European Journal of Physical Education and Sport Science
ISSN: 2501 - 1235
ISSN-L: 2501 - 1235
Available on-line at: www.oapub.org/edu

DOI: 10.46827/ejpe.v10i1.4866 Volume 10 | Issue 1 | 2023

AN EXAMINATION OF TEACHERS' RATIONALES FOR CHANGING A PHYSICAL EDUCATION INTERVENTION

Jerry W. Loflin[i]
North Carolina State University,
Department of Health and Exercise Studies,
USA

Abstract:
New school-based curricular interventions are fundamental in meeting the diverse needs of today's students and improving student outcomes. In terms of curricular interventions, teachers are the primary implementation agents; therefore, the fidelity of such interventions depends on teacher adoption and delivery. To understand and meet such fidelity challenges, this qualitative research study examined the contextual components and implementation mechanisms contributing to the variation in teachers' perspectives and methods of implementing the *Science of Healthful Living* curriculum; a research-based intervention designed to increase middle school students' fitness-based knowledge through physically active lessons. The results of this study suggested a multitude of preexisting contextual factors, such as lack of instructional time, space, and equipment, influence teachers' fidelity to the intended curriculum. These factors, however, may or may not negatively influence the intended scope of the curriculum and should be considered when making judgments about teacher fidelity. In conclusion, intervention researchers should consider the nature of the contextual factors and whether they negatively impact the intervention when designing and revising school-based interventions.

Keywords: fidelity, school-based physical education interventions, contextual factors, teacher interviews

1. Introduction

The American educational system has remained relatively stable for the last century as technology, personnel, and evidence-based practices have evolved in schools. Schools have primarily resisted changes in design, curricula, scheduling, and leadership structures (Seltz, 2008). However, the linear, factory-like ideals that historically facilitated school design are proving to be ineffective at meeting current students' needs. "*Designed*

[i] Correspondence: email loflinj@greensboro.edu

in another time, for the purposes of that time, the typical school often shows a remarkable lack of flexibility" (Garmston & Wellman, 1995, p. 6). When the modern American educational system was designed in the early 1900s, approximately 51% of 5- to 19-year olds attended school (National Center for Education Statistics, 2012). Today's schools were never intended to meet the moral and economic demands of graduating all students. Furthermore, as the diversity of student populations increases, more poverty-stricken students will be entering America's schools. Tomorrow's students will demand curricula and teaching practices that offset the adverse living conditions that they have experienced since birth (Stevenson, 2010). Today's schools are complex from the classroom level to the district office level and are poorly represented by linear, factory-like frameworks (Davis & Sumara, 2005).

New school-based curricular interventions are fundamental in meeting the diverse needs of today's students and improving student outcomes. The No Child Left Behind Act of 2001 (NCLB; 2003) states teachers must "*use only research-based teaching methods and programs 'proven' to be effective*" (Slavin, 2003, p. 12). Proven means that programs have been evaluated through a "*rigorous, systematic, and objective set of procedures to obtain valid knowledge*" (Slavin, 2003, p. 12). Interventions provide one method of measuring program effectiveness using rigorous, systematic, and objective procedures. Effective intervention designs use valid and reliable measures of achievement to compare intervention sites that use a particular program with sites that do not. If the intervention sites produce increased outcomes compared to the sites that do not implement the program, then the intervention/program may be labeled effective. However, the level of program effectiveness may be diminished or nullified if a program is implemented in a manner inconsistent with the innovator's plan. Therefore, measuring the extent to which a program implementer faithfully adheres (i.e., fidelity) to the innovator's program ideals during an intervention can contribute to program validation. According to Mowbray, Holter, Teague, and Bybee (2003), fidelity is the magnitude to which intervention delivery adheres to the program model originally developed. The measurement of fidelity during efficacy and effectiveness studies is gaining increased interest (National Research Council, 2004).

To maximize fidelity, researchers should identify contextual factors that hinder or facilitate interventions. According to Berman and McLaughlin (1976), three primary variables can impact school-based interventions and implementation fidelity: (a) federal policies, (b) institutional settings, and (c) project characteristics. Federal policies may mandate management theories and objectives, such as the requirement that schools/students meet adequate yearly progress achievement outcomes. Due to adequate yearly progress standards, students may receive more instructional time in some disciplines compared to others, and as a result, impact an intervention's frequency and duration. Institutional setting factors, such as school and district characteristics, organizational climate, and staff motivation, can positively or negatively impact intervention effectiveness. Project characteristics, encompassing resource levels, the nature of the intervention, and implementation strategies, can increase or decrease

intervention outcomes. At the institutional level, teachers are schools' main resource (Wayne & Youngs, 2003) and play a primary role in the faithful implementation of school-based interventions.

Public health and physical education pedagogy scholars have become increasingly concerned about the declining instructional time and overall quality of school-based physical education and physical activity programs. As a result, federal and foundational funding has become available to propose and test school-based physical activity interventions and disseminate effective alternatives to increase physical activity in youth. Research findings describing intervention characteristics and outcomes have been disseminated to inform scholars and practitioners of best practices. Yet very few school-based physical activity intervention researchers have measured and reported fidelity levels (Sallis et al., 2012). Multiple organizations, such as the U.S. Department of Education, National Institutes of Health, and National Center on Response to Intervention, are requesting implementation fidelity research accompany large-scale intervention proposals. Recently, the National Institutes of Health (2011) established an office of Dissemination and Implementation Research to support future implementation studies.

The purpose of this study was to investigate teachers' perceptions and justifications for changing critical intervention components and design principles. This research was guided by the following research question: what reasons do teachers offer for making changes to the intended curriculum as they implement it in their school contexts? When researchers understand teacher justifications for adapting intervention components, they can design or modify interventions to accommodate diverse contexts, minimizing factors that negatively impact implementation. The data gathered in this study provide information about the variables that enhanced or constrained the effectiveness of a large-scale physical education intervention and teacher rationales for intervention adaptations within their context.

1.1 Science of Healthful Living Project

The *Science of Healthful Living (SHL)* project was a 5-year National Institutes of Health funded project at a medium-sized university in the southeastern United States. One goal of the *SHL* project was to develop a physically active, science-based middle school *SHL* curriculum. The *SHL* curriculum consists of two units: *Cardio Fitness Club* and *Healthy Lifestyles*. Each unit consists of twenty, 35-minute lessons using physical activity as a tool to teach health-related science and nutrition within the 5 Es (i.e., Engagement, Exploration, Explanation, Elaboration, and Evaluation) learning cycle strategy (Bybee et al., 1989). Students examine the effects of exercise on their bodies while participating in moderate to vigorous physical activities. Detailed rubrics, student science journals, and validated multiple-choice tests provide opportunities for content valid student assessment. A detailed vocabulary list enhances opportunities for students to understand science terminology, concepts, and principles as they participate in enjoyable physical activities.

During Year 2, seven local education agencies from the Piedmont region of North Carolina participated in the *SHL* project. This included 25 middle schools (five schools were new to the project during Year 2), 16,000 diverse middle school students, and 70 middle school physical education teachers. Using free and reduced-price meals data and end-of-grade test scores (i.e., mathematics and reading), middle schools were stratified into matched pairs. Each school in each pair was then randomly assigned to teach either the *SHL* curriculum (experimental school) or traditional multi-activity physical education (control school). This study occurred during Year 2 as a part of the larger *SHL* project.

2. Literature review

2.1 Implementation fidelity

Because teachers implement instructional interventions in their classrooms, implementation fidelity hinges on teacher adoption. In the case of the *SHL* curriculum, I operationalized fidelity as the extent to which physical education teachers teach the lessons as structured while using effective teaching strategies. Threats to fidelity include factors that lead to the reduction of consistent delivery of the core elements of an intervention. In the case of the *SHL* curriculum, that meant the use of the 5 Es learning cycle strategy of science education (Bybee et al., 1989). Still, there are many other factors that can threaten implementation fidelity; therefore, researchers seek high levels of standardization through the development of strategies such as program manuals, professional development training, and site visits by intervention supporters (Tyler & Blythe, 2008). Despite such efforts, researchers and teachers face a myriad of challenges to high implementation fidelity.

Implementation fidelity in school-based interventions can be measured using a number of strategies (O'Hare, 2005). Examples of strategies include case analyses, direct observations, process assessments, standardized questionnaires, and surveys. Measuring the implementation process gauges internal validity, that is, the extent to which the level of confidence researchers can assert that observable differences in outcomes – or lack thereof – were due to the intervention and not extraneous factors (Tucker & Blythe, 2008). Too few research studies in school settings, however, assess implementation fidelity (Tucker & Blythe, 2008). These findings underscore the need for more attention to implementation fidelity in educational research as a necessary component for establishing effective evidence-based practices in education (McLeod & Southam-Gerow, 2009; Mowbray et al., 2003; Smith, Daunic, & Taylor, 2007). Below, I describe several influences of implementation fidelity. Monitoring these factors can be effective for understanding participants' implementation methods, strengthening implementation fidelity protocols, and informing subsequent analyses and implementations.

2.2 Contextual factors

In evaluating implementation fidelity, the implementation context often helps explain the degree to which implementation processes have an effect on intervention outcomes. In a

meta-analysis of 81 studies, Durlak and DuPre (2008) identified 23 contextual factors that influenced implementation and situated those factors in three contextual categories: (a) community factors, (b) provider characteristics, and (c) intervention characteristics. Community factors affect an intervention by means of such dynamics as politics, funding, or policies. For example, the successful implementation of a multi-school intervention program may be conditional on school officials' ability to petition for funding of the intervention through political support. School officials include the superintendent, principals, teachers, and other school administrators who are in the position to facilitate or delay implementation.

The second contextual category includes teacher characteristics, such as perceptions of the intervention, beliefs about the need for the intervention, self-efficacy, teaching experience, and skill competence. For example, experienced teachers, already having years of teaching experience and feeling skilled with numerous teaching strategies, may be more reluctant to change their established teaching practices, thus affecting fidelity. However, compared to seasoned teachers, novice teachers may respond favorably to an intervention they assume may help strengthen their skills and add to their repertoire of teaching practices (Stein et al., 2008). Teachers with positive perceptions of an intervention may demonstrate confidence, consequently affecting their level of adherence and contribution to overall fidelity compared to teachers with a low opinion of the intervention (Durlak & DuPre, 2008). This suggests researchers' understanding of the range of teacher characteristics is an important dimension of intervention implementation.

The last contextual category, intervention characteristics, refers to the ease in which teachers can adapt the intervention to their needs and the extent to which the intervention is compatible with their roles, responsibilities, priorities, and the mission of the organization. An intervention that teachers consider "adaptable" suggests implementation fidelity is feasible when the components of the intervention complement their competencies. Overall, Durlak and DuPre (2008) suggest that fidelity may be attainable and sustained when intervention processes fit the organizational context, in that the components align with both teachers' characteristics and the established systems and structure in which teachers work.

2.3 Social validity

Social validity is another intervention characteristic that contributes to fidelity. Social validity refers both to teachers' acceptance level of an intervention and their perceptions of intervention effectiveness in the classroom (Carter & Pesko, 2008). The relationship between social validity and implementation fidelity is an extension of Wolf's (1978) research on implementers' perceptions of an intervention and the intervention's social significance. Wolf (1978) explained that changes in behavior assessed by an objective measure (e.g., direct observation utilizing a reliable instrument) may contradict a teacher's report of program effectiveness. For example, a student in a treatment program may show a slight improvement in academic performance, but feedback from the teacher

may indicate significantly higher improvement. In this case, the difference between teacher feedback and the objective score underlines Wolf's contention that intervention effectiveness is contingent on the social validity of the teacher.

For teachers, one aspect of intervention feasibility is the extent to which the proposed intervention complements existing teaching practices (Carter & Pesko, 2008). Rather than competing for teachers' limited time, energy, and resources, or expecting them to exceed their roles and responsibilities, intervention practices that match classroom dynamics positively influence teachers' decisions to accept and adhere to a new intervention protocol (Carter & Pesko, 2008). For example, in an evaluation of a school-based violence prevention program, Biggs, Vernberg, Twemlow, Fonagy, and Dill (2008) examined the social validity teachers placed on a particular intervention and its effect on teachers' decisions to implement the program. The researchers assumed social validity to be a function of perceived fit of the intervention with existing teaching practices. In measuring social validity, these researchers assessed a) the teachers' acceptance of the program, b) the degree to which their attitudes and belief systems aligned with the intervention's purpose, and c) their perceptions of the intervention's effectiveness (Biggs et al., 2008). Findings suggested teachers' level of new program acceptance and adherence aligned with the ease to which teachers felt that program components could be incorporated into their classroom routines, as opposed to representing discrete new classroom activities. Further, teachers' perceptions of the acceptability and usefulness of an intervention were significantly associated with program fidelity (Biggs et al., 2008). Interestingly, teachers' reports of intervention utility increased significantly over time. These assessments also provided opportunities for teachers to comment on the intervention. Although most comments were positive in Biggs et al.'s (2008) study, teachers' expressed concerns regarding the limited time allocated for collecting data for the intervention and the perceived unnecessary requirements to change some of their teaching practices.

In a similar report of intervention effectiveness, Martens and McIntyre (2009) discussed the importance of evaluating educators' acceptability of an intervention. Acceptability here refers to the match between the characteristics of the intervention and teachers' own perceptions of its appropriateness and value (Martens & McIntyre, 2009). The authors contended assessing practitioners' willingness to implement a program is as important as demonstrating treatment effectiveness. They explained practitioners may be more likely to respond positively to the intervention (i.e., increased levels of program commitment, higher rate of implementation fidelity, and sustainability of program protocol over time) when educators perceive an intervention as useful. Such research findings reinforce the layering effect and two-level nature – teachers in their work environment and students in their learning environment – of the school as a setting for intervention research discussed above. However, Martens and McIntyre (2009) contend that acceptability does not necessarily yield consistent and sustainable implementation of intervention protocols by teachers. To remedy declining fidelity among teachers,

continuous support and reinforcement, monitoring, and feedback are suggested methods for ensuring implementation integrity over time (Martens & McIntyre, 2009).

Research has confirmed that training and other forms of professional skill development are essential for ensuring fidelity, leading to the conclusion that there is a positive correlation between training and high levels of fidelity (Stead et al., 2007). For example, Stead and colleagues (2007) concluded that time constraints in teachers' ability to deliver quality lessons, teachers' concerns about classroom disruptions during interactive assignments, and teachers' recognition of their limited content expertise were factors affecting their responses to the effectiveness of a new intervention (Sobeck, 2006). Further, program complexity appears to be associated with implementation fidelity, in that teachers may be less likely to implement complex interventions with high fidelity (Sobeck, 2006). In view of the challenges of maintaining implementation fidelity, in this study, I investigated the reasons sixth-grade physical education teachers cite for changing or not following the structured lessons of the *SHL* curriculum.

3. Material and Methods

3.1 Participants

Purposeful sampling (Patton, 2002) was used to select six middle school physical education teachers participating for the first time in the larger *SHL* project. Teacher selection was based on their participation in the larger *SHL* project and on criteria (summarized below) that paralleled those identified by Sato, Hodge, Murata, and Maeda (2007) and Hodge, Ammah, Casebolt, Lamaster, and O'Sullivan (2004). First, all teachers were physical educators whose schools were located in adjacent school districts in the Piedmont region of North Carolina. Second, although these teachers were new to the *SHL* project, they had developed strong teaching records in their respective local education agency. Third, each had five or more years of teaching experience. According to Katz (1972), teachers are at the "maturity stage" once they meet these three conditions. In the maturity stage, "*teachers begin to ask questions of themselves and their teaching that focus on their insights, perspectives, and beliefs regarding teaching and children*" (Stroot, 1996, p. 342). Thus, participants in this research could reflect on their physical education teaching experiences. Because all six teachers participated in the larger *SHL* project, they were invited to 18 hours of professional development, received equipment to teach the lessons, and had a coach assigned to assist them in implementing the curriculum intervention in their schools. I served as the *SHL* coach for all six teachers in this study by providing intervention support and serving as a liaison between the teachers and the intervention developers. In this study, all six physical education teachers were teaching the sixth-grade *Cardio Fitness Club* unit of the *SHL* curriculum.

The selected teachers ranged in age from the upper twenties to the upper forties, had an average of 11 years (SD = 6.6) of teaching experience, and averaged 38.2 students (SD = 15.3) per sixth-grade physical education class. Table 1 presents the teachers' demographic and physical education class information.

Table 1: Teacher Demographics

Teacher	Gender	Age	Ethnicity	Years Teaching	Degree Level	Class Size
East	F	30-34	White	11	Masters	23
Roberts	F	25-29	Black	5	Masters	55
Barns	F	40-44	White	10	Bachelors	45
Parker	M	45-49	White	23	Bachelors	28
Adams	M	25-29	White	5	Bachelors	55
Nifong	F	35-39	White	12	Bachelors	23

Note: Teacher names are pseudonyms.

3.2 Setting

Ms. East and Ms. Roberts taught middle school physical education to female students at Albany Middle School (pseudonym). Albany Middle School was an urban middle school with over 220 sixth-grade students (69% Black, 14% White, 7% Hispanic, 6% Asian, and 73% free and reduced-price meals [FARM]; Education First NC School Report Cards, 2011) during the 2012-2013 academic year. The school had one medium-sized gym and one small multipurpose room available for physical education instruction. Each sixth-grade physical education class was scheduled to meet for 38 minutes each school day for the entire academic year. Ms. Roberts taught one sixth-grade physical education class and Ms. East taught two sixth-grade physical education classes. Ms. East's two sixth-grade physical education classes were combined to form one sixth-grade physical education class during data analysis.

Ms. Barns and Mr. Parker taught coeducational middle school physical education at New River Middle School (pseudonym). New River Middle School was a city middle school with over 190 sixth-grade students (12% Black, 35% White, 48% Hispanic, and 77% FARM; Education First NC School Report Cards, 2011) during the 2012-2013 academic year. The school had one medium-sized gym available for physical education instruction. Each sixth-grade physical education class was scheduled to meet for 50 minutes each school day during the first semester. Ms. Barns and Mr. Parker both taught sixth-grade physical education in the same gym during New River Middle School's third period. The teachers elected to team teach the *Cardio Fitness Club* lessons during third period. Ms. Barns was the lead teacher and Mr. Parker was the assisting teacher. Mr. Parker taught one sixth-grade physical education class during New River Middle School's fourth period and his class was the only class in the gymnasium during this period.

Mr. Adams and Ms. Nifong taught coeducational middle school physical education at St. Anthony Middle School (pseudonym). St. Anthony Middle School also was a city middle school with over 180 sixth-grade students (17% Black, 52% White, 25% Hispanic, and 60% FARM; Education First NC School Report Cards, 2011) during the 2012-2013 academic year. The school had one medium-sized gym available for physical education instruction. Each sixth-grade physical education class was scheduled to meet for 55 minutes each school day during the first semester. Mr. Adams and Ms. Nifong both taught sixth-grade physical education in the same gym during St. Anthony Middle School's first period. The teachers elected to team teach the *Cardio Fitness Club* lessons

during first period. Mr. Adams was the lead teacher and Ms. Nifong was the assisting teacher. Ms. Nifong taught one sixth-grade physical education class during St. Anthony Middle School's second period and her class was the only class in the gymnasium during this period.

3.3 Data collection

Once the teachers began teaching the sixth-grade *Cardio Fitness Club* unit, I began visiting each school. I began to collect detailed observation field notes on lesson 6. I did not collect observation field notes during lessons 1-5 to allow teachers time to adapt to the structure of the intervention lessons. I observed in a non-participatory capacity, comparing the lesson taught with the structured, scripted lesson that was provided in the intervention. I did not inform the teachers of when and which lessons I planned to observe. I documented the nature of the *Cardio Fitness Club* lessons for up to 5 weeks, observing six to seven lessons taught by each teacher. I paid special attention to the teacher's adherence and content delivery of the structured sixth-grade *Cardio Fitness Club* lessons.

After each lesson observation, I interviewed each teacher in their gymnasium asking unique questions based on the recently completed lesson observation. Each participating teacher was interviewed six to seven times during the study. The questions were based on observed deviations from the lessons as written and probed teachers on why they elected to make changes to the intended lessons.

3.4 Data analysis

I analyzed the interview data through open, axial, and selective coding (Corbin & Strauss, 2008). During open coding I read, coded, and compared interview transcripts immediately following each school visit. This process "opened up the data" for interrogation, further inquiry, and conceptualization (Corbin & Strauss, 2008). The list of open codes referred to justifications teachers offered for lesson modifications. Once all transcripts were coded, I reviewed and reevaluated the coding for consistency and accuracy.

I used axial coding to organize the open coding categories into related clusters and generate connections among the open coding categories that explained the teachers' justifications. At this stage of analysis, interpretation of the data occurred as I identified relationships and linkages among open coding categories and attached meaning and significance to the analysis.

As themes emerged from the data, I used selective coding to connect these findings to the existing literature and further develop themes theoretically. During selective coding, categorical relationships defined during axial coding were connected and further refined to answer the research question. Central themes were related to each category through the use of explanatory relationship statements and then named and connected to the existing literature.

3.5 Credibility

Five primary techniques were utilized to maximize the credibility of the information gathered in this study. First, I spent 5 weeks interacting with the participants and observing their sixth-grade physical education classes. This time frame allowed me to gain the participants' trust and encouraged the participants to become comfortable with my presence in their classes. Second, I triangulated the data sources (i.e., lessons as written, detailed observation field notes, and interviews) to enhance the believability of the study (Patton, 2002). Third, I used member checks providing teachers with copies of their transcribed interviews and asking them to confirm and provide feedback regarding the accuracy of the transcriptions and any identified categories and themes (Creswell, 2011). Fourth, I wrote rich, thick descriptions of classroom observations to convey the nature of the class context and the extent to which teachers followed the lesson plans provided by the intervention developers (Creswell, 2011). Fifth, I utilized a competent peer debriefer throughout data collection and analysis to maintain research ethics and maximize the trustworthiness of the data (Lincoln & Guba, 1985).

4. Results

The purpose of this study was to investigate teachers' perceptions and justifications for changing critical *SHL* intervention components and design principles. The findings of this study illuminated the effects of contextual factors on implementation fidelity. The concepts identified during the open and axial coding process were organized into seven categories that spoke to reasons why teachers changed lesson structure, tasks, or task order. One core category, school contextual constraints, emerged within this examination of the curriculum implementation process. The story line that follows is interlaced and interconnected with all six participants' voices.

4.1 School contextual constraints

a. Appropriate instructional time

Teachers' level of adaptability varied between implementing the intervention as intended and modifying the intervention to meet time constraints in the classroom. Teachers indicated two factors contributing to the variation of adaptability. In the first variation of adaptability, teachers discussed the length of their schools' physical education periods and the intended length of the *SHL* lessons. Albany, New River, and St. Anthony Middle Schools allotted 38, 50, and 55 minutes, respectively, for their physical education class periods.

For example, Ms. East at Albany Middle School expressed concern for the limited time available to implement the 35-minute lesson during her 38-minute physical education period:

> *"…38 minutes to teach a 35-minute lesson. Students need time to arrive to the gym, get their journals, and sit down. I need some time to introduce the lesson and teach the new activities. I had to skip the last two Es of the lesson today because we ran out of time."*

Similarly, Ms. Roberts who also taught at Albany Middle School commented after a lesson by saying:

> "*I just don't have time to teach the whole lesson. I think I could do it if I had the time. As you saw today, I barely started the third E [Explanation] and the students did not finish their journals*."

These two teachers (both from Albany Middle School) consistently referenced short physical education class periods as the main reason for modifying the intended lessons.

Both teachers attended the *SHL* professional development sessions where strategies were presented to manage physical education class periods less than or equal to 35 minutes. Ms. Roberts attended 12 out of the 18 hours offered and Ms. East attended all 18 hours. A few of the time-saving strategies presented by the *SHL* intervention team included reducing the length of the Engagement, disturbing journals by placing them on the bleachers so students could pick them up as they entered the gym, and not requiring students to change clothes for physical education. Ms. East and Ms. Roberts did not require their sixth-grade students to change clothes for physical education and consistently had journals laid out for students to pick up upon entering the gymnasium. They did not, however, elect to reduce the Engagement time.

The second variation of adaptability was related to the lessons having too much content to cover in the prescribed 35 minutes. Several participating teachers with 50- or 55-minute physical education periods tried to teach the *SHL* lessons in 35 minutes. These teachers attempted to motivate their students by offering "free play" or "student choice" opportunities in the class time remaining after the 35-minute *SHL* lesson. In some cases, the teachers were successful, and in other cases, content had to be omitted. For example, Mr. Parker noted:

> *"This lesson [lesson 18] requires more than 35 minutes. I had to omit the explanation of ATP [adenosine triphosphate] and the physical activity homework to get through all the Es and journal work. I'm lucky that I have 50 minutes with this class so I can go over if I need to."*

Along similar lines, a small group of participating teachers pointed out that the content was too challenging for sixth-grade students to learn in the allotted time. Ms. Nifong said:

"*Energy systems are hard concepts for sixth graders. In the current structure, I don't have time to cover them well while still keeping the class moving*."

The teachers consistently questioned the amount of content to be covered in lessons 9, 16, and 18 from the sixth-grade *Cardio Fitness Club* unit. The topics of these three lessons were the intensity of exercise, characteristics of anaerobic exercise, and energy systems, respectively.

b. Equipment needs

During my observations, I noticed participating teachers modifying or replacing the intended physical activities on a regular basis. One reason for these modifications was the lack of equipment. All teachers participating in the larger *SHL* project received new, curriculum-specific equipment to teach the *SHL* curriculum. However, Mr. Adams explained during one interview:

"*We only have 30 pedometers for 50 students. There was no way for us to give each student their own pedometer. We decided to let students work in pairs and share a pedometer*."

Furthermore, Ms. Barns shared:

"*The department only has 20 jump ropes. It isn't enough for the whole class. I gave half the class a jump rope to use and told the other half to jump an imaginary jump rope. The lesson worked out to be the same."*

Jump ropes were not supplied by the *SHL* project, as it was assumed most middle physical education programs would have an ample supply.

c. Space needs

Another common reason for modifying the intended lessons was the lack of space. All three schools participating in this study had at least one medium-sized gymnasium (i.e., large enough for a middle school basketball court and retractable bleachers). Albany Middle School also had a multipurpose room available for physical education instruction. Ms. Nifong said after lesson 18 that:

"*Our gym isn't big enough to allow everyone to do the shuttle run at the same time. I decided to let the girls go first and then the boys*."

Additionally, Ms. East mentioned:

"*We do not have the space to run four games of Steal the Diamonds at the same time. I had to cut it down to two games and rotated in new teams every 3 minutes.*" Ms. East, from

Albany Middle School, was using the smaller multipurpose room the day she had to modify Steal the Diamonds.

d. Appropriate class sizes

Related to lack of equipment and lack of space is large class sizes. On a few occasions teachers justified their lesson modifications by pointing out their large class sizes. In this study, class sizes ranged from 23 students (Ms. East and Ms. Nifong) to 55 students (Mr. Adams). Ms. Roberts pointed out that:

> "*I had to add two stations to today's lesson [lesson 12]. The original lesson called for five stations but that would've made the small groups too big and reduced physical activity time*."

Mr. Adams decided on a similar modification by adding a water station to reduce the number of students per group. During professional development, teachers were encouraged to add additional moderate to vigorous intensity stations to accommodate large classes in lessons utilizing station work.

e. Student skill level

Some teachers explained that low-skilled students were unable to perform skillfully at motor skill tasks as a reason to modify the lessons. A majority of the lessons in the *SHL* curriculum incorporated individualized fitness activities that could be differentiated for students' diverse fitness levels. Some of the lessons, however, utilized sports-based physical activities to help students learn content. Successful completion of sport-based activities requires a minimum skill level. Mr. Parker quickly noted during an interview that:

> "*… our sixth-grade students cannot do a [basketball] layup at all. I know the lesson [lesson 19] called for a layup station, but I decided to replace it with basketball wall passing*."

Ms. Roberts made a similar modification and explained after lesson 8:

> "*… the students don't know how to throw a Frisbee. I decided to replace the Frisbee with a foam ball*."

Teachers were given the autonomy to make decisions like the above as long as the modified or new activities supported the original intent of the lessons.

f. Class management

One teacher voiced class management as a reason for modifying the intended lessons in the *SHL* curriculum. The teachers in this study utilized numerous class management techniques. For example, Ms. East expected her students to sit down along a specified

wall anytime verbal instructions were to be communicated. Mr. Parker used his whistle (i.e., one whistle blow) to notify students when it was time to stop moving and talking. During the observation of lesson 9 at New River Middle School, I noted that Mr. Parker replaced tennis racquet ball striking against a wall with badminton racquet shuttlecock hitting to a wall. After the lesson I asked Mr. Parker about the change and he explained:

> "*I changed that station to be safer. I didn't want tennis balls rolling all over the gym floor as other students were working at other stations. The shuttlecocks ain't going to go far after they bounce off the wall.*"

On a different occasion I observed Mr. Parker control station rotation when the lesson provided students autonomy encouraging them to rotate to a new station when they finished their current station. Again, I asked Mr. Parker about this modification and he pointed out

> "*… students rotating on their own is too chaotic and didn't give equal opportunity to all the students at all the stations. I wanted to make sure most of the students had time to complete the work at each station before another group came.*"

The *SHL* project staff encouraged teachers to manage their classes based on what they knew to be effective for their classes and school.

g. Teacher planning time

Teacher planning time was used as a reason for changing the lessons on a few occasions. On average, Ms. Nifong and Ms. Roberts stated they spent less than 10 minutes planning to teach each lesson, Mr. Adams and Mr. Parker said they spent 10-20 minutes, and Ms. Barns and Ms. East said they spent greater than 20 minutes. During one observation (i.e., lesson 13) I observed Mr. Adams ask his students to perform two types of push-ups during the Engagement and two additional types of push-ups during the Elaboration. I noticed the two types of push-ups performed during the Elaboration should have been performed during the Engagement. After the lesson, I asked Mr. Adams about the change and his response was:

> "*I messed that up pretty bad. I realized it [all four push-ups types were to be performed during the Engagement] when I got to the Elaboration. I arrived late to school this morning and didn't have time to look at the lesson*."

Teachers also were quick to note they had time to look at the lessons, but would put other responsibilities (i.e., coaching and athletic director) before reviewing and planning to teach the lessons. During the first 6-hour professional development, teachers were encouraged to read and study the lessons before implementing them. They were

provided with recommendations on how to plan to teach the lessons and how long, on average, it would take to prepare to teach someone else's lessons.

5. Discussion

5.1 Weighing the consequences of an intervention modification

School contextual factors have been shown to positively (e.g., Dariotis, Bumbarger, Duncan, & Greenberg, 2008; Elias, Zins, Graczyk, & Weissberg, 2003; Kam, Greenberg, & Walls, 2003; Wanless, Patton, Rimm-Kaufman, & Deutsch, 2012) and negatively (e.g., Kramer, Lauman, & Brunson, 2000; Wanless et al., 2012) promote implementation fidelity. In larger school-based interventions, such as randomized controlled trials, it is unlikely that all school contexts will lend themselves to implementation without adjustments or modifications. In these settings, developers expect modifications and monitor implementation to provide data for future intervention revisions. As discussed above there are different types of modifications that hold different consequences for implementation fidelity. Some contextual modifications simply adjust the lessons for the unique characteristics of the school environment while others result in substantial changes to the intent of the intervention.

The type of modification should be considered when evaluating implementation fidelity. For example, little to no change occurred to the original intent of two lessons when Ms. Roberts from Albany Middle School decided to add two extra stations and replace a Frisbee with a foam ball. These types of changes were encouraged by the program staff to promote student success and did not negatively impact implementation fidelity. Conversely, the original intent of a lesson was negatively impacted when Mr. Parker from New River Middle School decided to reduce some of the content to be covered in a lesson even though he had ample time in his 50-minute period to fully cover the content. A change such as this had a negative impact on implementation fidelity.

5.2 Role of teacher attitudes and beliefs

Additionally, interventions may require teachers to make choices that are inconsistent with their philosophical goals, attitudes, and beliefs concerning physical education. It is likely that decisions to implement tasks or policies in conflict can cause teacher distress and may lead to inconsistent or short-term adherence (Beets et al., 2008; Evans, 1996; Ringwalt et al., 2003; Rohrbach, Graham, & Hansen, 1993). Teachers' may demonstrate less resistance to a new intervention when (a) there is no external requirement of implementation (Smylie, 1988), (b) teachers have autonomy in program adoption decisions (Parcel et al., 1991), and (c) appealing professional development is made available for teachers at their convenience (Kent, 2004).

As described in the results section, class management and teacher planning time were two teacher justifications for making changes to the intended curriculum. These justifications are related to and stem from teachers' beliefs and attitudes. For example, Mr. Parker from New River Middle School had concerns about students' safety and equal

access to physical activities and made changes to the intended lessons based on his beliefs about effective class management. Likewise, Mr. Adams from St. Anthony Middle School elected not to plan and prepare for an appropriate amount of time before some lessons. Mr. Adams based this decision on his priorities, which ranked other school-based responsibilities in front of preparing to teach the intervention lessons. Mr. Adams' decision-making process was at least partially mediated by his beliefs about physical education and attitudes toward the *SHL* curriculum.

Both New River Middle School and St. Anthony Middle School were in the same local education agency where a district administrator decided that the physical education teachers at New River and St. Anthony Middle Schools would implement the *SHL* curriculum. It is unclear what impact this top-down decision had on Mr. Parker's and Mr. Adam's acceptance of the intervention, but it is clear that neither teacher had a role in intervention adoption. Furthermore, both teachers were invited to and attended 3 days (18 hours) of project-sponsored professional development. The *SHL* project team secured a centralized meeting location, organized and led the sessions, provided breakfast and lunch, paid for teacher substitutes, and awarded continuing education units that could be used for renewing professional teaching licenses as required by the state of North Carolina. Some of the professional development included class management techniques and teacher preparation suggestions. Given the nature of this study, it is not known what impact the professional development had on these two teachers' attitudes towards and beliefs about the *SHL* curriculum. The project staff, however, attempted to create professional development opportunities for all participating teachers that were both convenient and appealing in hopes of promoting teacher buy-in.

Measuring teacher fidelity levels are helpful to ensure that outcomes are robust and valid in intervention research (Tucker & Blythe, 2008). As previously indicated, there are several methods to evaluate fidelity including randomized observational checks, videotaped intervention sessions, audio-taped sessions, process assessment, standardized evaluation forms, and post-session assessment. Such methods help evaluators and scholars organize and categorize barriers to teacher fidelity, identify the effectiveness of program components, incorporate practitioners' suggestions, and distinguish variations found in program outcomes.

6. Conclusions

In the current study, I used qualitative methods to examine teachers' reasons for modifying structured lessons from the *SHL* curriculum. The current findings suggest teachers changed the lessons due to instructional time, space, equipment, class size, student skill level, class management concerns, and teacher planning time. The current findings show potential for informing scholars of the merit and efficacy of the intervention on student outcomes. Thus, research on implementation fidelity has the potential to advance the quality of evidence-based program development and research. Further, growing demands to demonstrate the efficacy and scalability of school reform

programs should drive the need for fidelity evaluations to identify variations of program effectiveness across different school-based populations. For that reason, research on implementation fidelity adds value to existing services, especially when it helps practitioners enhance their knowledge and skills, thus better-standardizing intervention delivery.

Conflict of Interest Statement

The author declares no conflicts of interest.

About the Author

Jerry W. Loflin, Assistant Professor, Department of Health and Exercise Studies, North Carolina State University, USA. ORCID: orcid.org/0009-0009-9003-6085

References

Beets, M. W., Flay, B. R., Vuchinich, S., Acock, A. C., Li, K., & Allred, C. (2008). School climate and teachers' beliefs and attitudes associated with implementation of the positive action program: A diffusion of innovations model. *Prevention Science, 9*, 264-275. doi:10.1007/s11121-008-0100-2

Berman, P., & McLaughlin, M. (1976). Implementation of educational innovation. *The Educational Forum, 40*, 345-370. doi:10.1080/00131727609336469

Biggs, B., Vernberg, E., Twemlow, S., Fonagy, P., & Dill, E. (2008). Teacher adherence and its relation to teacher attitudes and student outcomes in an elementary school-based violence prevention program. *School Psychology Review, 37*, 533-549. Retrieved from http://www.nasponline.org/publications/spr/index_xml.aspx?vol=37&issue=4

Bybee, R. W., Buchwald, C. E., Crissman, S., Heil, D. R., Kuerbis, P. J., Matsumoto, C., & McInerney, J. D. (1989). *Science and technology education for the elementary years: Frameworks for curriculum and instruction*. Washington, DC: The National Center for Improving Science Education. Retrieved from ERIC database. (ED314237)

Carter, E., & Pesko, M. (2008). Social validity of peer interaction intervention strategies in high school classrooms: Effectiveness, feasibility, and actual use. *Exceptionality, 16*(3), 156-173. doi:10.1080/09362830802198427

Corbin, J., & Strauss, A. (2008). *Basics of qualitative research* (3rd ed.). Thousand Oaks, CA: Sage.

Creswell, J. W. (2011). *Educational research: Planning, conducting, and evaluating quantitative and qualitative approaches to research* (4th ed.). Upper Saddle River, NJ: Pearson Education.

Dariotis, J. K., Bumbarger, B. K., Duncan, L. G., & Greenberg, M. T. (2008). How do implementation efforts relate to program adherence? Examining the role of

organizational, implementer, and program factors. *Journal of Community Psychology, 36*, 744-760. doi:10.1002/jcop.20255

Davis, B., & Sumara, D. J. (2005). Challenging images of knowing: Complexity science and educational research. *International Journal of Qualitative Studies in Education, 18*, 305-321. doi:10.1080/09518390500082293

Durlak, J., & DuPre, E. (2008). Implementation matters: A review of research on the influence of implementation on program outcomes and the factors affecting implementation. *American Journal of Community Psychology, 41*, 327-350. doi:10.1007/s10464-008-9165-0

Education First NC School Report Cards. (2011, October). *NC school report cards – 2010-2011 school year.* Retrieved from www.ncreportcards.org

Elias, M. J., Zins, J. E., Graczyk, P. A., & Weissberg, R. P. (2003). Implementation, sustainability, and scaling up of social-emotional and academic innovations in public schools. *School Psychology Review, 32*, 303-319. Retrieved from http://www.nasponline.org/publications/spr/index-list.aspx

Evans, R. (1996). The human side of school change: Reform, resistance, and the real-life problems of innovation. San Francisco, CA: Jossey-Bass.

Garmston, R., & Wellman, B. (1995, April). Adaptive schools in a quantum universe. *Educational Leadership, 52*(7), 6-12. Retrieved from http://www.ascd.org/publications/educational-leadership/apr95/vol52/num07/Adaptive-Schools-in-a-Quantum-Universe.aspx

Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. New York, NY: Aldine.

Hodge, S. R., Ammah, J. O. A., Casebolt, K., Lamaster, K., & O'Sullivan, M. (2004). High school general physical education teachers' behaviors and beliefs associated with inclusion. *Sport, Education and Society, 9*(3), 395-419. doi:10.1080/1357332042331302458

Kam, C., Greenberg, M. T., & Walls, C. T. (2003). Examining the role of implementation quality in school-based prevention using PATHS curriculum. *Prevention Science, 4*, 55-63. doi:10.1023/A:1021786811186

Katz, L. G. (1972). Developmental stages of preschool teachers. *Elementary School Journal, 73*(1), 50-54. doi:10.1086/460731

Kent, A. M. (2004). Improving teacher quality through professional development. *Education, 124*, 427-435. Retrieved from http://www.projectinnovation.biz/education_2006.html

Kramer, L., Laumann, G., & Brunson, L. (2000). Implementation and diffusion of the Rainbows program in rural communities: Implications for school-based prevention programming. *Journal of Educational and Psychological Consultation, 11*, 37-64. doi:10.1207/s1532768Xjepc1101_04

Lincoln, Y. S., & Guba, E. G. (1985). Naturalistic inquiry. Newbury Park, CA: Sage.

Martens, B., & McIntyre, L. (2009). The importance of treatment integrity in school-based behavioral intervention. In A. Akin-Little (Ed.), *Behavioral interventions in schools:*

Evidence-based positive strategies (pp. 59-71). Washington, DC: American Psychological Association.

McLeod, B. D., & Southam-Gerow, M. A. (2009). Conceptual and methodological issues in treatment integrity measurement. *School Psychology Review, 28*, 541-546. Retrieved from http://www.nasponline.org/publications/spr/spr384index.aspx

Mowbray, C. T., Holter, M. C., Teague, G. B., & Bybee, D. (2003). Fidelity criteria: Development, measurement, and validation. *American Journal of Evaluation, 24*, 315-340. doi:10.1177/109821400302400303

National Center for Education Statistics (2012). *120 Years of Literacy.* Washington, DC: Institute of Education Sciences. Retrieved from http://nces.ed.gov/naal/lit_history.asp

National Institutes of Health. (2011). *Dissemination and implementation*. Retrieved from http://obssr.od.nih.gov/scientific_areas/translation/dissemination_and_implementation/index.aspx

National Research Council Committee for a Review of the Evaluation Data on the Effectiveness of NSF-Supported and Commercially Generated Mathematics Curriculum Materials, Mathematical Sciences, Education Board, Center for Education, Division of Behavioral and Social Sciences and Education. (2004). *On evaluating curricular effectiveness: Judging the quality of K-12 mathematics evaluations*. Washington, DC: National Academies Press.

No Child Left Behind (NCLB) Act of 2001, 20 U.S.C.A. § 6301 *et seq.* (West 2003)

O'Hare, T. (2005). *Evidence-based practices for social workers: An interdisciplinary approach*. Chicago, IL: Lyceum Books.

Parcel, G. S., Ross, J. G., Lavin, A. T., Portnoy, B., Nelson, G. D., & Winters, F. (1991). Enhancing implementation of the teenage health teaching modules. *Journal of School Health, 61*, 35-38. doi:10.1111/j.1746-1561.1991.tb07857.x

Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). Thousand Oaks, CA: Sage.

Ringwalt, C. L., Ennett, S., Johnson, R., Rohrbach, L. A., Simons-Rudolph, A., Vincus, A., & Thorne, J. (2003). Factors associated with fidelity to substance use prevention curriculum guides in the nation's middle schools. *Health Education & Behavior, 30*, 375-391. doi:10.1177/1090198103030003010

Rohrbach, L. A., Graham, J. W., & Hansen, W. B. (1993). Diffusion of a school-based substance abuse prevention program: Predictors of program implementation. *Preventive Medicine, 22*, 237-260. doi:10.1006/pmed.1993.1020

Sallis, J. F., McKenzie, T. L., Beets, M. W., Beighle, A., Erwin, H., & Lee, S. (2012). Physical education's role in public health: Steps forward and backward over 20 years and HOPE for the future. *Research Quarterly for Exercise and Sport, 83*, 125-135. doi:10.1080/02701367.2012.10599842

Sato, T., Hodge, S. R., Murata, N. M., & Maeda, J. K. (2007). Japanese physical education teachers' beliefs about teaching students with disabilities. *Sport, Education and Society, 12*(2), 211-230. doi:10.1080/13573320701287536

Seltz, J. (2008, May). Looking back, looking forward: A focus on high school reform. *Educational Leadership, 65*(8), 96. Retrieved from http://www.ascd.org/publications/educational-leadership/may08/vol65/num08/Looking-Back,-Looking-Forward@-A-Focus-on-High-School-Reform.aspx

Slavin, R. (2003). A reader's guide to scientifically based research: Learning how to assess the validity of education research is vital for creating effective, sustained reform. *Educational Leadership, 60*(5), 12-16. Retrieved from http://www.ascd.org/publications/educational-leadership.aspx

Smith, S. W., Daunic, A. P., & Taylor, G. G. (2007). Treatment fidelity in applied educational research: Expanding the adoption and application of measures to ensure evidence-based practice. *Education and Treatment of Children, 30*(4), 121-134. doi:10.1353/etc.2007.0033

Smylie, M. A. (1988). The enhancement function of staff development: Organizational and psychological antecedents to individual teacher change. *American Educational Research Journal, 25*, 1-30. doi:10.3102/00028312025001001

Sobeck, J. L. (2006). Lessons learned from implementing school-based substance abuse prevention curriculums. *Children & Schools, 28*(2), 77-85. doi:10.1093/cs/28.2.77

Stead, M., Stradling, R., Macneil, M., Mackintosh, A., & Minty, S. (2007). Implementation evaluation of the blueprint multi-component drug prevention programme: Fidelity of school component delivery. *Drug and Alcohol Review, 26*, 653-664. doi:10.1080/0959230701613809

Stein, M. L., Berends, M., Fuchs, D., McMaster, K., Sáenz, L., Yen, L., . . . Compton, D. L. (2008). Scaling up an early reading program: Relationships among teacher support, fidelity of implementation, and student performance across different sites and years. *Educational Evaluation and Policy Analysis, 30*, 368-388. doi:10.3102/0162373708322738

Stevenson, K. R. (2010). Educational trends shaping school planning, design, construction, funding and operation. *National Clearinghouse for Educational Facilities.* Washington, DC: National Institute of Building Sciences. Retrieved from http://www.ncef.org/pubs/educationaltrends.pdf

Stroot, S. A. (1996). Organizational socialization: factors impacting beginning teachers. In S. J. Silverman & C. D. Ennis (Eds.), *Student learning in physical education: Applying research to enhance instruction* (pp. 339-365). Champaign, IL: Human Kinetics.

Tucker, A. R., & Blythe, B. (2008). Attention to treatment fidelity in social work outcomes: A review of the literature from the 1990s. *Social Work Research, 32*(3), 185-190. doi:10.1093/swr/32.3.185

Wanless, S. B., Patton, C. L., Rimm-Kaufman, S. E., & Deutsch, N. L. (2013). Setting-level influences on implementation of the Responsive Classroom approach. *Prevention Science, 14*, 40-51. doi:10.1007/s11121-012-0294-1

Wayne, A., & Youngs, P. (2003). Teacher characteristics and student achievement gains: A review. *Review of Educational Research, 73*, 89-122. doi:10.3102/00346543073001089

Wolf, M. M. (1978). Social validity: The case for subjective measurement or how applied behavior analysis is finding its heart. *Journal of Applied Behavior Analysis, 11*(2), 203-214. doi:10.1901/jaba.1978.11-203