ohio were both rural settings, but the program could also be implemented in a city school with different results. If this program were implemented at another school, early stakeholder involvement, fitness outcome tracking and teacher commitment would be crucial to success. Ultimately, the goal is to reach 30 minutes of exercise in a day, the time does not have to be divided evenly between periods and some classes may be easier to include the physical activity than others. If a district has daily recess, the commitment could be to get all students moving during recess which would eliminate the bursts in the classroom. Whether the activity is a 30-
minute block of time or bursts in the classroom, the benefits to health are present and carry over to the next day.

The CDC does have a Comprehensive School Physical Activity Program (CSPAP) (2014). This program is designed to increase physical activity in kindergarten through high school. It makes suggestions to increase physical activity before, during and after school in an effort to reach the 60-minute recommendation for daily activity. The program is a step-by-step approach to increasing activity in the school, but specifics of programs are not outlined. The program is available on the website and there is no fee. The program is guide that stakeholders could use to develop a plan for their school. In relation to this project, Activity Bursts in the Classroom could be a specific program that could be used within the CSPAP.

When considering the role of the DNP, the DNP can contract with schools to collaborate with wellness and health initiatives. The DNP could provide the latest evidence regarding health and schools could assess what services were needed. The barrier will be funding.

In the past, health based initiatives and laws like Ohio SB 210 were passed to provide for measurements of BMI, but after discord, lobbying, and no funding, the law was changed and the BMI measurements were no longer required. The debate will continue regarding what schools are responsible for and what health professionals are responsible for, but the top priority should be providing services that are best for the children.

School-based clinics do exist in larger school districts like Cincinnati. These clinics serve faculty, students, and sometimes families. The clinics bill insurance companies and Medicaid for services, which sustain the clinics. In the rural community, data would have to be gathered from community assessments before a health care need could be identified and the proposal of a school-based clinic could be considered. The DNP could have an active role in the
community assessment, establishing a clinic, and providing services through the clinic. The current President of the Ohio Senate, Keith Faber, is a resident of a neighboring county. He was not a supporter of SB 210. He is a representative of the county and letters that support school health and healthy communities could be sent to him in an effort to build the political network of the DNP and develop another point of impact.

In reference to Fox’s cradle of impact, delivery of the program at the school allowed the DNP student to interact with the school and teachers in an effort to impact fitness of students. Students actively performing Activity Bursts in the Classroom allowed teachers to gather information that was shared with the DNP student to further contribute to current knowledge. As the DNP student receives the data and energy from the students, it allows for a broader perspective when considering school-based programs to increase physical activity. The broader perspective also affects current practice when encountering families in an office setting. DNPs need to continue to educate children and their families in all settings. Families pay taxes that support the school and if the community supports healthy initiatives for students, the public schools will respond to their stakeholders. DNPs, families, and communities can all communicate with legislators to support healthy lifestyles during the school day, but the current trend of mandating school policy and programming without funding is not working.

**Conclusion**

This project developed from the belief that pediatric obesity is not inevitable, but preventable. Pender’s health promotion model (revised) provided the theoretical foundation and Gardner’s theory of multiple intelligences supports the mind body connection in relationship to learning. Larrabee’s model for evidenced-based practice changes was the framework for the project. The development of Fox’s cradle of impact provide a conceptual framework for the
DNP. The model guides the DNP through interactions with community, families, and children that in turn provides the DNP with evidence that can be shared with legislators, school boards, school administrators, and teachers to have broader impact than the office setting.

Performance of a literature search provided the best evidence-based information on effective school-based interventions to increase physical activity and improve fitness. Based on the literature search, Activity Bursts in the Classroom (ABC) for Fitness was selected for the program. Physical education teachers, classroom teachers, school administration, school nurse, families and students are all key stakeholders to be considered in the program development and implementation process. Data were collected using Fitnessgram, AIMSweb testing, STAR reading assessment; Math timed tests and Activity Bursts in the Classroom evaluations. Significant improvements were noted in student performance of curl-ups in the Fitnessgram measures. AIMSweb analysis reported significant improvements for students in reading comprehension and math concepts. The STAR reading assessment showed improvement in performance, but the change was not significant. The teachers thought that the program was easy to understand and the instructions were not difficult, but finding the time in the classroom for the activity was a burden and they were only able to meet the 30-minute goal, 55% of the time. Activity Bursts in the Classroom is an affordable and feasible program that could be used by schools to increase levels of physical activity. Recommendations would include providing the program for an academic year and expanding the program to kindergarten through fifth grade. The program is recommended for these age groups and having all elementary grades participating could increase teacher commitment and offer collegial support.

Step 6, Larrabee’s final step, included celebrating the end of the program and the teachers requested yogurt “sticks” for all the students as an afternoon snack. Discussion of integration
and maintenance of the program, yielded a decision by the district to continue to use the web-based Fitnessgram, but to not continue the Activity Bursts in the Classroom. Larrabee’s final step includes dissemination of the findings to all stakeholders. A column will be written in the school’s quarterly newsletter and preparation of a poster presentation is planned. Preparation of an article for publication would promote dissemination as well. Regardless of the outcomes and the district’s decision to not continue the Activity Bursts in the Classroom program, evidence gathered lead to lessons learned and increased efforts to promote health and fitness for children.

To disseminate information in a broader way that could influence public opinion and policy, a process guide could be developed to assist other grades in this school district or other school districts interested in implementing Activity Bursts in the Classroom as a means to increase fitness. To share the importance of fitness and health with parents, schools and legislators, a one-page information sheets could be developed to handout highlighting the benefits of fitness on physical and mental health. Improving children’s health can be one small step toward development of a healthier adult population and decreasing health care costs for the state and the nation. The DNP is positioned to have an impact. The DNP sees the daily struggles of children and families within his or her communities and has the power to ignite change and influence public policy to promote health and fitness.
References


*Research Quarterly for Exercise and Sport, 81*(3), S24-S30.


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http://www.ode.state.oh.us/GD/Templates/Pages/ODE/ODEDetail.aspx?page=3&TopicRelationID=1793&ContentID=118761


Ohio Department of Health. (2010). Guidelines for measuring heights and weights and calculation of body mass index- for-age in Ohio’s schools. Retrieved from 

http://www.odh.ohio.gov/~media/ODH/ASSETS/Files/chss/school%20nursing/bmiscree ningguidelines.ashx


Appendix A

Summary Table of the Literature Review
First Author (Year) | Conceptual Framework | Design/Method | Sample/Setting | Major Variables Studied (and their Definitions) | Measures | Data Analysis | Findings | Appraisal: Worth to Practice |
--- | --- | --- | --- | --- | --- | --- | --- | --- |
Dobbins, M. et al. *The Cochrane Library* 2009; 3 | None | Systematic Review | 26 studies | Review of the Literature | Systematic Review | School-based interventions that worked: increased physical activity at school, at minimum, printed educational material & change curriculum to increase activity | Level I |
Gutin, B., et al. *International Journal of Pediatric Obesity* 2008; 3 CINAHL | Randomized Control Trial | 206 students | IV: Planet Health or Dance for Health DV: Fitness % body fat Bone density Weight Height BMI | Pre-post intervention | | Increased fitness Decreased Fatness only during school year-reverted over summer | Level II |
Katz, D.L. et al. *Centers for Disease Control* 2010; 7(4): 1-10 CINAHL | None | Randomized Control | N= 1,214 Elementary Students | BMI Academic performance Upper body strength Abdominal | Pre-post testing | Statistics | Intervention decreased BMI Increased Fitness Decreased | Level III Small study in one district |
<table>
<thead>
<tr>
<th>National Association of Pediatric Nurse Practitioners 2006; 78 pages</th>
<th>None Guideline</th>
<th>HEAT initiative Healthy Eating and Activity Together</th>
<th>Level VII</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Belief model &amp; Transtheoretic Model of Behavior or Change</td>
<td>School program devised from Cochrane Review</td>
<td>IV: fitness program DV: physical endurance, upper body &amp; abdominal strength, flexibility BMI academic performance</td>
<td>3 year Increase in all physical fitness measures, increase # healthy BMI, improved academic performance</td>
</tr>
</tbody>
</table>

**Table: School Based Intervention for Promotion of Fitness**

<table>
<thead>
<tr>
<th>Study</th>
<th>Description</th>
<th>Interventions</th>
<th>Outcomes</th>
<th>Evidence Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Association of Pediatric Nurse Practitioners 2006; 78 pages</td>
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<td></td>
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</tr>
</tbody>
</table>
Appendix B

Letter of Commitment
March 12, 2012
RE: Kami Fox’s Evidenced-Based Practice Project for the University of Toledo

Dear Committee Members:
Kami Fox has explained her evidence-based practice project. Our third grade teachers have agreed to implement Activity Bursts in the Classroom (ABC) for Fitness for nine weeks during the fall of the 2012-2013 academic year. I understand that she will move forward and obtain committee and IRB approvals as dictated by the University of Toledo. Inclusion into the study will be voluntary and all permission forms will be sent home with the third grade students at the beginning of the school year. The physical education teachers agree to participate and will continue using Fitnessgram as a tool for physical fitness measurement. Kami agrees to provide resources and any needed education for the teachers to implement the program. She agrees to share her findings with our staff when her project is complete.

Sincerely,
Appendix C

Fitnessgram Sample Report
FITNESSGRAM

Your scores on 5 of 6 tests were in or above the Healthy Fitness Zone. In addition to doing strength and flexibility exercises, you should play active games, sports, or other activities most every day.

VO2Max

Current: 55
Past: 45
VO2max is based on your aerobic test score. It shows your ability to do activities such as running, cycling, or sports at a high level. HF2 begins at 42.

Walk Time

Current: 14.45

(Abdominal) Curl Up

Current: 23
Past: 19

(Trunk Extension) Trunk Lift

Current: 11
Past: 11

(Upper Body) Push-Up

Current: 15
Past: 15

(Flexibility) Back-Saver Sit and Reach R, L

Current: 12.00, 10.00
Past: 9.00, 10.00

Percent Body Fat

Healthy Fitness Zone: 22.32
Needs Improvement: 10.38

Being too lean or too heavy may be a sign of (or lead to) health problems.

Instructor: Karla Tripp
Date: 05/22/2006
Height: 5' 5"
Weight: 140 lbs
Past: 05/16/2005
Height: 5' 6"
Weight: 135 lbs

Joe Jogger
Grade: 6 Age: 13
Cooper Institute Elementary School

Although your aerobic capacity score is very good now, you are not doing enough physical activity. You should try to play very actively at least 60 minutes at least 5 days each week to look and feel good.

To improve your upper-body strength, be sure that your strength activities include full push-ups, push-ups, and climbing activities. You may need to do more arm exercises.

Your abdominal and trunk strength are both in the Healthy Fitness Zone. To maintain your fitness, be sure that your strength-training activities include exercises for each of these areas. Abdominal and trunk exercises should be done at least 3 to 5 days each week.

Your flexibility is in the Healthy Fitness Zone. To maintain your fitness, stretch slowly 3 or 4 days each week, holding the stretch 20-30 seconds. Don’t forget that you need to stretch all areas of the body.

Joe, your body composition is in the Healthy Fitness Zone. If you will be active most days each week, it may help to maintain your level of body composition. You should also eat a healthy diet including more fruits and vegetables and fewer fats and sugars.

Healthy Fitness Zone for 13-year-old boys

Walk Test = 42 - 52 minutes

Cur-Up = 21 - 40 repetitions

Trunk Lift = 8 - 12 inches

Push-Up = 12 - 25 repetitions

Back-Saver Sit and Reach =

At least 9 inches on R & L

Percent Body Fat = 7.00 - 25.00 %

On how many of the past 7 days did you participate in physical activity for a total of 30-60 minutes, or more, over the course of the day?

On how many of the past 7 days did you do exercises to strengthen or tone your muscles?

On how many of the past 7 days did you do exercises to loosen up or relax your muscles?

Number of Days

4
2
3

To be healthy and fit it is important to do some physical activity almost every day. Aerobic exercise is good for your heart and body composition. Strength and flexibility exercises are good for your muscles and joints.

Good job! You are doing some aerobic activity and strength and flexibility exercises. Additional vigorous aerobic activity would help to promote higher levels of fitness.

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Appendix D

Parent Consent Form
This trial program at New Bremen is part of Kami Fox’s doctoral studies at the University of Toledo and she will be gathering data regarding Activity Bursts in the Classroom, Fitnessgram, AIMSweb testing and math timed tests. I understand that no individual students will be identified. The students that participate will be analyzed as a group.

She will perform statistical analysis under the supervision of her faculty advisor and share her findings with the university, district, parents and community.

Potential risks: There are minimal risks to participation in this study. If any student should trip or fall during the physical activity in the classroom or in the gym class the teachers will assess the seriousness of the injury and send your child to the school nurse if necessary. Activity Bursts in the Classroom incorporates movements like arm circles, marching, knee bends and stretching so the risk of any injury is low. Physical activity levels in gym class will be the same. There is a low risk that a breach of confidentiality could occur, but consent forms and data will be kept locked and secured at the University of Toledo and data will be coded so no personal identifiers are used.

Potential Benefits: The anticipated benefits are to make the classroom more fun and engaging. The benefits of exercise can also promote learning, improve memory, reduce stress and increase feelings of well-being.

Voluntary Participation: We invite all third grade students to take part in this evidence-based program trialing Activity Bursts in the Classroom, Fitnessgram fitness measures, and BMI screening, but it is your choice whether or not to allow us to screen your child for BMI and include the student’s anonymous information in the data collection. No action will be taken against you, your child, or the district or school if your child does not take part. In addition, you may discontinue participation in the data collection at any time without any penalty.

Continued on back…

Please be aware that if you do not sign and return this form, your child will still have the same classroom experiences, but the student will not be measured for height, weight, BMI or included in any of the data collection for the evidence-based program for the doctoral study. Please sign the form and return to school by October 29,
SCHOOL BASED INTERVENTION FOR PROMOTION OF FITNESS

2012. Thank you for considering participation in this research project so that we can continue to evaluate different classroom strategies to improve learning.

Child's Name: ____________________________ (Please Print)  Grade:  3

My signature below indicates my decision to have my child included in the data collection for the Activity Bursts in the Classroom program. I have read the information provided above, have had my questions answered, and agree to allow my child to participate in the research. Ethical standards require that the student assent or agree to participate in the research as well. Both consents are required before the student’s data will be included.

Parent or guardian’s Name: ____________________________ (please print)

Parent or guardian’s Signature: ____________________________  Date: __________

☐ I do not have internet access. Please send home my child’s Fitnessgram report in a sealed envelope

This Adult and Child Research Informed Consent document has been reviewed and approved by the University of Toledo Social, Behavioral and Educational IRB for the period of time specified below.

Approved Number of Subjects: 70

University of Toledo IRB Approved
Approval Date: 10/12/12
Expiration Date: 10/11/13
Appendix E

Student Assent Form
CHILD RESEARCH SUBJECT ASSENT FORM
School Based Intervention for Promotion of Fitness and Learning in Third Grade Children

Student Investigator: Kami L. Fox, MS, CNP
DNP student
419-305-5999

Faculty Advisor: Marilynne R. Wood, PhD, MSN, RN
Professor and Course Coordinator
Health Promotion, Outcomes, Systems, Policy Dept.
419-383-5870

• You are being asked to be in a study to help understand people better.
• You should ask any questions you have before making up your mind. You can think about it and discuss it with your family or friends before you decide.
• It is okay to say “No” if you don’t want to be in the study. If you say “Yes” you can change your mind and then quit the study at any time without getting in trouble.

We are doing a research study about moving your body during the school day so your brain gets a chance to wake up and help you learn. A research study is a way to learn more about people. If you decide that you want to be part of this study, you will be asked to join your class in doing different things like marching, clapping, arm circles, and dancing to wake up your body through the day. The class will do short 1-2 minute bursts of movement for a total of 30 minutes per school day.

Whenever people move, there is always the chance of an accident, like someone trips and falls, but the activity is meant to be fun and should not hurt.

Not everyone who takes part in this study will benefit. A benefit means that something good happens to you. We think these benefits might be that your body wakes up with the activity and your brain is able to learn better and remember more.

When we are finished with this study we will write a report about what was learned. This report will not include your name or say that you were in the study.

If you have any questions about the study, you can ask Mrs. Kami Fox. You can call her at the number listed at the top of this page if you have a question later.

If you decide to be in this study, thank you for helping me learn and please print and sign your name below.
I, ____________________________, want to be in this research study.

(Print your name here)

Sign your Name: ____________________________ Date: ____________________

University of Toledo IRB Approved
Approval Date: 10/12/12
Expiration Date: 10/11/13
Appendix F
Teacher Consent Form
CHILD RESEARCH TEACHER CONSENT FORM

School Based Intervention for Promotion of Fitness and Learning in Third Grade Children

Student Investigator: Kami L. Fox, MS, CNP
Faculty Advisor: Marilynne R. Wood, PhD, MSN, RN
DNP student Professor and Course Coordinator
419-305-5999 Health Promotion, Outcomes, Systems, Policy Dept.

This trial program at New Bremen is part of Kami Fox’s doctoral studies at the University of Toledo and she will be gathering data regarding Activity Bursts in the Classroom, Fitnessgram, AIMSweb testing and math timed tests. I understand that no individual students will be identified. The students that participate will be analyzed as a group. She will perform statistical analysis under the supervision of her faculty advisor and share her findings with the university, district, parents and community.

Potential risks: There are minimal risks to participation in this study. If any student should trip or fall during the physical activity in the classroom or in the gym class the teachers will assess the seriousness of the injury and send the child to the school nurse if necessary. Activity Bursts in the Classroom incorporates movements like arm circles, marching, knee bends and stretching so the risk of any injury is low. Physical activity levels in gym class will be the same. There is a low risk that a breach of confidentiality could occur, but consent forms and data will be kept locked and secured at the University of Toledo and data will be coded so no personal identifiers are used.

Potential Benefits: The anticipated benefits are to make the classroom more fun and engaging. The benefits of exercise can also promote learning, improve memory, reduce stress and increase feelings of well-being.

Voluntary Participation: We invite all third grade students and teachers to take part in this evidence-based program trialing Activity Bursts in the Classroom, but it is your choice to participate. No action will be taken against you, if you choose not to take part. In addition, you may discontinue participation in the data collection at any time without any penalty.
All children will still have the same classroom experiences. Please sign the form and return to school by October 29, 2012. Thank you for considering participation in this research project so that we can continue to evaluate different classroom strategies to improve learning.

My signature below indicates my decision to participate in the data collection for the Activity Bursts in the Classroom program. I have read the program information provided and have had my questions answered. Ethical standards require that the student assent or agree to participate in the research as well. Both parent, student and teacher signatures are required for participation.

Teacher’s Name: ______________________ (please print)
Teacher’s Signature: ______________________ Date: __________

This Adult and Child Research Informed Consent document has been reviewed and approved by the University of Toledo Social, Behavioral and Educational IRB for the period of time specified below.

Approved Number of Subjects:  70

University of Toledo IRB Approved
Approval Date: 10/12/12
Expiration Date: 10/11/13
Appendix G

ABC for Fitness Evaluation
ABC FOR FITNESS©

PROGRAM EVALUATION

If you have taught Dr. David Katz’s *ABC for Fitness*© program in a school or other setting, you are invited to provide your feedback. We value your comments on the teacher’s manual and your experience in teaching the program. Your comments will help us fine-tune future editions of the *ABC for Fitness*© manual to ensure that the program and information presented will best meet the needs of teachers, students, and parents.

Please complete and return this form to:
Judy Treu, Research Associate
Yale-Griffin Prevention Research Center
130 Division St., Derby, CT 06418
Phone: 203-732-1371
Fax: 203-732-1374
Email: judy.treu@yalegriffinprc.org

1. Who arranged to offer the *ABC for Fitness*© program in your local area?

   Name and title: __________________________________________________________
   __________________________________________________________
   School, district, agency, or organization: ________________________________ _______________
   __________________________________________________________
   Mailing address: ______________________________________________________
   __________________________________________________________
   Phone number: ______________________________________________________
   __________________________________________________________
   Email address: ______________________________________________________

2. If the current contact person for this program is different from above, please list the contact information for this person.

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

2. Please tell us how *ABC for Fitness*© was taught, or is currently being taught.

   When was it taught? ______________________________________________________
   (Please list months
2. Please tell us about your experience in using the manual and offering the program.

a. How easy was it to integrate ABC for Fitness© into the school schedule?
   1. Very difficult
   2. Somewhat difficult
   3. Somewhat easy
   4. Very easy
   5. Not applicable

b. Please describe your reaction to the ABC for Fitness© materials in the teacher’s manual. If you cannot describe your reaction because you have not personally seen the materials, please circle “5” for “not applicable.”
   - The materials were engaging and appealing.
     1. Strongly disagree
     2. Disagree a little
3. Agree a little
4. Strongly agree
5. Not applicable

- The materials were easy to understand.
  1. Strongly disagree
  2. Disagree a little
  3. Agree a little
  4. Strongly agree
  5. Not applicable

- The materials were useful.
  1. Strongly disagree
  2. Disagree a little
  3. Agree a little
  4. Strongly agree
  5. Not applicable

- The materials were comprehensive.
  1. Strongly disagree
  2. Disagree a little
  3. Agree a little
  4. Strongly agree
  5. Not applicable

c. What do you like the MOST about the ABC for Fitness® program?

d. What do you like the LEAST about ABC for Fitness®?

e. What has been the biggest challenge (if any) in teaching ABC for Fitness®?
f. If you have any additional comments, please share them below.