

Implementation challenges for a constructivist physical education curriculum

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Abstract:

Background: Curriculum fidelity describes the extent to which a curriculum is implemented faithfully as planned. Curriculum fidelity issues may arise when teachers implement the curriculum inconsistently due to differences in philosophy, barriers in the setting, or other local concerns.

Purpose: The study examined challenges that a teacher faced in implementing a constructivist physical education curriculum that had fidelity implications.

Research design: Ethnographic case study design was employed in the research.

Participants and setting: One physical education teacher, 'Daniel', and his students in the third, fourth, and fifth grades participated in the study as they were involved in a curriculum intervention in a large urban school district in the US. Daniel's school was randomly assigned to an experimental group to implement a physical education curriculum based on health/fitness-related science.

Data collection: The researchers observed 75 lessons taught by Daniel using non-participant observation techniques and conducted two structured interviews with Daniel and eight interviews with his students.

Data analysis: Constant comparison with open and axial coding was used to analyze the observation and interview data.

Findings: Two thematic challenges emerged: (1) school contextual constraints that limited the fitness science learning environment in physical education, and (2) Daniel's personal values and preference for a recreational rather than a science-based physical education program. These challenges impacted Daniel's decisions when teaching the curriculum.

Keywords: curriculum implementation | constructivist | physical education

Article:

Curriculum innovation is central to many school-based initiatives in physical education. Curriculum innovation cannot easily succeed if it fails to recognize the central role of the learners: who they are, how and what they learn (Macdonald 2003). Based on this belief, the constructivist learning theory has been considered as a relevant theoretical foundation for curriculum innovations where the active role of the learner is acknowledged and serves as a focal point for the development of the innovative curriculum. Rather than transmitting the content for the learner to passively receive the information, a constructivist curriculum gives ample opportunities for the learner to actively engage themselves in connecting their prior experiences with new knowledge to construct personally meaningful understanding (Shuell 1986). A constructivist curriculum also emphasizes the importance of the context in which learning is taking place. The curriculum acknowledges the impact of the social and cultural contexts the learner lives in both in and outside the school. Further, it provides guidance for the teacher to construct learning tasks that use learner experiences in the large context as advantageous resources to enhance learning rather than constraints.

Based on these constructivist learning principles, *Science, PE, and Me (SPEM)*, a constructivist physical education curriculum was developed and tested in a randomized-controlled intervention context. *SPEM* was a curriculum innovation in an urban context through the partnership between a research university and local school district, and it emphasized students' learning of health-related fitness knowledge in physical education. Previous research on the effect of *SPEM* has shown that students in experimental schools learning the health-related fitness curriculum scored significantly better than their counterparts in comparison schools learning their traditional curricula (Chen et al. 2007). In order to sustain the effect of the curriculum on student learning, it is important to understand the extent to which the intended learning experiences in the curriculum are experienced by the learners. Therefore the way a teacher implements the curriculum will have a direct impact on student learning experiences. According to Rovegno and Bandhauer (1997a), a teacher might construct his/her understanding of a curriculum and develop implementation methods based on prior experiences, personal and professional beliefs, and instructional context. These influential factors, along with others such as the teacher's educational philosophy, instructional skills, and motivation to implement the curriculum, are essential issues within the concept of curricular fidelity. This process of constructing and developing pedagogical content knowledge is likely to lead to curricular enhancement or curricular infidelity in which the curriculum is taught contrary to the original design. Curricular implementation becomes critical to fulfilling the planned goals of the curriculum. The purpose of this case study was to examine challenges in implementing a science-based physical education curriculum (i.e., *SPEM*) by documenting personal and contextual conflict experienced by an elementary school physical education teacher and his students.

Curriculum fidelity

The word *curriculum* has many meanings and definitions (Goodlad, Klein, and Tye 1979). Each person may have different definitions depending on different philosophical standing points (Jewett, Bain, and Ennis 1995). As the constructivism paradigm emerged from behaviorism in educational psychology, curriculum theorists and developers began to develop curricula based on constructivist learning theories (von Glasersfeld 1995). Success of constructivist curricula and instructional approaches has also been documented in physical education (Rovegno and

Dolly 2006). Particularly in this study, we define a curriculum as planned educational experiences for both students and teachers offered by a school which can take place within and beyond schools. In this sense, *curriculum* is not conceived solely as a curriculum package (i.e., *Teacher's Manual* etc.), but as the learning experiences derived from the package and constructed by the teachers and students. We at times use the term *curriculum* to refer to the *Teacher's Manual* for communication purposes.

When a curriculum is tested in a clinical trial, it is critical that the teachers implement it with high fidelity so that the students can achieve the learning goals that the curriculum is designed for. Curriculum fidelity describes the extent to which a curriculum is implemented as originally planned. From this perspective, researchers tend to study curriculum fidelity by focusing on: (1) the degree to which a particular innovative curriculum is implemented as planned and (2) the factors that facilitate or hinder planned implementation (Snyder, Bolin, and Zumwalt 1992). Studying curriculum implementation from a fidelity perspective could deepen our understanding of how contextual factors shape the learning experiences for students. Studying curriculum implementation also provides an opportunity to listen to teachers' voices and help them obtain the ownership of the curriculum (Kirk and Macdonald 2001).

Implementing a constructivist curriculum is a difficult, long-term process even in a supportive environment (Roehler and Putnam 1986). Researchers studying curriculum implementation often focus on the following three factors that are considered to influence implementation fidelity: teacher psychological disposition (Perkins, Jay, and Tishman 1993), teacher belief and personal curricular preference (Pajares 1992), and curriculum delivery contexts (Fraser-Thomas and Beaudoin 2002). These three factors represent the components of a conceptual framework in the study of curriculum fidelity.

Psychological dispositions

Psychological dispositions reflect teacher thinking and beliefs about teaching (Perkins, Jay, and Tishman 1993). Psychological disposition theory when applied to teachers' acceptance and implementation of a curriculum proposes three psychological components that must be present to spark teaching behavior. These three elements are: (a) sensitivity – the teacher's perception of the appropriateness of a particular behavior; (b) inclination – the teacher's felt impetus towards a behavior; and (c) ability – the teacher's basic capacity to follow through with the behavior (Perkins, Jay, and Tishman 1993).

Teacher psychological dispositions can help to explain instructional knowledge development and teacher change. For example, Rovegno and Bandhauer (1997a) reported the role of dispositions in helping a teacher shift her teaching approach from a traditional to a constructivist movement perspective. The researchers identified several psychological dispositions that facilitated the shift. For example, the teacher has the disposition to acknowledge the difficulties and persist in seeking clarification; to justify and develop practices consistent with the educational philosophy and theoretical foundations of the approach; and to believe in constant change and in learning new teaching ideas (Rovegno and Bandhauer 1997a).

Rovegno and Bandhauer (1997a) concluded that the teacher's value for the dispositions sustained and encouraged the persistence required to shift successfully to teaching a constructivist curriculum. The researchers (Rovegno and Bandhauer 1997a) reported, however, that even with these positive dispositions, a teacher might feel that it is difficult to accept and implement the constructivist teaching approach. Without these positive dispositions, it would be difficult for a teacher to implement a curriculum based on the constructivist learning principles. Thus, it is important to facilitate teachers to develop and sustain positive dispositions toward curricular implementation in the process of transforming physical education curricula.

Teachers' belief and personal curricular preference

The second factor influencing teachers' curricular and instructional decisions are teachers' beliefs and personal curricular preference. Eisner and Vallance (1974) used the term 'value orientations' to describe teachers' educational beliefs or curricular ideologies that appear to influence curriculum-related decisions. In physical education, teachers' values, beliefs, and personal preferences could have a critical impact on the type and quality of physical education curriculum they implement. Rovegno and Bandhauer (1997b) reported that a teacher who valued and believed in a constructivist approach could persist and succeed in teaching the curriculum even in a disadvantaged context. Conversely in a similar restrictive pedagogical environment, O'Reilly, Tompkins, and Gallant (2001) observed that physical educators could change the programs based on their personal belief and preferences into one that only reinforced students' feelings of fun other than their learning. These research findings suggested that to a large extent it is physical educators' values, beliefs, and personal preferences that determine physical education curriculum implementation in school contexts.

Teachers' values and preferences are influenced by the context in which they teach. Thus, to understand teachers' values and beliefs systems, researchers examine the context and document its relationship with teacher action decisions. Nespor (1985) observed that because the instructional context is richly layered and extends beyond the classroom and school building, researchers should investigate not only the classroom context, but also characteristics of communities, students, and their families.

Curriculum context

Curricular implementation is rarely 'trouble-free' (Snyder, Bolin, and Zumwalt 1992, 403). Many factors within the school context can hinder curricular implementation fidelity. For example, Fraser-Thomas and Beaudoin (2002) reported that lack of time to achieve outcome goals, inadequate equipment, large classes, heavy teaching loads, lack of professional development, and lack of consultant support can constrain physical educators' opportunities to implement an innovative curriculum. Snyder, Bolin, and Zumwalt (1992, 416) argued that the 'life and death of an innovation' depended on the unique configuration of social, historical, political, and ideological factors that exist in the school and its social, community context. Schools act as communities where values as well as resources and customs are shared (Noddings 1996). Therefore, curricular implementation relies on key participants' perceptions of the school as a community context.

In curriculum implementation, the factors are intertwined either facilitating or challenging curriculum implementation. Previous studies in classroom education and physical education examined the issue of curriculum implementation often from a single factor perspective (Snyder, Bolin, and Zumwalt 1992). In this study, we intended to use the three-factor conceptual framework to examine the issue. We chose to study these issues in a rather complex curricular environment in which a science-based physical education curriculum was implemented in a context where a traditional, recreational curriculum had been in place for at least three decades. Our interest was to document implementation challenges the teacher identified and attempted to overcome. Therefore, this case study can potentially provide useful evidence about teacher perspectives and school context instrumental to understanding the curricular implementation fidelity.

In the study, we focused on the following specific research questions: (1) to what extent did the teacher's dispositions and personal curricular preferences influence his willingness to implement the constructivist curriculum?; and (2) how did the school context shape the teacher's perspectives regarding curricular implementation? This research is meaningful because it contributes to our understanding of teacher-related and contextual challenges influencing the fidelity of curriculum implementation in physical education from both teacher and student perspectives.

Methods

The current case study was part of a large physical education curriculum intervention study that examined the implementation of an externally designed science-based physical education curriculum promoting students' learning in health-related fitness knowledge. The larger research project used a randomized clinical trial design to examine urban students' fitness knowledge achievement. In the larger study, 30 elementary schools were randomly selected from 135 schools in a school district and were randomly assigned into either experiment or comparison groups. The current research examines the process used by one teacher who was chosen randomly to implement the intervention curriculum.

Participants and participant selection

The participants of this study included an elementary physical education teacher, Daniel,¹ and his third through fifth grade students (three classes each grade) learning the intervention curriculum at Oak Grove Elementary School. Daniel was a Caucasian, experienced elementary physical education teacher who had been teaching for 33 years and was in his third year of teaching the intervention curriculum. Oak Grove was selected because students' fitness knowledge test scores were average when compared with the other 14 experiment schools. Consent forms were collected from the teacher and his third through fifth grade students experiencing the intervention curriculum.

¹ All names are pseudonyms.

Research setting

The Oak Grove Elementary School was a public school located in a very large, urban area in the northeastern United States. Of its 600 students, 50.3% were female. Students at Oak Grove represented 40 countries: approximately 40% of the students were African American, 25.9% Hispanic, 24.6% Caucasian, and 8.1% Asian. Most physical education lessons were conducted in a full-size gymnasium and each lesson lasted 30 minutes. Students participated in two physical education classes each week. The physical education curriculum taught prior to the intervention for grades 3–5, according to Daniel, was a traditional multi-activity physical education program.

The intervention curriculum

The intervention curriculum is a science-based curriculum that uses a hands-on, problem-solving approach to teach health-related fitness concepts in physical education. The educational experiences of the *SPEM* curriculum are determined primarily by three components: the *Teacher's Manual*, *Student Science Journal*, and the *Family Science Activity Night*. The *Teacher's Manual* describes 90 lessons sequenced in three units, 'Dr. Love's Healthy Heart' (cardio-respiratory content), 'Mickey's Mighty Muscles' (muscular strength and endurance) and 'Flex Coolbody's Fitness Club' (flexibility, nutrition/caloric balance). Students assume the role of 'junior scientists' to conduct experiments in each physical education lesson examining the effects of exercise on their bodies. Each lesson is structured using the '5 Es' scientific inquiry process and contains an engagement (warm-up), exploration (physical activity), explanation, elaboration (application of knowledge outside of physical education), and evaluation (Balci, Cakiroglu, and Tekkaya 2006). Junior scientists are physically active throughout each lesson using their personal responses to physical activity as science data in experiments. They record data in their *Student Science Journal* (a 70-page workbook with entries for each lesson), answering questions, graphing and calculating outcomes, drawing conclusions, and communicating their findings to others. During the semi-annual *Family Science Activity Night*, students lead their parents and siblings to experiment the effects of physical activity on their body and teach them the health-related fitness concepts they have learned. In summary, the learning experiences entailed by the *SPEM* curriculum emphasized on the active role of students (i.e., 'junior scientists'), the interaction among peer students and with the contents (i.e., workbook), deep understanding through the '5 Es' inquiry, and connection to real life (i.e., *Family Science Activity Night*). These characteristics of *SPEM*, according to Rovegno and Dolly (2006), are the essential elements of a constructivist curriculum.

Throughout the three years, Daniel attended three, full day staff development sessions each year before and during the implementation of the curriculum. The staff development topics ranged from using constructivist strategies to teach physical education to sessions on using the *Science Journals*, fitness concepts, and effective class management. The *Teacher's Manual* was designed strategically to provide lesson plans and to serve as a staff development tool. The *Manual* begins with an extensive preface explaining how the *Manual* should be used, offering tips to integrate cognitive and physical activity content into a coherent lesson. It then explains the 5 Es learning cycle strategy, describing how the framework is woven through each lesson.

Data collection

This research design employed an ethnographic case study to develop an in-depth understanding of the teacher's dispositions, personal curricular preferences, and the school context. Data in this case study included field observations, structured interviews, and document analysis.

Field observations

Observation data were collected in an initial concentrated three-week period followed by an additional observation period encompassing nine weeks during which student interviews also were conducted. During the initial concentrated (three week) observation period, data were collected in 25 lessons for third, fourth, and fifth grades within the *Dr. Love's Healthy Heart* unit. During this period, at least two lessons were observed three to four times per week. A researcher sat passively at the side of the class within hearing distance of the teacher and students (Emerson, Fretz, and Shaw 1995). Our primary focus was describing how the teacher implemented the curriculum and students' reactions to the teacher's actions. Teacher and student interviews were initiated following the third week of observation. During this time 50 additional lessons were observed, totaling 75 observed lessons at the study's conclusion. Of the lessons observed over the subsequent nine-week period, 30 focused on cardio-respiratory endurance, 25 on muscular strength and endurance, and 20 on flexibility.

Interviews

Teacher and student individual and focus group interviews were conducted over a six-week period. Following the initial three-week observation, we conducted two, 30-minute, structured interviews with Daniel and eight, ten-minute structured interviews with 18 students in Daniel's classes. The students were selected from all three grades based on their class engagement. The selection resulted in a group of students with low to high engagement. We also conducted two focus group interviews; the first with four and the second with five students representing all grades and classes to examine their in-class experiences (Patton 2001). During the six-week interview period, we interviewed the teacher in the first and the fourth week and three to four students each week. All interviews were conducted in the teacher's office, using a laptop computer with external microphone to record the interview. The interview questions focused on gathering information about curriculum implementation challenges from the teacher and student perspectives, and the teacher's as well as students' perceptions of the curriculum. Questions were developed according to Patton's question matrix (Patton 2001) to gradually elicit in-depth information. Following each interview, the audio files were transcribed and saved electronically for analysis.

Instructional documents

Before each observation, we located and identified the lesson plans in the *Teacher's Manual* (Goetz and LeCompte 1984). We used the lesson plans to substantiate our observation of Daniel's lessons. As we were observing, we recorded field notes and later typed and saved them electronically. After each lesson, we also reviewed five students' journal entries to check for student understanding of the lesson content.

Data analysis

The observation and interview data were analyzed using open and axial coding (Strauss and Corbin 1998). The data from field notes, interviews, and relevant researcher memos were coded into relevant categories using open coding with the imaginative use of theoretical comparisons (Strauss and Corbin 1998). Next the data were reassembled with the initial open-coded categories grouped into broader categories and further related to their subcategories by axial coding. At this point, the data were examined for similarities and dissimilarities by triangulating across field notes, interview transcriptions, and documents. The coding process was conducted using the qualitative analysis software, *MaxQDA2*®.

Analysis of documents

We used latent content analysis to contrast the *Teacher's Manual* lesson plans with the lessons we actually observed (Goetz and LeCompte 1984). We compared field notes from observations with the written lesson plan to write reflective notes on Daniel's curriculum implementation. We also looked at students' responses in their workbooks to provide supplementary materials to personalize the interview questions for students.

Data trustworthiness

Due to the fact that the first author was not a native English speaker, cultural gap and researcher subjectivity were inherent in the methods and findings of this study. To address these threats to the trustworthiness of this study, we employed the following strategies. First, interview questions and procedures were developed and discussed among all three researchers based on the observation field notes. Second, the researchers used informal conversations frequently to corroborate what we had seen and heard in the participant's classes. Third, we read the analyzed data, discussed and resolved discrepancies, and arrived at the common themes based on common codes, categories, properties, and dimensions across documents, interviews, and observations.

Results

Two salient themes emerged within this examination of the curriculum implementation process. The first theme focused on the contextual constraints of a science-based physical education curriculum. The second theme emphasized the teacher's recreation-oriented beliefs about physical education conflicting with the goals of the intervention curriculum.

'It's hard to keep everything straight' contextual constraints for learning

In this study, contextual factors constrained the learning environment in physical education. These were manifested in several ways in Oak Grove Elementary School, including scheduling conflicts for physical education, tardy classes and students, limited space, and lack of ESOL (English for Speakers of Other Languages) teachers. These constraints, from Daniel's perspective, prohibited him from implementing the curriculum completely as it was originally

planned. He had to make adjustments to accommodate the constraints while teaching the content in the curriculum as best as he could.

Scheduling conflicts

Daniel explained that one of the biggest challenges he faced was not having enough time to prepare equipment for back-to-back lessons for different grades. Although similar lessons taught for third, fourth, and fifth grade used the same equipment and organization formations (e.g., stations), school scheduling disruptions, such as standardized testing, field trips, and school assemblies, altered the scheduled curricular sequence. Some classes moved quickly through the lessons with no disruptions, while other classes were delayed. Thus, the cross-grade equipment arrangement recommended in the *Teacher's Manual* was ineffective. Daniel had to rearrange equipment to accommodate the schedule disruption. For example he had to put away the equipment and lesson setup for lesson 6 taught to the first period class and prepare equipment for lesson 4 for the second period class because that class was delayed by a school assembly and a field trip. Thus, negotiating these scheduling irregularities was a major challenge for Daniel in curriculum implementation. In the first interview, he explained:

The biggest challenge is the setup time between classes. There is simply no time to setup, adjust, or rearrange equipment for the next lesson. One class comes in and the other class leaves. Because my schedule is the way it is, today, I have fifth grade, fifth grade, sixth grade, fourth grade, fourth grade, third grade. [Because of scheduling disruptions] they are all doing different activities. Tuesday and Thursday I have fifth grade, third grade, kindergarten, sixth grade, fourth grade, third grade, and second grade. Every thing [class] is different, so that's hard.

Our observation of the context confirmed there was no time between classes for the teacher to prepare lessons or set up equipment. Usually, Daniel asked students to help setup equipment, except for the first class when Daniel was able to come early to set up prior to the students' arrival. Therefore the efforts of the intervention curriculum developers to use a uniform set of equipment in a given lesson across grades (e.g., the fifth lesson in third, fourth, and fifth grade sequence within a particular unit used the same equipment) was not helpful at Oak Grove Elementary School. The disruption was not limited to cross-grade instruction; however, it also occurred between classes in the same grade. Schedule disruptions often forced Daniel to teach different lessons without enough time between lessons to reflect and plan.

The disruptive schedule for Daniel not only left no time for him to prepare space and equipment for his classes, but also deprived him of time between classes to review the lesson for that grade. During observations, we noticed that he sometimes held one page of the lesson plan in his hand while he taught. This phenomenon did not happen often, but it revealed an important issue of curriculum familiarity within the curricular implementation process. After comparing our observation field notes with the corresponding lessons in the *Teacher's Manual*, we recognized that the latter lessons went more smoothly and covered more content than those taught previously. It seemed that after Daniel read parts of a lesson to his students while actively teaching the lesson the first time, his teaching of that lesson improved in subsequent teachings to

other classes in that grade. Daniel mentioned some of the reasons for this during the second interview:

It's tough when I read it over the night before then I come in to school next day. I have to go over it right before class because of all the different things shifting around. I have that trouble, like sometimes they are supposed to predict stuff. I forgot to make a prediction because of all the different lessons you know. And then I go out, and kids forget to make a prediction, but, you know, it's just...it's hard to keep everything straight.

Daniel explained that he had to read the lesson plans while teaching. Although he reported no difficulty in following the instructional procedures explained in the lesson plan, when rushed he simply left out some tasks or other content in the curriculum. Because he was concerned that he could not keep all the activities in mind while instructing, he sometimes taught with the lesson plan page in hand to ensure that he included each section of the lesson in the order planned in the curriculum.

Students arriving late for physical education

Additionally, other challenges exacerbated the scheduling problem, especially that of students arriving late for the physical education. This, ironically, seemed an unwanted solution to the schedule disruption reported above. Daniel indicated that when a class was late, he had enough time to setup the equipment and space, but unfortunately he would not have enough time to teach the lesson. Daniel further commented:

It's very frustrating [that] a lot of classes are five or even 10 minutes late, which I can't control, depending on their schedules. And they switch around between different classes. So then I have to teach the half-hour lesson in less than 25 minutes, and that's frustrating. And then if they talk in the transitions, that costs even more time, so... you know (shrug), but the lessons I think are very well structured.

When students were late, they lost five or more minutes from the lesson. Based on observations, this problem occurred about one third of the time and at times was detrimental to the curriculum implementation. When we compared our observation field notes with the lessons in the *Teacher's Manual*, we found that the teacher omitted lesson content due to time limitations. Unfortunately, what the teacher shortened and even omitted were important learning sections in the lesson (see theme two for details).

Lack of space

An additional contextual problem that arose in this urban school was that of lacking a dedicated instructional space for physical education. Daniel explained in the first interview:

Sometimes, it's frustrating because of the lack of space, like this morning, we have two fifth grades that did the obstacle course. They had to design it and they had to teach other groups to do it. And when we had to do it, we had to keep our heart rates up, and we tried to monitor the heart rate. That was hard because of the limited managed space we had.

The issue with limited space was a particular concern when two classes of students had lessons simultaneously in the basketball court-sized gymnasium. For instance, sometimes while Daniel was asking questions and students were writing in the science journal, the other class taught by a part-time teacher were playing floor hockey, screaming in the other half of the basketball court. These different types of physical education lessons occurring in the same space aggravated the space problem and negatively influenced the implementation.

Lack of support for ESOL students

As an urban school, Oak Grove had many students who spoke English as Second Language. Many ESOL students could not follow directions well and frequently needed help, frustrating Daniel. Unfortunately, ESOL teachers available in the classroom throughout the day did not accompany students to physical education. Some of the ESOL students consistently responded to his directions more slowly than others. At times the teacher chose to spend extra time on question explanation and class management to assist these students. Daniel explained:

And I was little surprised that they [ESOL students] didn't follow the directions better than they do, and that's a little bit shocking. And I was also surprised that they don't write as well as I thought they would like, especially with the [*No Child Left Behind*] testing going on. That makes me crazy.

ESOL students' difficulties in learning the fitness curriculum also reflected in their journal entries. Many of them wrote 'nick' for neck, 'rist' for wrist, and 'lo' for low and so forth. On one item that required students to describe how to measure their heart rate in physical education, some ESOL students either left the answer blank or wrote a couple of illegible and incorrect English words, while others drew pictures. Only a few could write their answer legibly enough for Daniel to read and grade it.

'Too much thinking ... they just want to have fun' belief of recreational physical education

Both observations and interviews with Daniel indicated that he held a recreation-oriented belief about physical education while he was learning to teach the intervention curriculum. Through informal conversations and field observation, we noticed that Daniel was not quite concerned about student learning. Rather he was very concerned if his students had fun and sufficient physical activities when learning the lessons in the intervention curriculum. Daniel's recreational focus for physical education was also reflected in his goal for physical education. He explained that his aim was to provide a variety of physical activities to increase students' fun and physical activity:

My aim is to have students try a broad range of different activities because not everybody likes football, hockey and baseball, so I try to get them different activities to do. That way they will have fun and get more activities.

Further he explained that he wanted his students to like physical education and physical activity. He believed that this could be accomplished through having fun in physical education. His belief

was reflected in the level of fidelity with which he implemented the components of the curriculum, particularly when he did not have adequate time to complete the lesson and he had to make decisions about what content to omit. To enhance student learning, the intervention curriculum employs a 5Es science inquiry learning cycle to structure each lesson with many fun activities that the teacher can choose from an activity directory. Teachers may make decisions to include or omit some activities. Daniel said in an interview:

A lot of time, I will skip the introductory explanation part if they are late. Just get to the middle [physical activity component] of the lesson, but it depends on the class. Sometimes we run out of time at the end, it's time for Elaboration, so you know. Sometimes we cut the elaboration short because we were in the middle of activity and I wanted them to get the activity done before they moved to their journals. So we skipped the Elaboration part (to have more fun).

Daniel did not want to shorten the activity-rich Engagement and Exploration lesson components, instead choosing to limit or omit the student-constructed explanations, elaboration of values related to students' lives outside physical education, and evaluations where students could self-assess their achievement and Daniel could check for understanding. Because students spent more time completing the physical activities in the Engagement and Exploration, they spent less actual time and less quality time on learning fitness concepts in the Explanation, Elaboration, and Evaluation sections. Students' opportunities to learn the health-related fitness concept, the goal of the intervention curriculum, therefore, were limited by Daniel's decisions.

Daniel's instructional decisions were consistent with his recreational physical activity focus. He explained that he wanted to include as many physical activities as possible within the limited time he had available to implement the intervention curriculum. This decision directly influenced intervention curriculum implementation because Daniel's students spent less time on learning strategies designed to help students construct their understanding of fitness concept than it was described in the lesson plan.

However, even when his classes were running out of time or coming in late, Daniel rarely cut the time for students to respond to the *Science Journals*. Journal entries, used to reinforce the science inquiry process, were the most salient distinction between intervention curriculum and traditional physical education curriculum. While Daniel recognized journal entries as the most significant change from his past physical education curriculum, his appreciation for this curriculum component influenced his decision to include this element when implementing the curriculum. He explained that the journaling did help students understand and learn health-related fitness concepts. He said he liked it personally, but he was concerned about the students' view of the curriculum:

I wanted to try to do the curriculum [the intervention curriculum – *SPEM*] because after 33 years [of teaching] I want to try something different, and I really love the curriculum [*SPEM*], (but) I don't think the kids love it as much (as I do).

This quote reflects Daniel's personal belief about the *SPEM* curriculum. He personally liked the curriculum because he wanted to try something different after teaching traditional physical

education for a long time. While he was trying to implement the curriculum in Oak Grove, he expressed concern that students might not like the curriculum as much as he did. He explained:

Uh, because there are too many restrictions and everything is setup for them, you know (shrug), and I don't think it's as fun as regular physical education. And I think they don't look at it as P.E., they look at it as more science...I don't think the kids like it a lot. Too much writing, and too much thinking for them, they just want to come, and run, and have fun.

From Daniel's explanation, he thought students had the same expectations for physical education as he did. Even though Daniel thought implementing a new curriculum might help students to learn, he was concerned that students only wanted to have fun but did not like thinking or learning while participating in physical activities. Despite the fact that Daniel did not perceive that students would like to think and learn in physical education, his students thought otherwise. Students in one focus group interview segment, below, presented their views in response to the questions about the curriculum.

Researcher: So generally, how much do you think you've learned from your new PE lessons?

Students: A lot! A lot! A lot!

Researcher: What kind of knowledge have you learned?

Lisa: I learned a lot of things about my body, what I never knew before, like how to take the heart rate from here (touch her neck) and the radius [radial pulse]. And I never learned that before. And I never learned how to do... ah this pedometer. And I learned a lot about my heart and things like that (Caucasian, female).

Rosetta: I learned that... ah how to do all those things to get more flexible, and how to take heart rate (Latina, female).

Dae-Hee: I learned a lot like muscles and... I never knew about radius pulse and carotid pulse before (Asian, male).

Rashad: I didn't know how to do some exercises, but now I do. And I know I need to exercise at home regularly. And...I need to pace myself while I exercise (African American, male).

Researcher: Really, do you like your new physical education classes?

Students: Yeah, yes, I like it.

Students' responses indicated they valued the learning experiences in physical education and contradicted Daniel's perceptions of students' recreational goals. Students demonstrated that they knew they had learned about fitness and exercise. The data showed that they valued it more than

Daniel would have imagined. As we interviewed students in different grade levels the students' support for learning health-related fitness knowledge through physical activities was confirmed. They reported that they had enjoyed learning various concepts in *SPEM*. Many students also reported that they liked writing in the *Science Journal* during the lesson. For instance, a fourth grader, Michelle responded:

(Writing in the journal is) great and I really want to write it. I like to write stories, highlight the columns, and check the little hearts... You know, you can also express your thinking in the journal, drawing pictures and stuff.

Journal writing, however, was not a positive experience for every student, especially for learners who spoke English as their second language. During the interviews, some of the ESOL students could not effectively communicate with us or their peers orally or in writing. This also was confirmed by analyzing their journal entries. They often left answers blank, spelled words incorrectly, wrote answers that did not correspond to the questions, or drew pictures instead of writing words or sentences in their journals. These students had difficulty completing journal entries during the three to five minutes allocated to journal writing during or at the conclusion of the lesson. Consequently the extent of their learning was difficult to assess.

In summary, two themes evolved as challenges for the intervention curriculum fidelity. We found that Oak Grove's contextual constraints of creating a learning environment for a science-based physical education program emerged from these categories: schedule disruptions for physical education, classes not arriving on time, limited space, and lack of ESOL support. Besides the contextual constraints, the tension between Daniel's recreational physical education belief and the science-based physical education curriculum (i.e., *SPEM*) that emphasized students' learning in fitness knowledge hindered curriculum implementation. Daniel disclosed his recreational belief that students just wanted to have fun in physical education. This belief, however, contradicted students' responses in terms of thinking, learning, and journal writing in physical education.

Discussion

The purpose of this study was to investigate implementation challenges of a constructivist physical education curriculum from a curriculum fidelity perspective. Specifically, we intended to answer the questions: (1) to what extent did the teacher's dispositions and personal curricular preference influence his willingness to implement the constructivist curriculum?; and (2) how did the school context shape the teacher's perspectives regarding curricular implementation? Two major themes emerged as challenges for implementing the constructivist curriculum: (1) school contextual constraints of creating a learning environment in physical education, and (2) the teacher's recreation-oriented belief about physical education that limited students' opportunities to learn fitness concepts from the curriculum.

A need for de-marginalizing physical education

Snyder, Bolin, and Zumwalt (1992) emphasized that principal support was critical in curriculum implementation at the school level. In this case, the principal and school district had been very

supportive of implementing the science-based physical education curriculum. However, even at the school level, we found that principal and school district support alone was not enough to ensure effective implementation of the curriculum. School contextual factors formed major challenges for Daniel when he was attempting to teach the curriculum. Classroom teachers released students late for physical education class. Schedule disruptions added difficulties for the teacher when organizing equipment and decreased instruction time. With heavy teaching loads and limited space, the teacher felt it was very difficult to implement the curriculum (Fraser-Thomas and Beaudoin 2002). The school contextual constraints limited his ability to create a learning environment in physical education, challenging curriculum implementation fidelity.

In Daniel's school, with its full-size gym, the space issue should not have been a challenge for the intervention curriculum implementation. Based on the observations, however, the fact that he had to share the gym with another teacher whose students played team sports each lesson became a challenge. The screaming from the other side of the gym distracted Daniel and his students while they were learning fitness concepts through physical activities and logging physical activity data in the workbooks. Therefore, space became a challenge for the curriculum implementation in Daniel's context.

Rovegno and Bandhauer (1997a) reported that the teacher's psychological disposition to support the curriculum was crucial to facilitating long-term, complex curriculum innovations. In this study, Daniel was willing to change from the traditional multi-activity curriculum and implement the intervention curriculum. He reported that he had gained adequate knowledge in the staff development workshops about the intervention curriculum, itself, and constructivist approaches in teaching physical education. However, he still found it challenging to overcome the many contextual factors present in his school. Thus, even with positive disposition to change, implementing the curriculum was challenging. A positive and supportive psychological disposition for change alone was inadequate to overcome the challenges of implementing this curricular innovation.

A need for learning-oriented physical education

In Daniel's case, his concerns that his students would not like or support a learning-oriented approach to physical education were unfounded. Instead, his students appeared to enjoy and appreciate opportunities to learn in physical education, contradicting Daniel's own professional beliefs about the value of teaching and learning in his class. In this study, he disclosed his concerns that a learning-oriented approach to physical education would not be accepted by his students, thus tending to include as many physical activities as possible. Thinking that students just wanted to 'come and run and have fun', and that they did not like thinking and writing in physical education classes, had limited his program in the past to a multi-activity approach, constraining his students' opportunities to learn cognitive knowledge about physical activities.

Daniel's recreation-oriented personal belief about physical education is not unusual among physical educators. In a pedagogically restrictive context, physical education teachers may construct their program solely for entertaining students, ensuring students having fun (O'Reilly, Tompkins, and Gallant 2001). Using short-term novelty of the innovative physical activities and entertainment in physical education will not help students' learning in the long run

(Siedentop 2002), neither will it sustain students' interest in physical education because it is superficial and lacks student value (Dewey 1913). In Daniel's case, he had been trying to include as many different physical activities as possible in his past program. After decades of practicing the recreation-oriented multi-activity approach, Daniel found nothing had changed. Instead, students grew taller, but rarely learned concepts or became more skilled. Although he wanted to implement the intervention curriculum, he was still concerned that his students were having fun and participating in physical activities. In other words, he endorsed the new curriculum within the constraints of his recreation-oriented beliefs about physical education.

These results supported the premise that teachers' values and beliefs are important in their curricular decisions (Chen and Ennis 1995). When a learning-based physical education curriculum is taught by a recreation-oriented physical educator, students' learning experience is likely to be limited because of the teacher's curricular decisions. There appears to be a second consideration, however, that can have an important impact on curriculum implementation process. Teachers need to understand what their students really value in a curriculum and trust their students to engage in learning-based programs in physical education. Therefore, it may not be students' likes or dislikes that structure their acceptance as much as the quality of the curricular design, the integrity of the teacher implementation, and the value that students hold for the content.

Curriculum implementation as a learning opportunity

Educators constantly seek to develop or adopt innovative educational programs and curricula to facilitate students' learning in schools. The implementation of an innovative curriculum often provides physical educators opportunities to learn and practice new ideas and pedagogical methods. For example, Kinchin and O'Sullivan (2003) observed that careful planning and choosing appropriate pedagogy is the key for successful implementation of their curricular initiative termed a *Cultural Studies Unit*. In examining student teachers' implementation of a curricular innovation, *Games Concept Approach*, Wright and his colleagues (2006) reported that student teachers believed that their greatest facilitator was the tactical approach course that they took before. Student teachers in Wright et al.'s (2006) study also reported that they needed more practice in teaching the innovative tactical approach curriculum during the practicum.

During the implementation of an innovative curriculum, physical educators, both experienced or novice, need to learn and practice new pedagogical knowledge to accommodate the changes associated with the curricular innovation. In addition to that, physical educators may also have the opportunities to refresh their content knowledge. In the South Carolina Physical Education Assessment Program (SCPEAP), a statewide physical education initiative, physical education teachers' health-related fitness knowledge was tested. Despite the fact that teachers were very confident in their health-related fitness knowledge, their test scores did not meet the standard of achievement expected of a ninth-grade student as assessed by SCPEAP, suggesting otherwise (Castelli and Williams 2007). Undoubtedly, physical education teachers in SCPEAP could better obtain and maintain their health-related knowledge through the initiative. In Daniel's case, not only did he have the opportunity to help himself maintain and obtain his health-related knowledge, he also became familiar with the constructivist approaches and the 5E learning cycle.

Curriculum fidelity

Curriculum fidelity might not be an issue when teachers act as primary agents of curricular and pedagogical reforms (Leander and Osborne 2008). Unfortunately in many schools physical education programs either continue to use ‘roll the ball out’ approach or resist curriculum reforms. Many curriculum reforms may be destined to fail because they are blind to the central roles of students and teachers (Kirk and Macdonald 2001; Macdonald 2003). Another possible reason for the failure of curriculum reforms initiated by special interest groups, as pointed out by Macdonald (2003), was that their effects were not clinically tested before large-scale implementation. When an intervention curriculum was tested in a clinical trial, as in the present case, where *SPEM* was trialed in an urban context to examine its effect, curriculum fidelity becomes an important issue.

‘Even the best program in education will fail to have the intended impact if its essential elements are not implemented properly’ (Ruiz-Primo 2005, 1). Implementing an innovative physical education curriculum seems challenging as limited resources are devoted to physical education due to its marginal status in school. In such a pedagogically restrictive context, how teachers make instructional decisions is crucial in implementing an innovative curriculum. Teachers who have dispositions to change and believe in the curricular approach may be able to overcome the contextual challenges and eventually turn the context into a supportive one (Rovegno and Bandhauer 1997b). In contrast, some teachers may choose the easy option, inadvertently sacrificing students’ learning opportunities in physical education (O’Reilly, Tompkins, and Gallant 2001).

In summary, implementing a constructivist curriculum like the *SPEM* in this study is a very complex process in urban schools where often there is limited support for quality physical education. For physical educators, implementing an innovative curriculum can bring opportunities to learn as well as challenges to quit. Challenges come not only from the school context, but also from the teachers themselves. As the only physical education teacher teaching the *SPEM* curriculum in Oak Grove Elementary school, Daniel struggled with those challenges even though he had the disposition to change. After a four-year struggle with the challenges, Daniel stopped teaching the constructivist intervention curriculum, and the physical education program in Oak Grove Elementary School reverted to the recreational multi-activity curriculum. This compelling case suggests that the implementation of a complex constructivist curriculum not only requires a teacher with willingness to change, but also requires the teacher to believe in the value of the curriculum and to be supported in their efforts by the classroom teachers and school administration.

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