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DATA-DRIVEN DECISION MAKING IN PHYSICAL EDUCATION: A CASE STUDY

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DATA-DRIVEN DECISION MAKING IN PHYSICAL EDUCATION: A CASE STUDY

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Dedication

This dissertation is dedicated to my Mom and Dad for teaching me to believe that I can accomplish anything I set my mind to.

This dissertation is dedicated to my sister, Laura, who has challenged my thinking and pushed me over the years to be my very best.

Most of all, this dissertation is dedicated to my wife, Elena for supporting me through the many sleepless nights and stressful times over the past few years. Without your love and support, there is no way I would have been able to make it.

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DATA-DRIVEN DECISION MAKING IN PHYSICAL EDUCATION:

A CASE STUDY

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The purpose of this study was to explore the data-driven decision making process within the context of K-12 physical education. Although the topic has received extraordinary attention in other areas of education, it has yet to be investigated directly in physical education settings. A conceptual framework proposed by Mandinach, Honey, Light, and Brunner (2008) guided the investigation. Using a multi-site case study design, one school district previously awarded a Carol M. White Physical Education Program Grant served as the overarching case and eight schools within the district served as embedded cases. Eight physical education teachers, three district coordinators, one principal, and one school counselor participated in the study. Evidence was gathered through interviews, observations, documents, archival records, and artifacts. Analytic strategies such as pattern matching, examining rival explanations, and drawing diagrams were utilized to generate common themes within the data.

Overall, findings indicated that physical education teachers collected substantial amounts of physical activity and fitness data aligned with policy requirements, often at the expense of data related to other important teaching domains. Evidence also indicated that teachers rarely transformed collected data into actionable knowledge. It seemed as though teachers were only collecting data because they were required to and held little value in the data once they were collected. Teachers reported that the data collection process was time-consuming and challenges associated with pedometers and information management systems served as barriers to the collection/organization process. In addition, professional development was not utilized to help teachers use data for effective teaching as district coordinators had limited access to teachers on designated professional development days. It is important to note that teachers had substantial concerns surrounding the validity and reliability of the data that were collected. This likely contributed to the low value that was placed upon data. Based upon the findings, ten recommendations for the enhancement of the DDDM process in physical education were generated. One of the most important recommendations is to provide physical education teachers with support in developing data literacy skills so they can take full advantage of the data they collect for the benefit of student learning.

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Chapter 1: Introduction

BACKGROUND

Data-driven decision making pertains to the systematic collection, analysis, examination, and interpretation of data to inform practice and policy in educational settings.

- Mandinach, 2012, p. 71

Data-driven decision making (DDDM) is not a new concept in education. For years, effective educators have been relying on various forms of data to inform their practice. Recently, however, two important factors have elevated the status of DDDM in education: a) the standards, assessment and accountability movement, and b) the availability of new technologies that can assist in the collection/management of data. These two factors have shifted the educational landscape into a new paradigm where it is no longer acceptable to make decisions based upon hunches and anecdotal evidence (Mandinach, 2012; Mandinach & Grummer, 2013). Instead, educators are now expected to collect a wide array of data and use it to make decisions ranging from appropriate interventions, to student placement, to school resource allocation.

Although the volume of data being collected in schools has increased exponentially over the past decade, many educators are experiencing a situation in which they find themselves "data rich, but information poor" (Wayman, Conoly, Gasko, & Stringfield, 2008, p. 172). In other words, educators have unprecedented access to data, but often struggle to translate that data into *actionable knowledge* (Light, Wexler, & Heinz, 2005). A growing body of research is now focused on helping educators take full

advantage of the data they have access to and use it to make a positive impact on student learning (Kronholtz, 2012; Mandinach, 2012; Marsh, Payne, & Hamilton, 2006).

RATIONALE FOR THE STUDY

Physical educators, like their counterparts in other subject areas, desire high levels of student achievement and mastery of subject matter knowledge. In accordance with contemporary educational reform, the field of physical education has adopted national content standards defining what students should know and be able to do as a result of a quality physical education experience (American Alliance for Health, Physical Education, Recreation, and Dance [AAHPERD], 2013; National Association for Sport and Physical Education [NASPE], 1995, 2004). In addition to standards, numerous assessment materials have been published to help physical educators gather evidence of student achievement (e.g., Holt/Hale, 1999; Lambert, 1999; Lund & Kirk, 2002; Melograno, 2000; NASPE, 2010c, 2011). However, a recent report indicates that only one third of states actually have policies in place that require assessment in physical education (NASPE, 2010a) and it is unknown to what extent physical educators engage in assessment in the absence of these policies. Furthermore, when No Child Left Behind (NCLB) was passed into federal law in 2002, physical education was not included in the prescribed accountability system (NCLB, 2002). Many scholars contend that physical education is likely to continue experiencing a marginalized status in schools unless the field decides to strengthen its commitment to assessment and accountability (Collier, 2011; Henninger & Carlson, 2011). As Rink and Mitchell (2002) stated, "One unintended

outcome of the standards, assessment, and accountability movement is that any program not included in high stakes state level assessment, for all practical purposes, does not count" (p. 209).

A large volume of work has been conducted on the topic of assessment in physical education (e.g., Graber, 2012; Hay, 2006; Melegrano, 1997; Zhu et al., 2011). This work has mirrored other areas of education with a focus on the development of valid, reliable, and useful tools for collecting evidence of student learning. Efforts have also been made to develop accountability systems at the state level linked with assessment. The South Carolina Physical Education Assessment Program [SCPEAP] is one example of this kind of reform effort (e.g., Rink & Mitchell, 2002, 2003; Rink, Jones, Kirby, Mitchell, & Doutis, 2007). In addition, a number of textbooks on curriculum development have outlined the importance of using data to drive curricular decisions (Kelly & Melograno, 2004; Lund & Tannehill, 2005) and national guidance documents point to the importance of using assessment data to drive instruction (NASPE, 2007a, 2007b, 2008a, 2008b). However, to our knowledge, little to no research has been conducted to understand how the full DDDM process actually unfolds within the context of K-12 physical education. It remains largely unknown how physical educators collect, manage, and analyze various types of data to inform their practice. It is also unclear what factors may facilitate or inhibit the process at various levels within the school system. If physical educators are going to successfully engage in the DDDM process, we must first

come to an understanding of where the process is working and where it may still need improvement. This is the gap the present study was created to fill.

OVERVIEW OF METHODOLOGY

The purpose of this study was to conduct an in-depth exploration of the DDDM process within the context of K-12 physical education. Due to the paucity of information currently available on the topic, qualitative methods were employed to explore the full nature of the phenomenon. A conceptual framework for DDDM proposed by Mandinach and colleagues (2008) was used to guide the study. The framework consists of six steps in the DDDM process that can occur at the levels of the classroom, school, or district. The steps detail how raw data can be transformed into actionable knowledge through a process of data collection, organization, analysis, summarization, synthesis, and prioritization. According to the framework, the process culminates in a decision, of which the impact can be monitored and the cycle can be repeated in an iterative fashion with feedback loops re-entering the cycle at various steps. An important consideration within the framework is the role that technology can play throughout the process (Mandinach et al., 2008).

One school district in the Southern United States was selected as the research site. An embedded case study design was employed in which the district served as the overarching case and eight individual schools and teachers served as embedded cases (Yin, 2009). The district was selected purposefully on the criterion that it had been awarded a Carol M. White Physical Education Program (PEP) grant. The grant program

contained substantial data collection requirements and served to ensure that physical educators within the district had access to at least a minimum amount of data with which to make decisions (U.S. Department of Education, 2012).

Data for the study were collected via documents, archival records, interviews, direct observations, and physical artifacts. With the conceptual framework as a guide, data were coded for common themes and categories related to the DDDM process. Analytic tools such as pattern matching, examining rival explanations, and drawing diagrams were employed to gain further insight into the DDDM process in physical education (Strauss & Corbin, 1998; Yin, 2009). Strategies such as triangulation, member checking, and peer debriefing were used to ensure the trustworthiness and credibility of the data and resulting interpretations. The most salient themes were reported along with a discussion of findings and implications.

RESEARCH QUESTIONS & CASE STUDY QUESTIONS

Four research questions and 15 case study questions guided the investigation. The questions were based upon: a) the conceptual framework of Mandinach and colleagues (2008), b) the DDDM literature in general education, and c) best practice documents in physical education. Table 1 depicts how the research questions, case study questions, and literature align with one another.

Research Questions	Case Study Questions	Theoretical Support
In a school district that was awarded a Carol M. White Physical Education Program (PEP) grant… 1. What types of physical education-related data were teachers and administrators collecting and how?	a) What types of input data were collected (e.g., equipment, facilities, class sizes, meeting frequency, school health environment, curriculum alignment, etc.)? b) What types of process data were collected (e.g., instructional time, MVPA time, management time, instances of teacher feedback, standards addressed in lessons, teacher trainings, etc.)? c) What types of outcome data were collected (e.g., student achievement of NASPE/state standards, health behaviors, self-efficacy, etc.)? d) What types of satisfaction data were collected (e.g., opinions of students, teachers, parents, etc.)? e) How were the data being collected (e.g., by whom, using what kinds of tools, how frequently)?	Levels of DDDM (Mandinach et al., 2008) ▪ Teacher ▪ School ▪ District Types of data (Marsh, Pane, & Hamilton, 2006) ▪ Input ▪ Process ▪ Outcome ▪ Satisfaction Quality physical education (NASPE, 2004) ▪ Opportunity to learn ▪ Appropriate practices ▪ Meaningful content o Motor skills o Concepts o Physical activity o Fitness o Social skills o Values

Table 1. Alignment between research questions, case study questions, and literature.

Research Questions	Case Study Questions	Theoretical Support
2. Once collected, how were physical education-related data transformed into actionable knowledge?	a) How were data analyzed and summarized (e.g., by whom, using what tools, when)? b) How were data reported (e.g., to whom, in what format)? c) How were data synthesized and prioritized (e.g., by whom, using what tools, when)?	Data to knowledge continuum (Light, Wexler, & Heinz, 2005; Mandinach, Honey, & Light, 2006) ▪ Data → Information → Knowledge ○ Collect ○ Organize ○ Analyze ○ Summarize ○ Synthesize ○ Prioritize
3. In what ways were physical education-related data used to inform decisions at the levels of the classroom, school, and district?	a) How did physical education teachers use data to guide instructional decisions (e.g., lesson content, teaching methods, differentiation, additional interventions, etc.)? b) How did physical education teachers, school administrators and district administrators use data to drive program improvement (e.g., curriculum reform, policy reform, resource allocation, teacher training, goal setting, progress monitoring, etc.)? c) In what ways were physical education-related data used to hold students, teachers, and schools accountable (e.g., student achievement of outcomes, teacher effectiveness, policy compliance, etc.)?	Levels of DDDM (Mandinach et al., 2008) ▪ Classroom ▪ School ▪ District Purposes of DDDM (Moody & Dede, 2008) ▪ Accountability ▪ School improvement ▪ Reflection NASPE guidance documents (NASPE, 2007a, 2007b, 2008a, 2008b) ▪ Physical education teacher evaluation tool ▪ What constitutes a highly qualified physical education teacher ▪ National standards for initial physical education teacher education ▪ Advanced standards for physical education teacher education

Table 1. Alignment between research questions, case study questions, and literature.

Research Questions	Case Study Questions	Theoretical Support
4. What factors positively or negatively influenced the use of data in physical education**?**	a) What role did technology play in the DDDM process in physical education?	Technology influences the DDDM process (Light et al., 2005; Mandinach et al., 2008)
	b) What factors encouraged or facilitated the use of data in physical education?	Factors that influence the use of data for decision-making (Marsh et al., 2006) ▪ Accessibility of data ▪ Quality of data ▪ Motivation to use data ▪ Timeliness of data ▪ Staff capacity and support ▪ Curriculum pacing pressures ▪ Lack of time ▪ Organizational culture and leadership ▪ History of state accountability
	c) What factors served as barriers or limited the use of data in physical education?	
	d) How could the DDDM process be enhanced in physical education?	

Table 1. Alignment between research questions, case study questions, and literature.

One of the reasons for grounding the research questions and case study questions so firmly in the DDDM literature is so that direct comparisons could be made between how the process unfolds in other areas of education versus how the process unfolds in physical education.

Chapter 2: Review of Literature

The purpose of this review is to describe the DDDM process and provide background information to contextualize the study. The first sections present information from the general education literature along with common critiques of DDDM. The remaining sections explore issues in physical education related to DDDM and introduce the reader to some of the new technologies that may facilitate the process in this subject area. As a result of the review, it is expected that readers will move forward with a clearer understanding of the DDDM process and a strong rationale for the present study.

AN INTRODUCTION TO DDDM

DDDM is defined as "the systematic collection, analysis, examination, and interpretation of data to inform practice and policy in educational settings" (Mandinach, 2012, p. 71). It refers to the process by which "teachers, principals, and administrators systematically collect and analyze various types of data… to guide a range of decisions to help improve the success of students and schools" (Marsh et al., 2006, p. 1). The topic has received extraordinary attention in educational dialogue over the past decade in the form of: a) federal education policy documents (NCLB, 2002; U.S. Department of Education, 2009), b) reports from large-scale national studies (Means, Padilla, DeBarger, & Bakia, 2009, Means, Padilla, & Gallagher, 2010), c) practice guides published by organizations such as the Institute of Educational Sciences (Hamilton et al., 2009), d) edited books (Herman & Haertel, 2005; Kowalski & Lasley, 2008; Mandinach, Honey, & Linn, 2008), e) special issues in academic journals, (Scherer, 2008; Wayman, 2005a), f)

research syntheses from organizations such as RAND Corporation (Marsh et al., 2006), g) guidebooks for educators (Bernhardt, 2004; Blink, 2007; Creighton, 2007; Mandinach & Jackson, 2012; Picciano, 2006), and h) online resources from advocacy groups such as the Data Quality Campaign (DQC, 2012). These voluminous collections speak to the relevance of the topic and serve to ground it decisively within contemporary educational discourse. As Mandinach and Jackson (2012) suggest, DDDM is not a passing fad, it is here to stay (p. 11).

Purposes of DDDM

To fully understand the DDDM process, it is important to consider why educators might turn to data for decision-making purposes in the first place and what kinds of data may inform the decisions that educators are likely to make. The following educator queries have been synthesized from the work of Breiter and Light (2006), Hamilton and colleagues (2009), and Marsh and colleagues (2006):

Administrators

- What are the areas of greatest need on our campus and in the district?
- How might we best allocate resources to address these needs?
- How well is our curriculum addressing the standards?
- How effective are our teachers?
- What kinds of professional development may be useful for our teachers?

Teachers

- What are my students' greatest strengths and needs?
- How well did I accomplish my objectives in that lesson?
- How will I allocate available instructional time in the future?
- What teaching methods are most effective with this class/student?
- What additional interventions may be necessary to help struggling learners?

These questions are the types of questions that educators at various levels of the school system may turn to data for answers.

Moody and Dede (2008) organize the purposes of DDDM (referred to as data-based decision making in the text) into three main categories: a) DDDM for accountability, b) DDDM for school improvement, and c) DDDM as a reflective process. *DDDM for accountability* is focused on using data as evidence of responsible practice with student achievement data representing one of the most highly regarded forms of evidence. An example of DDDM for accountability exists in the policies associated with NCLB. These policies require schools to report standardized test scores which are connected to funding decisions and other consequences for schools (NCLB, 2002). The emphasis in DDDM for accountability falls on product-related data and often involves the implementation of standardized solutions when outcomes are not sufficient (Moody & Dede, 2008).

DDDM for school improvement, although similar in focus to DDDM for accountability in terms of collecting evidence of responsible practice, is more school-centered and prescriptive. Rather than addressing external reporting requirements, data are collected for the purposes of diagnosing school-level problems and fixing them, often with a level of flexibility that is not available within external accountability systems (Moody & Dede, 2008). An example of DDDM for school improvement is using benchmark testing to identify shortcomings in the curriculum and revising the curriculum to address these deficiencies.

Lastly, *DDDM as a reflective process* moves away from an emphasis on product-related data and moves toward a closer exploration of teacher practice. DDDM as a reflective process involves using many kinds of data, both "hard" and "soft" to guide conversations about practice (Moody & Dede, 2008, p. 240). Hard data may include results of standardized test scores, while soft data may include teacher observations of student behavior. Collaboration among educators is considered key to the reflective process. Team meetings where teachers come together to discuss challenges and share instructional strategies is an example of how data ca be used in a reflective process.

Types of Data

In addition to the purposes for which data may be used in educational settings, Marsh and colleagues (2006) organize the types of data that may be used into four different categories: a) input, b) process, c) outcome, and d) satisfaction data. *Input data* can include data on school expenditures or student demographic factors. *Process data* can

include information on financial operations or instructional quality. *Outcome data* can include student test scores or dropout rates. And *satisfaction data* can include opinions from stakeholders such as teachers, students, and parents (Marsh et al., 2006). When examining data-use practices in schools, one must consider all of the various types of data that may be used to inform educational decisions and even the interactions that may exist between various data sources. .

DRIVING FORCES BEHIND DDDM

Although educators have been using various sources of data to make decisions for years, until recently data-use has been neither systematized nor automated (Mandinach, 2012). Based upon a synthesis of the literature, two crucial factors have contributed to the recent emphasis on DDDM in education: a) the standards, assessment, and accountability movement and b) advancements in new technologies capable of supporting the DDDM process. Each of these factors is discussed in further detail below.

Standards, Assessment, and Accountability

In 1983, the National Commission on Excellence in Education (NCEE) published a report entitled *A Nation at Risk: The Imperative for Educational Reform*. This report highlighted the apparent failure of American schools to produce graduates capable of competing on a global level (NCEE, 1983). As one result of this report, national and state organizations representing various content areas began the process of more thoroughly defining what it is that students should know and be able to do as a result of a quality

educational experience; leading to the development of content standards and learning outcomes. In parallel, professional organizations also worked to create assessments capable of measuring student achievement. Many subject areas, including those considered "non-core" like physical education, were engaged in the process of developing standards, outcomes, and assessments (e.g., NASPE, 1992, 1995, 2004, Lambert, 1999).

In 2001, the reauthorization of the Elementary and Secondary Education Improvement Act known as No Child Left Behind (NCLB) instituted a formal accountability system tied to standardized test scores in core content areas (leaving out subjects considered non-core, like physical education). This legislation included rigorous reporting requirements and pushed for the documentation of continuous school improvement (NCLB, 2002). Due to strict accountability systems associated with NCLB, schools had substantial incentive to collect, report, and act upon large volumes of educational data. Eight years later, the American Recovery and Reinvestment Act, and its educational component Race to the Top, continued much of NCLB's focus on assessment and accountability. One of its four pillars was dedicated to the development of data systems capable of measuring student growth and informing instruction (U.S. Department of Education, 2009). This legislation, building upon NCLB and the broader standards, assessment, and accountability movement, helped firmly establish the emphasis on data-use that exists in American education today.

Technology

Despite substantial policy support and the best intentions of educators, engaging in effective data-use is challenging. As Wayman and colleagues (2008) suggest, "While the idea of using a broad range of student data to help understand individual student learning is attractive, it is easier said than done" (p. 174). Tools must be available to help educators collect, manage, analyze, and interpret data if they are going to make informed decisions based upon data (Wayman et al., 2008). Over the past two decades, new technological tools have been developed to facilitate the DDDM process. Much of the attention recently has focused on data systems, comprised of the software and hardware designed to assist educators in each step of the DDDM process (Bernhardt, 2005; Hupert, Heinze, Gunn, & Stewart, 2008; Wayman, 2005b; Wayman, Stringfield, and Yakimowski, 2004)

Data systems are commonly organized into three categories: a) student information systems, b) assessment/instructional management systems, and c) data warehousing systems (Bernhardt, 2005; Wayman, 2005b). *Student information systems* are databases that house demographic information like gender, age, and family income in addition to information on attendance, enrollment, class schedules, and discipline referrals. *Assessment/instructional management systems* facilitate the organization and analysis of benchmark achievement data and have the capability of helping teachers align lessons to standardized objectives. *Data warehousing systems* integrate often disparate databases and contain longitudinal/historical data connected to students, teachers, and

schools (Bernhardt, 2005; Wayman, 2005b). These three types of data systems can be locally- or commercially-developed and often vary on the features they provide users. Frequently, handheld computers or personal digital assistants (PDAs) are used in conjunction with these systems to facilitate efficient collection and management of data (Hupert et al., 2008). Wayman and colleagues (2004) provide an in-depth review of some of the most prominent commercially available tools and the reader is guided to the work of King and Amon (2008) and Long, Rivas, Light, and Mandinach (2008) for a more thorough discussion of the features that data systems can provide educators.

Light, Wexler, and Heinz (2005) have identified six characteristics that impact data system utility. These characteristics include: a) access and ease of use (i.e., user-friendliness), b) length of feedback loop (i.e., time from collection to reporting), c) comprehensibility of the data (i.e., how data are reported), d) manipulation of the data (i.e., query tools), e) utility and quality of the data (i.e., alignment with objectives, validity, reliability), and f) links to instruction (i.e., connections with practice). The presence or absence of these characteristics, along with the availability of the proper tools to collect and manage data, help determine the extent to which educators are capable of engaging in the DDDM process (Breiter & Light, 2006; Marsh et al., 2006).

Summary

The climate created by the standards, assessment and accountability movement in parallel with advancements in new technology have made the notion of using data to drive educational decisions both logical and feasible. Many educators now have the

impetus and technological capacity to engage in DDDM. Some argue that data-use in education has shifted from being a suggestion for best practice to a clear expectation (Mandinach, 2012). Consequently, much attention has been paid recently to developing successful strategies for implementation.

STRATEGIES FOR EFFECTIVE DATA-USE

One of the most thorough sources of information on effective data-use is a recent report published by the Institute of Educational Sciences [IES] (Hamilton et al., 2009) which synthesizes the empirical literature related to DDDM over the past 20 years. The product of this work is a list of five recommendations for the effective use of student achievement data in driving instructional practice. The five recommendations are:

1. Make data part of an ongoing cycle of instructional improvement
2. Teach students to examine their own data and set learning goals
3. Establish a clear vision for school-wide data use
4. Provide supports that foster a data-driven culture within the school
5. Develop and maintain a district-wide data system

(Hamilton et al., 2009, p. 8)

Recommendation one suggests that teachers continuously engage in a cycle of instructional inquiry that consists of three steps a) developing hypotheses about how to improve student learning, b) modifying instruction to improve student learning, and c) collecting a variety of data to test if the hypotheses were correct. This approach guides teachers into a systematic evaluation of their own teaching practices and helps relate

those practices directly to student learning. Engaging in this process can help teachers more effectively allocate time, group students, and order the curriculum (Hamilton et al., 2009).

Recommendation two suggests that students become more involved in examining their own learning data. The rationale for this recommendation is that students are in the best position to monitor their own learning and providing them with the tools to do so can motivate them and give them a sense of control over their own outcomes. To carry out this recommendation, teachers need to clearly explain expectations and assessment criteria to students, provide quality feedback, help students learn from the feedback they receive, and use the students' analyses to guide instructional changes (Hamilton et al., 2009).

Recommendations three and four involve the development of a clear vision and a culture of school-wide data use. The vision should include a detailed plan for how the use of data will contribute to student achievement goals and the school culture should include strong leadership and guidance for staff members as they engage in the DDDM process. To achieve these recommendations, schools and districts should a) provide professional development to teachers related to data-use, b) schedule time for collaboration over data, and c) invest in technology and other resources to facilitate the use of data (Hamilton et al., 2009).

Lastly, recommendation five involves the development and maintenance of a district-wide data system that allows all stakeholders to access relevant data in a timely

fashion. A variety of stakeholders should be involved in the process of selecting the data system to ensure that everyone's needs are addressed. The six characteristics of effective data systems described by Light and colleagues (2005) are particularly relevant when selecting or developing appropriate data systems.

Although the IES practice guide panel reviewed a large number of sources in the creation of these recommendations, it is important to note that the overall level of empirical support for these strategies was deemed low. This is because the panel used the causal validity standards of the What Works Clearinghouse to determine the strength of the evidence. The system relies heavily on the results of randomized controlled trials and much of the evidence to support DDDM practices comes from case studies. In addition, the recommendations primarily focus on the use of student achievement data, or outcome data, for the purpose of improving instruction. They do not provide in-depth guidance on the use of input data, process data, or satisfaction data to drive other types of decisions that educators are likely make. Regardless, the practice guide represents one of the most comprehensive compilations of what we currently know about effective data-use practices in education.

Another useful resource pertaining to effective data-use practices in education is a research synthesis conducted by the RAND Corporation (Marsh et al., 2006). This resource contains evidence from four large-scale case studies conducted between 2000 and 2007. The product of this synthesis is the identification of nine factors that influence the effectiveness of data-use by educators. These factors include a) the accessibility of

data, b) the perceived or real quality of data, c) educators' motivation to use data, d) the timeliness of data, e) staff capacity and support, f) curriculum pacing pressures, g) time issues, h) organizational culture/leadership, and j) history of state accountability (Marsh et al., 2006). Many of these factors align closely with the recommendations in the IES practice guide. For example, both reports reinforce the need for a supportive school culture surrounding data-use and supplying ample time for professional development. What is clear from each of these reports is that effective data-use does not occur by chance; it is the result of system-wide efforts to improve data-use practices and collaborations from all involved levels are key to the successful use of the model (Hamilton et al., 2009; Marsh et al., 2006).

CRITIQUES OF DDDM

Although the idea of using data to drive decision making in schools makes intuitive sense and has gathered popularity over the past decade, it does not exist without criticism. The most common critiques of DDDM are related to one major concern: an over-reliance on standardized testing data used for the purposes of accountability. To illustrate this concern, Booher-Jennings (2005) described how testing practices in one Texas school led to "educational triage", a situation in which students on the threshold of passing the state accountability test received greater attention and support compared with other students that were either way below the cut-point or not in danger of failing at all. This led to a disparate allocation of resources toward "bubble kids". The author also described how other questionable tactics such as unnecessarily qualifying low-achieving

students for special education services were used to create an illusion of test score improvement over time. These examples demonstrate how an over-emphasis on testing data for the purposes of accountability can lead to inappropriate uses of DDDM.

Other scholars strongly contend that test score data are not even the kind of data that are most useful in making educational decisions. Hoerr (2008) argued that standardized tests fail to measure many of the interpersonal skills that lead to success later in life and fail to acknowledge the various ways that students learn. Schmoker (2008) likewise contended that standardized tests do not measure 21st century skills and that because of the accountability systems that are in place, many teachers end up focusing on test preparation at the expense of authentic learning. Some authors have also communicated concerns over equity in using standardized test data to make high stakes educational decisions. Confrey (2008) described how "NCLB is riddled with contradictions around issues of equity" and argued that "the resolution to the contradictions depends on the development of a clear, concise idea of instructional validity, which should encompass documentation of opportunity to learn and clear specifications for the development of instructional guidance from test results" (p. 49). A student's bill of testing rights was proposed that included procedures for ensuring that student test data are used appropriately and lead to improved equity in the school system.

Wayman and colleagues (2008) sum up the response of many scholars to the problem of over-reliance on standardized testing data that has been documented in the literature. The authors state:

> We believe educators must extend their use of student data past the narrowest assessment and reporting mandates of accountability policies, toward the thoughtful, efficient use of a broad range of individual learning information on each student: data use in addition to accountability.
>
> (Wayman, et al., 2008, p. 173)

DDDM IN PHYSICAL EDUCATION

In the sections above, two factors were identified as primary contributors to the prominence of DDDM in education: a) the standards, assessment, and accountability movement, and b) advancements in new technologies. When considering DDDM within the context of physical education, these two factors remain relevant. Physical education as a subject-area has been participating in the standards, assessment, and accountability movement (at least in part) over the past three decades and has experienced advancements in new technologies that have the potential to assist in the DDDM process. Yet the field has not seen the kind of boom in research and practice that has been seen in other content areas related to effective data-use. In the following sections, factors that may have contributed to this situation are explored and based upon this evidence, a rationale for the present study is proposed.

Standards, Assessment, and Accountability in Physical Education

In parallel with the greater standards, assessment, and accountability movement in the late 1980's and 1990's, NASPE published the *Outcomes of Quality Physical*

Education Programs (NASPE, 1992) and the *National Standards for Physical Education* (NASPE, 1995) to more clearly define what students should know and be able to do as a result of a quality physical education experience. Following the publication of these documents, the Standards and Assessment Task Force continued with the publication of an assessment series that included numerous resources to help teachers measure the achievement of key outcomes in physical education (e.g., Lambert, 1999; Melograno, 2000). The national standards were later revised in 2004 and after nearly a decade of work conducted by a new Assessment Task Force, an assessment series entitled *PE Metrics* was published in 2010, including rigorously tested assessment tools aligned with each of the six revised national standards (NASPE, 2010c, 2011). Throughout the process, states and districts developed their own standards, outcomes, and assessments for physical education, many of which were based upon the national standards (NASPE, 2010a). Recently, the standards have been revised again with the newest edition including five national standards for physical education (AAHPERD, 2013). This brief timeline outlines physical education's involvement in the standards and assessment pieces of the standards, assessment, and accountability movement.

When NCLB was passed into law in 2002, new requirements related to assessment and accountability were included in the policy. Schools were required to report a wealth of data related to student achievement in core content areas along with demographic factors that could help determine if an achievement gap was being closed and if schools were demonstrating adequate yearly progress (NCLB, 2002). Physical

education was not included as a core content area within this policy. As a result, many of the accountability systems did not apply to physical education. In spite of this, some states made efforts to develop their own systems of accountability for physical education. One of the best documented efforts was the South Carolina Physical Education Assessment Program (Rink & Mitchell, 2002, 2003; Rink et al., 2007). This reform effort took part in three waves and included the development of state standards, outcomes, and assessments/policies for physical education accountability (Rink & Mitchell, 2002). Although the reforms were widely viewed as successful, few states have been able to replicate them. Many scholars contend that physical education still lacks sufficient systems of assessment and accountability, which contributes to the marginalization of the subject-matter in schools (Collier, 2011; Henninger & Carlson, 2011). Specifically, Collier contends:

> In light of the lack of value currently assigned to physical education, it would be wise for teachers to commit to a philosophical shift and change assessment and evaluation practices not only to enhance instructional processes and student learning, but to add worth to the field.
>
> (Collier, 2011, p. 39)

It appears that physical education is in an interesting position. On the one hand, exclusion from formal accountability systems could be contributing to the marginalization of the subject matter. However, on the other hand, the absence of strict guidelines and reporting requirements associated with these systems could be leaving the

door open to more wholesome uses of data in the field. The reader is reminded that accountability is only one purpose for which data may be used in schools. Program improvement and teacher reflection also represent worthwhile endeavors (Moody & Dede, 2008). Physical education may in fact be in an ideal position to determine its own path toward effective data-use and serve as a model for other subject areas where rigid policies have tainted the process.

Data-Use in Physical Education

Although there is an overall paucity of research on the topic of effective data-use in physical education, a number of resources point to the importance of pursuing data-driven practices in the field. Textbooks on curriculum development make explicit the role that assessment and evaluation must play in developing and implementing a quality physical education curriculum. Lund and Tannehill (2005) and Kelly and Melograno (2004) argue that student assessment should be common practice in physical education and should be integrated with instruction. They describe how student assessment data, in conjunction with other sources of data, should be used in a continuous process of program evaluation. Lund and Tannehill (2005) describe the purposes of evaluation in relation to gauging teacher effectiveness, determining student satisfaction, engaging in program improvement efforts, and building accountability. They argue that "good evaluation" is systematic, objective, involves all stakeholders, is thorough, uses defensible data sources, and includes evaluation context (pp. 282-284). Kelly and Melograno (2004) similarly propose an achievement-based model for program evaluation

that relies heavily on student assessment data to determine overall program and teacher effectiveness. They also specifically refer to "data-based decision making" and "data-based program evaluation" as the processes by which student achievement data are used to critically examine strengths and weaknesses within the physical education curriculum (Kelly & Melograno, 2004, pp. 263, 267).

Some of the most convincing evidence for the need for data-driven practices in physical education comes from national guidance documents describing the characteristics of effective physical educators. In *What Constitutes a Highly Qualified Physical Education Teacher*, NASPE (2007b) states that highly qualified teachers "view assessment as an integral component of the teaching-learning process" and regularly use assessment to gain "valuable information about student achievement of the content standards and to guide the program evaluation process to affect meaningful curriculum change" (p. 2). Likewise, the *Physical Education Teacher Evaluation Tool* (NASPE, 2007a) contains a number of elements that align with the practice of DDDM. For example:

> Element 1-N: Student performance is continually evaluated to guide instruction.
>
> Element 1-O: Lesson presentation is changed in response to observation of student performance and/or information from formative assessment.
>
> (NASPE, 2007a, p. 11)

In addition, NASPE provides guidance related to the effective preparation of future physical educators. The *National Standards for Initial Physical Education Teacher*

Education (NASPE, 2008b) and the *Advanced Standards for Physical Education* (NASPE, 2008a) reference preparing teacher candidates who "use assessments and reflection to foster student learning and inform decisions about instruction" (NASPE, 2008b, p. 3). According to NASPE, effective candidates exhibit teaching that "reflects integration of planning, instruction and assessment as a unified process to achieve long- and short-term outcomes/goals" (NASPE, 2008a, p. 9). The fact that these standards were identified by the leading professional organization in the field makes for a convincing argument in favor of working to build greater DDDM capacity in K-12 physical education.

Curriculum textbooks and national guidance documents describe numerous ways in which data can be used in physical education. They also offer hope and optimism in relation to the potential of physical educators to engage in the DDDM process. However, there is little evidence to support the notion that K-12 physical educators, especially in the absence of policies that require assessment or provide some level of accountability, actually put these ideas into practice. However, one physical education context within which the successful implementation of a data-driven approach *has* been documented is within higher education. Professors in the Health and Physical Education Teacher Education program at Georgia State University have been implementing a data-driven approach to the preparation of teachers for more than a decade (Metzler & Blankenship, 2008). They've created the "development, research and improvement (DRI)" framework to guide comprehensive program assessment and evaluation (Metzler & Tjeerdsma,

1998). One of the most interesting features of this model is its reliance on what the authors describe as "research quality data" to drive decision making. The outcome of the project has been the development of a "learning organization" that is constantly collecting and analyzing various types of data to drive program improvement (Metzler & Blankenship, 2008; Metzler & Tjeerdsma, 1998, 2000). This example also provides hope and optimism in relation to the implementation of DDDM within the context of physical education. However, the example is limited to higher education. As such, there is a clear need for more research on the topic of effective data-use practices at the K-12 level.

Technology in Physical Education

As alluded to earlier in this review, the desire to engage in DDDM is only one piece of the puzzle. Sufficient tools and resources must be available to facilitate the process. In relation to physical education, a number of recent advancements in technology have the potential to make the DDDM process more feasible for physical educators. A brief overview of some of these technologies follows.

Fifteen years ago, Lambdin (1997) introduced the field to Computer Organized Physical Education (COPE), a data management system designed to assist in record keeping, planning, and communication. As a teacher, the author described how she wanted to use data to identify students in need of additional instruction, to evaluate various aspects of her physical education program, and to communicate more effectively with parents and administrators, but lacked the necessary tools to do so effectively (Lambdin, 1997). Project COPE was the product of these struggles.

Since that time, a number of commercial data management systems tailored toward physical education have entered the marketplace (e.g., *PE Manager*: Polar Co.; *Virtual PE Administrator*: Great Activities Publishing Co.; *SPIRIT System*: Interactive Health Technologies). These systems allow for the efficient upload and management of large amounts of data ranging from attendance to heart rate data. They also provide features for analyzing and reporting physical education-related data. Handheld computers, tablets, and PDA's can be used in conjunction with these data management systems to facilitate efficient data collection and transfer (Gubacs-Collins & Juniu, 2009; Mohnsen & Mauch, 1998; Nye, 2010; Wegis & van der Mars, 2006). Like data systems discussed in other subject areas, data systems in physical education make the idea of collecting, managing, analyzing, and reporting large amounts of data more appealing and feasible for educators.

Activity monitors represent another type of technology that has the potential to facilitate the DDDM process in physical education. Activity monitors include any device capable of measuring an individual's physical activity participation. Most commonly, these devices include pedometers, accelerometers, and heart rate monitors (Freedson & Miller, 2000). NASPE suggests that a physically educated individual participates regularly in physical activity (NASPE, 2004). Activity monitors provide an objective way of assessing this standard. However, as McCaughtry and colleagues (2008) caution, teachers may encounter practical issues in getting the devices to work properly and may have reservations about the accuracy of the data these devices produce. Others, like

Mears (2010), have concluded that "activity monitoring devices can provide a key avenue for practitioners to obtain valid and objective data of student activity levels" (p. 31).

Data management systems, handheld computing devices, and activity monitors represent some of the most promising types of technology available to physical educators to assist in the DDDM process. They can assist physical educators in the data collection process and the process of transforming raw data into actionable knowledge. Unfortunately, little is known about the extent to which physical educators have access to these technologies or the practical issues that may be encountered with their use. Regardless, these technologies hold potential in helping physical educators overcome some of the logistical barriers that may exist to DDDM.

Summary

Physical education has been a participant in the standards, assessment and accountability movement, albeit to a limited extent. Despite its exclusion from federal policies like NCLB, calls from within the field have highlighted the critical need for improved systems of assessment and accountability. Textbooks on curriculum development clearly point to the necessity of using various sources of data to drive instruction and program improvement efforts. Although few examples of DDDM in K-12 physical education exist in the literature, we can look toward models from higher education for direction. Furthermore, national guidance documents from NASPE clearly outline the characteristics of effective physical educators and consistently highlight data-

driven practices. These documents help provide a convincing argument for the development of greater DDDM capacity in physical education.

Considering the evidence presented above, it is clear that the time has never been better for physical education professionals to enter into the DDDM conversation. If serious progress is to be made, however, we must first come to an understanding of the process as it exists in real life K-12 physical education contexts. We need to have a better understanding of what is currently happening and what is not. Information regarding how the DDDM process unfolds and where physical educators may get stuck along the way will enrich our knowledge about the implementation of DDDM. Knowledge about what factors facilitate the process and what factors may be holding educators back is also needed. Until we have a grasp of these details, it will be difficult to move forward in the pursuit of effective data-use in physical education.

CONCEPTUAL FRAMEWORK FOR DDDM

In order to understand how the DDDM process unfolds in physical education, it is important to have a conceptual framework to guide our understanding of the process. A number of conceptual frameworks detailing the process have been presented in the literature (see Abbott, 2008; Hamilton et al., 2009; Ikemoto & Marsh, 2007; Mandinach et al., 2008; Means et al., 2010). One framework in particular excels in detailing the intricacies of how data are transformed into actionable knowledge (Mandinach et al., 2008). It is the product of work conducted at the Center for Children and Technology with support from the National Science Foundation. Six case studies of exemplary school

districts across the United States were used to gather information about how educators at various levels of the school system engaged in the DDDM process. The framework is the product of the findings from these studies (see Figure 1).

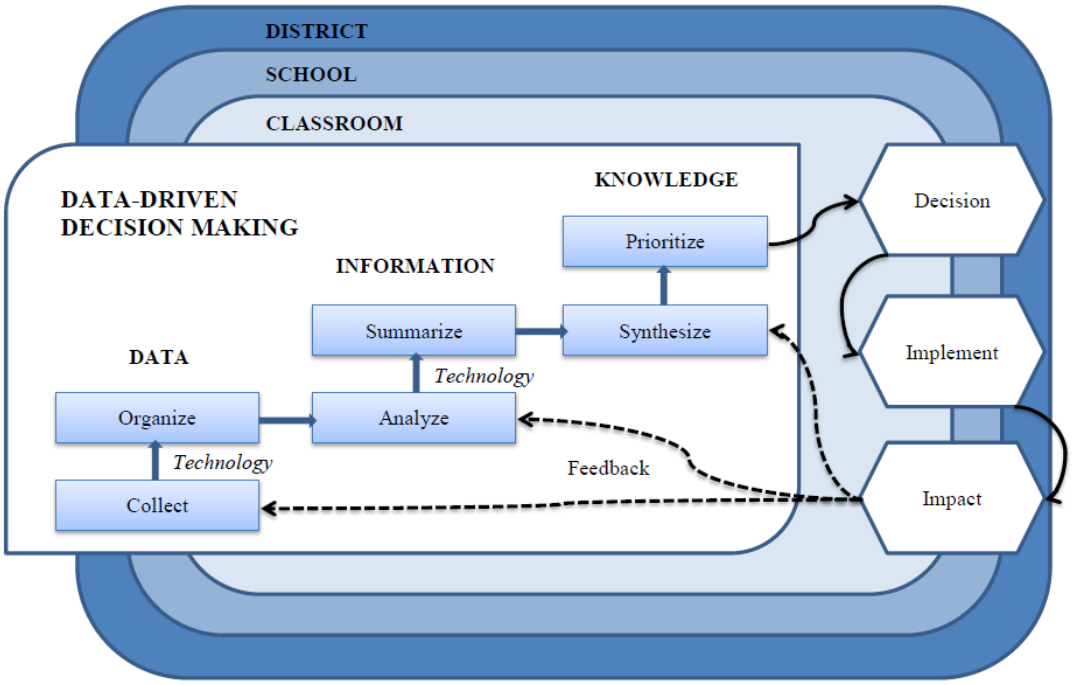


Figure 1: Framework for data-driven decision making (adapted from Mandinach et al., 2008).

The model is founded upon organizational and management theory (e.g., Ackoff, 1989), which states that data, information, and knowledge exist on a continuum. As Light and colleagues (2005) have proposed, *data* exist in a raw state and are inherently void of meaning. Only when connected with context are data able to be used for understanding the environment. Data are thus transformed into *information* when connected with context. However, even information in and of itself, the authors contend, does not imply

future action. A collection of information must be deemed useful by the user in order to be defined as *knowledge*, and will only then be used to guide action. The process by which raw data are transformed into actionable knowledge is referred to as the "data-to-knowledge continuum" (Light et al., 2005). This continuum serves as the foundation for the conceptual framework.

At each level of the data-to-knowledge continuum, two processes have been identified that are considered crucial to the decision-making process (Mandinach et al., 2008). At the level of data, the processes are *collection* and *organization*. Through these processes stakeholders determine what kinds of data to collect based upon the issue under investigation and organize the data in some systematic fashion. Without organized data, the authors contend it is difficult to proceed to higher levels of data-use (Mandinach et al., 2008).

At the level of information, the proposed processes include *analysis* and *summarization*. Through these processes stakeholders use various strategies to analyze the data depending on the questions that are being asked. According to the authors, the types of analyses conducted also depend upon the availability of technology and the capabilities of the stakeholder. Once relevant analyses have been performed, the results can be summarized so that the most useful information becomes readily apparent (Mandinach et al., 2008).

At the final level of the continuum, the processes of *synthesis* and *prioritization* are proposed. Through these processes, the stakeholder can unify the compiled

information and judge its relative importance. The most pressing aspects of an issue can be moved to the forefront and possible solutions can be considered. At this point, the authors contend that data have completed their transformation into actionable knowledge (Light et al., 2005; Mandinach et al., 2008).

At the end of the six-step process lies a *decision*. At this point, the authors contend that the stakeholder is able to take the knowledge that has been generated and use it to make the best decision possible for a given situation. The stakeholder is able to then *implement* the decision and monitors its *impact*. According to the authors, the model is iterative in nature, meaning the process can loop back into itself at any of the three levels. Based upon the impact, stakeholders may choose to collect more data, re-analyze existing data, or re-conceptualize the issue (Mandinach et al., 2008). Likewise, the presence of technology is proposed to impact the model at nearly every stage. The six characteristics of data systems presented previously (Light et al., 2005; Long et al., 2008) are proposed to influence how the data are organized and transformed into actionable knowledge.

The final component of the conceptual framework consists of three levels of stakeholders within which the DDDM process is proposed to occur: the teacher, the school, and the district (Mandinach et al., 2008). Stakeholders at each of these levels are likely to ask different questions and pursue different sources of data to answer those questions. However, the process by which stakeholders generate actionable knowledge remains fundamentally the same. (Mandinach et al., 2008).

The conceptual framework of Mandinach and colleagues effectively addresses the intricacies of the DDDM process. It provides a basis for understanding each step in the generation of actionable knowledge and captures the iterative nature of the process. It takes into consideration various stakeholders that are likely to engage in DDDM and acknowledges the important influence that technology can have at various stages of the process. The framework is informed by real life examples of DDDM from districts around the country and has been used as a guide in prominent research syntheses of the topic (see Marsh et al., 2006). As such, it is believed that this framework can serve as a useful guide for the present study.

Chapter 3: Methodology

The purpose of this study was to embark on an in-depth exploration of the DDDM process within the context of K-12 physical education. The goal was to gain a clearer understanding of how physical educators at various levels within the school system use data to make important decisions. Using the conceptual framework of Mandinach and colleagues (2008) as a guide, research questions were proposed that examined various aspects of the DDDM process. Based upon these purposes, it was deemed that qualitative methods offered the greatest potential for answering these questions and contributing a rich and detailed portrayal of DDDM to the field. Descriptions of the methods used in the study are presented in the sections below.

RESEARCH DESIGN

According to Creswell (2008), qualitative methodology is particularly useful when little is known about a topic of inquiry and the research is considered exploratory in nature. It takes an inductive approach, meaning the researcher attempts to make sense of a given phenomenon in its natural context without imposing a rigid set of pre-existing conditions on the phenomenon under study (Mertens, 2010). Qualitative methodology has recently become more common in physical education research and has been said to have the potential to inform best practice in the field (Hemphill, Richards, Templin, & Blankenship, 2012). According to Marshall and Rossman (2011), there are five hallmarks of qualitative research:

1. It takes place in the natural world
2. It uses multiple methods that are interactive and humanistic
3. It focuses on context
4. It is emergent, rather than tightly prefigured
5. It is fundamentally interpretive

(Marshall & Rossman, 2011, p. 3)

Case study research is one form of qualitative research that is used to "investigate a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (Yin, 2009, p. 18). This method is useful in answering research questions that pertain to the "how" or "why" of a given phenomenon (Yin, 2009). An embedded case study design involves one overarching case within which the entire study is contextualized, and multiple sub-cases that can be used for more extensive analysis (Yin, 2009).

A qualitative, embedded case study design was employed in this study to explore the DDDM process within the context of K-12 physical education. One school district served as the overarching case while individual schools served as sub-cases. This allowed for a rich and detailed description to be generated from the sub-cases, while maintaining one common context that linked them all together. A graphic depicting the case study design is displayed in Figure 2.

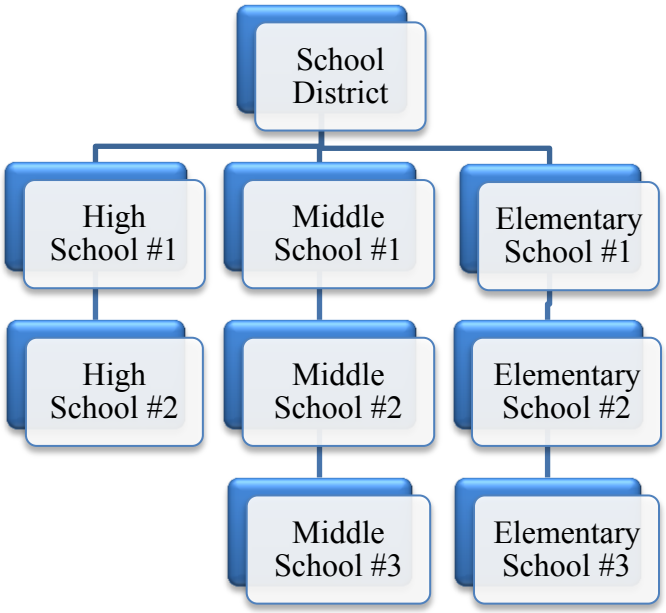


Figure 2. Embedded case study design used in the present study.

Case Selection

Purposeful sampling was used to determine an appropriate research site for the study. Purposeful sampling is defined as "a qualitative sampling procedure in which researchers intentionally select individuals and sites to learn or understand the central phenomenon" (Creswell, 2008, p. 645). In qualitative research, statistical analyses that require random sampling are generally unnecessary and researchers are not attempting to make broad claims of generalizability. Therefore, purposeful sampling is considered an appropriate form of participant selection, as it allows for the intentional inclusion of information-rich cases (Patton, 2002).

The sampling strategy used in this study can be described as a combination of intensity sampling and criterion sampling. According to Marshall and Rossman (2011),

intensity sampling "…involves information-rich cases that manifest the phenomenon intensely, but not extremely" (p. 111). Criterion sampling includes all cases that meet a pre-determined criterion. The criterion used to identify information-rich cases in this study was a school district in the Southern United States that had been awarded a Carol M. White Physical Education Program (PEP) grant within the past two years. PEP grants are intended to "initiate, expand, and/or enhance physical education programs that help students make progress toward meeting state standards" (U.S. Department of Education, 2012). Districts receiving a PEP grant are required to complete the Centers for Disease Control and Prevention's (CDC) School Health Index prior to applying for the grant and must align project goals with the results of this evaluation. Once the grants have been awarded, districts are required to collect physical activity, cardiovascular fitness, and fruit/vegetable consumption data at least four times per year using pedometers, a self-reported physical activity tool, a 20-meter shuttle run, and a nutrition survey (U.S. Department of Education, 2012). Based upon these requirements, it was assumed that districts awarded this grant would have access to at least a minimum amount of data with which to make decisions. Furthermore, language within the application is aligned with the basic premises of DDDM. For example, one of the selection criteria for the grant is "the extent to which the methods of evaluation will provide performance feedback and permit periodic assessment of progress toward achieving intended outcomes" (U.S. Department of Education, 2012). It was assumed that districts having been awarded this grant would have successfully addressed these criteria within their project plans.

Rigorous data collection and reporting requirements within the PEP grant program would allow districts receiving this award to qualify as information-rich cases in relation to DDDM practice in physical education.

Case. Saint Thomas Independent School District[1] (STISD) was selected as the case study site. The district is located in the Southern United States and serves approximately 54,000 students in pre-kindergarten through grade twelve. Ninety percent of the student population is Hispanic and 93% come from economically disadvantaged families. During the 2011-2012 school year, the district employed 7,390 total staff members, of which 59% were professional staff (i.e., teachers, administrators, and support staff). Sixty-one percent were Hispanic, 27% White, and 10% African American. Seventy-seven percent were female. Nearly all of the staff in the district held college degrees (99.6%) and the average number of years of teaching experience was eleven. The district was awarded a PEP grant that was funded over a three-year time period. The primary goals of the project were to improve student physical fitness and nutrition by:

1. Providing targeted professional development to physical education instructors
2. Establishing an intensive course for the most at-risk students
3. Developing and implementing new nutrition modules in physical education courses
4. Developing and implementing new physical activity modules for physical education courses

[1] All district, school, and participant names are pseudonyms.

5. Encouraging family involvement in student physical education and activities
6. Assessing student fitness and student feedback to determine the success of activities

(Document Analysis of District PEP Grant, p. 1)

Participants

A formal research proposal was submitted to the district's research review committee and the university's institutional review board. All participants completed an informed consent form prior to data collection. Individual physical education teachers and schools within the case district were identified with the assistance of school district personnel. In all, eight physical education teachers in eight different schools were recruited for participation in the study: two at the high school level, three at the middle school level, and three at the elementary school level. Three district-level physical education coordinators were also recruited to participate in the study. District level employees included one full-time physical education coordinator and two administrators hired for the purposes of assisting with the PEP grant. Over the course of the study, one principal and one school counselor were also recruited to participate. A summary of participant characteristics are presented in Table 2.

Participants	#	Gender	Experience in Education
Physical Education Teachers	8	Female- 8 Male- 0	Average- 20 years
District Physical Education Administrators	3	Female- 0 Male- 3	Average- 19 years
School Principal	1	Female	12 years
School Counselor	1	Female	15 years
Total	13	Female- 77% Male- 23%	Average- 19 years

Table 2. Participant characteristics.

Interestingly, all of the teachers that participated in the study were female. This was not intentional; rather, it was a result of access granted by the school district and likely due to probability, considering 77% of the teachers in the district were female. Participants at all levels were experienced educators. Teachers averaged 20 years of educational experience, district coordinators averaged 19 years of experience, and the principal and school counselor had 12 and 15 years of educational experience, respectively.

Data Collection

Five sources of evidence were used to inform the case study: a) interviews, b) documents, c) observations, d) archival records, and e) physical artifacts (Yin, 2009). A brief overview of each source of evidence is presented below, along with the specific procedures used for data collection.

Interviews

According to Yin (2009), interviews are one of the most important sources of data in case study research. They can be open and in-depth, focused, or highly structured like a survey. The interview allows a researcher to gain insight into the perspectives of participants through their own words.

Two types of interviews were conducted in the study: a) interviews that were conversational, and b) interviews that were structured and utilized an interview guide (Patton, 2002). Both types of interviews were approached from a responsive interviewing perspective (Rubin & Rubin, 2005). In this perspective, interviewing was viewed as "a dynamic and iterative process, not a set of tools to be applied mechanically" (Rubin & Rubin, 2005, p. 16).

Conversational interviews were informal and took place most frequently during transitional times during site visits. They consisted of relatively short conversations where either the researcher would ask clarifying questions or the participant would volunteer additional information about a lesson or student.

Structured interviews consisted of main questions, probes, and follow ups. Main questions got the conversation going and ensured that the research topic was fully covered; probes elicited more details from interviewees without changing the focus of the conversation; and follow ups were used to further explore themes or topics that were brought up during the course of conversations (Rubin & Rubin, 2005). Structured interviews were completed with all participants. They took place on school campuses and

at the district headquarters. Each teacher and coordinator participated in two structured interviews, while the principal and school counselor participated in one, resulting in twenty-four total interviews. The interviews lasted between fifteen minutes and an hour each. Informed consent was obtained prior to the start of interviews and permission to use an electronic recording device was requested. All participants except one agreed to have the interviews recorded. Electronic recordings were transcribed and saved on a password-protected computer for later analysis. The unrecorded interviews were documented using notes and jottings. Each participant was provided with a full transcript of each interview and/or the notes that were taken during the interview to confirm that the information collected was accurate and fully represented the interviewee's thoughts and beliefs. A complete list of interview questions along with their correlations to overall case study and research questions is provided in Appendix A.

Documents

According to Yin (2009), documents are a valuable source of evidence in case study research because they can be reviewed repeatedly by the researcher in an unobtrusive manner. They are most frequently used in case study research to "corroborate and augment evidence from other sources" (p. 103). They are also useful in providing contextual information for the case.

In this study, documents collected included data collection forms, a checklist, a newsletter, a data collection calendar, the grant proposal, and the grant budget. The documents were collected in both hard copy and electronic formats. Some documents

were requested from participants, while other documents were offered to the researcher without request. In addition to the documents provided by participants, school and district websites were reviewed to locate other relevant documents. Hard copy documents were labeled with case identification codes and scanned into electronic formats. All electronic documents were stored on a password protected computer for later analysis.

Direct Observation

According to Yin (2009), direct observation allows a researcher to observe a phenomenon of interest within its natural setting. It is an important source of evidence to link what is written or said about a topic with what actually occurs in a real-life context. Direct observation can be conducted formally with pre-determined observation instruments or casually in conjunction with other data collection methods.

In this study, observations were made during physical education classes. The purpose of the observations was to gain further insight into the data collection process. A minimum of two lessons were observed for each teacher, resulting in eighteen total observations and 15 hours of direct observation time. Observations were documented using a researcher developed form. The form included a section for recording observation context (e.g., date, time, location, number of students, grade level, lesson context), a section for recording events including direct quotes and more in-depth contextual factors, and a section for researcher reflections. Keeping the events and reflections separate was a deliberate attempt to maintain an awareness of any potential researcher subjectivities that may have entered into the observations. Notes were recorded in the form of jottings, or

short-hand notes, which were expanded upon immediately after each observation (Emerson, Fretz, & Shaw, 1995). Expanded field notes were stored electronically on a password-protected computer for later analysis.

Archival Records

According to Yin (2009), archival records are sources of data that have already been generated within a case. For example, archival records could include student or teacher demographic data, budgetary expenditures, or publicly reported data. Archival records can be a useful source of quantitative data to enhance the context of a case study and augment other data sources.

In this study, archival records collected included a hard copy sample of a student fitness report, a sample printout of a workout schedule, an evaluation report that was submitted to the Department of Education, and demographic reports for each school included in the study. All personally identifying information was removed from the records prior to labeling and scanning of the records into electronic form. Digital copies of archival records were stored on a password protected computer for later analysis.

Physical Artifacts

According to Yin (2009), physical artifacts are also an important source of evidence in case study research. Physical artifacts can include technological devices, tools/equipment, or the material culture within a setting (e.g., posters, cue charts, bulletin

boards). Physical artifacts can offer important insights into the operations within a setting and help develop a vivid portrayal of the culture within a given context.

In this study, a total of 32 physical artifacts were archived using digital photos. Permission was requested prior to collection of each artifact. Artifacts included posters hanging on the gym walls, bulletin boards, data collection tools such as pedometers and scales, and unique pieces of physical education equipment like bicycles. Photos were labeled with the date and location of the image and stored on a password-protected computer for later analysis.

Summary

Five sources of evidence were utilized in the present case study to gain greater insight into the DDDM process within the context of K-12 physical education: a) interviews, b) documents, c) observations, d) archival records, and e) physical artifacts. Each source of evidence by itself can be considered incomplete. However, when combined together, these various sources of evidence had the potential to corroborate one another and expose the most salient features of the phenomenon.

DATA ANALYSIS

The process of bringing order, structure, and interpretation to a mass of collected data is messy, ambiguous, time-consuming, creative and fascinating. It does not proceed in a linear fashion; it is not neat.

(Marshall & Rossman, 2011, p. 207)

As depicted in the quotation above, qualitative data analysis can be both challenging and rewarding. Although many approaches have been presented in the literature (e.g., Emerson et al., 1995; Lincoln & Guba, 1985; Patton, 2002; Strauss & Corbin, 1998; Yin, 2009), most scholars acknowledge that the analysis of data within qualitative research is personal, rather than prescriptive. As Yin (2009) suggests, "Much depends on an investigator's own style of rigorous empirical thinking, along with sufficient presentation of evidence and careful consideration of alternative explanations." (p. 127). In addition, qualitative data analysis is commonly viewed as an iterative process where "data collection and analysis go hand in hand to build a coherent interpretation" (Marshall & Rossman, 2011, p. 208). In the present study, analytic strategies commonly used in case study research were employed (Yin, 2009), but due to the exploratory nature of the study, other methods of analysis were also consulted (e.g., Emerson et al., 1995; Strauss & Corbin, 1998).

Analytic Procedures

First, all forms of evidence were logged in a digital case study database. Recorded interviews were transcribed and placed in a word processing file. Jottings that were taken

in the field were expanded upon in prose form to include more detail about the experience (Emmerson et al., 1995). And documents, archival records, and artifacts were saved in digital form for later integration and interpretation.

A modified version of open coding was performed with field notes and interview transcriptions. Using the conceptual framework of Mandinach and colleagues (2008) as a guide, root codes (i.e., partial codes that can be built upon with further information) were developed that aligned to different aspects of the model; including steps within the data-to-knowledge continuum, levels of implementation, and the impact of various technologies on the DDDM process. These a priori root codes served as the foundation for the analysis (see Table 3).

Element	Root Code	Element	Root Code
District	Red	Knowledge/Synthesize	KS-
School	Green	Knowledge/Prioritize	KP-
Physical Educator	Blue	Decision	D-
Data/Collect	DC-	Implement	I-
Data/Organize	DO-	Impact	IM-
Information/Analyze	IA-	Technology	T-
Information/Summarize	IS-		

Table 3. Coding scheme for evidence relating to the conceptual framework.

Each root code was connected with a descriptive word or phrase that was used to provide more detail about the phenomenon of interest. For example, a situation in which a physical education teacher collected fitness scores from a class of sixth graders was coded as: DC- Fitness. The 'DC' represented the root code for data collection. The word 'fitness' was used as a descriptor. And the blue text signified that the event occurred at

the level of the physical educator. This coding scheme provided a direct linkage between the conceptual framework and the case study data, while at the same time allowing for a detailed portrayal of the DDDM process as it unfolded in physical education. Events that did not directly align with one aspect of the conceptual framework were simply coded without a root.

Using an axial coding process, like-codes were integrated and chunked with one another (Emerson et al., 1995; Strauss & Corbin, 1998). Sometimes new descriptive words were required to accurately depict the concept and at other times, existing codes were sufficient. When possible, "in vivo" codes were used where the actual words of the participants themselves were used as the codes or categories (Strauss & Corbin, 1998). Once the data were organized into categories, analytic integrative memos were produced (Emerson et al., 1995; Strauss & Corbin, 1998). These memos included key messages from the categories along with preliminary interpretations of findings. Lastly, a process of data reduction was used to clump categories into broader themes, bridge gaps within the data, and connect main ideas. Categories with insufficient evidence were removed from the data set. Throughout the process, analytic strategies such as pattern matching, examining rival explanations, and drawing diagrams were infused into the process (Strauss & Corbin, 1998; Yin, 2009). Examples of the flow charts used to analyze themes across educational levels are provided in Appendix B.

RESEARCHER EXPERIENCE AND POSITIONALITY

When conducting qualitative research, it is important to remember that the researcher is the primary instrument for data collection and analysis (Marshall & Rossman, 2011). Whether conducting interviews, collecting artifacts, or recognizing patterns within the data, the researcher must possess intricate knowledge of the subject matter and sufficient skills of inquiry to successfully engage in each step of the process. As such, experience is of paramount importance.

As a physical education teacher in a public charter school for six years, I had the unique opportunity to experience the DDDM process firsthand. The school in which I taught was distinctively dedicated to the use of data for student achievement and school improvement. As described in the literature, the school had strong leadership that encouraged a culture of data use (Bertfield & Merrill, 2008; Blink, 2007; Hamilton et al., 2009; Marsh et al., 2006; Ronka, Lachat, Slaughter, & Meltzer, 2008; Steele & Boudett, 2008); data teams were in place and were provided consistent time to analyze data in collaboration (Hamilton et al., 2009; King & Amon, 2008; Murnane, Sharkey, & Boudett, 2005; Steele & Boudett, 2008); and special interventionists served as data coaches to help teachers progress monitor and use student outcome data to drive instructional decision-making (Carrigg & Kurabinski, 2008; Hupert et al., 2008; Marsh et al., 2006). As the physical education teacher at the school, I was encouraged by the administration to engage in DDDM to promote physical activity and fitness among students. I was included in staffing meetings where important decisions about placements and interventions were

made using not only academic data, but data from physical education. A unique model for DDDM in physical education was developed and became part of the culture of the school. The process was documented through a number of professional channels (Dauenhauer, 2012; Dauenhauer & Knipe, 2012; Dauenhauer, Keating, & Lambdin, 2011; Dauenhauer, Keating, & Lambdin, 2010). These experiences provided me with firsthand knowledge about the process of DDDM within the context of physical education and sparked the impetus for the present study.

Experience, while important, can also be viewed as a source of bias. Because qualitative research is inherently interpretive in nature, our thoughts and beliefs, both acknowledged and unacknowledged, have the capability of influencing every part of the research process from the selection of a topic to the interpretation of results. As such, it is important for qualitative researchers to be critically reflexive throughout the research process and examine ways in which personal subjectivities may directly or indirectly be influencing the course of a study. I undoubtedly embarked on this research endeavor with experiences that shaped the way I think about DDDM within the context of physical education. I have also been influenced by the literature I have been exposed to and the professionals I have been in contact with. Throughout the research process, I was careful to honestly reflect on my own subjectivities and acknowledge ways in which they may have influenced study decisions. Specific steps were also taken to ensure the trustworthiness and credibility of the data collected. These steps are outline below.

TRUSTWORTHINESS & CREDIBILITY

Marshall and Rossman (2011) describe the notion of trustworthiness as the qualitative counterpart to the quantitative conception of research soundness, which includes constructs of validity, reliability, objectivity and generalizability (p. 39). A number of scholars over the years have proposed different ways in which researchers can ensure the rigor of qualitative research and give consumers some level of confidence in the results (Cho & Trent, 2006; Creswell & Miller, 2000; Lincoln & Guba, 1985; Patton, 2002; Strauss & Corbin, 1998). Some of these strategies include member checking, peer debriefing, triangulation, negative case analysis, creating an audit trail, and engaging in reflexivity. To ensure the trustworthiness of the data collected in this study and to inspire confidence in the resulting interpretations, a combination of these strategies were used.

Member Checking

Member checking is relied upon most frequently to confirm the accuracy and thoroughness of collected data, but it can also be used to check a researcher's interpretations of salient themes during the analysis process (Marshall & Rossman, 2011; Mertens, 2010). In this study, interview transcriptions and preliminary interpretations were shared with participants. Each participant was given the opportunity to check the accuracy of the recorded information and revise or elaborate upon statements they made during interviews. Involving participants in this manner ensured that participant perspectives were accurately represented and that researcher subjectivities did not unfairly influence the final interpretations.

Peer Debriefing

Peer debriefing is the process of engaging knowledgeable colleagues in the analysis of data (Marshall & Rossman, 2011). The purpose is to gain an outsider's perspective on important steps in the analytic process, like coding and memoing, to ensure that researcher subjectivities do not unfairly infiltrate the analyses and that all potential interpretations are considered. In this study, university colleagues including graduate students and faculty members were relied upon at various stages throughout the data collection and analysis process. Peer debriefers were asked to review codes, comment on emerging themes, and provide input on which sources of evidence to pursue further. Notes were taken during the peer debriefing sessions and were filed in the case study database.

Triangulation

Triangulation is one of the most frequently cited strategies used in qualitative research to bring rigor to a study (Marshall & Rossman, 2011). The basic premise behind triangulation is that any one given source of evidence is likely to have flaws and limitations. Therefore, basing interpretations upon only one form of evidence could lead to an inaccurate or incomplete portrayal of the phenomenon of interest. If, however, multiple sources of evidence are considered and more than one source points to the presence of a given theme, the level of confidence that surrounds the interpretation is elevated. As Yin (2009) suggests however, non-convergence can also be a source of interest. It can help pinpoint disconfirming evidence or bring to the surface contrasting

perspectives. In this study, five sources of evidence were used to triangulate the findings. Themes were generated based upon findings that had the most supporting evidence or had a particularly interesting contrast between sources of evidence. Findings were also triangulated by participants. Themes that spanned multiple educational levels were given analytic priority.

Negative Case Analysis

Negative case analysis is an analytic strategy used in qualitative research to intentionally search the data for alternative explanations (Maxwell, 1996). When patterns begin to emerge from the data, it may be the tendency of the researcher to focus more on evidence that reinforces those patterns, rather than looking at evidence that may disconfirm the findings (Creswell & Miller, 2000). Therefore, it is important that the qualitative researcher make a conscious effort to search the data for disconfirming evidence. In this study, negative case analysis was infused throughout the analytic process and peer debriefing sessions were used to help identify negative cases that may have been overlooked. This process helped ensure that the themes generated from the study did not have an abundance of contrasting support.

Audit Trail

The creation of an audit trail involves the documentation of the research process from start to finish (Marshall & Rossman, 2011). It includes the maintenance of a research log that shows data collection events, steps in the analytic process, and any

decisions that may have shifted the focus of the research endeavor. The purpose of an audit trail is to allow the researcher or other interested parties track the evolution of key findings and confirm that sufficient steps were taken throughout the process to ensure credibility and dependability (Mertens, 2010). Yin (2009) recommends the creation of a case study database to help maintain a chain of evidence throughout a study. This allows the researcher to cite specific sources of evidence, reveal the circumstances under which the data were collected, and confirm that the data collection procedures matched the original case study questions (Yin, 2009, p. 123). In this study, each step of the research process was meticulously recorded in a case study log. The log contained dates, times and locations of each source of evidence collected, in addition to records of important research decisions that were made along the way. Analytic memos that were generated throughout the study were saved after each instance of memo writing so that the interpretive process could be documented and revisited. Like a crime scene investigation, the trail of evidence clearly documented how important conclusions were arrived upon and helps bring a high level of credibility to the findings (Yin, 2009).

Researcher Reflections

In addition to these strategies, the researcher used one more approach to contribute to the trustworthiness of the present study. Built into each electronic record of evidence, whether it was field notes, interview transcripts, or photos of physical artifacts, was a space for researcher reflections. This space was reserved for personal thoughts about the circumstances in which the data were collected and allowed the researcher to

share initial reactions to the findings. Keeping these reflections separate from the actual evidence, but in a space nearby, allowed for a critical examination into how personal thoughts and beliefs were entering the research process.

Summary

Qualitative researchers must acknowledge how their thoughts, beliefs and experiences may influence the research process. In opposition to a post-positivist paradigm, most qualitative researchers subscribe to a notion that true objectivity is unachievable, particularly in social science research (Guba & Lincoln, 1998). Thus instead of striving for objectivity, qualitative researchers must come to a better understanding of their own subjectivities and take steps to ensure that they do not unfairly infiltrate the data and analyses. Many of the strategies used in this study epitomize this approach. Member checks helped ensure the accuracy of collected data and ensured that major themes emerging from the analyses were relevant to participants. Peer debriefing recruited outside perspective and helped identify instances where researcher subjectivities may have been functioning as blinders. Triangulation ensured that more than one source of evidence was considered to inform the understanding of the phenomenon, and through negative case analysis, allowed for the intentional examination of disconfirming evidence. And lastly, an audit trail allowed the researcher and others to closely inspect the entire research process from start to finish. In combination, these strategies limited the potentially harmful effects of subjectivity and added credibility and trustworthiness to the findings.

Chapter 4: Research Findings

The purpose of this study was to explore the DDDM process within the context of K-12 physical education. This chapter presents the results of the investigation in relation to four research questions and 15 case study questions. Findings in this chapter are organized broadly by research question, then by case study question and educational level. Evidence from the school district level is presented first, followed by the high school, middle school, and elementary school levels. Each case study section concludes with a summary of findings across all four educational levels.

Throughout the chapter, particular emphasis is placed upon sources of evidence. In-text citations refer to specific case study documents and denote the type of evidence, location the evidence was obtained, date of collection, and page number of the case study document, where appropriate. This citation method is intended to elevate the trustworthiness of the findings.

TYPES OF DATA & COLLECTION PROCEDURES

Research Question #1: *What types of physical education-related data were teachers and administrators collecting and how?*

The purpose of this section is to present evidence related to the types of data that were collected in the district and how they were collected. Four types of data were considered: input data, process data, outcome data, and satisfaction data. Figure 1 provides examples of physical education-related data that correspond to each data-type.

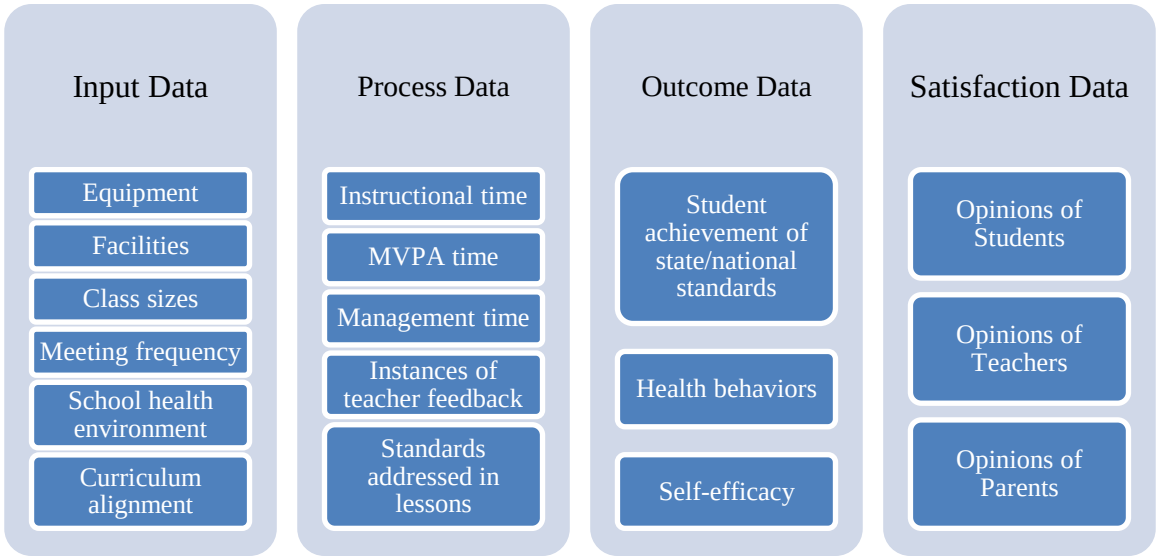


Figure 3. Examples of physical education-related data aligned with the four types of data identified by Marsh et al., 2006.

Five sources of evidence informed this section: a) coordinator interviews, b) teacher interviews, c) classroom observations, d) document analyses, and e) artifact analyses.

Input Data

Case Study Question #1A: What types of input data were collected in the district?

School District

According to documents and interviews with district level coordinators, much of the input data at the district level were collected prior to applying for the PEP grant as part of a needs assessment. The needs assessment included data from an evaluation of the school health environment and a curriculum review (Document Analysis- District PEP Grant, p. 3; CO-1_5-16-13, p. 9). In addition to the needs assessment, the district had access to input data from two other sources: a) a research study conducted the year prior

to applying for the PEP grant, and b) previous year's fitness testing data (Document Analysis- District PEP Grant, pp. 8-9; CO-1_5-16-13, pp. 9, 12). Data from each of these sources contributed to a section in the PEP grant application entitled "Need for the Project" (Document Analysis- District PEP Grant, p. 3). The only other input data identified at the district level was physical education class enrollment data derived from class rosters (CO-1-3_3-18-13, p. 3). These data documented student-to-teacher ratios in physical education, which according to district coordinators, were not to exceed 45:1 (CO-1-3_3-18-13, p. 3).

High School

Evidence from teacher interviews indicated that minimal amounts of input data were collected at the high school level. One teacher, Valerie, said that she conducted yearly equipment inventories and submitted class rosters to her school counselor to ensure that class sizes did not exceed a 45:1 student-to-teacher ratio (HS-1_4-16-13, p. 3). Specifically, Valerie stated,

> *As far as equipment, of course we do a yearly inventory – that's about the best we do with that. The size of our classes – the only thing we'll do maybe the first nine weeks of school we have to submit to the counselors what our classes are because we're not to exceed 45.* (HS-1_4-16-13, p. 3)

The other high school teacher, Angela, did not describe the collection of any input data.

Middle School

Similar to the high school level, minimal amounts of input data were collected at the middle school level. One teacher, Monica, said that she kept track of her rosters so

that she would know how many students were in each class. Like Valerie, she said that if the ratio became more than 45:1, she would contact the district coordinators. Monica stated:

> *We have to keep a schedule of our classes and they ask us to make sure that we list how many students we have, that if they give us more than 45 that we let them know because it's 45:1 ratio and it has to be less than, not greater than…* (MS-3_4-30-13, p. 1)

No other input data was identified by middle school teachers.

Elementary School

Similar to the middle and high school levels, interview evidence indicated that minimal amounts of input data were collected at the elementary school level. Teachers had schedules and rosters that they submitted to the district coordinator at the beginning of each school year. These documents informed the district coordinators of class sizes. Christy described the collection of input data like this:

> *There are records. I keep my schedule from year to year and we turn in a schedule to [Victor] every year at the beginning of the school year after a few weeks, after all the redistribution of kids settles down and the kids are settled into the school. So we know how big our classes are or how small our classes are; generally they're big. So yeah, we have records as far as class size.* (ES-1_4-18-13, p. 2)

No other input data were identified by elementary school teachers.

Summary of Input Data

Evidence from interviews and document analyses indicated that the primary source of input data in physical education stemmed from a needs assessment that was

conducted by the district prior to applying for the PEP grant. The needs assessment included data from an evaluation of the school health environment, a review of physical/health education curricula, a research study conducted in the district, and fitness testing scores from previous school years. In addition, an ongoing source of input data consisted of class rosters, which were collected at each educational level and documented how many students were enrolled in physical education classes. The district had a policy that class sizes in physical education were not to exceed a 45:1 student to teacher ratio.

Process Data

Case Study Question #2A: What types of process data were collected in the district?

School District

The school district collected minimal types of data related to what actually took place during physical education lessons. The only identified process data came from a system called the Virtual PE Administrator (Great Activities Publishing Company: Durham, NC). Using the system, teachers were able to login to a web-hosted platform and access resources for lesson planning. Once teachers selected activities, the lessons were documented in the system and district coordinators were able to see the types of activities that were being selected (CO-1_5-16-13, p. 10). The district coordinator for health and physical education, Victor, stated, "It's a resource, but for us it's going to be also, it analyzes what the students are doing… mainly we're looking at the classes, what types of lessons were being done by class" (CO-1_5-16-13, p. 10). Victor went on to describe how use of the system was limited at the present time:

> *… at the middle school, at the high school, I don't even know if they've gotten into virtual PE… because we're just really getting into more detail. But at the elementary—because we did have training on this—the elementary were already going into it this year. They were being looked at as a pilot… I think with the virtual PE there is still a lot to do.* (CO-1_5-16-13, p. 10)

At the time of the study, the district coordinators did not collect data related to physical activity time during lessons. However, this appeared to be an idea under consideration. In one interview, Victor discussed a new state senate bill mandating that 50% of class time in physical education be spent in moderate to vigorous physical activity (CO-1_5-16-13, p. 15). Specifically, Victor stated, "This data is not collected or analyzed by the district now, but there are plans to use this data in the future to monitor 50% MVPA during classes" (CO-1-3_3-18-13, p. 3).

High School

In regards to process data, the high school teachers confirmed that they had the capability of collecting data related to physical activity time during lessons. Specifically, teachers spoke about using heart rate monitors to measure MVPA. One teacher, Angela, described using the monitors in this way:

> *We've done that [measured MVPA during class]. We do the Suunto heart rate monitors and the kids really like to do that because I give them prizes. I make little things out of it so they can compete with each other. "Okay, starting right now, we're going to click it. Starting right now we're going to see who can reach their heart rate, who can stay in their heart rate zone the longest. If you want to go get water or take a break, that's fine, but you've got to know that you're still going." So they do. They're in there jumping around.* (HS-2_4-18-13- A-B, p. 13-14)

It was unclear if student heart rates were simply measured during physical education classes or if the heart rate data were stored in the software accompanying the monitors.

In contrast to Angela, Valerie stated that although she appreciated the technology that had been provided by the district to help measure MVPA during lessons (e.g., HR monitors), she felt as though she could tell if students were being active enough simply by observing them. As a result, she did not use the heart rate monitors with students. She stated:

> *And I hate to… I don't want to have a bad attitude because I think it's really awesome, the things that they've given us to work with, but I feel like I can see the kids. I can tell on my own and they can tell that they're really getting the 45 minutes that we're in here, exercise like they're supposed to.* (HS-1_4-16-13, p. 5)

Neither teacher at the high school level discussed the collection of other types of process data such as instructional time, management time, instances of teacher feedback, or standards addressed in lessons.

Middle School

Two of the teachers at the middle school level collected process data related to physical activity levels during lessons. Jessica described using heart rate monitors with one of her classes "every week" (MS-2_5-6-13, p. 1). However, similar to Angela at the high school level, it was unclear if the heart rate data were recorded into the software or simply monitored in real-time during lessons. The second teacher, Shawna, had students collect and record step counts during lessons using pedometers (Field Notes- MS-1_5-6-13, pp. 34-39). This provided process data related to physical activity participation. The third middle school teacher, Monica, when asked about the measurement of physical activity time during lessons stated that she was "aware" of MVPA time, but did not

formally collect data related to MVPA time (MS-3_4-30-13, p. 4). No other forms of process data were identified by teachers at the middle school level.

Elementary School

Similar to Monica at the middle school level and Valerie at the high school level, the elementary school teachers stated that they did not formally collect process data related to physical activity time during lessons, but they did have an awareness of how active students were during lessons. Specifically, teachers described having a consistent routine in place that ensured sufficient MVPA time. For example, Jennifer at Riverside Elementary School stated, "We don't collect, but we do have our schedule. We do warm-up, play time, activity time and then five minutes cool down at the end. That's basically what we do every day" (ES-2_4-16-13, p. 2). Likewise, Christy at Milan Elementary School stated, "I haven't done any kind of study, but I'm constantly aware of how much time I have the kids sitting down and instructing them" (ES-1_4-18-13, p. 3).

All three elementary teachers had access to pedometers that could be used to measure physical activity time during lessons (Field Notes_ES-1_4-18-13, p. 5; ES-2_4-16-13, p. 3; ES-3_4-19-13, p. 13), but only one teacher was observed using the devices. Christy at Milan Elementary School had classes of fifth grader students wear the pedometers during two lessons to monitor physical activity participation (Field Notes_ES-1_4-18-13, p. 5; Field Notes_ES-1_4-30-13, p. 12). Although steps were counted during the lesson, the data were not formally recorded. In an interview, Christy stated:

> *I do have a sheet that they can record their steps at a given point on and they take that with them, and it translates into how many calories and the distance as well. I don't use it that often. I'll use it maybe twice a year.* (ES-1_4-30-13- A-B, p. 1)

The other two elementary teachers acknowledged having pedometers, but for reasons discussed in subsequent sections said they were not using them to collect process data related to physical activity during classes (ES-2_4-16-13, p. 3; ES-3_4-19-13, p. 13). No other forms of process data were identified at the elementary school level.

Summary of Process Data

Evidence in this section indicated that the collection of process data in the district was minimal. District coordinators described the availability of a web-based system called Virtual PE Administrator in which teachers could document lesson content, but use of the system by teachers was only in pilot stages at the elementary school level. Interviews and observations indicated that teachers at each level had access to devices such as heart rate monitors and pedometers that could be used to monitor physical activity participation during lessons. However, only half of the teachers were currently using the devices for such purposes. Furthermore, within the cases that were using the devices, it was unclear how many of the teachers had formal recordings of the data either through the use of accompanying software or teacher-generated recording systems.

One particularly noteworthy finding was that the teachers who did not formally collect data on physical activity participation during lessons communicated a distinct awareness of physical activity time even in the absence of formal measurement. For example, two elementary school teachers indicated they had consistent routines in place

to ensure sufficient activity time during lessons, one high school teacher said her observations of physical activity participation during class were sufficient, and one middle school teacher said she had a general awareness of physical activity time.

Outcome Data

Case Study Question #1C: What types of outcome data were collected in the district?

School District

Two main sources of outcome data were collected in the district: data associated with the PEP grant (referred to as GPRA data; Government Performance and Results Act of 1993) and data collected from fitness testing using the FitnessGram® test battery (The Cooper Institute: Dallas, TX). As required by state law, the FitnessGram data were collected at all three educational levels, while the GPRA data, required by the PEP grant, were only collected at the high school and middle school levels (CO-1-3_3-18-13, p. 1).

There were five GPRA measures used to assess physical activity behaviors, nutritional behaviors, and aspects of health-related fitness. The measures included: a) a three-day physical activity recall (3DPAR), b) pedometer steps c) five questions from a fruit and vegetable questionnaire (Youth Risk Behavior Surveillance Questionnaire; YRBS), d) a 20-meter shuttle run (Progressive Aerobic Cardiovascular Endurance Run; PACER), and e) height/weight (CO-1-3_3-18-13, p. 1).

Fitness tests were related to the five identified areas of health-related fitness: aerobic capacity, muscular strength, muscular endurance, flexibility, and body composition (The Cooper Institute, 2013). The measures included: a) a 20-meter shuttle

run (PACER), b) pushups, c) curl-ups, d) trunk lift, e) shoulder stretch, and f) height/weight (CO-1_5-16-13, p. 5). As can be seen from the lists, there was partial overlap between the two sets of measures. Height, weight, and the PACER were used in both tests. Other forms of outcome data, such as those related to motor skills, knowledge, social skills, and values were not identified at the district level.

High School

Evidence from interviews and documents confirmed that the two primary sources of outcome data at the high school level were GPRA data and FitnessGram data (HS-1_4-16-13, p. 7; HS-2_4-18-13- A-B, p. 1; Document HS-1A; Document HS-2C). The measures associated with each data source aligned directly with those identified at the district level.

Beyond the GPRA and FitnessGram data, Valerie stated that she used to assess motor skills, but since she only teaches specialized classes focused on physical activity and health now, she does not conduct these kinds of assessments anymore. Specifically, Valerie stated, "Because I'm teaching the two [specialized classes], I don't do it. But before I used to do that where we would have 'skills day'" (HS-1_4-16-13, p. 6). When asked about cognitive tests, Valerie said that she did not administer them. She stated, "Last year I did. This year I didn't. Mainly because when we decided to do [the specialized course] with the freshmen, I was spending so much time trying to just get them to be quiet, to discipline" (HS-1_5-2-13- A-B, p. 1). However, Valerie went on to say, "We'll do different sports or we'll do different recreational stuff and sometimes I

like to test them on rules and stuff like that" (HS-1_5-2-13- A-B, p. 2), indicating that she did occasionally conduct some form of cognitive assessment.

When asked a similar question about cognitive tests, Angela stated that she sometimes included assessments related to the rules and etiquette of sports, comparable to Valerie. Angela stated:

> *Before we start a unit, we'll do just golf. We do the history. We do the rules, the etiquette, stuff like that. And we'll go over it for the one day. That will also be part of their little mini assessment on that. But for the most part that's pretty much it.* (HS-2_4-18-13- A-B, p. 16).

No other sources of outcome data were identified at the high school level.

Middle School

Just like at the high school level, the primary sources of outcome data at the middle school level were the GPRA and FitnessGram measures. They included the same measures listed under the school district section (MS-2_4-17-13, p. 6; MS-3_4-17-13- A-B, p. 1; Document MS-2D).

In addition to the GPRA and FitnessGram data, all three middle school teachers said they had done some form of skills testing in the past. For example, Shawna said, "Mainly its sports skills, you know like basketball, volleyball, soccer. I've even done track as well, you know; a little bit of tennis." (MS-1_5-6-13, p. 6) However since the start of the PEP grant, the teachers said that skills-testing had become less of an emphasis (MS-1_5-6-13, p. 6; MS-2_4-17-13, p. 8; MS-3_4-30-13, p. 4). Monica described the situation like this: "I have [collected data on motor skills] in the past. I have not been doing it… at all really this year because this year it's been more of fitness testing, fitness

testing, fitness testing the entire year" (MS-3_4-30-13, p. 4). She reiterated this point later in the interview when she was asked about cognitive tests. Monica stated, "I do health tests; I've done skills tests, written and other. Like I said, this year though it's been more fitness, fitness, fitness" (MS-3_4-30-13, p. 4). Jessica at Lamar Middle School also mentioned giving cognitive tests to students, but stated that most were given in health classes, not in physical education (MS-2_4-17-13, p. 9). No other sources of outcome data were identified at the middle school level.

Elementary School

FitnessGram was the primary source of outcome data at the elementary school level. FitnessGram measures included the same tests that were conducted at the upper educational levels (ES-2_4-16-13, p. 4; ES-3_4-19-13, p. 2). The PEP grant had not yet been expanded to the elementary school level. Therefore, GPRA data were not yet being collected at this level (Document Analysis- District PEP Grant, pp. 22-24).

Other than FitnessGram data, the only other source of outcome data identified at the elementary school level was cognitive data. Two of the elementary school teachers described occasionally testing students on health content (ES-1_4-30-13- A-B, p. 4; ES-3_4-19-13, p. 9). For example, Christy at Milan Elementary School stated:

> *I make some of them [health quizzes] up over the information that we've gone over – the skeleton, the body systems, you know, those kinds of things. I really hit a lot on those things, on the bones, the muscles and really the cardio stuff and the fitness stuff even into the health lessons. The nutrition is a huge part.* (ES-1_4-30-13- A-B, p. 4)

When asked about the collection of motor skill data, Christy said that she used to collect it, but had gotten away from it recently and was now focusing primarily on fitness. She said:

> *I don't [collect motor skill data]. This is my 21st year teaching and in the beginning everybody did skills testing, you know how many times you can get the ball in the goal and this goal and that goal and strike and make it in the bucket or whatever. It's gotten less important as far as fitness. You have sports skills and activities on one end, which as a coach—because I've been a coach as well—I want the kids to come to me with some skills and some knowledge of the sport, but I want them to be healthy and that's the majority of our kids. Our goal is to let them know what healthy means and it doesn't necessarily mean you can make ten shots in that basket up there. So I've gotten way away from that motor skills testing.* (ES-1_4-18-13, p. 4)

No other sources of input data were identified at the elementary school level.

Summary of Outcome Data

Two main types of outcome data were collected in the district: GPRA data and FitnessGram data. The GPRA data were only collected at the high school and middle school levels, while FitnessGram data were collected at all three levels. Teachers at each level said they occasionally collected cognitive data (e.g., knowledge of rules/etiquette, understanding of health content), but it seemed to be occurring less frequently. Additionally, five teachers shared that they used to collect data on motor skills, but did not do so anymore. The primary reason given for the omission of motor skill and cognitive data was an increased emphasis on fitness testing. Data related to social skills and values were not collected.

Satisfaction Data

Case Study Question #1D: What types of satisfaction data were collected in the district?

School District

Evidence from coordinator interviews indicated that formal procedures for collecting satisfaction data from key stakeholders (i.e., students, teachers, and parents) were not in place at the school district level. Instead, it seemed as though the district coordinators collected informal satisfaction data primarily by keeping open lines of communication with teachers and parents. For example, Carlos, the PEP grant technology support specialist, described how teachers were encouraged to share their ideas with the coordinators, which were then informally passed along to other teachers. He described it like this:

> *We always ask for input from the teachers because they're the ones in the trenches, so they're the ones who will know… So whenever another teacher does ask, we're like, "Well what do you do over there at [Pleasant Hill]?" And she sent me an email and was like, "Well here's what [Pleasant Hill] is doing. Maybe that'll work for you. Try it." And then they'll try it and they'll be like, "Yeah that worked, except for this." So we changed it this way, so they'll modify things.* (CO-3_5-16-13, p. 17)

The coordinators also described how they attended parent meetings and had discussions with parents about how to improve physical education and student health in the district (CO-1_5-16-13, p.13). According to Alex, the meetings were open to all parents and the coordinators solicited input not only on what parents believed was needed for their children, but what parents needed for themselves (CO-2_5-16-13, p. 4).

There did appear to be one formal procedure in place for collecting satisfaction data from one stakeholder group: teachers. In an interview, Alex reported that teachers in the district were provided with surveys after professional development workshops to "see what they got" out of the trainings and "what they still need more of" (CO-2_5-16-13, p. 2). This aligned with what was stated in the PEP grant application, which was that professional development would be "targeted" to the needs of physical educators (Document Analysis- District PEP Grant, p. 1).

High School and Middle School

There was no evidence of satisfaction data being collected at the high school or middle school levels.

Elementary School

Similar to the middle school and high school levels, there was no evidence of satisfaction data being collected at the elementary school level. However, further insight into the topic was provided by teachers. In one interview, Christy stated, "Surveys are real touchy in the district. We've been kind of told you don't do any surveys unless it's okayed by the president" (ES-1_4-18-13, p. 12). She went on to say, "…it has to be approved by everybody and you can only ask certain types of questions. Sometimes you even have to have a release to do the survey, so it's a lot of red tape." (ES-1_4-18-13, p. 12) According to Margaret, the strict policy on parent surveys was the result of a controversial survey that went home a long time ago. She described it like this:

> *A long time ago, someone sent out a survey and there was a big uproar over it. They pretty well said no surveys, so I have not sent a survey home. I'm not even sure what the survey was on, I just know it was like all of a sudden it was like you're not sending surveys home.* (ES-3_4-19-13, p. 10)

This evidence at the elementary school level provided insight into why satisfaction data was so rarely collected.

Summary of Satisfaction Data

The only formal satisfaction data collected in the district came from teacher surveys that were administered after professional development workshops. Teachers were provided with questions about the benefits they obtained from workshops and what professional development needs they had moving forward. Informally, the district coordinators described how open lines of communication were kept with teachers in order to share useful ideas. The coordinators also described how they attended parent meetings to solicit input on the needs of parents and children. None of the teachers at any educational level described being involved in the collection of satisfaction data. A strict district policy on the administration of parent surveys was identified by teachers as one contributing factor.

Data Collection Procedures

Case Study Question #1E: How were the data collected?

School District

Data collection procedures at the district level are organized by data type. They include: a) input data related to the school health environment, b) input data related to

curriculum, c) input data from a research study, d) outcome data via GPRA measures, and e) outcome data via FitnessGram.

The Collection of Input Data Related to the School Health Environment. The School Health Index (SHI; CDC, 2012b) was used to evaluate the school health environment. Four modules were selected by the district for review prior to the start of the PEP grant: a) school health policies, b) health education, c) physical education, and d) nutrition (Document Analysis- District PEP Grant, p. 4). According to Victor, the district coordinator for health and physical education, survey questions were answered by staff members from different campuses in each component area. For example, cafeteria staff answered the nutrition module questions and physical education teachers answered the physical education questions (CO-1_5-16-13, p. 9).

The Collection of Input Data Related to Curriculum. The Physical Education Curriculum Evaluation Tool (PECAT; CDC, 2006) and the Health Education Curriculum Evaluation Tool (HECAT; CDC 2012a) were used to evaluate the school district's curriculum in connection to national standards. Members of the PEP grant project team used the instruments to identify strengths and weaknesses in the district's physical education and health education curriculum (Document Analysis- District PEP Grant, p. 15).

The Collection of Input Data from a Research Study. A research study that was conducted in the district prior to the PEP grant was part of a larger project funded by the National Institutes of Health (Document Analysis- District PEP Grant, p. 8). Researchers

collected data from students on six high school campuses in the district. The data included a variety of health indicators, including body composition, physical activity behaviors, eating behaviors, and biomarkers for diabetes. Details on data collection methods for this research were not readily available.

The Collection of Outcome Data via GPRA Measures. The first year of the PEP grant, only high schools collected GPRA data. The second year, both high schools and middle schools collected data. In year three, high schools, middle schools, and elementary schools were scheduled to collect GPRA data. The data were collected five times over the course of the school year, with data collection periods occurring in October, November, February, April, and May (GPRA Data Calendar, MS-2B_4-17-13). Each data collection period lasted seven days (CO-1-3_3-18-13, p. 1). Teachers were provided with a set of pedometers (Yamax SW-200) and data collection forms for students (Document HS-1A_4-16-13). In addition, teachers were provided with instructions on how to collect the GPRA data. The following is an excerpt from a testing checklist provided to middle school teachers (bold and caps are included in the original document):

> ***To DO***
> - *Check pedometer batteries a week before testing date*
> - *Request volunteers to help assist with testing a week in advance*
> - *Have students fill out GPRA MEASURE FORM with student name, date of birth, school ID, grade. Measure Ht., Wt. for every GPRA test (5 times)*
> - *Complete PACER 5 times for GPRA (no pedometers should be used during the PACER). Pacer Standards for middle school* ***boys is 36 laps, for girls are 23 laps.***
> - *Complete 3 day physical activity recall (3DPAR) for Sunday, Monday, and Tuesday. On Wednesday, students will recall what they did the past 3 days on*

*the worksheet provided. Students must reach 60 minutes of physical activity per day. If met all three days, place a **YES** in the space, if they do not meet all three days, place a **NO** in the space provided.*

- *Complete Youth Risk Behavior Survey (YRBS) 5 times for GPRA testing (one for each test). If student consumes 3 vegetables and 2 fruits per day for 7 days straight students have met the standards, place a **YES** in the space provided. If students fail to consume the 3 vegetables and 2 fruits, one of the 7 days, place a **NO** in the space provided.*
- *Complete 7 days readings (SW-200) of **9100 steps per day** to meet standard. During the testing period if student does not meet 9100 standard per day place a **NO** in the space provided.*

(GPRA Testing Checklist, MS-2A_4-17-13)[2]

Once the GPRA data were collected, teachers were encouraged to manually input the data into an Excel spreadsheet and submit it to the coordinators (CO-1-3_3-18-13, p. 1). The following submission guidelines were provided to teachers:

Turn In Procedure

- *Input all students GPRA data in GPRA template then email to [Carlos] or physical education department no later than the following Friday after test is completed.*
- *All test material to be placed in manila folders with school's name, teacher's name, class period, month of test*
- *Bring folders to [Main Office]*

(GPRA Testing Checklist, MS-2A_4-17-13)

According to the coordinators, not all teachers input the data into the Excel spreadsheet that was provided. Instead, some teachers simply turned in the paper forms (CO-1-3_3-18-13, p. 1).

The Collection of Outcome Data via FitnessGram. Fitness data were also collected at each educational level (CO-1-3_3-18-13, p. 1), but little detail was provided

[2] Although specific instructions were provided for the collection of GPRA data, actual procedures varied by school. Detailed descriptions of data collection procedures are presented under each educational level below.

by coordinators in regards to data collection procedures. Instead, much of the emphasis was placed on the collection of GPRA data.

High School

At the high school level, the primary emphasis was on the collection of GPRA data. Based upon evidence from interviews, observations, documents, and artifacts, both high school teachers had similar data collection protocols in place for collecting GPRA data. At Bailey High School, data collection procedures were directly observed and discussed with the teacher. At Easton High School, details were gathered solely through teacher interviews and artifact analysis. Descriptions of data collection procedures and data management procedures associated with the GPRA measures are provided below.

Data Collection Procedures. In both high schools, GPRA data collection forms (Document HS-1A) and pencils were set out on the bleachers prior to class (HS-1_4-16-13, p. 10; Field Notes- HS-2_5-1-13, pp. 22, 27). Students picked up their forms as soon as they arrived in the gymnasium and began recording their data (Field Notes- HS-2_5-1-13, pp. 22, 27). Each of the seven days, students input their steps and reset their pedometers (HS-2_4-18-13- A-B, p. 3). On Monday, Tuesday, and Wednesday, students answered 3DPAR questions pertaining to the previous day's physical activity (HS-1_4-16-13, p. 10; Field Notes- HS-2_5-1-13, pp. 22, 27). Large posters with lists of activities were posted on the walls of the gymnasiums to facilitate the recording process (Artifact HS-2A_5-1-13, p. 4; Artifact HS-1A_5-2-13). After the 3DPAR data were collected, one

day was spent on each of the following data collection tasks: height/weight, PACER, and fruit and vegetable questionnaire (HS-1_4-16-13, p. 10; HS-2_4-18-13- A-B, p. 2).

Both teachers stated that the data collection process was easy now that they had done it so many times. Angela stated, "No, it's easy [data collection]. After we've done it so many times the kids already know, they already know. They're trained already." (HS-2_5-2-13, p. 9) Likewise, Valerie stated, "We've done the PEP Grant two years now, so it was a lot easier for me this year than it was last year" (HS-1_4-16-13, p. 15). As evidence of the ease of the process, in one observation at Bailey High School, students were able to record their pedometer scores and 3DPAR data in 3-5 minutes at the beginning of class with little-to-no guidance from the teacher (Field Notes_HS-2_5-1-13, p. 27).

Data Organization. Following collection, the two teachers took slightly different approaches to data organization. Valerie collected all of the forms from students and input the scores into a spreadsheet during her planning periods. She said it took her approximately six hours to input the GPRA data for ~450 students (HS-1_4-16-13, p. 21). Angela, on the other hand, strived to input most of the data during class periods while students were dressing out. She described it like this: "I try to knock it out during class. As they're bringing it in, boom, I punch it in" (HS-2_4-18-13- A-B, p. 5). Valerie stated that the data input process was "time consuming" (HS-1_4-16-13, p. 13), while Angela said that the process was "easy" (HS-2_5-2-13, p. 9).

Middle School

Similar to the high school level, much of the emphasis at the middle school level was on the collection of GPRA data. The year of the study was the first year that the middle school teachers were required to collect GPRA data (Document Analysis- District PEP Grant, p. 10). Although there were specific guidelines for data collection provided by the district (GPRA Testing Checklist, MS-2A_4-17-13), each middle school teacher had slightly different protocols in place for collecting the data. Therefore, a brief overview of each individual teacher's approach is provided below. Descriptions are based upon direct observations, interviews, documents, and informal conversations with teachers.

Data Collection and Organization at Damon Middle School. Two data collection lessons were observed at Damon Middle School (Field Notes_MS-1_5-6-13, pp. 34-39). Similar protocols were followed in each lesson. First, the teacher, Shawna, passed out GPRA forms (Document MS-2D_5-6-13). Students sat on the floor in small groups and filled in their answers to the 3DPAR and the fruit/vegetable questionnaire. They also filled in their PACER scores (the test was conducted the previous Friday; MS-1_5-6-13, p. 1). If students did not remember their scores, the teacher told them to come to her and she would give them their scores. As students recorded their answers, the teacher distributed pedometers. Once students had completed the 3DPAR and PACER recordings, they turned in their GPRA forms and began to walk around the perimeter of the gymnasium. This first portion of the data collection process took approximately 13 minutes (Field Notes_MS-1_5-6-13, p. 35). At the end of the lesson, the GPRA forms

were passed back to students and each student recorded his or her step counts obtained during the class period. The pedometers were then returned to the teacher. This second portion of the process took approximately six minutes (Field Notes_MS-1_5-6-13, p. 39). In connection with data organization, Shawna stated that she did not input the GPRA data into the spreadsheet electronically. Instead, she submitted paper forms to the district coordinators (MS-1_4-18-13, p. 4).

Data Collection and Organization at Lamar Middle School. Two data collection lessons were observed at Lamar Middle School (Field Notes_MS-2_4-29-13, pp. 8-11; Field Notes_MS-2_5-6-13, pp. 39-41). Similar protocols were followed in both lessons. Pedometers were checked out to students individually while students sat in squads. Pedometer numbers were recorded on a roster located on the teacher's clipboard. Students were given instructions to wear the pedometers "on their hip bone" and to attempt to get ≥ 9,100 steps per day (Field Notes_MS-2_4-29-13, p. 8). GPRA data collection forms (Document MS-2D_5-6-13) were passed out to students and students were asked to complete the 3DPAR and fruit and vegetable questionnaire. Students sat down on the floor and recorded their data. Periodically throughout the recording time, students moved to a height/weight station where they were weighed and measured by a university student volunteer assistant (Field Notes_MS-2_4-29-13, p. 8). A scale was used to measure weight (Artifact Analysis MS-2A_4-29-13, p. 6) and tick marks drawn on the wall were used to measure height (Artifact Analysis MS-2B_4-29-13, p. 7). The university student volunteer recorded the scores for the students on their GPRA forms.

This first portion of the data collection period took approximately 12 minutes (Field Notes_MS-2_4-29-13, p. 9). In each observed lesson, a handful of students did not participate in the data recording. Later, it was revealed that these particular students were either a) not enrolled in the school at the beginning of the school year, b) absent for the first data collection period, c) showed no interest in participating, or d) had lost their pedometers (Field Notes_MS-2_4-29-13, p. 8). Instead of participating in the data collection, these students sat against the wall of the gymnasium and socialized while other students recorded their data. Once complete, students submitted their GPRA forms to the teacher, Jessica, and proceeded to sit on the perimeter of the gymnasium while another class of students performed the PACER test in the gymnasium. This took approximately 13 minutes (Field Notes_MS-2_4-29-13, p. 9). Once the other class had completed the test, twelve students from Jessica's class completed the PACER test. In regards to data organization, Jessica stated that she did not believe it was that difficult to input the GPRA data into the spreadsheet, but she had been very busy lately, so she had just been submitting the paper forms to the district coordinators (MS-2_4-17-13, p. 4).

Data Collection and Organization at Rowling Middle School. Two data collection lessons were observed at Rowling Middle School (Field Notes- MS-3_4-30-13, pp. 14-19). To start each lesson, students entered the gymnasium and sat in squad lines. They performed a routine of stretches and exercises (e.g., curl ups and pushups) while the teacher took attendance. After approximately 10 minutes, the teacher, Monica, explained to students that they would be participating in the PACER test. In one class she said,

"This is the last one. You should do more today than you've ever done before. Your goal is to do your best." (Field Notes- MS-3_4-30-13, p. 15) The class was split in half and one group participated in the PACER test while the other group observed and counted laps. After all of the students in the group completed the PACER, recorders were asked to yell the score of their partner across the gym when their name was called so that the teacher could record the score. After both groups finished, the teacher told students to "Get physically active the rest of the period… moderate to vigorous physical activity. Get busy!" (Field Notes- MS-3_4-30-13, p. 17) Students proceeded to play with volleyballs, basketballs, and jump ropes while the teacher sat at her desk and recorded scores. In regards to data management, Monica stated:

> *I'll be honest, sometimes whenever I get one portion done or whatever, I'll tell the kids for the last part, "Y'all just get busy, get active, get physically active with any of the equipment and let me enter in and don't create a problem, so that I can keep working."* (MS-3_4-17-13- A-B, p. 2)

Other GPRA data collection protocols beyond the PACER test were not observed at Rowling Middle School, but according to the teacher, the process was "very hectic" (MS-3_4-17-13- A-B, p. 2). In interviews, Monica described how pedometers were checked out to students each day and students would report to her whether or not they reached the 9,100 step objective. Monica said she would write down a 'yes' or a 'no' depending on whether the students achieved the objective. If students did not answer 'yes', the pedometers were taken away and given to someone else. According to Monica, this often caused the pedometer data collection to go on longer than one week (MS-3_4-17-13- A-

B, p. 5). In addition, Monica described how students completed the 3DPAR and fruit and vegetable questionnaire in class and submitted it on the GPRA forms (Document MS-2D). She said that heights and weights were either measured by the teacher or by a student volunteer in the class. In regards to data organization, after the data were collected, Monica said she input the data into an Excel spreadsheet. The data for the 3DPAR and fruit and vegetable questionnaire were input in a similar fashion as the pedometer data, with a 'yes' or 'no', not a number. According to Monica, the data input process took "A long time… 3-4 hours per class" (MS-3_4-17-13- A-B, p. 6).

Elementary School

The primary source of data at the elementary school level was FitnessGram. The PEP grant had not yet been expanded to elementary schools at the time of the study, so collection procedures related to GPRA data were not applicable. Many of the teachers at the elementary school level followed similar protocols in the collection of FitnessGram data. As such, the procedures are presented for the group of teachers as a whole. Much of the evidence in this section is derived from teacher interviews. The only data collection procedures formally observed at the elementary school level were the collection of pedometer steps at Riverside Elementary School.

FitnessGram Data Collection Procedures. In two schools, Riverside Elementary and Schulman Elementary, FitnessGram data were collected once per year near the end of the year (ES-2_4-16-13, p. 1; ES-3_4-19-13, p. 2). In the third school, Milan Elementary, FitnessGram data were collected twice per year, once at the beginning and once at the

end (ES-1_4-18-13, p. 5). According to teachers, data collection typically took two-to-three weeks (ES-1_4-18-13, p. 6; ES-2_4-16-13, p. 8; ES-3_4-19-13, p. 2). Christy at Milan Elementary School stated, "We do the five components, including the height and weight, so probably to get through all the classes, twelve classes, probably two weeks" (ES-1_4-18-13, p. 6). Similarly, Margaret stated, "It [FitnessGram testing] usually takes us about three weeks" (ES-3_4-19-13, p. 2). All three elementary school teachers used a similar method for collecting FitnessGram data. They had rosters on a clipboard and recorded student scores from the various tests on the rosters. Christy described the process like this, "We print out classroom sheets and we just… It's very unscientific; I just jot it down" (ES-1_4-18-13, p. 6). Each school had two physical education teachers in the gymnasium at the same time. Therefore, there was always a second teacher available to assist with data collection. Students in two schools were usually split into smaller groups and tested on the various items simultaneously (ES-2_4-16-13, p.4; ES-3_4-19-13, p. 2). As Margaret described it:

> *I'm doing the PACER and I'm doing the shoulder stretch. The other coach, or my assistant, is taking the kids and doing the push-ups—the stuff you have to do on a mat—the push-ups, curl-ups and the trunk lift.* (ES-3_4-19-13, p. 2)

In addition to assistance from other teachers, Jennifer, the teacher at Riverside Elementary School, indicated that the school nurse assisted her with height/weight (ES-2_4-16-13, p. 4). The biggest anomaly in the collection of FitnessGram data at the elementary school level came at Riverside Elementary School. In one interview, Jennifer described how when she was collecting FitnessGram data, she had students stop at the

minimum required to achieve the Healthy Fitness Zone. She stated, "We just do the minimum because we have about 300 kids to test, so we do the minimum just so they can pass" (ES-2_4-16-13, p. 5).

Data Organization at the Elementary School Level. In regards to data organization, after scores were recorded on a roster, they were typically input into the FitnessGram software on the district server (ES-1_4-18-13, p. 6; ES-2_5-7-13, p. 6; ES-3_4-19-13, p. 4). Two of the teachers said they input the data during their planning periods (ES-1_4-18-13, p. 6; ES-2_4-16-13, p. 8) and one teacher said she tried to fit it in during transition times at the beginning and end of classes (ES-3_4-19-13, p. 5). Margaret described the data input process like this:

> *What I usually do is, okay my kids come in the gym and they jog for five minutes then we do exercises and stretching and then we get to the activities and then we line them up and we sit in the lines and if we need to talk about anything we talk about it and then they go out. So a lot of times when they're in that line and then when the next class is coming in jogging, I can use that time to [input data]*. (ES-3_4-19-13, p. 5)

The reported time it took to input FitnessGram data ranged from "a few conference periods" (ES-2_4-16-13, p. 8) to eight hours (ES-1_4-18-13, p. 6). When asked if she would prefer to have someone else input the data, Christy responded, "I think that would be great. That is more valuable than me inputting the scores—because I've already seen them here and I know who the students are that need help. Putting them in is just a reminder." (ES-1_4-18-13, p. 7)

The Collection of Pedometer Data. Although the data were not systematically recorded, one teacher, Christy, used pedometers with her fifth grade students during

class. Based upon two observations, the process of distributing and collecting the pedometers at the beginning and end of class was quite simple (Field Notes_ES-1_4-18-13, p. 5; Field Notes_ES-1_4-30-13, p. 14). When students entered the gymnasium, they chose a pedometer from a hanging case (Artifact Analysis_ ES-1G_4-18-13, p. 4). Students reset the pedometer, clipped it onto their hip, and attached the safety strap. Students had no difficulty putting the pedometers on and required no assistance from the teacher (Field Notes_ES-1_4-18-13, p. 5). At the end of class, students unclipped the pedometers and placed them back into the hanging case. It appeared that students had practiced this routine before and knew exactly what to do with little direction from the teacher (Field Notes_ES-1_4-18-13, p. 5; Field Notes_ES-1_4-30-13, p. 14). Although the data collection process seemed simple, it is important to note that the teacher did not assign specific pedometer numbers to students and did not formally record the step counts following the lessons. Instead, she just had students call out their step counts periodically throughout the lesson (Field Notes_ES-1_4-30-13, p. 12). It is also important to note that the observations were of two fifth grade classes. As such, it is unclear if younger elementary school students would have been able to accomplish the task with as much ease.

Summary of Data Collection Procedures

GPRA data were collected five times throughout the school year at the high school and middle school levels. The district provided teachers with data collection forms, pedometers, and a checklist of collection/input procedures. Evidence from

interviews and observations indicated that data collection procedures were relatively consistent at the high school level, but varied by teacher at the middle school level.

At the high school level, efficient routines allowed students to record physical activity data with little to no guidance from teachers. Assessments of aerobic endurance, body composition, and dietary behaviors were spaced evenly throughout the seven-day collection window. The high school teachers stated that the data collection process was easy now that they were in their second year of data collection. Following collection, the GPRA data were input into an Excel spreadsheet by teachers and submitted to the district electronically. One teacher said that she input the data during planning periods and it was time consuming. The other teacher said she used transition times and the process was easy.

At the middle school level, procedures for data collection and input varied by teacher. The most striking variations were associated with the collection of pedometer data. Two teachers had students bring the pedometers home, while one teacher only collected steps during class. Additionally, one teacher chose to record a 'yes' or a 'no' in regards to whether students had achieved a criterion number of steps, instead of recording the step count numbers. If students did not achieve the criterion, pedometers were taken away and given to another student. Overall, it appeared that data collection procedures at the middle school level took up a substantial amount of class time and were described by one teacher as "hectic". In observed lessons, 19-35 minutes were spent conducting data collection. In regards to data input, one teacher recorded data during class time and

submitted the spreadsheet electronically to the district. The other two teachers did not input the data themselves, they simply submitted paper forms to the district.

At the elementary school level, FitnessGram was the primary source of data. The data were collected at least once per year and all three teachers used similar protocols for collecting the data. Typically, students were split into smaller groups and sent to stations to complete the various tests. Teachers recorded student scores on class rosters and later input those scores into the FitnessGram software. Two teachers input the data during planning periods, while one teacher input data during transitions. The data collection process took approximately 2-3 weeks, while the data input process took up to eight hours. The only substantial variation observed in the procedures at the elementary school level was that one teacher had students stop the tests once they reached the healthy fitness zone, while the other two teachers had students obtain their personal best on each test.

DATA TRANSFORMATION

Research Question #2: Once collected, how were physical education-related data transformed into actionable knowledge?

The purpose of this section is to present evidence related to the ways in which data were transformed into actionable knowledge. Beyond the collection and organization of data addressed in the previous section, four data transformation processes were examined: analysis, summarization, synthesis, and prioritization. *Analysis* was defined as the systematic process of probing data to expose quantitative or qualitative patterns. *Summarization* was defined as an overview of the most relevant data. *Synthesis* was

defined as the generation of new knowledge through the unification of multiple sources of information. And *prioritization* was defined as the placement of value on certain types of information over others. In addition to data transformation processes, reporting practices were also examined to see how information was shared with key stakeholders. Four sources of evidence informed this section: a) coordinator interviews, b) teacher interviews, c) classroom observations, and d) document analyses.

Data Analysis & Summarization

Case Study Question #2A: How were data analyzed and summarized in the district?

School District

At the district level, only a few insights were obtained into the processes of data analysis and summarization. Through interviews with district coordinators, evidence indicated that much of the analytic emphasis was placed on the GPRA data post-collection; likely due to reporting requirements associated with the PEP grant.

Data Analysis. According to the coordinators, the GPRA data were analyzed at the end of the school year with the assistance of an external evaluator (CO-1-3_3-18-13, p. 2). Averages were calculated for raw scores on each GPRA measure and percentages were calculated for the number of students meeting each healthy criterion (CO-2_5-16-13, p. 2). Alex, the PEP grant program facilitator, described the analytic process like this: "We calculate a school average, a middle school average, and a high school average and percent improvement per year" (CO-2_5-16-13, p. 2). Victor, the district coordinator for health and physical education, stated: "I think we're primarily going to look at the

number of kids that participated. The BMIs to see if that changed. The PACER test, if that improved. The nutrition component." (CO-1_5-16-13, p. 21)

Although at the time of the study, the GPRA data were only analyzed on an annual basis, the lead coordinator discussed a desire to have the data analyzed more frequently throughout the school year. In an interview, Victor stated:

> *Now if I could get the data analyzed in-between each reading and then show them [the teachers], which we have the capability of doing some of that. I don't know how much time it would take, but [Carlos] is good at that and he's done it already, but he can show where there has been an improvement of BMIs or improvement of the number of laps and so on.* (CO-1_5-16-13, p.18)

Summarization. The GPRA data were summarized for an annual Grant Performance Report that was submitted to the Department of Education (Document CO-1A_6-28-13). The information was organized by four performance measures: a) the percentage of students who engaged in 60 minutes of daily physical activity, b) the percentage of students who achieved age-appropriate cardiovascular fitness levels, c) the percentage of students who consumed fruit two or more times per day and vegetables three or more times per day, and d) the number of students who were overweight or obese (Document CO-1A_6-28-13). The report also included a brief paragraph summarizing the data collection methods and results for each performance measure in relation to targets that were set forth in the PEP grant application (Document CO-1A_6-28-13).

Descriptions of Teacher Analysis & Summarization by Coordinators. The coordinators did not describe any formal data analysis or summarization procedures that they observed being implemented by teachers prior to the submission of the GPRA data,

regardless of the submission method (i.e., paper or electronic). However, the coordinators did feel quite strongly that the data input process itself was an important analytic step. Alex and Carlos both commented on how they felt they could tell the difference between teachers that input the data and teachers that simply handed in the forms. According to the coordinators, the teachers that input the data into the Excel spreadsheets showed greater improvements in GPRA scores over time (CO-3_3-18-13, p. 2; CO-2_5-16-13, p. 1). Carlos described it like this, "You can tell the difference between the teachers that are inputting the data themselves and the teachers that are not. Teachers that input the data themselves tend to see greater improvements over time." (CO-1-3_3-18-13, p. 2) In regards to why he thought this was the case, Alex postulated, "I think when you're putting the data in, you subconsciously see growth and declines and it impacts what you do with students" (CO-2_5-16-13, p. 1). Likewise, Carlos stated, "If you don't look at the data, you don't know it's broke, so you can't fix it" (CO-3_3-18-13, p. 2). This evidence indicated that the coordinators perceived the data input process as an important opportunity for teachers to engage in informal data analysis.

High School

Evidence from interviews at the high school level indicated that teachers did not conduct any form of analysis or summarization in relation to the GPRA data prior to submission. According to the teachers, they input the data into the Excel spreadsheet and submitted it to the district coordinators (HS-1_4-16-13, p. 15; HS-2_4-18-13- A-B, p. 5). Valerie described it like this: "That's what it was – get it on the spreadsheet and send it

off" (HS-1_4-16-13, p. 15). Similarly, there was no evidence of analysis or summarization in connection with the FitnessGram data.

Middle School

At the middle school level, the situation was similar to the high school level. There was no evidence of analysis or summarization of GPRA or FitnessGram data prior to submission. However, one teacher, Monica, did describe how she evaluated the GPRA data as she input it into the Excel spreadsheet. She stated:

> *I've gathered it and I'm going through the thing and going yes, they've got two check marks. Yes, yes, no on the fruit survey. So I go into the computer yes, no on that one person and then I go to the next one. And I'm trying to grade it essentially and put it in at the same time.* (MS-3_4-17-13- A-B, p. 6)

Monica went on to describe how she noticed certain trends in the data as she put it into the spreadsheet. She described one trend like this, "That's another thing a lot of the kids don't pass—the fruit and vegetable survey. They don't eat properly and I'm sitting there writing no, no, no. And I'm like oh God, what can I do?" (MS-3_4-17-13- A-B, p. 10) This evidence supports the district coordinators' assertion that informal data analysis can occur during the input process. In this case, the analysis came in the form of evaluating whether students had achieved the healthy criterion on each GPRA measure.

The other two middle school teachers did not input their own data. They simply collected the GPRA forms and submitted them to the district in paper form (MS-1_4-18-13, p. 4; MS-2_4-17-13, p. 4). Shawna, at Damon Middle School stated, "I turn them into

the district, to the PE office" (MS-1_4-18-13, p. 4). No other form of data analysis or summarization was described by the middle school teachers.

Elementary School

In interviews, similar to the middle school and high school levels, the elementary school teachers indicated that they did not conduct formal data analyses or summarization of the FitnessGram data prior to submitting them to the district. Jennifer at Riverside Elementary School stated quite clearly, "No, we don't go through the data. We just enter it and that's it." (ES-2_4-16-13, p.5) However, there was evidence to suggest that some of the teachers engaged in a form of informal data analyses during the data input process, similar to what was suggested by the coordinators and described by Monica at the middle school level. For example, Jennifer, the same teacher that said she only entered the data and submitted it, described a number of interesting relationships she noticed while inputting the FitnessGram data into the software. Specifically, Jennifer described noticing how many of the overweight and obese students in her class performed well on the trunk lift test, but struggled with the pushups and curl-ups. She stated:

> *So it is interesting. I mean I found that very interesting because a lot of the kids that we have are heavy, no curl-ups and no push-ups. I mean good trunk lift, but no push-ups. And the skinny kids can do all of it. You know what? The skinny kids don't have a good trunk lift, but they can do push-ups, curl-ups. That's pretty interesting.* (ES-2_4-16-13, p. 9)

Jennifer went on to describe how she noticed one little girl that rarely participated in the Zumba warm up during class, but tended to perform well on all of the FitnessGram tests.

She compared the little girl to another girl in class that loved to do Zumba, but performed poorly on many of the FitnessGram tests. She described the relationship like this:

> *I said "Look at this. We have one little girl who hardly moves. Very shy, hardly moves as far as the Zumba warm-up or whatever, but she did very well on every test – better than some of the kids who do exercise and put a lot into the warm-up." Then we have another little girl in fourth grade, she loves to do the Zumba and she moves a lot, but she didn't do well in the pushups or the curl-ups and the trunk lift – didn't do well on that. And I don't get it, you know.* (ES-2_5-7-13, p. 6)

These relationships that the teacher was recognizing could be compared to an informal method of correlational analysis. Whether the teacher was conscious of the process or not, she was analyzing relationships among the data as she was putting it into the software. This evidence supports the district coordinator's assertion that the data input process could provide an opportunity for informal data analysis.

In parallel, another example of informal data analysis took place in real time during certain lessons at Milan Elementary School. In two lessons observed where pedometers were being use, the teacher, Christy, asked students to repeatedly call out how many steps they had obtained at various time points throughout the lesson. For example, the teacher said things like, "Raise your hand if your number starts with a one. Raise your hand if your number starts with a two." (Field Notes_ES-1_4-18-13, p. 6) In addition, the teacher gave students specific prompts such as, "At this point, you should have at least 1,000 steps" (Field Notes_ES-1_4-18-13, p. 6) and, "Open your pedometers; you should be near 2,000 steps" (Field Notes_ES-1_4-30-13, p. 13). In total, students checked their step counts six separate times during one 45 minute class period (Field

Notes_ES-1_4-30-13, p. 14). This interactive process prompted students to analyze their own physical activity levels during the lesson and also allowed the teacher to analyze how active students were during the classes in real time.

Summary of Data Analysis and Summarization

Evidence from interviews indicated that physical education teachers in the district did not conduct formal data analyses on the GPRA data or the FitnessGram data prior to submission. Teachers simply collected the data and turned it into the district. Once the data were submitted, the coordinators calculated averages for the GPRA measures and calculated percentages of achievement of the healthy criterion for each measure, both by school and by educational level. An external evaluator assisted with the analyses. The GPRA data were then summarized for an annual report required by the Department of Education. No formal data analysis or summarization procedures were described by coordinators in relation to FitnessGram data.

Although teachers did not conduct formal analyses on the GPRA or FitnessGram data, the district coordinators felt strongly that through the data input process, teachers were able to notice trends in the data and use the process to evaluate student outcomes. Interview evidence from teachers confirmed this assertion. One teacher at the middle school level described noticing a pattern of poor nutritional behaviors among students while inputting data from the fruit and vegetable questionnaire. Likewise, a teacher at the elementary school level described noticing surprising trends between physical activity behaviors and student performance on various fitness tests. This evidence supports the

notion that the data input process can serve as a stimulator of informal data analyses. Another form of informal data analysis was observed at one elementary school. During lessons involving pedometers, students were asked to analyze step counts throughout the lesson and compare their results with targets identified by the teacher.

Data Reporting

Case Study Question #2B: How were the data reported in the district?

School District

Reporting of GPRA Data. Evidence from interviews and document analyses indicated that once the GPRA data were analyzed and summarized, they were included in annual reports submitted to the Department of Education (CO-1-3_3-18-13, p. 2; CO-1_5-16-13, p. 3; CO-3_5-16-13, p. 3; Document CO-1A_6-28-13). The reports included data on the four different performance measures described in the previous section.

Beyond the reporting of data to the federal government, the GPRA data had not yet been reported to teachers, principals, parents, or students in the school district. However, the coordinators stated that there were plans to report the data to teachers during upcoming professional development workshops and to principals during annual principal meetings (CO-1_5-16-13, p. 4 & 6; CO-3_5-16-13, p. 6). The plans were described by Alex as follows: "For the upcoming professional development, we are going to show the results from year one, the results from year two, and talk about where we want to be in year three" (CO-2_5-16-13, p. 2). The coordinator for health and physical education, Victor, also described how he was always ready to present the data to district

level administrators and school board members. He said, "A new superintendent may be coming in, so they may ask for PE data. You may present it to lots of people, but when someone new comes in, you have to tell the story all over again" (CO-1-3_3-18-13, p. 2).

Reporting of FitnessGram Data. At the district level, FitnessGram data were reported to the state as part of a statewide fitness assessment initiative. According to Victor, the reports were submitted annually (CO-1_5-16-13, p. 5). Interview evidence indicated that the coordinators did not report individual results of fitness testing to students or parents, but it was expected that teachers did so (CO-1-3_3-18-13, p. 2; CO-2_5-16-13, p. 2 & 4). As Alex stated, "It is our expectation that teachers send the FitnessGram reports home to parents each time they do it" (CO-2_5-16-13, p. 2).

Although not addressed by the coordinators during interviews, evidence from school-level interviews indicated that high school teachers and counselors were provided with a list of body mass index (BMI) scores for all of the students on an annual basis, generated by the district's Office of Research and Evaluation (HS-1_5-2-13-C, p. 3; HS-2_4-18-13- A-B, p. 6). As Linda, the counselor at Bailey High School described it, "Its alpha by grade level. It has the students' names, their IDs. It has their sex, their height, their weight, but most important it has their BMI" (HS-1_5-2-13-C, p. 3). Likewise, elementary school principals and teachers were provided with aggregate FitnessGram reports. The reports contained information on each test organized by class and grade level (ES-1_4-18-13, p. 8; ES-1_4-30-13, p. 2). Christy, the teacher at Milan Elementary School, described the reports like this:

> *When I get the data back from the district at the beginning of the next school year it's got all the summaries—how many kids passed this, how many didn't, what the range was, what their BMIs were and all. They [the district coordinators] give us about ten pages and it's just several different data compiled in different ways… It's per class and it shows the overall fitness level and how they scored in cardio, how they scored in flexibility, how they scored in abdominal strength.* (ES-1_4-18-13, pp. 7-8)

The principal at Milan Elementary School, Sonya, explained that she did not find the FitnessGram summary reports valuable (ES-1_4-30-13, p. 2). She said that the lead district coordinator, Victor, attended the principals meeting and passed out the reports, but did not give enough information about how to interpret the data to make it valuable. She stated:

> *I know at the beginning of the year, [Victor] told us about the FitnessGram and just said "You know, this is our data from the school year for last year." And so that was, he gave us a printout – I'm just going to be honest with you. It wasn't very… It didn't give me enough information. It was just general. I had looked at it, he went through it and when I looked at it again a couple of days later it was confusing. So it was just like "Okay, principals, here you go. This is how we did last year. We're going to do it again. Let's encourage the kids, blah, blah, blah." And that was it.* (ES-1_4-30-13, p. 2)

Sonya went on to state that she would have liked to have had access to the data in a more timely manner. She said:

> *…last year when I was here when the Fitness Gram took place I never got anything, not even from Coach or district. So I had to wait the whole summer and then at the beginning of August, that's when the information was presented to me.... It would be wonderful [to have reports during the school year]. I mean we do it for reading, we do it for math. I know every nine weeks these are how my kids are doing.* (ES-1_4-30-13, p. 3)

High School

At the high school level, interview and document evidence indicated that students were provided with FitnessGram reports after each test (HS-1_4-16-13, p. 16; HS-2_4-18-13- A-B, p. 10; Document HS-2C_5-1-13). The reports were generated automatically by the FitnessGram software (HS-2_4-18-13- A-B, p. 10). Once the data were transferred into the system, teachers were able to click a button and generate reports that included information on each test, along with suggestions for maintenance or improvement of fitness, depending on whether the child achieved the Healthy Fitness Zone or not (Document HS-2C_5-1-13). Angela, the teacher at Bailey High School, described the reports like this:

> *You can see the data, it calculates it for the kid; it breaks it down for the kid. I tell the kid "It's your fitness report card, are you passing or are you failing?" It tells you what you need to work on.* (HS-2_5-2-13, p. 4)

Valerie, the teacher at Easton High School, stated that she did not print and distribute the FitnessGram reports herself, but thought the school nurse printed them for students. She said:

> *I've never sent it [the FitnessGram report] out, but I know the kids have come back and said, "Miss, I thought I did this many," so that's how I know they're getting something. I don't know if the nurse… I don't know how it's getting… I don't know to be honest.* (HS-1_4-16-13, p. 16)

In contrast, Angela said that she sent the FitnessGram reports home with students three times per school year; at the beginning, middle, and end of the year. At the midpoint, she had students get the reports signed by their parents and used the signature as an exam grade (HS-2_4-18-13- A-B, p. 10). Specifically, Angela stated:

> *And I told them "Take it home. Sit down with your parents. Have them sign it. Bring it back signed." In the middle I have them bring them back signed and like I said, I use it as an exam.* (HS-2_4-18-13- A-B, p. 10)

Middle School

In interviews, two of the teachers at the middle school level said they did not print FitnessGram reports for students or parents. Jessica, the teacher at Lamar Middle School, acknowledged having the capability of printing out reports and said she would print them if parents asked, but went on to say, "To be honest, they don't ask" (MS-2_4-17-13, p. 7). Likewise, Shawna, the teacher at Damon Middle School, stated that she would have liked to have printed out the reports so that students could see their previous scores, but thought it would be too many copies. Specifically, she said, "There are just so many copies to make for each kid" (MS-1_4-18-13, p. 7). It was unclear if Monica, the teacher at Rowling Middle School, printed out FitnessGram reports or not.

In regards to the GPRA data, there was no evidence that the data were reported to any key stakeholders in the school. As Jessica described it, "We hand it over to the PE Department and they take care of it from there" (MS-2_4-17-13, p. 4). When asked if they received reports back from the district in relation to the GPRA data, all three middle school teachers confirmed that they did not (MS-1_4-18-13, p. 5; MS-2_4-17-13, p. 5; MS-3_4-17-13- A-B, p. 7). Jessica stated that she did not know what happened to the data once it was submitted to the district, but said she was "interested to see if the kids did lose, if their BMI was lowered" (MS-2_4-17-13, p. 5). Monica likewise stated, "Nothing has come back to me so far. I have no idea what they are going to do with it [the GPRA data]." (MS-3_4-17-13- A-B, p. 7)

Elementary School

At the elementary school level, the three teachers varied in their approaches to reporting FitnessGram data to students and parents. Christy, the teacher at Milan Elementary School, explained that she printed out reports for students and spent one class period helping them understand the information contained within the reports. She said, "Absolutely [I print the FitnessGram reports]. And that's just another day of going over that because if I give it to them and they don't understand it." (ES-1_4-18-13, p. 8) Christy also noted that she expected the reports to go home to parents. She said "That's for them both" (ES-1_4-18-13, p. 9). Margaret, the teacher at Schulman Elementary School, engaged in a similar reporting process, but shared her doubts as to whether the reports actually made their way home to parents. She stated, "Well, half the papers you know are never going to make it home" (ES-3_4-19-13, p. 4). In contrast to the first two elementary teachers, Jennifer at Riverside Elementary School stated that she only printed out the FitnessGram reports if they were requested by parents; and according to Jennifer, "they don't ask" (ES-2_4-16-13, p. 5).

Summary of Data Reporting

Reporting of GPRA Data. At the district level, GPRA data were reported to the Department of Education on an annual basis. The reports included information related to the achievement of four performance measures. At the time of the study, the GPRA data had not been reported to any stakeholders in the district (e.g., parents, teachers, administrators, or students). However, district coordinators did communicate a desire to report the results to teachers and principals during upcoming professional development

workshops. Similar to the district level, teachers at each educational level did not report GPRA data to any key stakeholders. Teachers simply collected the data and submitted it to the district.

Reporting of FitnessGram Data. FitnessGram data were reported annually to the state as part of a statewide fitness assessment initiative. The district coordinators also prepared fitness reports for teachers, principals, and school counselors at various educational levels. At the high school level, the reports included height, weight, and BMI information, presented in an alphabetical list. At the elementary school level, the reports were aggregated by grade level and organized by fitness test. One elementary school principal described the reports as having limited utility due to a lack of timeliness and insufficient explanation. As far as individual reports were concerned, teachers were expected to use the FitnessGram software to print out reports for students and parents after each test. However, interviews with teachers indicated that compliance with this expectation varied. Some teachers printed out reports consistently and even required students to collect signatures to prove that they had shared the information with their parents. Other teachers said that they did not print out FitnessGram reports because they required too much paper and/or parents did not ask for them. Overall, only half of the teachers interviewed in the study said they regularly printed FitnessGram reports.

Data Synthesis & Prioritization

Case Study Question #2C: How were the data synthesized and prioritized?

School District

At the district level, there was some evidence of the generation of new knowledge through higher level information processing. One of the clearest examples came in relation to the use of BMI data to identify students for a specialized course at the high school level. According to Victor, high school teachers were provided with a list of student BMI scores at one professional development workshop. Teachers were asked to review the data and circle all of the students with a BMI greater than 30 (CO-1_5-16-13, p. 18). According to the PEP grant application, this information was to be used to identify students eligible for a more intensive nutrition and physical education course (Document Analysis- District PEP Grant, p. 8). Another example of data being transformed into useful knowledge at the district level was the use of the PECAT to evaluate the physical education curriculum. As Victor stated, "We used it as a resource to compare what is being developed with what needs to be developed, according to the CDC" (CO-1_5-16-13, p. 12). The district coordinators also hinted at GPRA data being used to inform district and campus level improvement plans. Victor stated, "We will be sharing that information with the school district—we have a district improvement plan. We have a campus improvement plan." (CO-1_5-16-13, p. 4) But it was unclear exactly how the data would be synthesized and prioritized to inform these different action plans.

High School

At the high school level, BMI summary reports were used to prioritize students for the specialized course focused on physical activity and nutrition (Document Analysis-District PEP Grant, p. 8). The school counselors at Easton High School took the reports

and placed students in the specialized classes prior to the start of the school year. Linda, the school counselor, described the process like this:

> *I picked the students based on their BMI and we took all those students and we put them in one class. The first year I just scheduled them into it. When they asked, that is when I explained it to them… They all had very high BMIs, over 30.* (HS-1_5-2-13-C, p. 1)

Linda also described how she helped other counselors identify students for the specialized classes. According to evidence from one interview, she simply told the other counselors, "Put these kids in" (HS-1_5-2-13-C, p. 3).

At Baily High School, students were recruited to the specialized course by the physical education teacher from regular physical education classes. As Angela described it, "The first day of school, we're taking attendance and… what I did was I had this [student BMI list] with me and it's in alpha, so I was just able to go through that" (HS-2_4-18-13- A-B, p. 6). Angela went on to describe how she invited students and helped them change their schedules so they could enroll in the course. She described the recruitment of one particular student like this:

> *When I looked at this [the student BMI list] and I saw her name on it, I asked her and she was all for it. "Yeah, coach, I'll do it. What do I need to do?" I told her "Well, we'll probably have to change your schedule to get you into that class." And yeah, they did it. As long as we do it in the beginning of the school year, like the first week, week and a half, it's easy to change their schedules.* (HS-2_4-18-13- A-B, p. 6-7)

Middle School

The specialized course focusing on physical activity and nutrition was also offered at the middle school level. However, in contrast to the high school level, BMI

data were not used to prioritizing students for the course. Instead, some students were enrolled in the course because of behavior concerns. As Alex, the PEP grant facilitator, stated, "The program is still targeted at students with a high BMI, but many schools put the students with behavior problems into it." (CO-2_5-16-13, p. 3) Similarly, Carlos explained the situation like this:

> *...It's supposed to be for those at-risk. Do they use them all the time? I'm not really sure. I know sometimes the counselors will just put whomever in that class or sometimes they'll use it as… cause I think we have one high school where they'll put at-risk students that aren't high BMI – they're just behavior or something and they'll put them in that classroom.* CO-3_5-16-13, p. 11

Although BMI data did not appear to be used consistently to prioritize students for the specialized course at the middle school level, there were examples of data being used to prioritize students for other programs. In one instance, a teacher indicated using informal observation data and FitnessGram data to prioritize students for athletics. Shawna, the teacher at Damon Middle School, described how she looked at student performance on the FitnessGram test and used her observations of skill performance during sport-related units to identify potential athletes in sixth grade. In one interview, she stated:

> *Take my sixth graders for instance, I observe them a lot because they're not able to play sports sixth grade year, but I look at them in sixth grade year and decide okay, you might have some skills – I'd like to see that person next year. And I'll talk to them about it.* (MS-1_5-6-13, p. 6)

Shawna further described how she prioritized students for athletics using fitness data. She said:

> *And I'm like, okay, while I'm looking at all of this here [fitness data], I'm still looking at athletes that I want for next year. So I have a list where I write their name down hoping that they really will come out in seventh grade to participate in athletics.* (MS-1_5-6-13, p. 9)

In addition to using FitnessGram data to prioritize students for athletics, there was also an example of a middle school teacher using GPRA data to prioritize the content of physical education lessons. Monica at Rowling Middle School described how during the process of inputting 'yes's' and 'no's' into the GPRA data spreadsheet, she noticed a pattern of poor dietary habits among her students. She said it led to the realization that she needed to focus more on proper nutrition. Specifically, Monica stated:

> *That's another thing a lot of the kids don't pass—the fruit and vegetable survey. They don't eat properly and I'm sitting there writing no, no, no. And I'm like oh God, what can I do? I'd better start throwing vegetables at them. "Eat this, now."* (MS-3_4-17-13- A-B, p. 10)

The evidence from Shawna and Monica indicated that FitnessGram and GPRA data were not synthesized and prioritized systematically. Rather, informal trends noticed in the data were used to place higher priority on specific students or instructional needs.

Elementary School

At the elementary school level, only one teacher described how data were synthesized and/or prioritized. Christy, at Milan Elementary School, shared how she took the summary reports from the FitnessGram tests and "red flagged" students with high BMI's (ES-1_4-18-13, p. 7). She said after red flagging students, she touched base with

the school nurse and compared notes on the students. After these conversations, the nurse was sometimes able to contact parents and discuss health risks associated with poor fitness (ES-1_4-30-13- A-B, p. 7). No other evidence related to the synthesis or prioritization of data was obtained at the elementary school level.

Summary of Data Synthesis and Prioritization

Evidence indicated that coordinators and teachers were processing and reviewing various sources of data to help prioritize students and content, but it was not always done systematically. At the district level, coordinators reviewed the physical education curriculum to identify areas of alignment and non-alignment with national standards. They also spoke about using GPRA data to inform district and campus level improvement plans. At the high school level, teachers circled all of the students with a BMI over 30 as a means of prioritizing students for a specialized course for overweight students. Counselors at this level also got involved in reviewing BMI data to prioritize students for the specialized course. At the middle school level, a similar course was available, but BMI data were not utilized the same way. Instead, students were frequently placed in the course due to behavioral concerns. However, one middle school teacher did describe using FitnessGram data and informal observation data to prioritize students for athletics and another middle school teacher expressed a desire to emphasize nutrition content based upon results of a fruit and vegetable questionnaire. Lastly, at the elementary school level, one teacher described a process of "red flagging" students based upon their performance on various FitnessGram measures.

DATA-DRIVEN DECISIONS

Research Question #3: In what ways were physical education-related data used to inform decisions at the levels of the classroom, school, and district?

The purpose of this section is to present evidence related to ways in which data were used for decision-making purposes. Three uses of data were examined in the study: a) data-use for instructional decisions, b) data-use for program improvement, and c) data-use for accountability. Instructional decisions were only discussed at the teacher level, as coordinators did not have direct contact with students. Data-use for accountability was further divided into student accountability and teacher accountability. Four primary sources of evidence informed this section: a) coordinator interviews, b) teacher interviews, c) classroom observations, and d) document analyses.

Instructional Decisions

Case Study Question #3A: How did physical education teachers use data to drive instructional decisions?

High School

At the high school level, data did not drive instructional decisions per se, but the process of collecting data did have an impact on teacher practice in two main ways: a) it motivated adjustments in course content, and b) it stimulated conversations with students about the importance of physical activity and health.

At Easton High School, Valerie said that the collection of GPRA and FitnessGram data motivated her to consider more creative ways of infusing physical activity and fitness into lessons. Valerie described the motivation like this:

> *Well for me, I think it [the data] opened my eyes at finding other ways to teach some type of fitness. When you hear the word fitness, everybody thinks of okay, they're not excited about it and I think it opened my eyes at what other kind of things can I do to keep the kids motivated, that are going to want to continue, that I'm going to know as a teacher that they're keeping their heart rate up, that they are getting a good at least 45 minutes of physical activity the whole time. So that was one of the things that I feel it made me a better teacher, made me do different things.* (HS-1_4-16-13, p. 19)

Valerie went on to say:

> *Well, I think the data that we get from the pedometers and when we do the shuttle and any kind of physical activity and they see and I see that they did more than what we did before. I think that's all positive and I wouldn't know that if we didn't have this information and we didn't have to write anything down. So it is important and it does motivate me. Actually it makes me think about how can I help them get more steps in during my PE class and then remind them about walking.* (HS-1_5-2-13- A-B, p. 6)

Although the motivation to infuse more physical activity and fitness into lessons was not a direct result of an analysis of student outcome scores, the process of collecting GPRA and FitnessGram data did change the way Valerie approached her instruction.

Building on this evidence, both Valerie and Angela also described conversations with students that were stimulated by the data collection process. The conversations occurred before, during, and after data collection periods and were focused on the health risks of physical inactivity. One of the conversations was described by Valerie in this way:

> *We talked about how a lot of their parents are diabetic or have heart disease and that's very common in the Hispanic culture too, especially diabetes. And most of them had people in their families who were diabetic. And I said this is why you*

> *need to take care of yourself right now because this is where it starts, not when you get older.* (HS-1_4-16-13, p. 11)

Similarly, Angela described one of the conversations with her students like this:

> *Before we do any of this, "who knows what dialysis is? Who knows what diabetes is?"… And I think a lot of times I try to do it where it hits home: "How many of you guys know anybody in your family who has diabetes? How many of you guys know anybody that's actually been through dialysis? How many of you guys have anybody that had an amputation?" you know.* (HS-2_4-18-13- A-B, p. 11; HS-2_5-2-13, p.5)

These conversations were not driven by specific scores on the GPRA and FitnessGram tests, but did appear to be stimulated by the data collection process.

Middle School

In contrast to the high school level, evidence at the middle school level indicated that data had little influence on the instructional behaviors of teachers. For example, when asked if the GPRA data had influenced the way she taught, Jessica answered, "No, I mean I set aside for that timeframe that it needs to be taken care of [the data collection]" (MS-2_5-6-13, p. 8). Similarly, when asked if the GPRA data influenced her teaching, Monica stated, "Not really, I just have to log more and do a lot more data" (MS-3_4-17-13- A-B, p. 10).

At one point, Monica hinted at considering changes to her curriculum based upon trends in the GPRA data. She said, "They don't eat properly and I'm sitting there writing no, no, no. And I'm like oh God, what can I do? I'd better start throwing vegetables at

them." (MS-3_4-17-13- A-B, p. 10) However, it was unclear if she actually adjusted her instruction based upon this data.

Elementary School

At the elementary school level, there was evidence that the data collection process stimulated conversations with students just as it did at the high school level (ES-1_4-18-13, p. 5; ES-3_4-19-13, p. 4), but there were also more concrete examples of how data were used to directly inform instructional decisions. At this level, evidence indicated that data were used in three main ways: a) to individualize instruction, b) to set targets for student performance, and c) to adjust course content.

In relation to the individualization of instruction, Christy at Milan Elementary School described using FitnessGram data to "red-flag" students with poor fitness so that she could follow up with them through private conversations about the importance of physical activity and health. According to Christy, red flagging meant…

> *… that I need to touch base with that student when I get those forms out ready to explain to them what it means. And when we explain all of the criteria that will help them to improve those scores, I need to pull them aside and talk to them specifically so that they know 'This is telling you this, and if this doesn't get changed these other things can happen.' And so I'll specifically touch base with those kids. I'll give them their form and I'll say "I'll need to talk to you," and then I'll pull a couple at the end of class and I'll jot some names down and eventually I'll get to them within a couple of days.* (ES-1_4-30-13- A-B, p. 8)

Similar to Christy, Margaret at Schulman Elementary School also described focusing instruction on individual students based upon FitnessGram data. She described the process like this:

> *Well, especially the kids that are really bad I try to talk to them about just health. I mean you do the general, "If you're in this, if you're in that, if you're in this you might want to look into…," you know in general. But then I try to pull some of the kids aside, the ones I think really need to do it.* (ES-3_4-19-13, p. 7)

Beyond identifying students in need of additional attention, Christy at Milan Elementary School also described using FitnessGram data to set new targets for student performance on subsequent fitness tests. For example, she told students, "…remember your number from last time and plus two. See if you can go plus two today or meet it." (ES-1_4-18-13, p. 4) Christy was the only elementary school teacher that conducted the FitnessGram tests twice a year. Therefore, she was the only teacher that had the opportunity to engage students in this kind of process over the course of a school year.

Lastly, both Christy and Margaret shared how FitnessGram data informed the kinds of activities they chose to do with their students. For example, Christy stated, "It [the FitnessGram data] drives what I do. That, in addition to just seeing how unfit some of the kids are drives me to do cardio, cardio, cardio; movement, movement, movement in everything I do." (ES-1_4-18-13, p. 4) Similarly, Margaret stated:

> *Well, you know, you feel like… If my kids are not doing as well then you feel like where are they lacking? And I know one of the big things is upper body strength, so we do a lot of pushups. We try to do the burpees and then we try to play games where [students support their body weight on their hands]*. (ES-3_5-7-13, p. 9)

In distinction with the high school level, these decisions were directly informed by the results of the FitnessGram tests.

Although there were examples of data-use for instructional purposes at Milan and Schulman Elementary Schools, the situation at Riverside Elementary School was drastically different. When asked whether the data from the FitnessGram influenced her instruction, Jennifer responded:

> *No, it doesn't. We just keep doing the same thing because there are not enough of us to even change what we do. We do what works best as a whole, not as individuals. Do you know what I'm saying? We do our activities that are going to lead to the least problems because there are only two of us. There are a lot of students that could not do the curl-ups because they're overweight, but we cannot do something extra for them like take them outside to run because there is just nobody to do it. It's 45:1, so we both have to stay here with all the students.* (ES-2_4-16-13, p. 6)

Jennifer went on to say, "We've never used data to drive our instruction; we just follow the curriculum. That's basically what we do." (ES-2_4-16-13, p. 9)

Summary of Instructional Decisions

Half of the teachers interviewed in the study described ways in which data influenced their instruction. The other half stated that data had little impact on how they taught. At the high school and elementary school levels, three teachers described using data collection times as opportunities to discuss the importance of physical activity and the dangers of inactivity. The teachers described trying to connect assessment information to the personal experiences of students, specifically relating fitness concepts to the experiences of having family members at home with health problems. Teachers at both levels also spoke about making adjustments to course content. At the high school level, one teacher described exploring new and creative ways of integrating fitness into

lessons. At the elementary school level, teachers discussed tailoring activities to address specific aspects of fitness where deficits were identified. Lastly, two elementary school teachers described using fitness data to identify students that they perceived to be at an elevated health risk. According to the teachers, these individual students were pulled aside for more individualized conversations surrounding the importance of physical activity and nutrition.

The other half of the teachers in the study indicated that the collection of GPRA and FitnessGram data had little to no impact on their instruction. As an example, two of the middle school teachers (who were in their first year of GPRA data collection) said that the only difference they noticed between this year and previous years was that they now had to set aside time to collect the GPRA data. Likewise, a teacher at the elementary school level said that she did not feel she had the manpower to create specialized experiences for students. Instead, she just followed the district curriculum and chose activities that would lead to the least amount of problems during class.

Program Improvement

Case Study Question #3B: How did physical education teachers, school administrators, and district administrators use data to drive program improvement efforts?

School District

At the school district level, a needs assessment conducted prior to the PEP grant helped determine the areas of greatest need (Document Analysis- District PEP Grant, pp. 3-7). For example, based upon the results of the needs assessment and the personal observations of the coordinators, it was determined that high school physical education

was in the greatest need of improvement. Therefore, the district chose to ramp up the PEP grant over three years, starting with the high school level first (Document Analysis- District PEP Grant, pp. 3-7). In addition, based upon the results of the curriculum evaluation (i.e., PECAT/HECAT), the district revised the high school curriculum to include more fitness-oriented activities. This included the development and implementation of new physical activity and nutrition modules across the entire physical education curriculum (Document Analysis- District PEP Grant, p. 2). A specialized physical education course was also developed for students with high BMIs to help them learn how to better manage their weight. The content of the course included greater emphasis on nutrition, fitness, and family involvement (Document Analysis- District PEP Grant, p. 2). The rationale for offering the course was that a preliminary needs assessment indicated a large percentage of overweight and obese students in the district (Document Analysis- District PEP Grant, p. 8).

Beyond the use of the needs assessment data to drive program improvement efforts, the district also identified 10 measurable outcomes and eight ways of using "performance feedback to guide continuous improvement" within the PEP grant application (Document Analysis- District PEP Grant, pp. 11-15). A few examples of these outcomes and strategies are listed below:

> ***Measurable Outcome #2:*** *At least 10% of the at-risk students at each high school will complete the [specialized] physical education course by the end of year 1, 10% at each middle school by the end of year 2, and 10% at each elementary school by the end of year 3.*

> ***Measurable Outcome #3:*** *80% of middle and high school physical education classes will include the new nutrition modules and two or more of the new physical education modules in year 2, and 80% of elementary physical education classes will include these components in year 3.*
>
> ***Measurable Outcome #7:*** *The percentage of students who achieve cardiovascular fitness levels as measured by the 20-meter shuttle run (i.e., the Fitnessgram Pacer test) will increase by 5% per year during the three-year program. (GPRA measure 2)*
>
> ***Strategy #1:*** *During all professional development teachers will be completing feedback forms in writing and verbally to discuss examples of successes and challenges of the physical education class proposed project design.*
>
> ***Strategy #5:*** *Monitor improvement of student's fitness level, heart rate monitors, pedometers, personal wellness journals and the use of the Virtual PE/IHT Information Management System to insure state standard instruction.*
>
> (Document Analysis- District PEP Grant, pp. 11-15)

Each of these examples demonstrates how the district considered a variety of data sources to drive program improvement efforts.

High School

There was no evidence provided by high school teachers of using data directly to drive program improvement efforts. However, it was clear that in at least one high school, a teacher was going to great lengths to modify the curriculum in the specialized physical education class in order to motivate students. At Bailey High School, Angela described the implementation of a creative new biking unit like this:

> *I said, okay what can we do a little bit different? And I said, "You know what? Let's start riding bikes. Let's see if we can get bikes. So we kind of started getting into that and it just blew up. I had people left and right, "Coach, how can we help*

> *you? What can we do?" So I have about 30 bikes that got donated. And that was big motivator I noticed. It's something different. We play games in here. We'll go out to the track. We'll play games out in the field, but it was just something different and they liked it. They really enjoyed it.* (HS-2_4-18-13- A-B, p. 8)

It was unclear if the changes in the curriculum were a direct result of the data, but they seemed to coincide with the implementation of the PEP grant and its specific emphasis on obesity prevention.

Middle School

There was little evidence of data driving program improvement efforts at the middle school level. As stated previously, one teacher, Monica, described a desire to address fruit and vegetable consumption based upon poor results on a questionnaire (MS-3_4-17-13- A-B, p. 10). However, it was unclear if changes in the curriculum actually resulted from the knowledge obtained through the GPRA measurements.

Elementary School

Similar to the middle school and high school levels, little evidence supported the use of data for program improvement efforts at the elementary school level. Instead, teachers said they just followed the district's curriculum guide (ES-2_4-16-13, p. 9; ES-3_4-19-13, p. 11). Teachers did not talk about how they adjusted the curriculum, sought training, or set programmatic goals based upon the data they were gathering.

Summary of Program Improvement

Many of the program improvement efforts identified in the study occurred at the district level as opposed to the school or teacher level. For example, district coordinators

used results from the initial needs-assessment to guide the development of the PEP grant. New modules emphasizing physical activity and proper nutrition were created to address worrisome obesity statistics and high school physical education was given top priority due to elevated concerns about the quality of instruction at that level. In addition, district coordinators used needs-assessment data to develop measurable outcomes associated with the PEP grant and to identify strategies for progress monitoring. One of the most visible program improvement efforts came in the form of a specialized course designed to address obesity at the high school and middle school levels. Little evidence, however, indicated the involvement of teachers in the development of program improvement strategies.

Accountability

Case Study Question #3C: In what ways were physical education-related data used to hold students, teachers, and schools accountable?

School District

According to the district coordinators, the issue of accountability in physical education was extremely important. The lead coordinator, Victor, stated multiple times throughout an interview that, "It's all about accountability" (CO-1_5-16-13, p. 6). And the importance of accountability seemed to lie primarily in building credibility for physical education as a subject area. For example, when asked about using data to build greater accountability in physical education, Alex replied, "It's going to make you look more like core". Likewise, when responding to a question about data-use for accountability purposes, Victor suggested that accountability had grown in physical

education because of the PEP grant and administrators were now beginning to see the importance of the subject matter. He stated, "The fact is that there is accountability now in PE that-- they're beginning to understand the importance of it. The administrators are beginning to support it." (CO-1_5-16-13, p. 4)

Interestingly, however, there were no formal expectations placed upon teachers for the achievement of specific outcomes. Instead, coordinators said they were just looking for some indication of improvement as they reviewed the data (CO-1_5-16-13, p. 3). Carlos stated, "As long as we see improvement, I mean that's basically what we're looking for – improvement" (CO-3_5-16-13, p. 6). Alex saw this as a problem. He stated, "Accountability, that's where we're having trouble. Just like with students, you've got to give clear expectations and clear guidelines for what needs to be done." (CO-2_5-16-13, p. 1) At the time of the study, it seemed as though accountability was being generated simply through the data collection process and teacher pride. As Alex described it, "It's more intrinsic in that teachers want to see their students get better and want good things for their kids" (CO-2_5-16-13, p. 1).

One thing was clear, however, teachers were being held accountable for the collection and submission of the GPRA data at each data collection period. Each of the coordinators confirmed that this was not a request, it was "mandatory" because of the PEP grant (CO-1_5-16-13, p. 2; CO-1-3_3-18-13, p. 3; CO-3_5-16-13, p. 5).

High School

The high school teachers agreed that the collection of the GPRA data throughout the school year contributed to a greater sense of student accountability (HS-1_4-16-13, p. 21; HS-2_5-2-13, p. 4). Valerie believed that by knowing what students had scored on previous attempts, she could hold them accountable for their personal best performance. She stated:

> *They already knew… the fact that I knew what they had – that's when they were like, "She even knows what I did last night." Because they know what they did... kids – they know. So I'd say, "Okay, this is what you had ... It's gotta be more." At the beginning of class I'd say, "Okay, I already know what you have and you cannot get 32. You have to have 33 at least."* (HS-1_4-16-13, p. 21)

Valerie went on to describe how the data collection process itself contributed to a greater sense of accountability among students. She said: "Yes, I do [see the GPRA data contributing to student accountability], because the kids start thinking about it; especially when they do that 3DPAR where they have to recall what kind of activities they've done" (HS-1_5-2-13- A-B, p. 5). In this example, Valerie seemed to be describing a form of accountability that developed when students engaged in the data collection process itself. As students recalled their physical activity participation, they were forced to reflect on their behaviors.

In regards to teacher accountability, it did not appear that the GPRA data were being used to hold teachers accountable, at least not externally. Valerie described how she took great pride in her teaching and always strived to do her very best no matter what. She said, "That's just in my nature – I want to do good" (HS-1_4-16-13, p. 23). In

alignment with what was stated at the district level, neither teacher described how district coordinators or any other external entities were using the data to hold teachers accountable.

Middle School

At the middle school level, it appeared that the collection of the GPRA data was contributing to some sense of accountability among students and teachers, but similar to the high school level, it appeared to be an internally provoked sense of accountability rather than a form of external accountability. For example, Shawna described how she believed students became accountable for their diet just by completing the fruit and vegetable questionnaire. She said:

> *Well, actually, during the fitness part of it, let's look at the fruit and vegetable questionnaire. That's being accountable because they ask you the question and I really feel like they're being honest here… And I actually see the kids trying to think. I think they're being accountable for it.* (MS-1_4-18-13, p. 17)

Shawna was not setting up formal rewards or punishments related to student performance. Instead, she felt that just by reflecting on their own nutritional behaviors, students were becoming more accountable for their behaviors.

At the teacher level, Monica described how she felt accountable for student scores on the various GPRA measures, not because the district was holding her accountable, but because she felt personally responsible for her students' performance. She struggled, however, because she did not feel that her students put forth their best effort. She elaborated upon this idea like this:

> *I feel horribly disgusted and embarrassed when they take their tests and they just don't try. I take it personally. I mean I'm like, "No, I did not let you sit around to go and fail that portion of that test." I'm accountable for their tests, but at the same time it frustrates the heck out of me because I know that they're not doing their best.* (MS-3_4-17-13- A-B, p. 14)

Monica tried to invoke a notion of external accountability on students by telling them that their GPRA and fitness scores were being submitted to the district. She told them that an administrator in the district office was looking at the scores and that the scores would "follow them wherever they go" (MS-3_4-17-13- A-B, p. 8). She described this as a "scare tactic" to try to get students to care a little more about the tests (MS-3_4-17-13- A-B, p. 8). However, it did not appear that there were any true forms of external accountability coming from the district related to student performance.

The only true form of external accountability associated with the GPRA data appeared to be in relation to the collection and submission of the data, rather than the results themselves. Shawna said that teachers were being held accountable for submitting the GPRA data to the district on time. Specifically, she said, "Oh, they send us plenty of emails [if data are not submitted on time]" (MS-1_4-18-13, p. 17). This evidence corroborates what was stated at the district level in regards to the data collection being mandatory. When asked whether or not she felt teachers were being held accountable for anything different as a result of the PEP grant, Jessica simply stated, "No" (MS-2_4-17-13, p. 13).

Elementary School

Two of the three teachers at the elementary school level stated that they believed the FitnessGram data contributed to greater accountability among students. One of the teachers described how students commented on previous test scores and held themselves accountable for improvement (ES-1_4-18-13, p. 13). Christy said, "They're extremely competitive [the students]. So I think it does [hold them accountable] to a certain extent; a number of kids." (ES-1_4-18-13, p. 13)

Similar to Monica at the middle school level, Margaret described a strategy she used to elevate student accountability associated with the FitnessGram tests. It involved invoking a sense of external accountability. She described it like this:

> *I mean I tell them [the students] from the beginning of the year when they go to do push-ups, "You're going to get tested on this at the end of the year. It's going to go to the district and it's going to go to the state, just like your STAAR test. You need to pass this." And the kids will go, "Oh my gosh," you know.* (ES-3_4-19-13, p. 13)

It appeared as though Margaret was adding additional pressure onto students to perform well on the test by comparing the FitnessGram to standardized tests that were conducted in other academic subject areas. There was no evidence to suggest, however, that the data were actually being used in this manner.

The same two teachers, Christy and Margaret, acknowledged that the FitnessGram data were being used to hold teachers more accountable too, but each teacher explained how it was not really a formal system of accountability quite yet. Instead, the teachers described how they were aware that district level administrators

were reviewing the data, but didn't feel they were acting upon it in any way. To the contrary, the teachers believed they were being trusted to do what was needed to be done in order to improve student scores on the various tests. For example, when Margaret was asked about whether or not the FitnessGram data were being used to hold teachers accountable, she stated:

> *Yeah, because you felt like if your class didn't do well, they were going to say, "Why?" And I don't think they actually followed up on any… I don't think they really talked to anybody about it. It was just given to you to kind of do what you felt was right.* (ES-3_4-19-13, p. 13)

Similarly, Christy responded to the same question:

> *So I think it does [hold teachers accountable]. You know big brother is looking over my shoulder at my scores. And if I'm not cutting the mustard, well they need to do something about it. Will they? I don't know. They don't do it so much in the classroom either. They haven't held it over our heads or anything. I've heard conversations about accountability. "You've got to be accountable. You're going to be held accountable. They're going to have to pass a fitness test to pass the class and then your scores are really going to be looked at." But it hasn't really come down yet.* (ES-1_4-18-13, p. 14)

Christy further described how she would not mind if the district used the FitnessGram data to hold her accountable. She said:

> *I have to look at it in a good way because if my job is to give these kids activities that are going to help them be healthy, then if this data is showing that the majority of them are extremely unhealthy cardio wise, then I don't think I'm doing my job. I am confident that what I do is going to get enough kids where they need to be. I'm not the greatest thing since sliced bread. There are many teachers way better than I am, but I know that I get the kids moving as much as I possibly can. So I mean if I get dinged for something I'm not doing, well I'll start doing it. I like my job. I want my job. You have to kind of think of it in terms of that.* (ES-1_4-18-13, p. 14)

In regards to being held accountable for student outcomes, Christy also presented a caveat, however. She explained how it was "kind of scary" that she could be held accountable for student fitness scores, in particular aerobic capacity scores, when she was so limited in teaching space and had overcrowded classes (ES-1_4-18-13, p. 13). She described a dilemma she frequently faced in terms of struggling to provide sufficient opportunities for vigorous physical activity while keeping the activities safe for everyone. She said:

> *I'm locked within these four walls basically with a whole bunch of kids, so either I have them crashing into each other to get everybody moving or I have them do less vigorous activities, which is not going to get them where they need to be.* (ES-1_4-18-13, p. 13)

Unlike the first two teachers, Jennifer shared her belief that data were not being used to hold students or teachers more accountable. When asked if the FitnessGram contributed to greater student or teacher accountability, Jennifer simply answered, "No" (ES-2_4-16-13, p. 7). Instead, according to Jennifer, the only thing that teachers were being held accountable for was submitting the data. She described how if the data were not submitted on time, the principal of the school would get a phone call reminding him or her that the data were past due so that principal could follow up with the teacher. She said, "I know they call her [the principal] if we have not entered it by close to the date. She will get an email letting her know that we haven't entered the data." (ES-2_4-16-13, p. 5) This evidence aligns with what was stated at the school district level.

Summary of Accountability

Evidence in this section indicated that data collection requirements associated with the PEP grant and with FitnessGram testing were contributing to a greater sense of accountability among students and teachers, despite the fact that no formal systems of accountability were in place. Instead, an elevated sense of accountability seemed to be associated with self-reflection and intrinsic desires to perform better.

At the student level, teachers described two common ways in which data contributed to accountability. First, students were perceived to be experiencing a greater sense of accountability simply by participating in the assessment process itself. In other words, by recording step counts and seeing how many laps they could complete on the PACER test, students were able to reflect on their own behaviors/achievements and hold themselves accountable for their performance. Some teachers mentioned high levels of competitiveness among students, which was believed to be contributing to a greater sense of accountability. Second, teachers described how students came to the realization that others would have access to their scores. Students realized that teachers had the capacity to see previous test scores and were therefore capable of holding them accountable for personal best performances on tests (which some teachers reported doing and others did not). Additionally, two teachers told students that their scores were being reviewed by district and state level administrators, similar to the way scores on standardized tests were being reviewed. The teachers contended that this knowledge contributed to enhanced accountability among students, even in absence of actual accountability systems.

At the teacher level, a parallel sense of accountability was evident. Teachers spoke about taking pride in student performance and feeling accountable for student scores, even though there were no rewards or punishments associated with student outcomes. A number of teachers also spoke about the knowledge that district coordinators could see their scores, which contributed to a greater sense of accountability. However, both teachers and district coordinators confirmed that no formal systems of accountability were in place. Instead, the only thing that teachers were truly held accountable for was collecting and submitting the GPRA and FitnessGram data.

At the district level, coordinators had targets in mind for improvements on the various GPRA measures, but those targets were not directly shared with teachers. Instead, teachers were just expected to do what they felt was best for their students. Additionally, there was no evidence that district level coordinators were being held accountable for any student or teacher outcomes based upon the data that were being collected.

FACILITATORS & BARRIERS

Research Question #4: What factors positively or negatively influenced the use of data in physical education.

The purpose of this section is to expose factors that positively or negatively influenced the DDDM process in physical education. In addition to facilitators and barriers, the distinct influence of technology is explored. At the end of the section, coordinators and teachers were asked to offer their ideas for the enhancement of the

DDDM process. Four sources of evidence informed this section: a) coordinator interviews, b) teacher interviews, c) classroom observations, and d) document analyses.

Technology

Case Study Question #4A: What role did technology play in the DDDM process in physical education?

School District

The coordinators agreed that technology played an important role in physical education (CO-1_5-16-13, p.15; CO-3_5-16-13, p. 18). Victor described it as a "major role" (CO-1_5-16-13, p. 15). Interview and observation evidence indicated that the district had access to a variety of different activity monitoring devices capable of measuring physical activity and a number of different software applications with the potential of assisting in data management and reporting. Table 3 summarizes the main types of technology available in the district and their general functions:

Heart Rate Monitors		
Suunto http://www.heartzones.com/	**Polar E30 & E600** http://www.polar.com/	**IHT Spirit System** http://ihtusa.com/
Suunto offers a group heart rate monitoring solution that projects user heart rate information onto a projector screen in real time. Users can visually monitor exercise intensity during a workout.	Polar heart rate monitoring systems consists of a strap and a watch. The watch shows the user real-time heart rate information and provides feedback on target heart rate zone. Heart rate data is uploadable.	The Spirit System includes a heart rate monitor strap for students that provides audio feedback to indicate heart rate zone status. Heart rate data can be uploaded to accompanying software.
Pedometers		
Yamax SW 200 & SW 701 http://www.pedometersusa.com/		**FitStep Pro** http://www.gophersport.com/
The SW200 measures steps only. The SW701 measures steps, distance, and calories.		The FitStep Pro pedometer measures and displays MVPA in addition to steps. It is uploadable.
Software		
FitnessGram http://www.fitnessgram.net/	**IHT Spirit System** http://ihtusa.com/	**Virtual PE Administrator** http://www.virtualpe.net/
The FitnessGram software allows the teacher to input fitness scores and print student/parent reports. Summary reports can be aggregated at the class or teacher level.	The IHT Spirit System Software interfaced with the accompanying heart rate monitors. The software has the capacity to generate summary reports that can be emailed or text messaged to students/parents.	The Virtual PE Administrator software includes curriculum resources, assessments, and rubrics for teachers. It allows teachers to track student assessments over time.

Table 4. Overview of technology available in STISD.

Despite the fact that the coordinators said technology played a major role in the DDDM process, much of the conversation surrounding technology-use had to do with technological challenges, rather than the ways in which technology facilitated data-use. For example, coordinators talked about batteries needing to be replaced in activity monitors and students losing pedometers (CO-1-3_3-18-13, p. 2; CO-2_5-16-13, p. 1; CO-1_5-16-13, p. 11). Coordinators also described in detail their belief that teachers were

using very little of the new technology available because of insufficient training (CO-1_5-16-13, p.12; CO-2_5-16-13, p. 3; CO-3_5-16-13, p. 10). These challenges and more are discussed in the "Barriers" section below.

High School

At the high school level, interview evidence indicated that one teacher used technology consistently and the other did not. Angela, at Bailey High School, described using Suunto heart rate monitors with students in her specialized classes. She said that the heart rate monitors helped motivate students to engage in physical activity during class. She described the use of the heart rate monitors like this:

> *We do the Suunto heart rate monitors and the kids really like to do that because I give them prizes. I make little things out of it so they can compete with each other. "Okay, starting right now, we're going to click it. Starting right now we're going to see who can reach their heart rate, who can stay in their heart rate zone the longest. If you want to go get water or take a break, that's fine, but you've got to know that you're still going." So they do. They're in there jumping around.* (HS-2_4-18-13- A-B, p. 13-14)

This quote suggests that students in Angela's classes may have been adjusting their physical activity levels based upon real-time feedback from the heart rate monitors.

In contrast to Angela's use of heart rate monitors, Valerie described shying away from technology because she did not consider herself computer savvy. She said "I'm not real good with computers – that probably has a lot to do with it" (HS-1_4-16-13, p. 5). Valerie went on to say, "…even though they trained us, I guess I've just been at it – teaching so long I feel like this works and don't fix it" (HS-1_4-16-13, p. 6).

In regards to training on the use of new technology, Angela shared her desire to have more professional development. She stated, "I like them [HR monitors]…I just wish we had more training. A lot of the stuff I learned I was just playing around with it... I just wish we had more hands on training using it." (HS-2_4-18-13- A-B, p. 14)

Middle School

Similar to the school district level, much of the evidence connected to technology at the middle school level revolved around challenges and barriers. For example, Shawna stated that she had both Polar and Sunnto heart rate monitors, but not enough for a full class; therefore she did not use them very often (MS-1_5-6-13, p. 1). However, one teacher, Jessica, said that she used Sunnto heart rate monitors on a weekly basis with her specialized class and that the students really enjoyed using them. Like Angela at the high school level, Jessica stated, "they do like seeing how hard they work and where they need to be" (MS-2_5-6-13, p. 2). This evidence suggests that the devices were influencing student physical activity involvement.

Elementary School

The most common technology used at the elementary school level was pedometers. All three teachers stated that they had used pedometers with their students at one point or another in their career (ES-1_4-18-13, p. 15; ES-2_4-16-13, p.3; ES-3_4-19-13, p. 14). According to Margaret, students enjoyed using the pedometers and thought they helped stimulate greater physical activity participation among children. She said, "Well the kids love them and they do better when they have them on because they like to

see those numbers. I mean I see a lot more jogging, a lot more fast jogging when they're wearing pedometers." (ES-3_4-19-13, p. 14) This evidence corroborated what was stated at the high school and middle school levels in regards to heart rate monitors influencing physical activity participation among students in a positive way.

However, similar to the other educational levels, much of the teacher discussion surrounding technology-use at the elementary school level was related to challenges. For example, two teachers said they did not use pedometers as frequently as they would like because they do not have enough in working condition. Christy stated, "... We never have enough. Batteries die and it's difficult to get batteries. [Victor] has given me a whole butt load of batteries at one point, but we just never have enough." (ES-1_4-18-13, p. 15) Likewise, Margaret pointed to her set of pedometers hanging on the storage closet wall during one interview and stated, "Probably half of these aren't working" (ES-3_4-19-13, p. 13). Evidence from observations indicated that Milan Elementary School had 41 pedometers in a hanging case (Artifact Analysis ES-1G_4-18-13) and Schulman Elementary School had nine (ES-3_5-7-13, p. 7). With class sizes averaging 70-90 students at Milan Elementary School (ES-1_4-18-13, p. 2) and 40-70 students at Schulman Elementary School (ES-3_5-7-13, p. 1), it was clear that the teachers did not have enough pedometers to give to all of their students.

Summary of Technology

Two categories of technology played an important role in the district: a) devices that measured physical activity participation and b) software that could assist in the

management of information. The primary devices used to measure physical activity participation were heart rate monitors and pedometers. Both types of devices appeared to be involved in motivating students to be more active during physical education classes. However, half of the teachers interviewed in the study indicated that they did not have enough working devices for an entire class; therefore use of the devices was limited. The district coordinators and one high school teacher identified a lack of training associated with technology as a limiting factor.

The software available in the district had the capability of assisting with the management and analysis of physical activity, fitness, and lesson content data. For example, software connected to the heart rate monitors had the capability of recording and reporting heart rate data, FitnessGram software had the capability of printing customized reports for students and parents, and Virtual PE Administrator software had the capability of monitoring lesson content. However, there was little evidence to indicate that the software was being used by teachers and coordinators to its fullest potential. For example, none of the teachers described going in to the heart rate monitor software to review student heart rate data or analyze activity levels during lessons. In addition, only half of the teachers printed FitnessGram reports for students and/or parents. Lastly, the Virtual PE Administrator and IHT Spirit Systems were in limited use due to concerns over data security and privacy. In essence, technology was available, but was not being utilized to its full capacity.

Facilitators

Case Study Question 4B: What factors encouraged or facilitated the use of data in physical education?

School District

When asked about the most powerful facilitators of data-use in the district, Victor identified people power; including both paid labor and volunteers. He stated, "The staff-being allowed to hire staff is what really helped" (CO-1_5-16-13, p. 14). He also mentioned the support of local health collaborative volunteers that were available to assist with data collection and management in the schools (CO-1_5-16-13, p. 14). The other district coordinators, Alex and Carlos, did not identify any specific facilitators of data-use in the district.

High School

At the high school level, no specific facilitating factors were identified by teachers in relation to data-use. However, the teachers did confirm that they were offered assistance from local health collaborative volunteers. Interestingly, neither teacher accepted the help. Instead, both teachers described how they preferred to collect and transfer data themselves. Valerie stated, "I'm just one of those people that I've got to do it myself" (HS-1_4-16-13, p. 20). Angela similarly stated, "…it's almost easier for me to do it myself because I know the kids and I have it here… I know the classes. I can put it in quick. I know the system." (HS-2_4-18-13- A-B, p. 12) Therefore, at the high school level, volunteers were not viewed as an important facilitator as suggested by the coordinators.

Middle School

At the middle school level, two teachers described accepting assistance from the local health collaborative volunteers (MS-1_5-6-13, p. 9; MS-2_4-17-13, p. 3). Both teachers indicated that the volunteers were helpful in collecting data. For example, Shawna stated:

> *She just helped me with the height and weight…and she stayed an entire day with that. So it worked out. It was quick with the help. I mean otherwise I would have to do so many kids… but it was very helpful that somebody came out. Yeah, it was very helpful.* (MS-1_5-6-13, p. 9)

Likewise, when asked if the volunteers were helpful, Jessica replied "Definitely" (MS-2_5-6-13, p. 6)

Monica, on the other hand, said that she was aware of the availability of volunteers, but like the high school teachers said she did not invite them out to her school because she thought it would be difficult for them to understand her data collection procedures. She said:

> *I'm going to do it myself, because only I can read my madness when I write it down and I'm jotting information. I know who's what and I wind up with crazy lines that mean something to me, but don't mean something to anybody else…* (MS-3_4-17-13- A-B, p. 9)

Further evidence from observations indicated that Monica did not use the GPRA data collection form that the other two middle school teachers used (Field Notes- MS-3_4-30-13, p. 18). Instead, she had her own system for writing down scores on roster sheets. This may have been one of the reasons why she did not feel that assistance from the volunteers

would have been useful. The middle school teachers did not describe any other factors that facilitated data-use.

Elementary School

When asked about facilitators of data-use, two of the elementary school teachers identified the FitnessGram software as a valuable tool (ES-1_4-18-13, p. 8; ES-2_4-16-13, p. 8). Christy stated, "Okay. I love that tool because it tells the student exactly what they can do to improve areas that they're low in" (ES-1_4-18-13, p. 8). Jennifer noted, "The software is pretty easy. It just takes time to enter all the data." (ES-2_4-16-13, p. 8) No other facilitators were identified at the elementary school level.

Summary of Facilitators

Minimal evidence was gathered in relation to facilitators of effective data-use in physical education. The lead coordinator for health and physical education and two middle school teachers identified people power as being helpful. For the lead coordinator, people power came in the form of two paid staff members that assisted with the implementation of the PEP grant and volunteers from a local health collaborative that supported data collection and management in the schools. The health collaborative volunteers were also identified by two of the middle school teachers as being helpful in collecting GPRA data. Interestingly, three of teachers at the middle school and high school levels acknowledged the availability of the volunteers, but stated their preference to collect the data on their own without the assistance of volunteers. The primary reason provided by teachers was that they knew their protocols better than anyone else and it

would have been more work to have someone new help with the process. The only other facilitator of data-use identified by teachers was the FitnessGram software. Two teachers at the elementary school level stated that the software was easy to use and provided useful reports for students.

Barriers

Case Study Question #4C: What factors served as barriers or limited the use of data in physical education.

School District

A number of challenges/barriers associated with data-use in physical education were identified by the district coordinators. They included: a) a lack of professional development time, b) a lack of training on technology-use, c) batteries dying in the pedometers/heart rate monitors, d) pedometer loss by students during GPRA data collection, e) data security concerns with the information management systems, f) the time required to implement the PEP grant on top of other responsibilities, g) a lack of time available for teachers to engage with data, h) difficulties comparing data from year to year, and j) not enough volunteers to assist with the data collection and management process. From this list, the barriers with the most substantial supporting evidence are presented in further detail below. In addition, concerns over data quality are addressed, as this was a recurring theme across all educational levels.

Lack of Professional Development Time. One of the most substantial challenges associated with the implementation of the PEP grant, according to the district coordinators, was a lack of time for professional development (CO-1-3_3-18-13, p. 3;

CO-1_5-16-13, p. 6; CO-3_5-16-13, p. 9). Providing targeted professional development for teachers was one of the project goals listed in the PEP grant application (Document Analysis- District PEP Grant). Specifically, one of the objectives was to provide 18 hours of professional development with attendance by at least 70% of the physical education teachers in the school district (Document Analysis- District PEP Grant, p. 28). Interview evidence indicated that the coordinators were planning to use district staff development days for trainings (CO-1_5-16-13, p. 6). However, access to teachers during those days was not granted. According to Victor, district-level leadership chose to have physical education teachers participate in campus-level professional development rather than attend physical-education-specific trainings on those days (CO-1_5-16-13, p. 6). Victor stated:

> *... The challenges were to try to get on days that were district staff development days. But all those were taken, well not taken, they were focused on the campus for academic instruction. And we were ready to [conduct trainings on those days], but we were not allowed to do it because of upper administration. That's what really hurt us...* (CO-1_5-16-13, p. 6)

In response to having been denied access to physical education teachers on staff development days, the coordinators considered having professional development workshops after-school and on Saturdays, but because many physical educators coach in addition to teaching, the coordinators anticipated low turnout; therefore they did not proceed with these trainings (CO-1-3_3-18-13, p. 3; CO-1_5-16-13, pp. 6-7; CO-2_5-16-13, p. 2; CO-3_5-16-13, p. 10). The final outcome was that physical educators were only able to participate in "one or two" professional development workshops throughout the

school year (CO-1_5-16-13, p. 6). And according to the coordinators, this was not enough training time for all that needed to be accomplished (CO-1-3_3-18-13, p. 3; CO-1_5-16-13, p. 6; CO-3_5-16-13, p. 9).

One consequence of limited professional development time was that many teachers had not been trained in the use of new technology that could have facilitated effective data-use. As Alex noted, "With the IHT system, only two schools have been trained, so they're pretty much the only schools that are using it" (CO-2_5-16-13, p. 3). However, Alex also speculated that a lack of professional development may have just been an excuse for some veteran teachers to not use new technology. He explained:

> *The teachers that don't use some of the technology complain that it is because they haven't been trained on it, but then once they get trained, some of them still don't use it. I'll go and visit them and they aren't using it… and the equipment looks brand new.* (CO-2_5-16-13, p. 3)

Although there was limited professional development time, it is important to note that the intended focus of the professional development was not on data-use strategies per se. According to the PEP grant application, the purpose of professional development was to:

> *Provide 18 additional hours of professional development per year for physical education instructors in the state standards, [specialized] curriculum, new activities (e.g., Zumba, HOPSports, Pilates, Yoga, etc.), nutrition education, developing individualized fitness/activity plans and personal wellness journals, and use of outcome-tracking equipment (i.e., pedometers, heart rate monitors). Teachers will be trained to collect data using the latest technology such as: the Virtual PE/Interactive Health Technologies (IHT) Information Management System.* (Document Analysis- District PEP Grant, pp. 9-10)

As Alex stated, "There is no training on data-use, just how to get the data and how to input the data, not really how to use the data" (CO-2_5-16-13, p. 5). He went on to share

his desire to better train teachers on data-use strategies. He said, "We want to teach teachers how to present the data in parent meetings, to graph growth or show what they need in order to be able to grow" (CO-2_5-16-13, p. 5). But at the time of the study, those kinds of trainings had not yet occurred.

Activity Monitor Challenges. Another challenge in the DDDM process was the loss of student pedometers. Seven days of step-count data were collected during each GPRA data collection period. Therefore, students were checking out pedometers and bringing them home. Unfortunately, many were not making their way back to school. Alex stated, "The biggest complaint is pedometer loss**.** The teachers say that kids are not being responsible and parents are not being responsible." (CO-2_5-16-13, p. 1) Alex suggested that the pedometers should be checked out like library books, and if they were not returned, report cards could be withheld until they are located or paid for (CO-2_5-16-13, p. 1).

In a related challenge, the batteries in the pedometers were not lasting the entire school year and needed to be changed out frequently. One of the coordinators described the logistical challenges associated with getting old batteries changed out for teachers. Carlos stated,

> *So they [teachers] have to get with us – not the day before; we ask for a week before to check the batteries because if they don't, then that day they're not going to have batteries. And sometimes we're somewhere else where we can't get to them right away. So we get to them as soon as we can, but sometimes it's not right away.* (CO-3_5-16-13, p. 7)

The same circumstances applied to other equipment that required batteries, such as heart rate monitors. Some of these devices had to be sent off to the manufacturer for battery replacement, so the process became even more prolonged (CO-3_5-16-13, p. 16).

Data Security. Another technology-related challenge identified by the lead district coordinator, Victor, was data security. Both of the information management systems written into the PEP grant (the IHT Spirit System and Virtual PE Administrator) involved data storage systems that involved student names and ID's. The district coordinator stated quite simply, "…we won't allow that" (CO-1_5-16-13, p. 11). Victor went on to say, "Now, we're still in negotiation with them as far as what kind of information they're going to be allowed to have because at first they wanted student IDs and student names and we can't do that." (CO-1_5-16-13, p. 10) Because of this particular challenge, the information management systems were in limited use.

Data Quality. Lastly, the issue of data quality came up at the district level and spanned all four educational levels. There was disagreement among the coordinators related to the quality of the data being collected as part of the PEP grant. The lead coordinator, Victor, stated quite clearly, "I feel it is very accurate" (CO-1_5-16-13, p. 1). He went on to describe how the data became more accurate as the teachers got used to collecting it. For example, he described how the high school had improved in the accuracy of the data collected from year one to year two. The language associated with his description was "accurate" to "very accurate" (CO-1_5-16-13, p. 2).

In opposition, Alex stated quite clearly, "I don't think it's too reliable" (CO-2_5-16-13, p. 1). He went on to describe how some teachers just kept the height and weight data the same for students between measures because they assumed that the numbers would not change much between data collection points (CO-2_5-16-13, p. 1). Alex also described how some teachers did not submit pedometer data because students had lost the pedometers. He said, "With the pedometers, some teachers say they didn't put anything new because the students are losing them" (CO-2_5-16-13, p. 1). Lastly, Alex expressed doubts about the validity of the fruit and vegetable questionnaire and its ability to truly capture a child's nutritional behaviors using only five questions. He said, "I don't really like the YRBS. I mean, how can you tell someone's nutrition from five questions? Journaling is much better." (CO-2_5-16-13, p. 2)

Carlos expressed similar concerns about the quality of some of the data being collected in relation to the 3DPAR rather than the YRBS. Due to the fact that it was based upon student recall, Carlos stated his belief that "…sometimes those kids aren't going to remember" (CO-3_5-16-13, p. 9).

High School

Only three barriers to effective data-use were identified by high school teachers during interviews. First, Valerie and Angela both described challenges associated with student motivation (HS-1_4-16-13, p. 6; HS-2_4-18-13- A-B, p. 2). Once students had completed the GPRA measures a number of times, the teachers said the students were not as excited about doing them another time. Angela stated, "And it's just basically more

motivating the kids because after the third or fourth time they're like 'I've got to do this again?'" (HS-2_4-18-13- A-B, p. 2) Angela also described challenges associated with the pedometers used in the GPRA measurement. She stated, "…the pedometers that we have are very outdated and they break, and I didn't have enough to give them to everybody" (HS-2_5-2-13, p. 2). Lastly, Angela described frustration in regards to a lack of training on the use of new technology. In one interview, she stated:

> *That's the one thing that really kind of bugs me a little bit. I was like, 'Man, teach us on this so we can use it... And I know [Victor] tries to do his best on trying to give us all training. And it's tough, especially at the high school because we're all coaches and it's hard for everybody to be there at one time.* (HS-2_4-18-13- A-B, p. 15)

Data Quality. In addition to the barriers listed above, both of the high school teachers also communicated concerns about the quality of the GPRA data that were being collected. For example, the teachers said that at times, students seemed to be just filling in random information on the 3DPAR questionnaire. Valerie described students hurrying through the 3DPAR like this: "And then I caught them putting an arrow and not really taking their time" (HS-1_4-16-13, p. 11) Angela also spoke about the quality of the 3DPAR data by saying:

> *You know I think this is just tedious. This [3DPAR] takes the kids the longest to do. I get mad because I want them to do it neat, so it's accurate, but the kids just want to hurry up and finish it.* (HS-2_4-18-13- A-B, p. 13)

In addition to questions about the validity of the 3DPAR, Valerie also shared her doubts about whether students were telling the truth on the fruit and vegetable questionnaire. During one interview, she noted quite bluntly:

> *I think that they cheat; I think that they're not really honest about the little questionnaire about their fruits and vegetables and all that. Honestly I don't believe that they eat what they say they eat. I think they're…"Well we're supposed to be eating that so I'm going to go ahead and circle that."* (HS-1_4-16-13, p. 24)

Other concerns related to data quality at the high school level included students forgetting to wear pedometers, students wearing pedometers in inappropriate places, and students not giving their best effort on tests like the PACER (HS-1_4-16-13, p. 24; HS-2_4-18-13- A-B, p. 11 & 13). Lastly, one high school teacher confirmed what was suggested at the school district level, which was that some teachers did not measure height during each data collection period. Valerie stated, "I start right here at their weight because their height for the most part – I didn't check it every time; I checked it every other time. They're not going to grow from month-to-month. Some do, but not much." (HS-1_4-16-13, p. 14)

Middle School

At the middle school level, many more barriers to data-use were identified by teachers. The barriers included: a) students not returning record sheets after bringing them home b) students not completing the logs or only partially completing them c) lost pedometers d) teachers having to change out batteries in pedometers frequently, e) low student motivation to complete forms completely and accurately, f) self-conscious students not wanting to take their shoes off to get measured, g) not enough pedometers or heart rate monitors, h) not all students participating in data collection, j) students misusing pedometers, k) measurements that were time consuming such as the 3DPAR, l)

additional time required for data input, m) minimal student effort on the PACER test, n) only being able to print one FitnessGram report at a time, o) students being pulled from physical education classes for work in other subject areas, and p) not enough time for data collection. The barriers with the most supporting evidence fell into two categories: pedometer challenges and data quality concerns. These two topics are discussed in further detail below.

Pedometer Challenges. All three teachers described challenges associated with the use of pedometers. Many of them revolved around students misplacing the devices or the batteries needing to be changed out. Shawna, at Damon Middle School, spoke about problems with students returning pedometers. She said:

> *That's the problem. That is my biggest problem. I have issued out all of those pedometers and have gotten very few back. I think that this seven day process is good, but I think it should be during class periods. What I'm saying is, I don't think it's wise that these kids take them home because more than 50% of the time I'm not getting them back.* (MS-1_4-18-13, p. 2)

In fact, Shawna was so frustrated with students not bringing the pedometers back to school that she stopped letting students bring them home at all. Instead, she just collected the GPRA pedometer data during class time (Field Notes- MS-1_5-6-13). Jessica also spoke about the issue of students misplacing pedometers. She described a similar return rate of "about half" (MS-2_5-6-13, p. 4). She said that even when she provided incentives, students still did not return the devices. Jessica described the situation like this:

> *I'm still collecting pedometers and still… even though we entice them and "Okay, you need to bring it back by Monday," if they do they get a free jean day that Friday. Some of them are all for it and some of them are "Eh, it doesn't matter to me."* (MS-2_4-17-13, p. 2)

Shawna similarly described trying to use incentives with students to get the pedometers back. She said:

> *I was eager to get started with this and get it going, but I couldn't get my pedometers back, which we all mentioned it in our professional development. "Well, give them an incentive." That's not working when we're talking about middle school kids, you know? I mean I had some come back, but not enough; not as many as I gave out.* (MS-1_5-6-13, p. 11)

Monica at Rowling Middle School reiterated many of the frustrations of the other two teachers in regards to student loss of pedometers. She also described the frustration involved when the batteries died on the pedometers. She said, "Lost pedometers… and then what do I tell a kid whenever the battery dies in the middle of their seven days? Sorry." (MS-3_4-17-13- A-B, p. 3) Monica went on to say:

> *So I try to rotate them and that takes a little while to do whenever you only have so many that are functioning, between that and the kids that like to lose them. That's the hardest part of the whole process is the pedometers.* (MS-3_4-17-13-A-B, p. 3)

Data Quality Concerns. Similar to the high school level, concerns over data quality were also identified as barriers to the DDDM process at the middle school level. Through teacher interviews and direct observation, three primary data quality issues became apparent: a) some students did not use pedometers correctly, b) some students did not complete the 3DPAR accurately, and c) some students did not try their best on the PACER.

The most common data quality issue was related to inappropriate pedometer use. Pedometers were intended to be worn on the waist just above the hip bone. During a lesson at Damon Middle School, three out of 28 students (11%) were observed wearing pedometers on their shoe and four out of 28 (14%) had pedometers hanging on their waist by the safety straps (Field Notes_MS-1_5-6-13, p. 37). At the end of the lesson while students were waiting to record their steps, approximately 75% of the class was observed shaking the pedometers to gain additional steps (Field Notes_MS-1_5-6-13, p. 38). At Lamar Middle School, students were also observed shaking pedometers and swinging them around their heads (Field Notes_MS-2_4-29-13, p. 10). This was in spite of the fact that both teachers gave students specific instructions to wear the pedometers on their hips and to not shake them (Field Notes_MS-1_5-6-13, p. 37; Field Notes_MS-2_4-29-13, p. 10). Jessica spoke about the misuse of pedometers among students:

> *… A lot of them don't take it seriously. They misuse the pedometers. They don't use them the way they're supposed to meaning they'll put them on their foot or they'll walk around… or I'll see them in their pocket… so I think a lot of times the data isn't going to be accurate…* (MS-2_4-17-13, p. 12)

Although pedometer use was not observed at Rowling Middle School, Monica confirmed in an interview that like the other two teachers, she had issues with pedometer misuse. She stated:

> *As far as pedometers go, I don't think it's very good… I sometimes get frustrated because they'll come up to me when it's time to read their numbers and they're trying to get the last 20 in by shaking it and making the numbers go up on the pedometer. (MS-3_4-17-13- A-B, p. 4)*

In addition to concerns over pedometer misuse, one teacher spoke extensively about her doubts related to the accuracy of the 3DPAR data. In an interview, Shawna described how she scanned through the 3DPAR forms and noticed that some students seemed to just be filling in random codes. For example, she said:

> *I see check marks like this and when I see this, you're just putting down anything… because they're all the same. What is it? 23? Sleeping? There's no way you're sleeping in class all this time. You see what I'm saying?* (MS-1_4-18-13, p. 9)

Furthermore, Shawna described how some students indicated on the 3DPAR that they were in class when it was night time. She said, "Sitting in class. How could you be sitting class? You don't have night classes. I'm thinking they're just jotting down anything and that doesn't make the data accurate, you know what I mean?" (MS-1_4-18-13, p. 1) Shawna went on to say "I don't even think it's halfway correct" (MS-1_4-18-13, p. 4). Jessica echoed Shawna's concerns over the quality of the 3DPAR data, stating "…it should take them longer than that. So obviously they're just filling it in" (MS-2_4-17-13, p. 13).

Lastly, the middle school teachers shared concerns about the accuracy of PACER test data, primarily because they questioned whether or not the students were giving their best effort. Shawna described how students would ask her what the minimum number of laps needed was to complete the PACER test. She said:

> *I try to push them to do a little bit more. I always tell them "Do as much as you can. Don't just set yourself for just the minimum. Push yourself a little bit more." Some of them do and a lot of them don't.* (MS-1_4-18-13, p. 6)

Likewise, Monica shared how some of her students expressed their discontent with the school by purposely performing poorly on the PACER test. She explained the situation like this:

> *I had one girl that just because she's been in trouble a little bit and it's time to do the PACER test. And I started the PACER test and she'll run over and stop and walk back and I'm done. I can't get her to understand you're not hurting me; you're hurting yourself and anybody's opinion of you anywhere else, not me. I didn't make you do what you did or whatever to get you in trouble. So sometimes when they're having a bad day they blow it.* (MS-3_4-17-13- A-B, p. 8)

During an observation at Rowling Middle School, the low motivation of some students was observed in relation to the PACER test. For example, one female student completed 10 laps on the PACER test and stopped, but she didn't even seem like she was breathing hard (Field Notes_MS-3_4-30-13, p. 16). At the end of the lesson, Monica asked the students "Tell me ladies, is that the best you've ever done?" A handful of students answered "No" (Field Notes_MS-3_4-30-13, p. 16). In a conversation later that day, Monica said that she struggles with motivation in this particular class. She said they just don't seem to care (Field Notes_MS-3_4-30-13, p. 16).

Elementary School

At the elementary school level, teachers reiterated a number of barriers that were identified at other levels, such as not having access to enough working pedometers and having difficulty keeping up with battery replacement (ES-1_4-18-13, p. 1; ES-1_4-18-13, p. 15; ES-3_4-19-13, p. 13). However, there was one resounding barrier at this level

that stood out above the rest: large class sizes. This barrier is addressed in addition to concerns over data quality.

Based upon observations and interviews with teachers, class sizes at the elementary school level ranged from 25 to 80 students. One observed class that had only 25 students was described by the teacher as an anomaly; a result of large numbers of students being pulled from physical education to obtain remedial instruction related to STAAR testing (ES-1_4-30-13- A-B, p. 3; Field Notes_ES-1_4-30-13, p. 11). Table 4 summarizes the typical class sizes at the elementary school level.

School	# of Combined Classes in PE	# of Students	# of Teachers
Milan Elementary School	3-4	70-90	2
Riverside Elementary School	3-4	70-90	2
Schulman Elementary School	2-3	45-65	2

Table 5. Typical class sizes in elementary school physical education.

During interviews, all three teachers spoke about the challenges associated with large class sizes. Christy at Milan Elementary School spoke about the dilemma she faced in terms of providing students with ample physical activity time during lessons. She said:

> *It makes it very difficult, and it's kind of scary, because I'm locked within these four walls basically with a whole bunch of kids. So either I have them crashing into each other to get everybody moving or I have them do less vigorous activities, which is not going to get them where they need to be…* (ES-1_4-18-13, p. 13)

Christy went on to say, "And maybe having PE three days a week isn't the answer… My class size and teachers that have large classes, it directly impacts what we can do, directly" (ES-1_4-18-13, p. 14) In another interview, Christy spoke about what it was like in physical education on the rare days when one class was missing. She said:

> *And they [students] see the difference when a class is missing or kids are pulled out for tutoring or kids are pulled out for whatever. When the class is smaller, 'Coach, it was fun today,' you know, because they didn't have conflicts. There are less issues in the room. It's a huge problem—class size.* (ES-1_4-30-13- A-B, p. 2)

When posed the following situation: "Let's say the world was to change and you were to see one class at a time – 22 students. How would that change what you do as a teacher?" Christy replied:

> *Where would I sign? It would change everything… I could see more one-to-one, individualized information. You know, I could see how you could really implement a lot of activities that really are more meaningful for the kids – more instruction, more problem solving, more higher order stuff rather than just movement.* (ES-1_4-30-13- A-B, p. 3)

At Schulman Elementary School, Margaret also spoke about the challenges associated with managing large numbers of students. She shared how difficult it was to record grades for students each week when she saw upwards of 300 students (ES-3_5-7-13, p. 6). She also shared how she was discouraged by her principal from printing out worksheets for students during health classes because of the large quantities of paper required for the copies (ES-3_5-7-13, p. 7). She said, "The other principal would discourage me from doing anything on paper because when you're starting to run off 300

worksheets …and you're trying to do that every time for health, it adds up in paper" (ES-3_5-7-13, p. 6).

However, it appeared that Jennifer at Riverside Elementary School seemed to have the strongest perception of large class sizes serving as a barrier to effective data-use. In interviews, she described how her classes were over-packed with students and how she felt like she did not have the time and/or manpower to do many of the things she wanted to do. For example, when asked if she used any other kinds of assessments besides FitnessGram, she stated, "No, we don't do any kind of testing other than the Fitnessgram. There are just not enough of us. There are only two of us." (ES-2_4-16-13, p. 3) When asked about whether or not she had students practice the correct form for the various FitnessGram tests, she replied, "We don't have time. Again because there are only two of us, we don't have the time and the manpower to teach them how to practice it or how to do it correctly." (ES-2_4-16-13, p. 9) When posed the following question: "How does the data that you collect with Fitnessgram influence what you do as a teacher, if at all?" Jennifer replied:

> *No, it doesn't. We just keep doing the same thing because there are not enough of us to even change what we do. We do what works best as a whole, not as individuals. Do you know what I'm saying? We do our activities that are going to lead to the least problems because there are only two of us. There are a lot of students that could not do the curl-ups because they're overweight, but we cannot do something extra for them, like take them outside to run because there is just nobody to do it. It's 45 to one, so we both have to stay here with all the students.* (ES-2_4-16-13, p.6)

It was clear that large class sizes were perceived by Jennifer as a powerful barrier to many different aspects of teaching, including using data to drive instruction. Evidence indicated that she did not feel as though she could be responsive to students' needs with so many students and so few teachers. The following statement provides one of the best summaries of how large class sizes limited what Jennifer perceived she could do with her students:

> *No [I never change what I do for students that are struggling]. I mean they just have to do what everybody else does. We don't have time to like have a special program for them and we don't have somebody to go to watch them, that they're doing a separate activity or whatever. We don't really… They just have to participate in what everybody else is doing, too.* (ES-2_5-7-13, p. 7)

Data Quality

In regards to data quality at the elementary school level, all three teachers agreed that the PACER test was the most accurate test in the FitnessGram battery (ES-1_4-18-13, p. 17; ES-2_4-16-13, p.9; ES-3_5-7-13, p. 9). Jennifer stated:

> *The Pacer, I would say it's… I mean the quality is very good on the Pacer test – that's the easiest thing to test because they just run from one black line to the other and they all get that, all of them get that.* (ES-2_5-7-13, p. 4)

Elementary teachers also shared their confidence in the accuracy of the height/weight measurements, the shoulder stretch, and the trunk lift (ES-1_4-18-13, p. 17; ES-2_5-7-13, p. 4). However, two teachers expressed concerns related to the quality of the pushup and curl-up test data. They described how the technique required in these two tests was a little more complex and difficult to evaluate. Jennifer at Riverside Elementary School described it like this:

> *As far as the push-ups and the curl-ups go… It's difficult to score all those kids and we have maybe ten kids lined up on the mats and we're just kind of skimming up and down making sure they're doing it right as the CD is going on and when we see them not making it, "Okay, you're done."* (ES-1_4-18-13, p. 17)

Furthermore, Jennifer described the challenges associated with the curl up test. She stated:

> *I would say the hardest thing to test is the curl-ups – they just don't get the position they're supposed to get in and that's the hardest thing. So the curl-ups is the one that I just have to make a judgment call on because they move from their spot and we don't have time to be correcting them, you know?* (ES-2_5-7-13, p. 4)

Lastly in connection with data quality, evidence indicated that one teacher had students complete only the minimum number of repetitions required to achieve the Healthy Fitness Zone (HFZ) on the curl-up and pushup tests (ES-2_5-7-13, p. 5). In other words, if a fifth grader needed to complete 23 pushups on the pushup test to make the HFZ, once that score was achieved, the test would be stopped. That means that there could have been students that were capable of completing more repetitions on the tests, but wouldn't have had the opportunity to attain their personal best score.

Summary of Barriers

Numerous barriers to effective data-use were identified in the study. The barriers can be classified into four main categories: a) professional development challenges, b) technology logistics, c) data quality concerns, and d) large class sizes. A summary of each category is provided below.

Professional Development Challenges. As part of the PEP grant, the district coordinators planned on conducting 18 hours of professional development for physical education teachers. However, due to differences of opinion among district level administrators, physical education teachers were unable to attend physical education-specific trainings on staff development days. Instead, teachers were required to remain on school campuses and participate in school-wide trainings related to core subject areas. The result was that district coordinators had limited time to train teachers on PEP grant procedures, new curricula, and new technology. Teachers said they did not feel comfortable using new software without sufficient training. Furthermore, teachers were not trained in effective data-use practices.

Technology Logistics. In regards to technology use, two logistical concerns emerged. First, many teachers reported that students misplaced or lost pedometers. As a result, teachers did not have enough pedometers to complete GPRA data collections and were unable to use pedometers with large classes. In connection, teachers also complained that the batteries often died and were difficult to replace. Second, district coordinators shared concerns over data security and student privacy with the use of web-based information management systems. The lead coordinator said he would not allow external entities to have access to student names and identification numbers. As a result, use of the information management systems was limited.

Data Quality Concerns. Three major areas of concern arose in relation to the quality of the data being collected from the GPRA measures and FitnessGram tests. First,

pedometer misuse was occurring at the secondary level. Instead of clipping the devices on the waist, some students wore pedometers on their shoes, had them hanging by safety straps, or put them in their pockets. In addition, some students shook the pedometers to add steps. As a result, the accuracy of the step count data was questionable.

Second, teachers at all three educational levels had concerns over the validity of certain data collection instruments. At the secondary level, the concern was over the self-report measures (e.g., 3DPAR, YRBS). Teachers shared their doubts as to whether students were able to accurately recall their physical activity and nutritional behaviors. Furthermore, teachers reported that some students were unwilling to take time to complete the logs accurately. Additionally, both high school and middle school teachers described low motivation among students to complete the 3DPAR instrument and reported having questions as to whether students were giving their best effort on the PACER test. Conversely, the PACER test was identified as one of the most accurate tests at the elementary school level. Yet teachers at this level communicated concerns in relation to the validity of the pushup and curl up tests.

Lastly, variations in data collection protocols were observed at the middle school and elementary school levels. At the middle school level, the variations occurred in connection with the pedometer data collection. Some teachers had students bring the pedometers home while other teachers only recorded steps during class. One teacher had students give up the pedometer if they were not achieving the healthy criterion for steps. At the elementary school level, there was one teacher that stopped fitness testing once

students had achieved the Healthy Fitness Zone on a particular measure. Two of the district level coordinators shared concerns over data quality that were similar to those of the teachers. However, it is important to note that the lead district coordinator was confident that the data being collected were sufficiently accurate.

Large Class Sizes. The final barrier to effective data-use was identified only at the elementary school level. At this level, teachers described struggling with large classes and limited space. Evidence indicated that typical class sizes ranged from 45-90 students and that most classes were conducted in one space under the supervision of two adults. Teachers described challenges with classroom management and concerns over student safety. One teacher said that based upon the FitnessGram data, she knew lessons needed to focus on building aerobic endurance. However, the teacher found herself having to make a difficult choice between vigorous activity and student safety, as overcrowded classes made it dangerous for intense movement. Other teachers described a desire to provide more individualized instruction for students, but felt overwhelmed by the number of students under their care and therefore did not feel this was achievable.

DDDM Enhancement

Case Study Question #4D: How could the DDDM process be enhanced in physical education?

School District

When district coordinators were asked how the DDDM process could be enhanced in physical education, a variety of ideas were presented. Victor, the lead

coordinator, spoke primarily about his desire to collect and analyze data related to physical activity time during lessons. He stated:

> *We haven't asked for that [MVPA data]. I know it's available through Polar. It's available through IHT. It's available through Suunto. We really haven't gone in and analyzed or pulled up data or put it on a server. That's another step that we need to look at… because I want to see what—the reason I want to see that is because of Senate Bill 891 which is 50% of the period has to have MVPA.* (CO-1_5-16-13, p. 15)

Victor went on to describe how pedometers could be used at the elementary school level to collect data on physical activity time. He said:

> *Now we can use these pedometers which are the Fit Step, which do measure MVPA and these can be downloaded where they are, you just put them on a reader. And those we're going to be using like ten or 12 per elementary school instead of heart rate monitors. Heart rate monitors are more accurate, but this will support the campus improvement plan.* (CO-1_5-16-13, p. 16)

Alex, the PEP grant facilitator, wanted to see a larger variety of student outcome data being collected. He said:

> *All the data being collected deal with health. At the elementary school level, I'd like to see some kind of fundamental skills testing, like skipping, galloping, leaping at kindergarten and fifth grade. That way, you can know which students might struggle in middle school.* (CO-2_5-16-13, p. 5)

He went on to say, "After the PEP grant, I would switch to four data collection times throughout the year, one each nine weeks" (CO-2_5-16-13, p. 2). Alex also expressed a desire to see teachers better trained in data-use. Specifically, he described wanting to help teachers learn how to analyze data and present it to key stakeholders. He described it like this:

> *There is no training on data-use, just how to get the data and how to input the data, not really how to use the data. We want to teach teachers how to present the data in parent meetings, to graph growth or show what they need in order to be able to grow.* (CO-2_5-16-13, p. 5)

Carlos, the technology support specialist, had two main ideas for enhancing the DDDM process. He wanted to find a better way to track individual students over time and find a way to streamline the data management process by shifting away from the use of paper. When discussing his desire to follow students longitudinally, he stated, "What I do wish is that we were able to follow those students… and to actually see if they got something out of it" (CO-3_5-16-13, p. 18). In regards to streamlining the data management process, he stated:

> *There's a lot of stuff that we could do, I mean just to make it a little bit easier and save paper. Just putting stuff on the websites where they can enter it there and we'll already have it. I mean it just goes more technology-wise.* (CO-3_5-16-13, p. 22)

High School

At the high school level, both teachers said that they wanted improved systems for reporting student data over time (HS-1_4-16-13, p. 21; HS-2_4-18-13- A-B, p. 9). In reference to the FitnessGram software, Angela stated:

> *So if we started it in the beginning of the school year, instead of me having to go in and redoing it again, I wish it had a side-by-side, every time we did it, it had their first time, their second time, their third time; and it kind of did like a progression. And on the print-out I wish the progression would show for that and then break it down.* (HS-2_5-2-13, p. 1)

Similarly, in describing the pedometer data, Valerie stated, "Well I think they [students] were motivated with especially the steps and this is why I say, I gotta do something

where they can see it because they were motivated" (HS-1_4-16-13, p. 21). Valerie went on to say she considered posting previous pedometer scores on the wall of the gymnasium, but was concerned about privacy issues (HS-1_5-2-13- A-B, p. 11). Plus, she said she would prefer to have a visual way of presenting the GPRA data rather than just having numbers (HS-1_5-2-13- A-B, p. 11).

One particularly interesting idea related to data reporting was shared by Angela. She said that she wanted a reporting feature that not only included previous scores, but extended scores to predict where students may be in the future if they continued along a similar trajectory. She described it like this:

> *And you know what would be great, if you could do like a progression, like "According to your information now as a 16-year-old, if you continue to do the same ten years down the road this is what you're going to look like." That would be cool and I think that would really, because I know that would open my eyes: "Whoa, if I continue to do the same thing and do like a ten-year down the road, you know, this is what you'd look like," I think that'd really open their eyes.* (HS-2_5-2-13, p. 7).

Middle School

Similar to the teachers at the high school level, Monica at Rowling Middle School described her desire to have a system for reporting previous scores back to students. From the description in the interview, it sounded like Monica wanted to use the data to help students set a target for the last round of testing. She said:

> *In fact, what I was going to do before the last one is put out all four [previous scores] and kind of counsel them along before we do it, to let them see this was the first one, second one, third one, fourth one. Here we are to the fifth one, "what do you want to do?" This is your weight from the beginning of the school year; this is where it's gone. "What do you want this last one to look like?"* (MS-3_4-17-13- A-B, p. 8)

Other suggestions for the enhancement of the DDDM process at the middle school level included: a) only collecting data on athletes instead of all students in physical education (MS-1_4-18-13, p. 6), b) better training students on proper pedometer use (MS-2_4-17-13, p. 15), and c) reducing the number of data collection periods from five to three (MS-3_4-30-13, p. 9). In regards to the latter, Monica stated:

> *I don't think we need to collect as much data. I think we could cut it in half to still say that I'm doing my job, beginning, middle and end or a beginning and end rather than one, two, three, four, five…* (MS-3_4-30-13, p. 9)

Elementary School

At the elementary school level, two main ideas for the enhancement of the DDDM process were identified. They included smaller class sizes and more assistance with data collection and management. As described in the previous section, large class sizes were identified as the primary barrier to effective data-use at the elementary school level. When asked about how a reduction in class sizes would impact her instruction, Christy summed it up best. She stated:

> *It would change everything. I could see more one-to-one, individualized information. You know, I could see how you could really implement a lot of activities that really are more meaningful for the kids – more instruction, more problem solving, more higher order stuff rather than just movement.* (ES-1_4-18-13, p. 7)

Elementary teachers also spoke about how they could benefit from outside assistance with data collection and input. In regards to collecting FitnessGram data on large numbers of students, Jennifer stated, "We need more help – that's the problem, we don't have enough help" (ES-2_5-7-13, p. 7). Similarly, Christy shared her desire to have

assistance with the data input process. She stated, “I think that would be great [having someone else input the FitnessGram scores]. That is more valuable than me inputting the scores—because I’ve already seen them here and I know who the students are that need help.” (ES-1_4-18-13, p. 7)

Summary of DDDM Enhancement

A number of ideas for the enhancement of the DDDM process within the context of physical education were presented by the coordinators and teachers. Few of them overlapped between educational levels. The only two ideas that did overlap were suggestions to reduce the number of data collection periods associated with the GPRA data and to develop better systems for reporting student data over time. The idea for fewer data collection periods was shared by one district coordinator and one middle school teacher. The suggestion was to reduce the number of data collection periods from five per year to three or four. The ideas for improved reporting systems were shared by two high school teachers and one middle school teacher. Suggestions included having reports with all previous scores listed on them and presenting data in a visual manner.

Other ideas for the enhancement of the DDDM process in physical education included: a) collecting and analyzing MVPA data at the district level, b) collecting a larger variety of student outcome data, c) training teachers how to analyze and present data, d) tracking students longitudinally, e) streamlining the data management process, f) only collecting data on athletes, g) training students on proper pedometer use, h)

providing greater assistance with data collection and management, and j) reducing class sizes at the elementary school level.

THE PERCEIVED VALUE OF DATA

Although not included in the original set of case study questions, one important topic emerged from the evidence at all four educational levels, and therefore warrants attention. The topic revolved around the perceived value of data. It was revealed first at the school district level through conversations with coordinators and was then filtered down to each educational level through one specific question asked to teachers during interviews: "Do you feel you need to systematically collect data to know that you are doing your job?" This section presents evidence on the topic gathered from each educational level.

School District

In discussing the value of the data that were being collected in physical education through the PEP grant and through FitnessGram, Victor, the lead coordinator, clearly stated his belief that the data were directly connected to funding decisions. He said, "… the data will dictate funding. The data will show the need for HopSports at the middle school, Adventure to Fitness in the elementary school, purchasing of additional laptops and technology." (CO-1_5-16-13, p. 17) He went on to say that even if the district did not have the PEP grant, he would continue to collect the GPRA data because it served as a needs assessment for future grants (CO-1_5-16-13, p. 5). In addition, Victor explained the value of the FitnessGram data in soliciting support from parents. He said that when

parents see the FitnessGram reports, they are first "alarmed" to see the low levels of fitness in their children. After that, they seem to be more willing to contribute to groups like the School Health Advisory Council (CO-1_5-16-13, p. 17).

Carlos described the value of data in terms of garnering greater status for physical education teachers in schools. He described it like this:

> *It's credibility, but I mean also sometimes I feel that – and maybe it's a bias because I am a PE teacher – but those PE teachers get overlooked as being teachers – they don't have that respect. But now that you can see exactly everything that they have to do, everything that they do plus more, cause I mean they spend that extra time coaching as well – they should get the respect that they deserve.* (CO-3_5-16-13, p. 21)

Carlos went on to discuss the importance of data in proving the value of physical education to key stakeholders. He stated:

> *And then also it's just something we can show proof to whomever – to whether it's the principal, to whether it's the parent, to a teacher, to anybody in the community – that this is what we're doing with our children; this is what they're learning and this is how they're going to better themselves – mind, body and spirit.* (CO-3_5-16-13, p. 19)

Carlos also alluded to the value of data in documenting student improvement and contributing to accountability. He stated:

> *And now we have data. Now we have something showing more improvement other than just grades, other than just saying, "Hey, we're only grading them by dressing out." We have the heart rate monitors which can measure how hard they are working. If they're in that healthy zone, for how long are they in that healthy zone. Checking the MVPA – we're supposed to be in the MVPA for half the class – 50%. We have the equipment to measure that. And then we can take that even if TEA comes and asks, "Are your teachers doing what they're supposed to?" "Here you go. Yes they are."* (CO-3_5-16-13, p. 21)

High School

Although both high school teachers acknowledged some advantages to collecting GPRA data, they contended it was not necessary to systematically collect data in order to know that they were doing their jobs. Instead, both teachers believed that they knew they were doing their jobs simply by observing the students. For example, Valerie stated:

> *That's why I tell you I'm an old-school teacher. I do it because we have to do it. But I don't think I would do it… I know I wouldn't do it if we didn't have to do it... I know what I need to do, but I can tell just by looking at kids, you know the way they started with me to the middle to the end and to know*. (HS-1_5-2-13- A-B, p. 8; HS-1_4-16-13, p. 19)

Valerie further elaborated on this contention with the following statement:

> *And I hate to… I don't want to have a bad attitude because I think it's really awesome, the things that they've given us to work with, but I feel like I can see the kids. I can tell on my own and they can tell that they're really getting the 45 minutes that we're in here, exercise like they're supposed to.* (HS-1_4-16-13, p. 5)

In agreement, Angela stated, *"*No [I don't need to systematically collect data to know I'm doing my job]. I mean… I know I'm keeping them active" (HS-2_5-2-13, p. 10).

Middle School

Like the teachers at the high school level, two of the three middle school teachers stated that they did not need to systematically collect data to know that they were doing their jobs (MS-1_5-6-13, p. 9; MS-3_4-30-13, p. 9). Shawna suggested that she was able to observe student changes over time without collecting data. She said:

> *I observe these kids and I can see the growth, you know, just the visual – not with numerical data. I can see just visually, you know. Like my sixth graders, I just talked about that the other day with one of the teachers. I said "You know these kids have really grown." Some have grown out, some have grown up, but that's to be expected with kids this age.* (MS-1_5-6-13, p. 11)

Monica shared her belief that the data collections were taking away too much time from her teaching. She said:

> *I want it to be something that's done in addition to what I do as a teacher, but I have found that it is more getting in the middle of what I do as a teacher and backing off of some things that I would like to do – some more skill-oriented games or stuff. And just it takes my time away from that.* (MS-3_4-30-13, p. 7)

When asked about the need to systematically collect data in order to know she was doing her job, Jessica shared a slightly different view than the other two teachers. Although she acknowledged that the GPRA data collection had not changed the way she taught (MS-2_4-17-13, p. 12), she did share her belief that the data were important and useful. She said that the data allowed students to see if they had grown or lost weight, and that was something that she felt students were interested in (MS-2_5-6-13, p. 8).

Elementary School

When asked whether or not they needed to systematically collect data to know they were doing their jobs, all three elementary teachers replied "no" (ES-1_4-30-13- A-B, p. 10; ES-2_5-7-13, p. 8; ES-3_5-7-13, p. 12). Christy shared her belief that if she got students' heart rates up during class, it would translate into improved fitness (ES-1_4-30-13- A-B). The other two teachers described how they felt that student fitness was out of their control. For example, Jennifer stated, "We teach them health, teach them how to eat

well, why it's important to exercise, but it's out of our control. There's nothing we can do about that." (ES-2_5-7-13, p. 8) Likewise, Margaret stated, "You can hope and pray, you know, and I can do the best I can here, but you know, I really don't know what they do once they get out of here" (ES-3_5-7-13, p. 12).

Summary of the Perceived Value of Data

District coordinators shared a strong belief in the value of data. They described it as contributing to greater funding, better buy-in from parents, and elevated credibility for the field of physical education. In contrast, seven out of the eight teachers interviewed said that they did not feel the need to systematically collect data to know they were doing their jobs. Many of the teachers described getting all the necessary information they needed from simply observing students. In addition, one middle school teacher suggested that the GPRA data collections were taking away time from instruction and two elementary school teachers shared their belief that student fitness outcomes were simply out of their control.

SUMMARY OF FINDINGS

According to the evidence, the most common types of data collected in the district were related to physical activity and fitness outcomes. These data sources were determined by a statewide fitness assessment mandate and evaluation requirements associated with the PEP grant. According to teachers, the data collection process was time consuming, but got easier with experience. Once data were collected, evidence indicated that teachers rarely engaged in formal data analyses, but were occasionally able

to notice trends and patterns in the data while transferring it from paper to electronic form. In regards to data-use, body mass index (BMI) data helped prioritize students for a specialized course at the high school level designed to promote healthy weight maintenance. There were also examples of teachers using data to guide instructional decisions, but half of the teachers in the study indicated that data had no impact on their instruction. Teachers were held accountable for collecting and submitting data to the district in a timely manner, but were not held responsible for student outcomes. Interestingly, an enhanced sense of accountability emerged that appeared to be based upon intrinsic factors such as competitiveness and a desire to achieve one's personal best. Findings indicated that there were substantial barriers to the DDDM process, many of which revolved around the use of technology. Other barriers included a lack of professional development time, concerns over data quality, and large class sizes at the elementary school level. On the optimistic side, participants had a number of ideas for the enhancement of the DDDM process, many of which were reasonable and feasible. One finding that emerged beyond the scope of the research questions was that district coordinators valued data, but teachers generally did not. Teachers felt that their own observations were sufficient indicators of teaching effectiveness and student growth.

Chapter 5: Discussion and Implications

This study represents one of the first systematic attempts at understanding how the DDDM process unfolds within the contexts of K-12 physical education. Up until this point, the field of physical education has had access to recommendations for best practice that align with the fundamentals of effective data-use, but few recommendations have been grounded in empirical evidence. One of the strengths of this study is its reliance on multiple sources of evidence to gain insight into each step of the DDDM process as it unfolded in practice.

In the previous chapter, evidence from interviews, observations, documents, archival records, and artifacts were presented to answer each of the four research questions and 15 case study questions that guided the study. The purpose of this chapter is to interpret and synthesize the key findings that emerged within and across research questions and to pinpoint critical junctions where the process flourished and/or floundered. Ideas for the enhancement of the process, drawn from both the existing knowledge base and suggestions from participants, are interspersed within the synthesis of findings. The chapter concludes with a list of recommendations to guide future practice and a brief discussion of the implications of the study in relation to future research.

TYPES OF DATA WERE DETERMINED BY POLICY

Results from the case study suggested that the types of data collected in the district were determined primarily by policy at the federal and state level. As an example,

a statewide fitness assessment initiative required that FitnessGram data be collected from students enrolled in physical education courses in grades 3-12 on an annual basis. Likewise, the terms of the PEP grant required that GPRA data be collected from students at least four times per year (U.S. Department of Education, 2012). Other sources of data, including class rosters, the School Health Index, and the PECAT/HECAT, also appeared to be collected in response to external policy requirements. Class rosters were associated with a statewide policy limiting class sizes in physical education to a 45:1 student-to-teacher ratio and the School Health Index and PECAT/HECAT were required evaluation data for the PEP grant (U.S. Department of Education, 2012).

Two main questions emerged as a result of these findings: a) what types of data *should* be collected in physical education, and b) who decides which types of data should receive the greatest attention? In this section, it is argued that the types of data collected in physical education should be related to a broad variety of best practice indicators, including standards and guidance documents, and that the opinions of a variety of stakeholders should be considered in determining which types of data receive the greatest attention in a school district.

According to national standards for physical education, a physically literate individual:

a) *Demonstrates competency in a variety of motor skills and movement patterns;*
b) *Applies knowledge of concepts, principles, strategies and tactics related to movement performance;*
c) *Demonstrates the knowledge and skills to achieve and maintain a health-enhancing level of physical activity and fitness;*

d) *Exhibits responsible personal and social behavior that respects self and others;*
e) *Recognizes the value of physical activity for health, enjoyment, challenge, self-expression and/or social interaction.*

(AAHPERD, 2013, p. 1)

The five national standards go beyond a narrow definition of a physically educated individual as someone who is simply active and fit. They encompass learning goals that lie in the psychomotor, cognitive, and affective domains and infer a curriculum that includes knowledge, skills and dispositions needed to achieve and maintain a healthy and active lifestyle (NASPE, 2004). Likewise, at the state level standards suggest outcomes for physical education that include movement competence, knowledge, healthy behaviors, and social skills.

In STISD, the types of student outcome data that were collected (e.g., FitnessGram and GPRA data) aligned more closely with a narrow definition of physical education focused primarily on physical activity and fitness. Teachers described previously collecting data related to motor skills and student knowledge, but it appeared that these data had been replaced by data associated with FitnessGram and PEP grant requirements. Although there was some alignment between these data and subject-area standards, the types of outcome data certainly fell short of encompassing all of the indicators of a physically educated individual. In order to achieve a standards-based physical education program, objectives, learning experiences and assessments must all be aligned to standards (NASPE, 2004). Therefore, if the district physical education program

is to be considered standards-based, other sources of student outcome data need to be considered beyond what was required solely by current state and federal policies.

On this topic, it is important to note that there is considerable debate in the field as to whether physical education is stretching itself too thin by trying to address a multitude of outcomes. Scholars, emerging both from the fields of physical education and public health have argued that physical activity *should* be the primary focus of physical education and other outcomes should be secondary (Reed et al., 2007; Sallis & McKenzie, 1991; Sallis et al., 2012; Trost, 2004, 2006; Wechsler, McKeena, Lee, & Dietz, 2004). As McKenzie summarized in the *Twenty Sixth Dudley Allen Sargent Commemorative Lecture*, "Reorienting traditional programs toward health-related physical education does not mean that all standard objectives of physical education need to be abandoned, but it does call for them to be reprioritized (McKenzie, 2007, p. 349). In line with this sentiment, it could be argued that STISD was subscribing more closely to a health-related physical education model, placing physical activity and health behavior data above all other potential sources of outcome data. This may indeed be the direction that physical education as a whole is moving; however, at this point in time, collecting data solely on health-related outcomes is not in alignment with the conception of standards-based physical education.

In addition to student outcome data, experts in the field of physical education have argued that other types of data should be considered to determine the overall quality of a physical education program (Lund & Tannehill, 2005). In this regard, national

guidance documents define quality physical education and can serve as a guide in determining what types of data to collect that go beyond student outcome data. For example, the *Opportunity to Learn Guidelines* include recommendations for best practice on topics related to curriculum, class size, and facilities (NASPE, 2010b). Likewise, the *Appropriate Instructional Practice Guidelines* include recommendations for best practice in areas such as creating a positive learning environment, instructional strategies, and professionalism (NASPE, 2009). These documents can be useful in helping to identify important sources of input and process data. In addition, scholars have long argued for the collection of satisfaction data related to the opinions of students, teachers, and parents (Conkle, 1997; Cox & Williams, 2008; Lund & Tannehill, 2005; McKenna & Millen, 2013). These data are considered the key to knowing whether or not physical education programs are meeting the needs of their constituents.

In this study, minimal amounts of input, process, and satisfaction data were collected. As stated previously, the main sources of input data were the needs-assessment required for the PEP grant application and class rosters used to document compliance with the statewide mandate on class sizes. Process data were rarely collected, but the plan according to the lead district coordinator was to begin collecting physical activity time data to monitor a new state law requiring 50% MVPA time during physical education lessons. Lastly, minimal amounts of satisfaction data were collected. The only systematic form of satisfaction data came from teacher surveys following professional development workshops used to document compliance with one of the PEP grant objectives. Each of

these sources of data appeared to be a direct response to policy requirements associated with either state law or the federal grant, as opposed to a conscious decision among educators to gather meaningful information about the quality of the physical education program.

In presenting this finding, the intention is not to diminish the value of the data that were collected, rather to expose the apparent impetus for its collection. If one were to consider the most ideal way of determining the types of data to be collected in a school district, a balance between external requirements and the interests of local stakeholders would likely be desired. The *CDC's Framework for Program Evaluation* and the *Joint Committee on Standards for Educational Evaluation [JCSEE]* support this contention, placing stakeholder input as one of the key steps in the program evaluation process (CDC, 1999; Yarbrough, Shulha, Hopson, & Caruthers, 2011). A broad understanding of what students, teachers, and parents truly want out of a physical education program would likely lead to the collection of more meaningful data. Likewise, as with the selection of outcome data, available standards and guidelines for best practice within the field should be consulted in determining the types of data to be collected.

DATA COLLECTION AND ORGANIZATION TOOK AN ABUNDANCE OF TIME

One of the reasons that teachers in the district may not have been collecting data beyond what was required by federal and state polices was because existing data collection requirements were particularly time-consuming. At the high school and middle school levels, the GPRA data collections by themselves were estimated to account for

14% of physical education class time (five data collection periods per year at five days a piece and 177 days of physical education class time available). At the elementary school level, FitnessGram testing was estimated to account for 12-16% of physical education class time (two collection periods per year at two-to-three weeks per collection and 142 days of physical education class time available). Data collection was so time consuming that one teacher at the middle school level complained it was taking away valuable time from instruction.

In addition to the time commitment associated with data collection, teachers were encouraged to transfer data from paper to electronic form either by inputting it into an Excel spreadsheet or transferring it into the FitnessGram software. Elementary school teachers estimated that the data input process took three-to-eight hours per data collection, resulting in up to 16 hours of data input time per year. At the middle school level, one teacher estimated data input time at three-to-four hours *per class*, resulting in an astonishing 120 hours of data input over the school year. While this second estimate was likely an exaggeration, the fact that the other two teachers at the middle school level chose not to input the data at all could speak to the time-consuming nature of the data input process. Reinforcing this point, Kelly and Melograno (2004) have suggested that the data recording process could be one of the biggest aversions that teachers have to the assessment process in general (p. 170).

Considering these findings, three possible strategies could be pursued to alleviate some of the time concerns with data collection and organization, without losing access to

sufficient data. First, the district could consider fewer data collection periods. This would reduce the time demands on teachers in terms of data collection/organization and free up additional instructional time within the physical education curriculum. Two participants made this very recommendation, suggesting that GPRA data be collected three-to-four times per year instead of five. Models for benchmark testing in other subject areas use a beginning (BOY), middle (MOY) and end of the year (EOY) approach. For example, in reading and literacy, the benchmarks for the *Dynamic Indicators of Basic Early Literacy Skills (DIBELS)* are collected on this three-times-per-year schedule (Good, Gruba, & Kaminshi, 2001). This same model could serve useful in physical education, as it would provide teachers with a baseline, midpoint, and summative indication of student progress throughout the school year on the main indicators of student achievement, without placing an excessive time burden on teachers and students.

A second strategy could be to help teachers implement more efficient data collection protocols through professional development. Many recommendations exist in the literature for how to make the assessment process less time-consuming (Gallo, Sheehy, Patton, & Griffin, 2006; Hopple, 2005; Mosier, 2012; Petray, 1989; Schiemer, 1997). Furthermore, research has shown that professional development can lead to substantial improvements in teacher practice in relation to assessment protocols (Patton & Griffin, 2008). In this study, both teachers at the high school level claimed that the data collection process was easy and observations at these schools indicated that effective protocols for collecting GPRA data were in place. Although effective protocols are likely

to vary by educational level due to the maturity of students, these high school teachers could potentially be used as resources during professional development workshops to help other teachers in the district work through logistical issues related to data collection and thus make the process more efficient.

Lastly, to address the time consuming nature of the data recording and transfer process, the district could consider investing in technology capable of assisting in data management. Pocket personal computers (PCs), personal digital assistants (PDAs), laptops, tablets, and even smart phones could be used to directly record data into an electronic format, thus removing the data transfer step from the collection and organization process. The benefits of using these devices in physical education have been discussed extensively in the literature (DerVanik, 2005; Gubacs-Collins & Juniu, 2009; Hopple, 2005; Mohnsen & Mauch, 1998; Nye, 2010; Rittner-Heir, 1999; Wegis & van der Mars, 2006). Other devices, such as fully uploadable pedometers (e.g., FitStepPro, Gopher Sport), could also be used to alleviate the need for the recording and transferring of data. It is important to note that the district had access to a number of useful tools capable of assisting in the collection and management of physical education-related data, but evidence indicated that the tools were under-utilized. This topic is discussed in greater detail in subsequent sections. By reducing the number of data collection periods, training teachers to become more efficient data collectors, and investing in tools capable of assisting in the data management process, the overall burden associated with data

collection could be reduced and still result in the collection of ample physical education data for decision making purposes.

STAKEHOLDERS NEEDED ACCESS TO ACTIONABLE KNOWLEDGE TO MAKE DECISIONS

The conceptual framework for DDDM put forth by Mandinach and colleagues (2008) suggests that data must be transformed along a data-to-knowledge continuum in order to become actionable. According to the framework, raw data must be analyzed and summarized to become information, then synthesized and prioritized to become actionable knowledge. The resulting knowledge can then be used by educational stakeholders to make decisions related to instruction and program improvement. One of the goals of this study was to investigate how the DDDM process unfolded in relation to this framework within the contexts of physical education.

Results from the study indicated that at the district level, various types of data were transformed through the full DDDM process and were subsequently used for decision-making purposes, in alignment with the conceptual framework. For example, input data for the needs assessment were collected, analyzed, and synthesized to identify targeted areas for improvement. Based upon the findings of the needs assessment, high school physical education and obesity prevention were given top priority in the district. An action plan was developed within the PEP grant application and adjustments were made to the physical education curriculum. One of the most noticeable changes in programming came in the form of a new course designed specifically for overweight and obese students. Throughout the PEP grant process, GPRA data were continuously

collected, analyzed, and summarized for annual reports submitted to the Department of Education. These data were also used to monitor the impact of the program in relation to established targets.

At the school level, the DDDM process rarely unfolded in the same manner. Instead, it appeared that a majority of teachers simply collected the data they were required to collect and submitted it to the district without further analysis. As a result, there were few examples of data driving decision making at this level. Some data, however, like the FitnessGram data, were analyzed at the district level and then reported back to teachers, administrators, and school counselors, thus resulting in the presence of actionable knowledge. Consequently, there were examples of these kinds of data being used for educational decisions. The best example was of teachers and counselors using BMI reports to enroll students in the specialized course for overweight and obese students at the high school level. These findings, in conjunction with the findings at the district level, support the structure of the conceptual framework and suggest that data do in fact need to be transformed into actionable knowledge in order to be used for decision-making purposes.

It is important to note, however, that data collection and organization, even in the absence of formal analysis, seemed to have a positive impact on teacher practice. For example, some teachers spoke about critical conversations that were stimulated by the data collection process. Other teachers described noticing trends and patterns in the data as they organized it that led them to consider adjustments in lesson content. These

findings suggest that certain aspects of teacher practice can be positively influenced by engaging in the data collection and organization process alone, without proceeding to higher levels of analysis and synthesis. However, these informal methods of data transformation may limit the types of questions that can be asked of the data and the types of conclusions that can be drawn. Furthermore, as stated in the previous section, using the data transfer and input process as the primary opportunity for data analysis may be an inefficient use of teachers' time. To better understand the opportunities that exist for meaningful data transformation and data-use, one can turn to the literature in physical education and general education.

In the book, *Developing the Physical Education Curriculum: An Achievement Based Approach*, Kelly and Melegrano (2004) offer a number of insights into how the DDDM process *could* unfold in physical education. As described in the first section of this chapter, the authors suggest that teachers collect a broad variety of student achievement data aligned with subject-area standards. Next, it is suggested that teachers engage with the data they collect after it is collected. For example, data-engagement could include statistical analyses such as the calculation of a class mean gain (CMG) or a class average percentage of mastery (CAM; p. 263). Analyses like these would allow teachers to evaluate student learning over a given unit of time and determine if students have achieved specific learning outcomes. Taken to the next level, this information could then be used to systematically determine potential modifications in content, the appropriateness of instructional approaches, and the overall effectiveness of the physical

education program. One of the key points that the authors make is that this process is one that could be undertaken both at the district *and* teacher level (p. 277).

Lund and Tannehill (2005), the authors of *Standards-Based Physical Education Curriculum Development*, advocate a similar approach to data-use for program evaluation purposes. They frame the conversation within the context of the question: "Are you doing what you intend to do, and how well are you doing this?" (p. 285). Again, the authors suggest that sources of data be aligned directly to standards and once collected, are engaged for practical purposes. Specifically, the authors describe collecting and analyzing a variety of data sources and using the data to compare outcomes with programmatic objectives. This information can then be used to develop an action plan based upon identified strengths and weaknesses in the program. Similar to Kelly and Melograno, Lund and Tannehill suggest that the process can unfold on a small scale at the teacher level or on a larger scale at the district level (p. 303). In the present study, it appeared that a program evaluation process similar to the one described by Lund and Tannehill occurred at the district level, but did not take place at the teacher level.

Looking beyond the context of physical education, one can also draw conclusions about how the DDDM process *could* unfold in physical education from models in other areas of education. For example, the response to intervention (RtI) model has gained recent attention as an example of effective data-use in education (Hughes & Dexter, 2011). This model is designed to help remediate student learning and address individual needs with tailored service (Jacobs et al., 2009). The Institute of Educational Sciences has

published two practice guides on the use of the model in both reading and math (Gersten et al., 2008, 2009). In essence, the model suggests that student outcome data be used to identify students falling below grade level expectations in a particular subject area. Based upon the information gathered, tiered interventions are developed to address the particular learning needs of students and frequent progress monitoring data are used to determine if interventions are resulting in desired outcomes. If they are not, alternative and more intensive interventions are considered. This model is an example of how data can be systematically used for instructional purposes at the school/teacher level. So far, it has received minimal attention in physical education (Dauenhauer, 2012; Stephens, Silliman-French, Kinnison, & French, 2010), but could potentially provide a useful framework for putting DDDM into action in physical education. The fact that STISD was already using BMI data to place students in a specialized course for overweight and obese students likely places them one step ahead in relation to RtI implementation.

Overall, the findings presented in this section suggest that the DDDM process materialized in physical education in close alignment with the conceptual framework presented by Mandinach and colleagues (2008). When data were transformed into actionable knowledge at the district level, they were used for educational decisions. However, data were rarely transformed into actionable knowledge at the school/teacher level. As a result, educational stakeholders likely missed out on a number of opportunities to put the data they collected to good use. Descriptions of how the DDDM process *could* unfold in physical education from experts in the field support the

contention that the data transformation process and decision making process could be enhanced. Likewise, models of effective data-use from other areas of education suggest that physical education has numerous opportunities to grow. Therefore, it is important to consider what could potentially be holding physical educators back from achieving effective data-use practices.

CHALLENGES WITH PEDOMETERS AND INFORMATION MANAGEMENT SYSTEMS RESULTED IN LIMITED UTILITY OF THIS TECHNOLOGY

The use of technology has been identified as a crucial factor within the DDDM process. The conceptual framework of Mandinach and colleagues (2008) suggests that technology can influence the process at multiple points along the data-to-knowledge continuum. Likewise, a number of authors have discussed ways in which technology can serve to enhance or inhibit data-use in general educational settings (Bernhardt, 2005; Wayman, 2005b; Wayman & Stringfield, 2006). Findings in this study suggest that technology did indeed play an important role within the DDDM process in physical education. Unfortunately, that role did not appear to be a positive one. Instead of facilitating the use of data, challenges associated with pedometer-use and information management systems appeared to be holding stakeholders back from using data to its fullest potential.

In regard to pedometer use, two particular challenges arose. First, when students took pedometers home with them to collect physical activity data, the devices rarely made their way back to school. As a result, teachers did not have access to enough

devices to collect data on full classes. In connection, teachers frequently reported that the batteries in the pedometers died and were difficult to replace. This also contributed to a lack of working devices for data collection. This may seem like a minor problem, but when considering the scale at which the devices were being used in the district and the complexity of schedules where teachers teach class after class with little down time, it became a substantial logistical challenge for teachers and coordinators. The accessibility of working pedometers became such an issue that one middle school teacher stopped allowing her students to take the devices home and instead began collecting physical activity data only during physical education classes. Likewise, a number of elementary school teachers simply didn't use pedometers anymore because there weren't enough working devices for full classes. These findings echo the findings of McCaughtry and colleagues (2008) who reported substantial logistical challenges associated with pedometer-use among elementary school physical education teachers. If pedometers are to become a useful tool for the collection of daily physical activity data, some of these logistical challenges need to be overcome.

The second technological challenge was related to the use of information management systems. The district had access to two systems, the Virtual PE Administrator and the IHT Spirit System. These systems had the capacity to house physical education-related data on student heart rates, lesson content, and a variety of other assessments. The systems also had the capacity to share and report data to key educational stakeholders including students, administrators, and parents. The problem

was that the information management systems were web-based and the lead district coordinator was concerned over the privacy and security of student data. Specifically, he stated that the publishers of the software could potentially have access to student names and identification numbers through the systems and that this would not be in compliance with district policies. The concerns of the district coordinator are shared by many other educational leaders around the country who are scrambling to determine appropriate policies for the protection of student data. On this topic, the Data Quality Campaign (DQC) has put forth the following recommendation:

> *Education stakeholders at every level have the responsibility to safeguard student data. Policymakers and district and school leaders should create and implement policies to minimize risk and protect privacy, security, and confidentiality while maximizing effective data use to improve student achievement.* (DQC, 2014)

The consequences of coordinator concerns surrounding data security and student privacy were that the information management systems in STISD were not being utilized to their full capacity. Overall, it is encouraging that the school district embarked on the use of technology in physical education, but more work is needed to overcome the challenges identified in this section.

LIMITED PROFESSIONAL DEVELOPMENT OPPORTUNITIES CONTRIBUTED TO A LACK OF EFFECTIVE DATA-USE

Logistical challenges with pedometers and concerns over data security/privacy were not the only reasons technology was underutilized in STISD. Teachers and coordinators also pointed to a lack of professional development time as a major barrier to

effective technology-use, and hence, effective data-use. It was apparent that the district had access to a wide array of technological tools capable of assisting with the collection, management, analysis, and reporting of data. However, due to limited training, teachers were not prepared to use the tools to their fullest potential. As a result, data rarely made their way into a usable form. Furthermore, professional development was not targeted at effective data-use strategies per se. If educators are going to be expected to engage with data in a meaningful way, they must be provided with the knowledge, skills, and support to do so.

The important connection between professional development and effective data-use is one that has been addressed frequently in the literature. Wayman (2005b) highlighted the necessity of ongoing support for teachers in effective data-use practices and specifically recommended an approach to professional development that relies on "in-house experts" to assist teachers with data transformation and data-use (p. 302). The approach entails having coaches or mentors sit down with teachers to help in the processing and interpretation of data. In agreement, both the Institute of Education Sciences report and the RAND research report on DDDM clearly point to teacher training and support as keys to building a successful culture of data-use in schools (Hamilton et al., 2009; Marsh et al., 2006). The reports specifically reinforce the use of data coaches and also suggest a collaborative teacher approach to professional development focused on improving data-use practices.

Recently, attention has been focused more closely on the notion of using professional development to enhance "data literacy" skills among teachers (Jacobs et al., 2009; Love, Stiles, Mundry, & DiRanna, 2008). Mandinach and Gummer (2013) define data literacy as "the ability to understand and use data effectively to inform decisions" (p. 30). The authors describe data literacy as "knowing how to identify, collect, organize, analyze, summarize, and prioritize data" (p. 30). They go on to say that the skills involved in effective data-use include "how to develop hypotheses, identify problems, interpret the data, and determine, plan, implement, and monitor courses of action" (p. 30)

In STISD, professional development was so limited that only a handful of teachers even felt confident enough to use available technology to assist with data collection, much less transform the data and use it for decision-making purposes. This finding exposes a lack of data literacy skills among teachers and suggests the need for additional professional development. Revisiting the recommendations of Wayman (2005b), in-house experts could potentially be used in physical education to assist teachers not only in the collection of data, but in the analysis, synthesis, and prioritization of data for decision making purposes. On this topic, a 2010 study by Marsh, McCombs, and Martorell described how a process of instructional coaching unfolded in 113 Florida middle schools focused on improving reading achievement. In the study, teachers were provided with instructional coaches that helped analyze student reading scores and identify strategies for using data to improve instruction. Results indicated that the more frequently teachers received support from instructional coaches, the more effective they

perceived their teaching to be. Moreover, there was a significant positive association between instructional coach support and student achievement scores, thus suggesting a trickle-down effect from teacher practice to student learning (Marsh et al., 2010). Although this approach toward professional development has not been tested in physical education settings, it could hold promise as an effective system for enhancing data literacy among physical educators.

Another approach to professional development that could result in enhanced data literacy skills among physical educators is a collaborative approach among teachers. Moody and Dede (2008) describe it as DDDM for reflective practice. The approach entails setting aside time for teachers to engage with data as reflective practitioners and come to a shared understanding of both problems and potential solutions. One of the benefits of this approach is that it places equal value on "hard" data such as student outcome scores and "soft" data such as teacher observations (Moody & Dede, 2008, p. 240). In a 2009 article in *Educational Leadership*, Steele and Boudett introduced one collaborative approach to professional development called "Data Wise" (p. 54). In the article, the authors described how teachers in one elementary school used the Data Wise process to collaboratively analyze state assessment data on literacy skills, identify areas in need of improvement, and develop collective solutions. Examples like these could help guide professional development efforts in physical education.

Findings from the study indicated that a dearth of professional development opportunities likely contributed to low data literacy skills among teachers in STISD. Not

only did teachers have difficulty collecting data using available technology, but once collected, teachers did not possess the skills or opportunity to transform that data into actionable knowledge. Recommendations from experts in education suggest two approaches toward professional development that may be useful to consider in physical education. One approach involves the use of data coaches to guide teachers through the various steps of the DDDM process. The other approach involves bringing teachers together in a collaborative environment to review available data and develop collective solutions to problems. Both approaches hold promise in physical education, but will require further research to determine their effectiveness.

Large Class Sizes Made Effective Data-Use Impractical at the Elementary School Level

Beyond a lack of professional development opportunities for teachers, other factors had a negative impact on teachers' abilities to use data effectively in physical education. One of those factors was large class sizes at the elementary school level. Evidence suggested that typical class sizes ranged from 45 to 90 students and that most of the time, classes met in one location (e.g., the gymnasium). With large class sizes, teachers shared concerns over student safety, logistical challenges with data collection, and an overall sense that individualized instruction was not feasible. Negative consequences such as these have been documented in the literature for many years (Barroso et al., 2005; Gallo et al., 2006; Hastie & Saunders, 1991; Skala et al., 2012), yet few changes have resulted from this knowledge (Keating et al., 2010).

National guidance documents recommend that class sizes at the elementary school level should not exceed a 25:1 student to teacher ratio (NASPE, 2006b). Unfortunately, state law is not in alignment with this recommendation. Rather, the law requires that if a physical education class has greater than a 45:1 student-to-teacher ratio, the district must have on file a safety plan indicating what will be done to keep students safe in the oversized class. Evidence from teachers clearly indicated that even in compliance with this state level policy, a large student-to-teacher ratio created a teaching situation where data-use was simply impractical. If teachers are going to be expected to engage in the full DDDM process, they must be provided with the conditions under which the process can be undertaken successfully. Reducing class sizes to match other academic content areas is a first logical step.

CONCERNS RELATED TO DATA QUALITY MINIMIZED ITS PERCEIVED VALUE AMONG EDUCATORS

In addition to the challenges associated with technology, professional development, and large class sizes, one remaining barrier to the DDDM process exists. Findings in this study indicated that teachers and some district level coordinators had serious concerns over the quality of the data that were collected. The concerns included both the GPRA data and the FitnessGram data. For example, at the secondary level, students frequently misused pedometers and teachers expressed concerns over low-motivation among students to complete the PACER test. Likewise, teachers had questions regarding the validity and reliability of self-report measures such as the 3DPAR

and fruit and vegetable questionnaire. At the elementary school level, the concerns were related to items on the FitnessGram test such as the pushup and curl-up test. Evidence from the DDDM literature suggests that when educators have concerns over the quality of data that are collected, they are less likely to turn to that data for decision-making purposes (Marsh et al., 2006). As such, it is essential that data quality concerns are addressed quickly and thoroughly.

In the literature, there is evidence indicating that many of the instruments used in STISD were valid and reliable tools. A review of 25 studies suggested that pedometers offer a valid and reliable measure of physical activity in children (McNamara, Hudson, & Taylor, 2010). Likewise, the YRBS fruit and vegetable questionnaire was shown to have moderate reliability among middle school and high school youth (Brener et al., 2002; Zullig et al., 2006). Two studies established the validity and reliability of the 3DPAR among adolescents (McMurray et al., 2004; Pate et al, 2003) and the battery of tests included in the FitnessGram were shown to be valid and reliable indicators of health-related fitness in children (Morrow, Martin, & Jackson 2010).

However, it is interesting to note that the research also introduces caveats that may help explain why some educators in this study had concerns over the quality of the data collected. McCaughtry and colleagues (2008) reported that due to logistical concerns with pedometers in physical education classes, teachers were unwilling to consider the instruments as valid sources of physical activity data. Additionally, in a study examining the use of the 3DPAR instrument with adolescents, 31% of participants said that the

recording sheets took too long to complete (McMurray et al., 2004). In regards to the FitnessGram measures, items associated with musculoskeletal fitness (e.g., pushups and curl-ups) were actually found to have the lowest reliability of all of the measures in the battery (Morrow et al., 2010) and a separate qualitative study exposed a number of threats to field validity including testing errors among teachers and low motivation among students at the secondary level (Martin, Ede, Morrow, & Jackson, 2010). Considering this evidence, it is easier to understand why some of the educators in STISD had concerns over the quality of the data. Although it is beyond the scope of this study to recommend specific fixes for each of the concerns identified above, it is clear that the range of concerns could potentially have an impact on an educator's confidence level in the data and thus influence their willingness to make decisions based upon the data.

Building upon this proposition, it is interesting to point out that seven out of eight teachers in this study insisted they did not need to systematically collect data to know they were doing their jobs. Most of the teachers indicated that their own personal observations were adequate sources of evidence of student learning and achievement. In light of the data quality concerns introduced above, it is possible that the teachers in this study had more confidence in their own subjective observations than the "objective" tools used to collect data on student outcomes. As a result, there was a low value placed upon the data among teachers. Although this finding is understandable, current educational discourse strongly suggests that this form of anecdotal decision-making is no longer

acceptable in education (Mandinach, 2012; Mandinach & Grummer, 2013). Therefore, every effort is needed to address the data quality concerns presented in this section.

Ten Recommendations for Effective Data-Use in Physical Education

Based upon the findings presented above and recommendations for best practice in the broader DDDM literature, ten recommendations have been identified that have the potential of improving data-use practices in physical education in the case study school district. Generalizability of these recommendations to other school contexts must be determined on a case-by-case basis. Table 6 summarizes the recommendations and denotes the locus of support for each recommendation.

Recommendation	Support
1. Collect data on a wide variety of student outcomes associated with quality physical education	▪ Kelly & Melograno, 2004 ▪ Lund & Tannehill, 2005 ▪ NASPE, 2004
2. Gather input, process, and satisfaction data for decision-making purposes	▪ Conkle, 1997 ▪ Cox & Williams, 2008 ▪ Lund & Tannehill, 2005 ▪ Marsh et al., 2006 ▪ McKenna & Millen, 2013
3. Involve a variety of educational stakeholders in the selection of data	▪ CDC, 1999 ▪ Yarbrough et al., 2011
4. Collect benchmark data on student outcomes three times per year	▪ Good et al., 2001
5. Provide teachers with professional development opportunities that support efficient data collection protocols	▪ Gallo et al., 2006 ▪ Hopple, 2005 ▪ Mosier, 2012 ▪ Patton & Griffin, 2008 ▪ Petray, 1989 ▪ Schiemer, 1997

6. Invest in technology that assists with the data collection process	▪ DerVanik, 2005 ▪ Gubacs-Collins & Juniu, 2009 ▪ Hopple, 2005 ▪ Mandinach et al., 2008 ▪ Mohnsen & Mauch, 1998 ▪ Nye, 2010 ▪ Rittner-Heir, 1999 ▪ Wegis & van der Mars, 2006
7. Ensure that all educational stakeholders have access to actionable knowledge through enhanced reporting systems	▪ Light et al., 2005 ▪ Mandinach et al., 2008
8. Help teachers build data literacy skills by offering instructional coaches and opportunities for collaboration	▪ Hamilton et al., 2009 ▪ Jacobs et al., 2009 ▪ Love, et al., 2008 ▪ Mandinach & Gummer, 2013 ▪ Marsh et al., 2010 ▪ Marsh et al., 2006 ▪ Moody & Dede, 2008 ▪ Steele & Boudett, 2009 ▪ Wayman, 2005b
9. Reduce class sizes in elementary school physical education	▪ Barroso et al., 2005 ▪ Gallo et al., 2006 ▪ Hastie & Saunders, 1991 ▪ NASPE, 2006b ▪ Skala et al., 2012
10. Address data quality concerns through professional development	▪ Marsh et al., 2006

Table 6. Ten recommendations for effective data-use in physical education.

In addition to the ten recommendations presented above, policy implications can also be drawn based upon the results of the study. Evidence indicated that the school district selected data sources in accordance with PEP grant requirements and state-level policies, but many of these policies were not in alignment with national recommendations for best practice in physical education. The PEP grant requirements were narrowly focused on physical activity and fitness outcomes instead of standards that include motor

skill development and the cognitive and affective domains of learning. Likewise, state-level policies for class sizes substantially exceeded national recommendations, thus resulting in unrealistic conditions for effective data-use at the elementary school level. It is important that policy makers at the federal and state levels thoroughly review existing literature on best practice in the field and consult with professional organizations when determining grant requirements and state-level policies. Districts like STISD rely heavily on guidance from these sources; therefore they must be in alignment with best practices in the field.

Lastly, one topic that was not directly informed by evidence from the study, but deserves further attention, is how teacher preparation programs equip future generations of educators to effectively engage with data. Mandinach and Gummer (2013) have pointed out that while there is growing emphasis among policymakers surrounding effective data-use in education, many schools of education at the university level have yet to incorporate data-literacy skills into their coursework. In order to have a long term impact on teacher practice, the authors recommend that data-literacy skills be introduced early on in pre-service experiences and continue on into in-service professional development.

LIMITATIONS

Every study, regardless of the rigor with which it was undertaken, has certain limitations. In this study, there were two primary limitations. First, the district that was selected for investigation was chosen because of its successful attainment of a PEP grant.

Although this circumstance helped ensure an information-rich case, it also had the potential of limiting the representativeness of the findings. Districts that have not been awarded a PEP grant may experience drastically different circumstances in relation to the types of data available and the procedures for data collection. Furthermore, the case study was conducted in a large, urban, lower income school district that may or may not be comparable to other school contexts around the country. As such, broad generalizability of the findings is not endorsed. Second, despite multiple attempts to recruit school administrators to participate in the study, only one agreed to participate. As a result, the school level perspective was largely absent from the findings. It would have been interesting to gain further insights from principals and other school administrators who frequently operate in a data-driven atmosphere to see how physical education may fit within the bigger picture of data-use in schools. Despite these limitations, it is believed that the study provides important contributions to the knowledge base and offers valuable directions for future research.

DIRECTIONS FOR FUTURE RESEARCH

This study was exploratory in nature. As such, it likely generated more questions than it answered. The topic of DDDM in physical education is relatively new. Therefore there are many potential avenues for future research. Based upon the limitations presented above, one of the first directions for future research could be to explore how the DDDM process unfolds in a district that has not received a PEP grant. The requirements of the grant exerted an immense influence in STISD and dictated many of

the types of data and procedures that were in place. It would be interesting to see how the process may vary in a district that is not so heavily influenced by a federal grant.

Next, it would be interesting to gain a broader perspective on data-use practices in physical education through the use of alternative methods. For example, the results of this study could be used to generate survey items that are distributed to physical education stakeholders across the country. The results of this kind of study would be more generalizable and could potentially help dictate policy decisions in regards to effective data-use in physical education.

Lastly, one of the clearest findings from this study was that physical educators were in need of professional development related to effective data-use practices. While one can derive guidance from professional development models in other areas of education, few of these models have been tested in physical education settings. It would be interesting to see if the instructional coach and collaborative approaches to the development of data-literacy skills work as well in a physical education context as they do in other areas of education. Eventually, the hope would be to investigate how enhanced data-use among physical educators trickles down to student learning and student achievement. That kind of study is likely still a ways off in the future, but in the end, student learning is the outcome of greatest interest.

CLOSING REMARKS

Conversations surrounding effective data-use have permeated many spheres of education since the passing of NCLB and all indicators suggest that DDDM is here to

stay. Up to this point, physical education has operated on the periphery of these conversations and the subject area has been largely excluded from policies that dictate educational practice. As a result, we find ourselves with a unique opportunity to navigate our own path forward. Without the burden of strict policy guidelines, we can determine what types of data we want to collect, how/when we want to collect them, and how we are going to put them to good use for the benefit of our students. This study represents one of the first systematic attempts at exploring the DDDM process within the contexts of K-12 physical education and will hopefully serve as a building block for future work on the topic.

Appendix A: Interview Question Correlations

GUIDE FOR PHYSICAL EDUCATION TEACHER INTERVIEWS

Case Study Questions	Interview Questions
1a. What types of input data are being collected (e.g., equipment, facilities, class sizes, meeting frequency, school health environment, curriculum alignment, etc.)?	1. Have you ever collected any data about the physical education program at your school, such as … ▪ Equipment availability? ▪ Status of available facilities? ▪ Class sizes? ▪ How often you see your classes? ▪ Others? 2. Have your ever completed any modules from the School Health Index? ▪ Have you completed the physical education module? 3. Have you ever evaluated your curriculum using a tool like the PECAT?
1b. What types of process data are being collected (e.g., instructional time, MVPA time, management time, instances of teacher feedback, standards addressed in lessons, teacher trainings, etc.)?	1. Have you ever collected any data about your instruction, such as … ▪ How much time you spend teaching? ▪ How much time you spend managing a class? ▪ How much time students are engaged in moderate to vigorous physical activity? ▪ How much and/or what kinds of feedback you provide students? ▪ Others? 2. Do you document in any way how the lessons you teach address the state or national physical education standards?

1c. What types of outcome data are being collected (e.g., student achievement of NASPE/state standards, health behaviors, self-efficacy, etc.)?	1. Do you collect any student achievement data like … ▪ Motor skill performance? ▪ Mastery of physical education concepts? ▪ Physical activity participation? ▪ Fitness levels? ▪ Social skills? ▪ Values related to physical activity? 2. Do you collect any other student data like … ▪ Health or nutritional behaviors? ▪ Self-efficacy? ▪ Others? 3. Can you describe the data you are collecting as part of the PEP grant?
1d. What types of satisfaction data are being collected (e.g., opinions of students, teachers, parents, etc.)?	1. Do you collect any data about the beliefs or opinions of … ▪ Students? ▪ Parents? ▪ Other members of your school community?
1e. How are the data being collected (e.g., by whom, using what kinds of tools, how frequently)?	1. If you do collect these data, what tools do you use to collect these data? ▪ Equipment? ▪ Technology? 2. How frequently are these data collected? 3. If you do not collect these data, do you know someone on your campus or in your district that does?
2a. How are the data analyzed and summarized (e.g., by whom, using what tools, when)?	1. What happens to these data after they are collected? ▪ Are they analyzed or summarized in any way? ▪ How? ▪ By whom? ▪ When does the analysis or summarization take place?
2b. How are the data reported (e.g., to whom, in what format)?	1. Are the data reported in any way? ▪ To students? ▪ To parents? ▪ To administrators? 2. If so, how are the data reported?

2c. How are the data synthesized and prioritized (e.g., by whom, using what tools, when)?	1. Does anyone work to pool together this data and make sense of it? ▪ How is this done? 2. Is this data ever used to prioritize issues that may be relevant to physical education?
3a. How do physical education teachers use data to guide instructional decisions (e.g., lesson content, teaching methods, differentiation, additional interventions, etc.)?	1. Do you ever use the data that have been collected to guide your teaching? ▪ To determine what content to teach? ▪ To determine what methods to use? ▪ To differentiate instruction for high or low level learners? ▪ To provide additional interventions to those in need? 2. Can you provide me with examples of how you do this?
3b. How do physical education teachers, school administrators and district administrators use data to drive program improvement (e.g., curriculum reform, policy reform, resource allocation, teacher training, goal setting, progress monitoring, etc.)?	1. Do you ever use the data that has been collected to drive improvements in the physical education program? ▪ To make changes in the curriculum? ▪ To make changes in physical education policies? ▪ To make budget decisions? ▪ To seek out specific types of professional development? ▪ To set goals for yourself or the program? ▪ To monitor program improvements? 2. Can you provide me with any examples of how you do this?
3c. In what ways are physical education-related data used to hold students, teachers, and schools accountable (e.g., student achievement of outcomes, teacher effectiveness, policy compliance, etc.)?	1. Are any of these data used to hold students accountable? ▪ How? 2. Are any of these data used to hold you accountable? ▪ How? 3. Are any of these data used to hold the school or district accountable? ▪ How?

4a. What role does technology play in the DDDM process in physical education?	1. What role do you see technology playing in the process of collecting and using data to drive your decision making? ▪ In what ways does technology facilitate the process? ▪ In what ways does technology limit the process?
4b. What factors encourage or facilitate the use of data in physical education? 4c. What factors serve as barriers or limit the use of data in physical education?	1. Are there any factors that seem to encourage you or help you use data to inform the decisions you make as a physical education teacher? 2. Are there any factors that seem to hold you back from using data to the extent you would like? 3. Do you feel like you have access to all the data you need? 4. Do you feel like the data you collect in your physical education program is of high quality? ▪ Why or why not? 5. To what extent do you feel motivated to use data to drive your work as a physical educator? 6. What kinds of training have you received that may help you engage in the data-driven decision making process? 7. What other kinds of support do you receive related to the collection, analysis and/or use of data in your work as a physical educator? 8. What role do you see time playing in your ability to effectively engage in the data-driven decision making process?
4d. How could the DDDM process be enhanced in physical education?	1. Do you think physical educators should engage in the data-driven decision making process? ▪ Why or why not? 2. If so, how do you think the process could be enhanced?

GUIDE FOR DISTRICT COORDINATOR INTERVIEWS

Case Study Questions	Interview Questions
1a. What types of input data are being collected (e.g., equipment, facilities, class sizes, school health environment, curriculum alignment, etc.)?	1. What other types of data does the district collect in relation to school physical education programs? 2. Do any schools complete the School Health Index? 3. Has the district ever evaluated its physical education curriculum using a tool like the PECAT?
1b. What types of process data are being collected (e.g., instructional time, MVPA time, management time, instances of teacher feedback, standards addressed in lessons, teacher trainings, etc.)?	1. Does the district collect any data related to what is being taught in physical education or how it is being taught? ▪ If so, can you provide any examples? 2. Does the district monitor how many minutes of physical education students receive or how many minutes are spent in moderate to vigorous physical activity during classes? ▪ If so, how?
1c. What types of outcome data are being collected (e.g., student achievement of NASPE/state standards, health behaviors, self-efficacy, etc.)?	1. What types of data are being collected in connection with your PEP grant? 2. What kinds of data are collected in relation to student achievement in physical education? ▪ Motor skill performance? ▪ Mastery of physical education concepts? ▪ Physical activity participation? ▪ Fitness levels? ▪ Social skills? ▪ Values related to physical activity? 3. Are any other kinds of student data being collected that could be related to physical education? ▪ Health or nutritional behavior data? ▪ Physical activity self-efficacy? ▪ Others?

1d. What types of satisfaction data are being collected (e.g., opinions of students, teachers, parents)?	1. Does the district collect any data related to the beliefs or opinions of ____ as they relate to physical education? ▪ Students ▪ Teachers ▪ Administrators ▪ Parents ▪ Other members of the community
1e. How are the data being collected (e.g., by whom, using what kinds of tools, how frequently)?	1. How are these data collected? ▪ By whom? ▪ Using what tools? ▪ How often?
2a. How are the data analyzed and summarized (e.g., by whom, using what tools, when)?	1. What happens to these data after they are collected? ▪ Are they analyzed or summarized in any way? ▪ How? ▪ By whom? ▪ When does the analysis or summarization take place?
2b. How are the data reported (e.g., to whom, in what format)?	1. Are the data reported in any way? ▪ To teachers? ▪ To parents? ▪ To school- or district-level administrators? ▪ To the school board? ▪ To the state? ▪ To the federal government? 2. If so, how are the data reported?
2c. How are the data synthesized and prioritized (e.g., by whom, using what tools, when)?	1. How are the data synthesized to generate meaning? 2. Is this data used to prioritize issues relevant to physical education? ▪ If so, how?
3a. How do physical education teachers use data to guide instructional decisions (e.g., lesson content, teaching methods, differentiation, additional interventions, etc.)?	1. Do you see physical education teachers using data to drive instruction? ▪ If so, in what ways?

3b. How do physical education teachers, school administrators and district administrators use data to drive program improvement (e.g., curriculum reform, policy reform, resource allocation, teacher training, goal setting, progress monitoring, etc.)?	1. In what ways does the district use the data that has been collected to drive improvements in physical education? ▪ To guide curriculum reform? ▪ To inform policy? ▪ To allocate resources? ▪ To determine professional development needs? ▪ To set goals for teachers, schools, or the district? ▪ To monitor program improvements?
3c. In what ways are physical education-related data used to hold students, teachers, and schools accountable (e.g., student achievement of outcomes, teacher effectiveness, policy compliance, etc.)?	1. Are any of these data used to hold students accountable? ▪ How? 2. Are any of these data used to hold teachers accountable? ▪ How? 3. Are any of these data used to hold schools or the district accountable? ▪ How?
4a. What role does technology play in the DDDM process in physical education?	1. What role do you see technology playing in the process of collecting and using data to drive decision making in physical education? ▪ In what ways does technology facilitate the process? ▪ In what ways does technology limit the process?

4b. What factors encourage or facilitate the use of data in physical education? 4c. What factors serve as barriers or limit the use of data in physical education?	1. Are there any factors that encourage or facilitate the use of data in your district? 2. Are there any factors that limit the use of data in your district? 3. Do you feel like you have access to all the data you need? ▪ Do you feel like your teachers do? 4. Do you feel like the data you and your teachers collect is of high quality? ▪ Why or why not? 5. To what extent do you think your physical education teachers are motivated to use data to drive their decision-making? 6. To what extent do you feel motivated to use data to drive your own decision-making? 7. What kinds of training does the district provide to teachers related to data-driven decision making? 8. What kinds of training have you received related to data-driven decision making? 9. What kinds of support do you receive related to the collection, analysis and/or use of data?
4d. How could the DDDM process be enhanced in physical education?	1. To what extent do you think physical education should be involved in data-driven decision making? 2. How do you think the process be enhanced in physical education?

GUIDE FOR SCHOOL ADMINISTRATOR INTERVIEWS

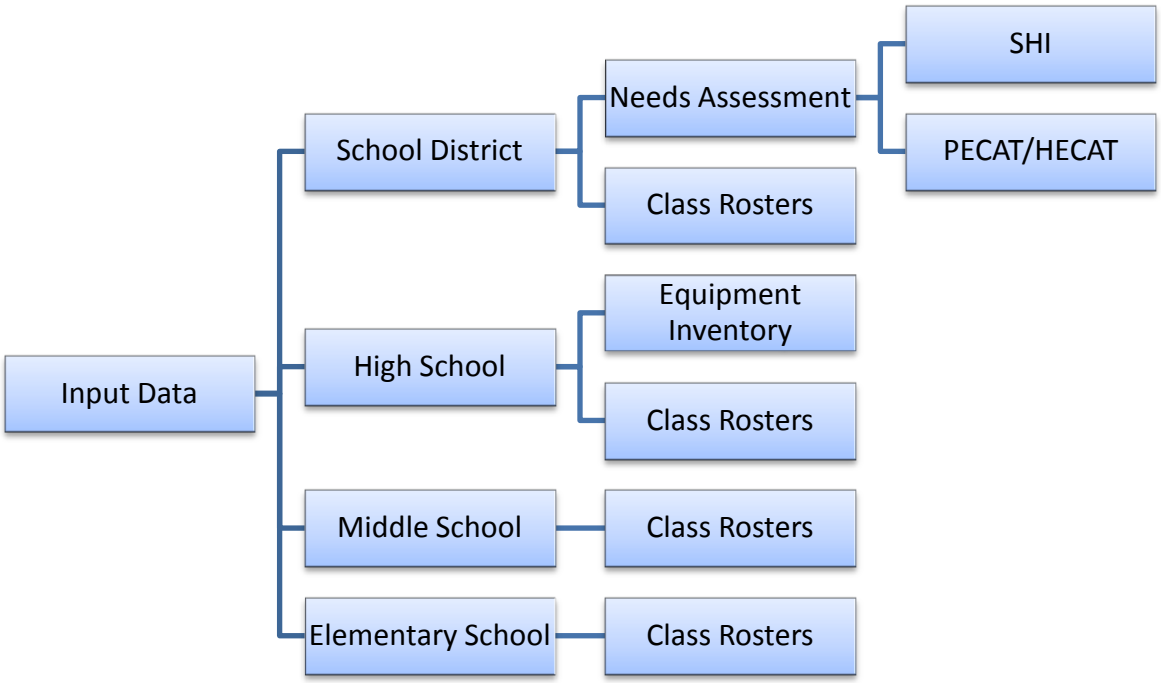
Case Study Questions	Interview Questions
1b. What types of process data are being collected (e.g., instructional time, MVPA time, management time, instances of teacher feedback, standards addressed in lessons, teacher trainings, etc.)?	1. Does the school collect any data related to what is being taught in physical education or how it is being taught? ▪ If so, can you provide any examples? 2. Does the school monitor how many minutes of physical education students receive or how many minutes are spent in moderate to vigorous physical activity during classes? ▪ If so, how?
1d. What types of satisfaction data are being collected (e.g., opinions of students, teachers, parents)?	1. Does the school collect any data related to the beliefs or opinions of ____ as they relate to physical education? ▪ Students ▪ Teachers ▪ Parents ▪ Other members of the community
1e. How are the data being collected (e.g., by whom, using what kinds of tools, how frequently)?	1. How are these data collected? ▪ By whom? ▪ Using what tools? ▪ How often?
2a. How are the data analyzed and summarized (e.g., by whom, using what tools, when)?	1. What happens to these data after they are collected? ▪ Are they analyzed or summarized in any way? ▪ How? ▪ By whom? ▪ When does the analysis or summarization take place? 2. Are the data connected with any other sources of data being collected at the school?
2b. How are the data reported (e.g., to whom, in what format)?	1. Are the data reported in any way? ▪ To students? ▪ To teachers? ▪ To parents? ▪ To district administrators? 2. If so, how are the data reported?

3a. How do physical education teachers use data to guide instructional decisions (e.g., lesson content, teaching methods, differentiation, additional interventions, etc.)?	1. Do you see physical education teachers using data to drive instruction? ▪ If so, in what ways?
3b. How do physical education teachers, school administrators and district administrators use data to drive program improvement (e.g., curriculum reform, policy reform, resource allocation, teacher training, goal setting, progress monitoring, etc.)?	1. In what ways does the school use data to drive improvements in physical education? ▪ To inform policy? ▪ To allocate resources? ▪ To determine professional development needs? ▪ To set goals for students and teachers? ▪ To monitor program improvements? 2. Is physical education-related data used to inform the campus improvement plan? ▪ If so, in what ways?
3c. In what ways are physical education-related data used to hold students, teachers, and schools accountable (e.g., student achievement of outcomes, teacher effectiveness, policy compliance, etc.)?	1. Are any of these data used to hold students accountable? ▪ How? 2. Are any of these data used to hold teachers accountable? ▪ How? 3. Are any of these data used to hold the school accountable? ▪ How?
4b. What factors encourage or facilitate the use of data in physical education? 4c. What factors serve as barriers or limit the use of data in physical education?	1. Are there any factors that encourage or facilitate the use of data in your school's physical education program? 2. Are there any factors that limit the use of data in your school's physical education program? 3. To what extent do you think your physical education teachers are motivated to use data to drive their decision-making? 4. What kinds of training does the school provide to physical education teachers related to data-driven decision making?

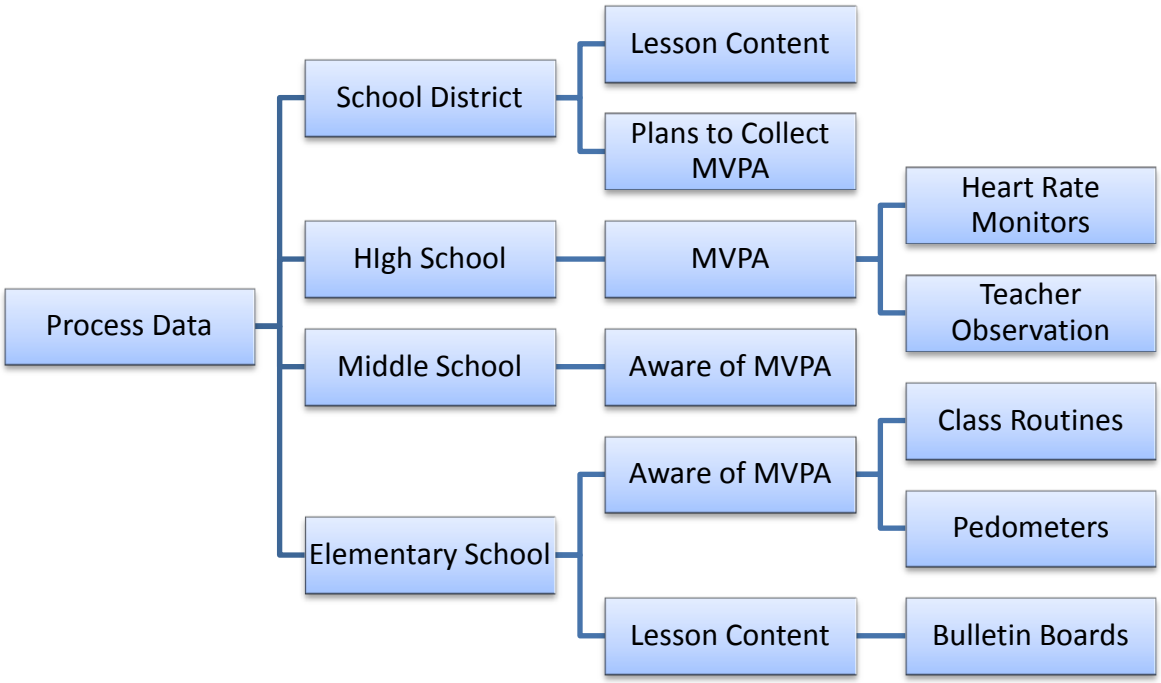
4d. How could the DDDM process be enhanced in physical education?	1. To what extent do you think physical education should be involved in data-driven decision making? 2. How do you think the process be enhanced in physical education?

Appendix B: Analytic Flow Charts

Case Study Question #1a



Case Study Question #1B



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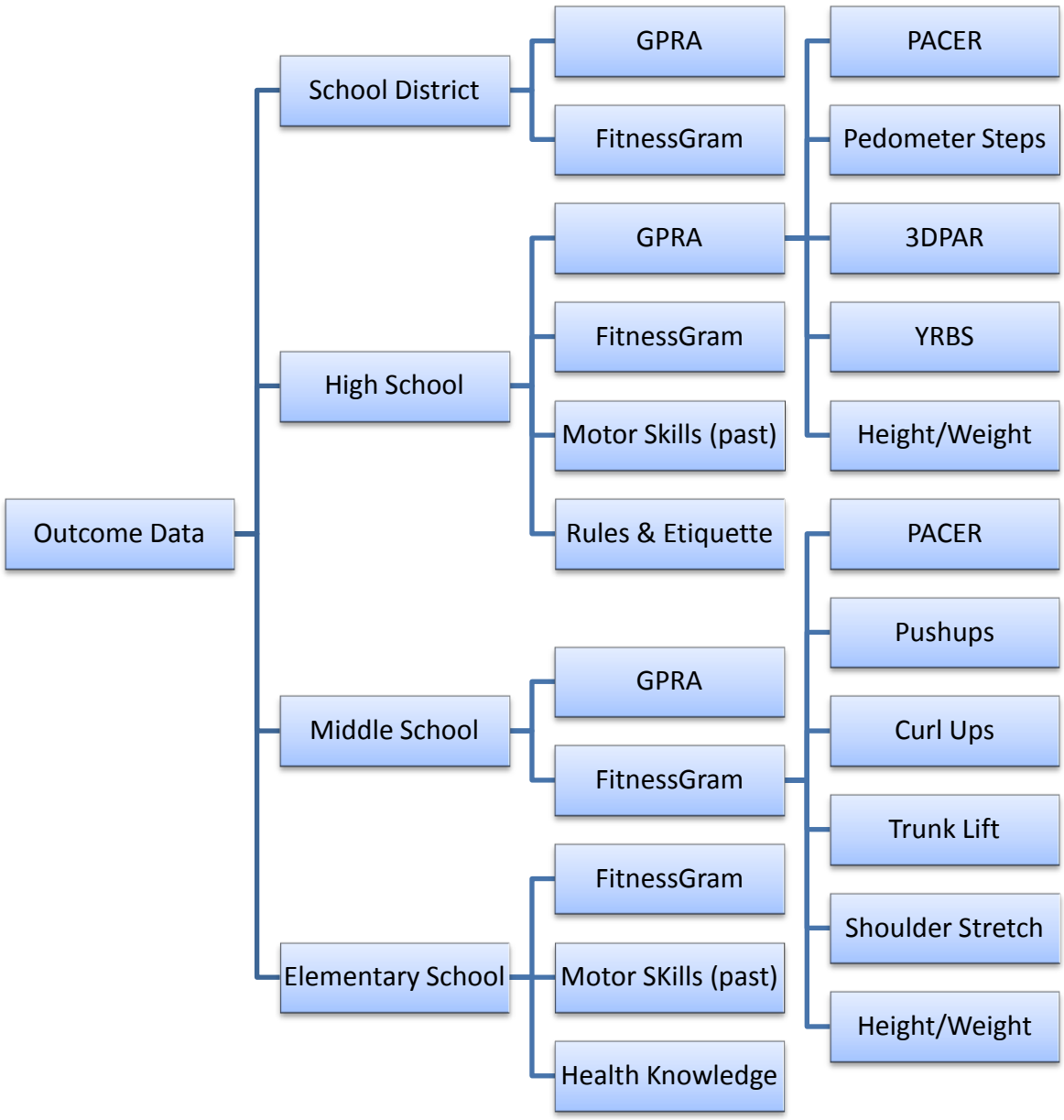

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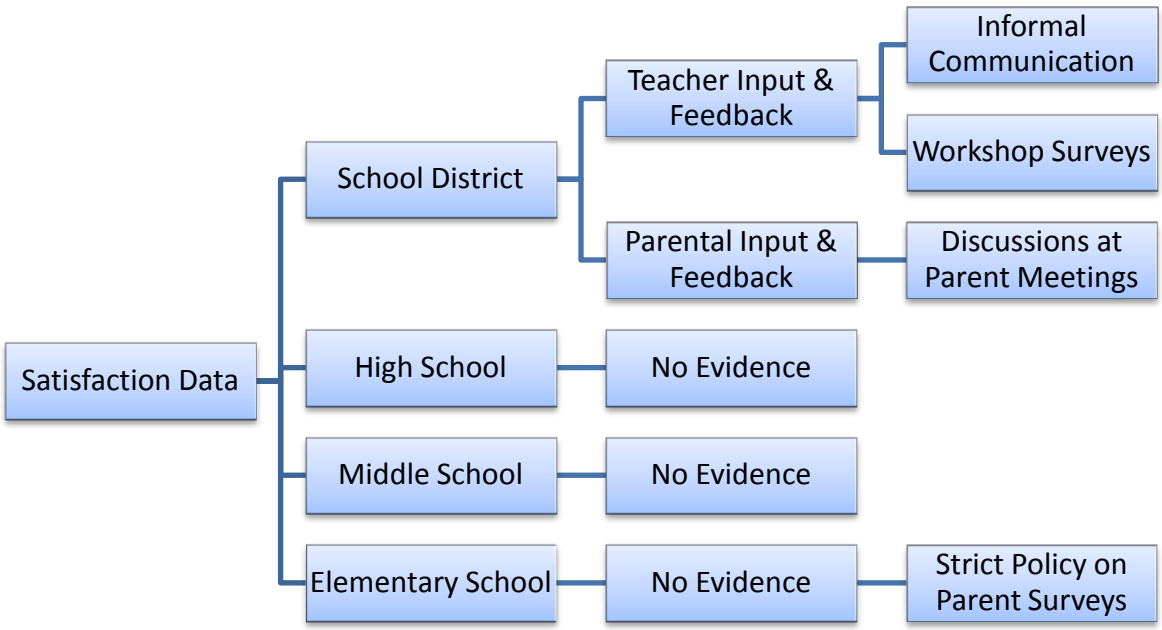

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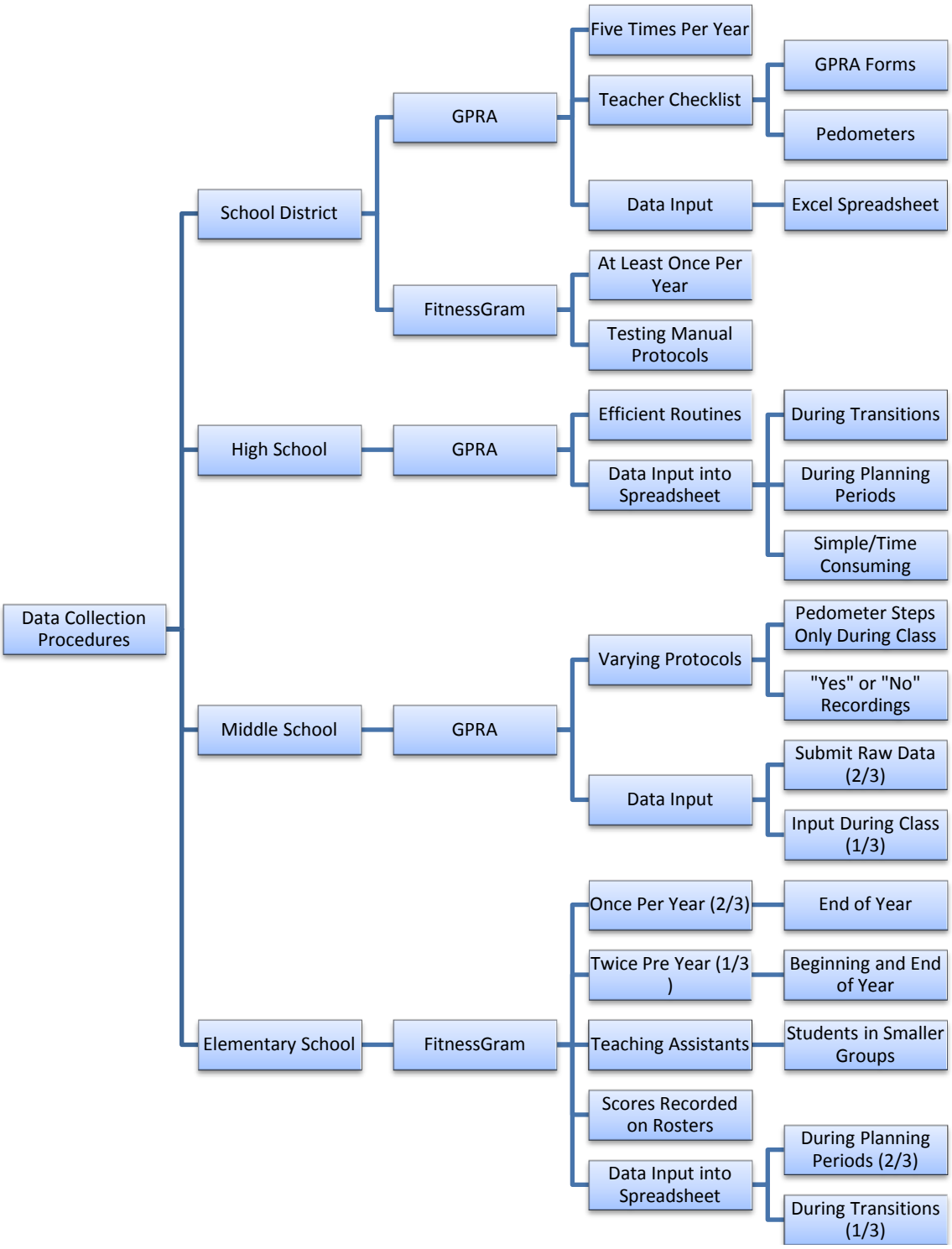
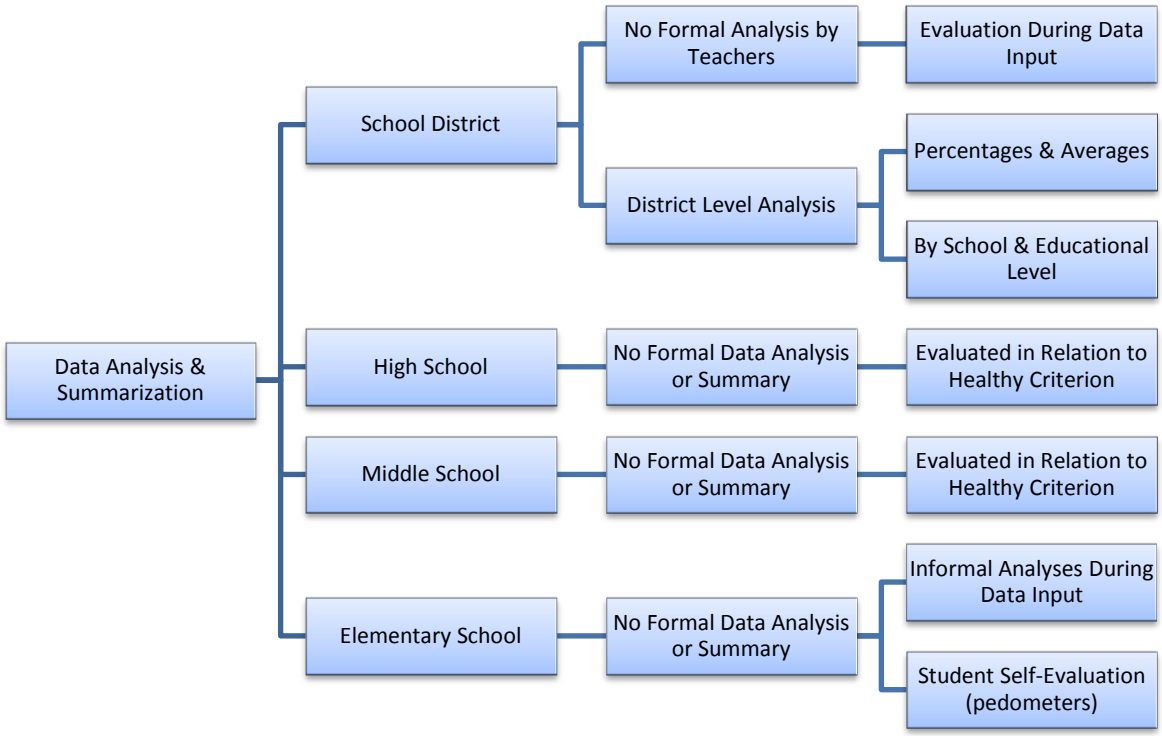


Case Study Question #2A



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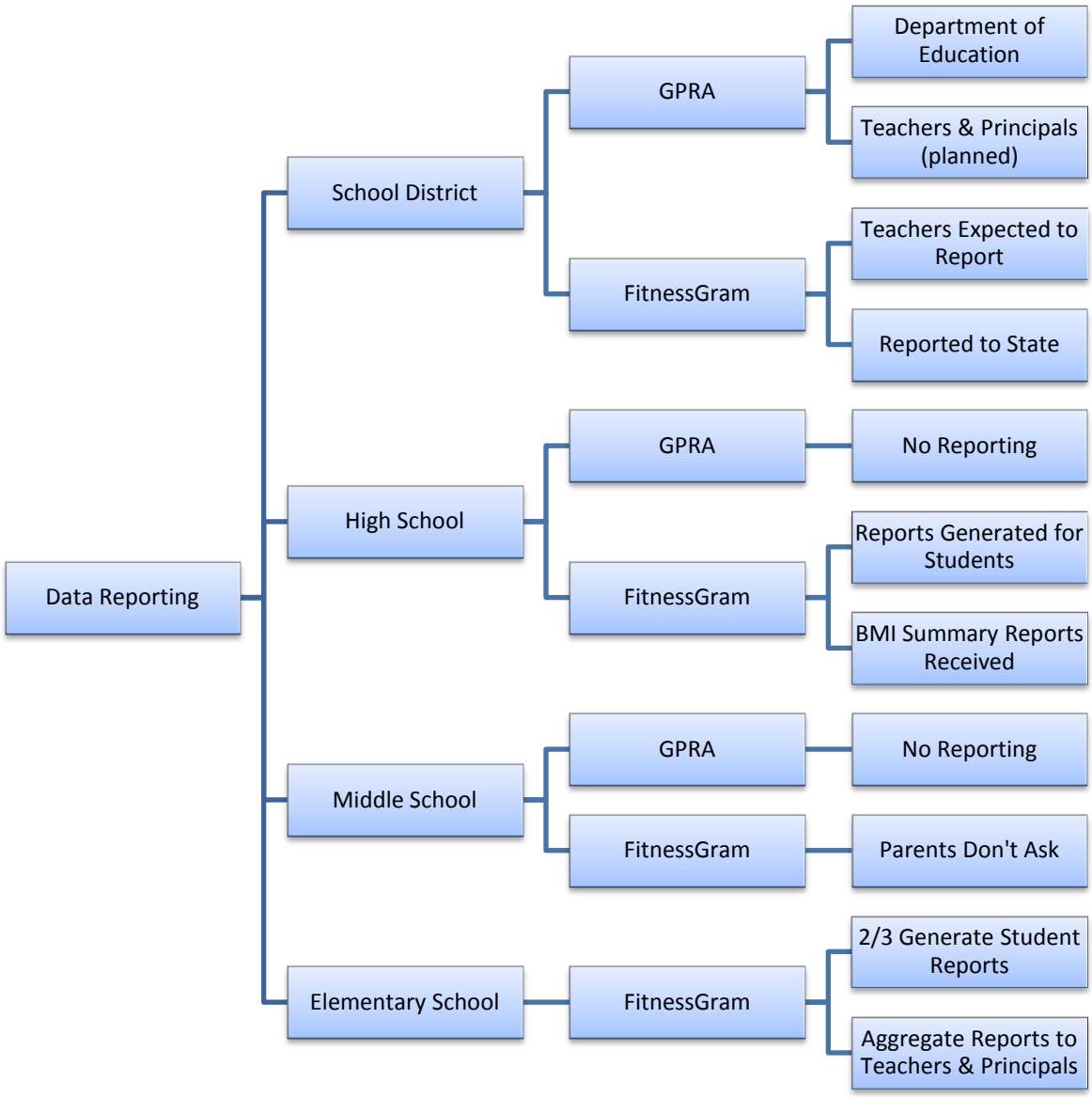

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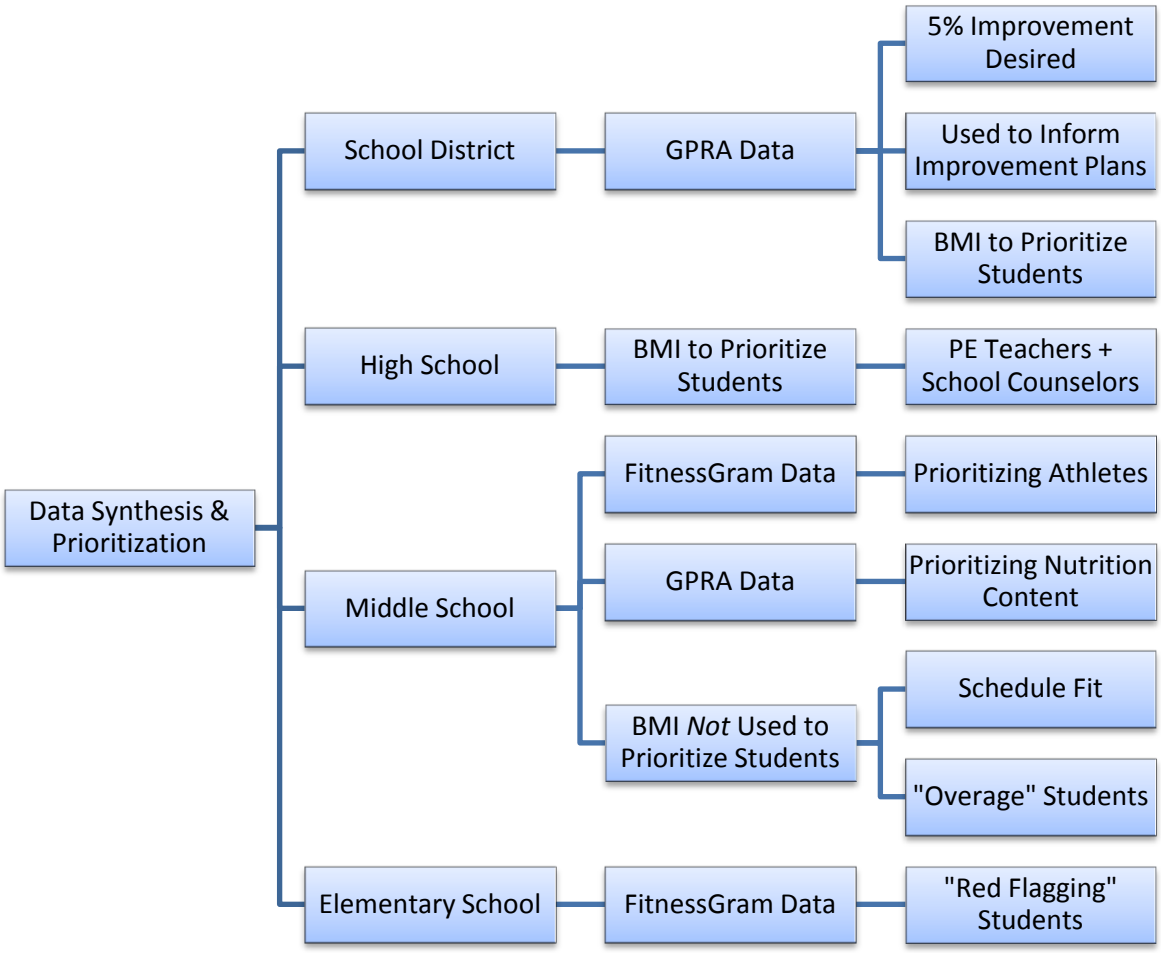

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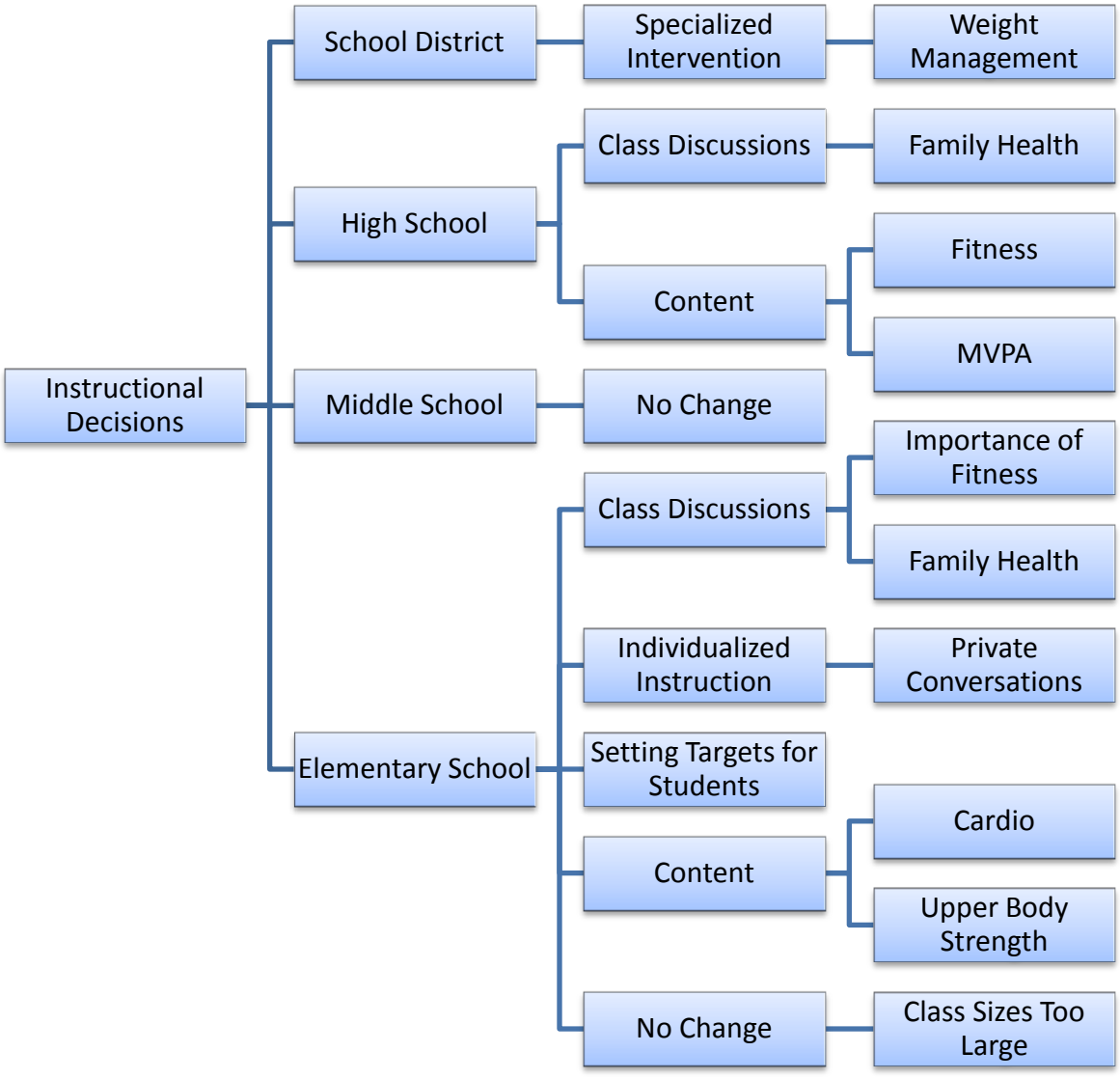

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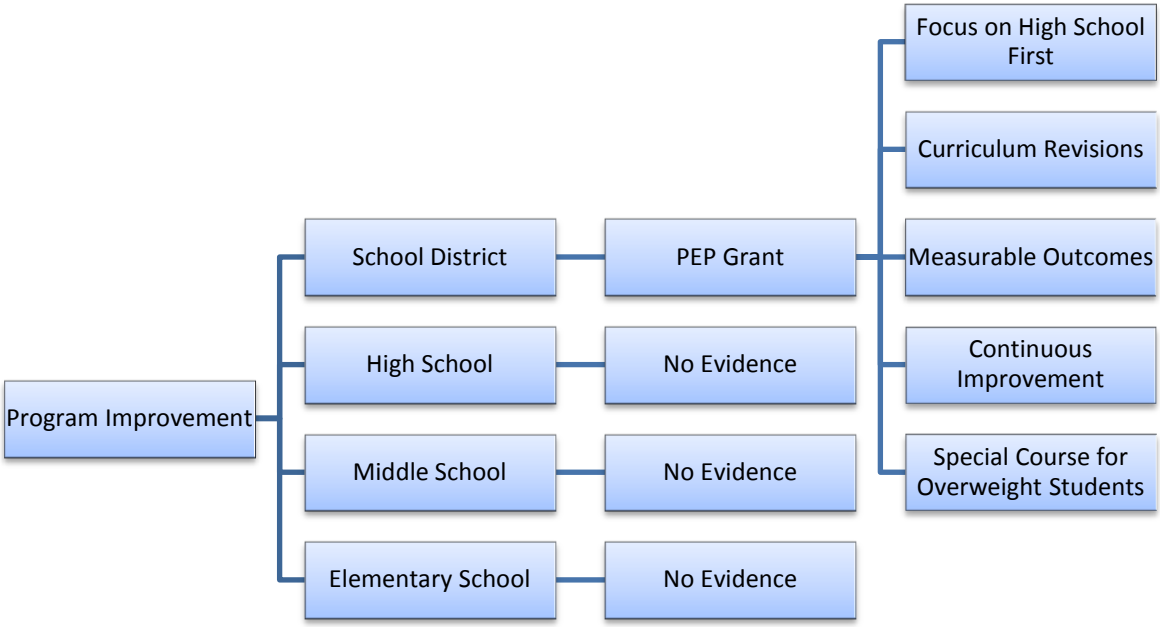

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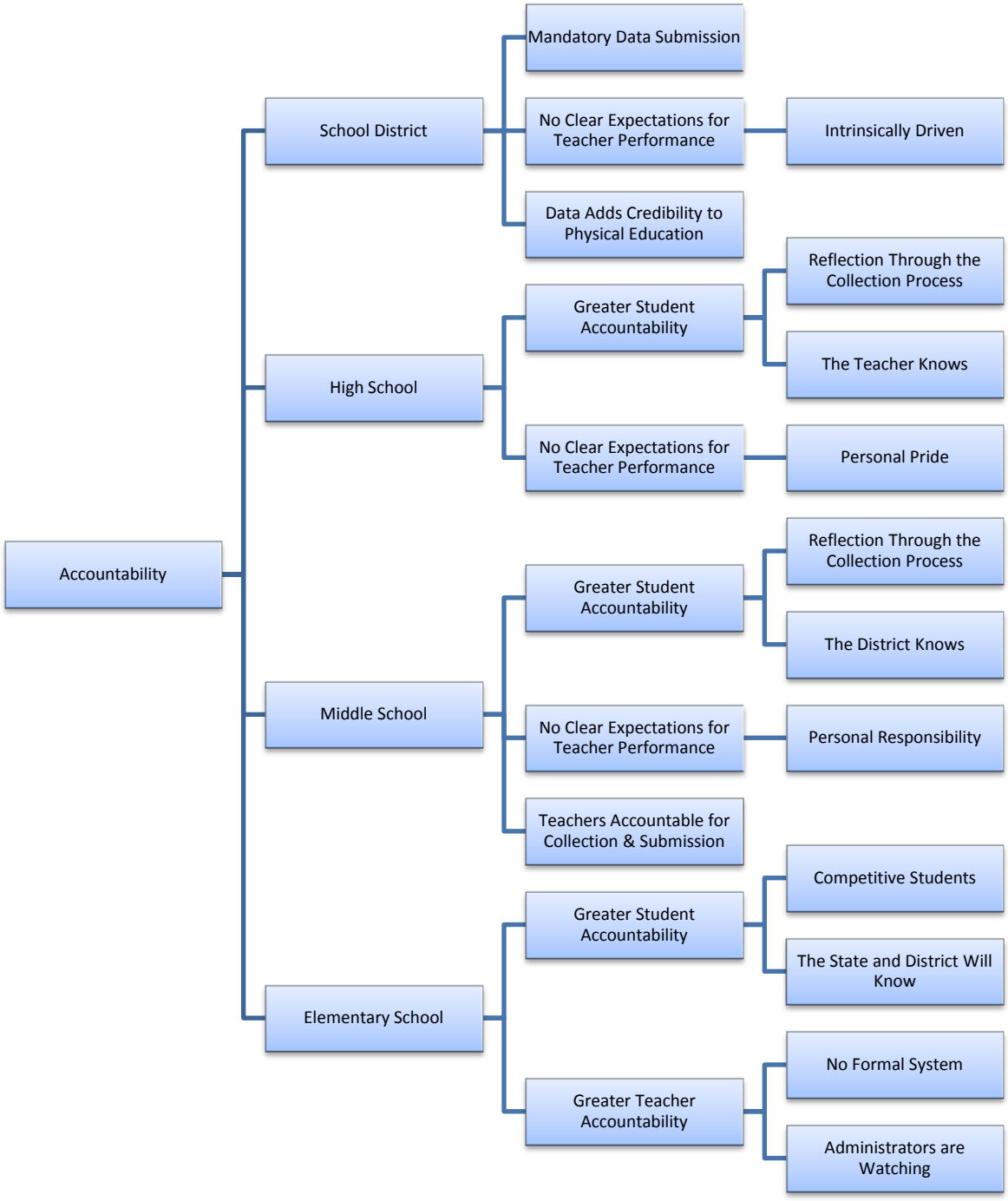

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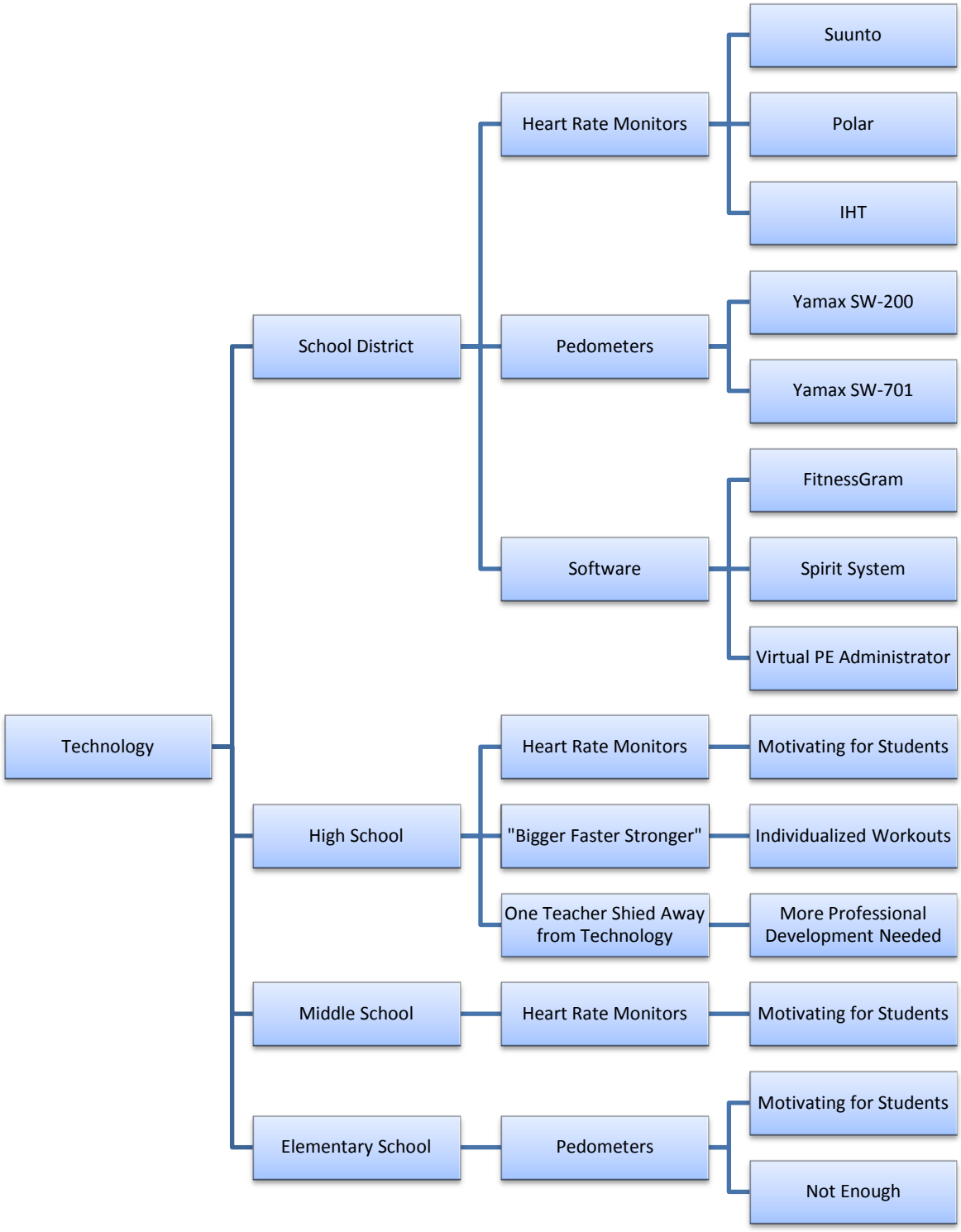

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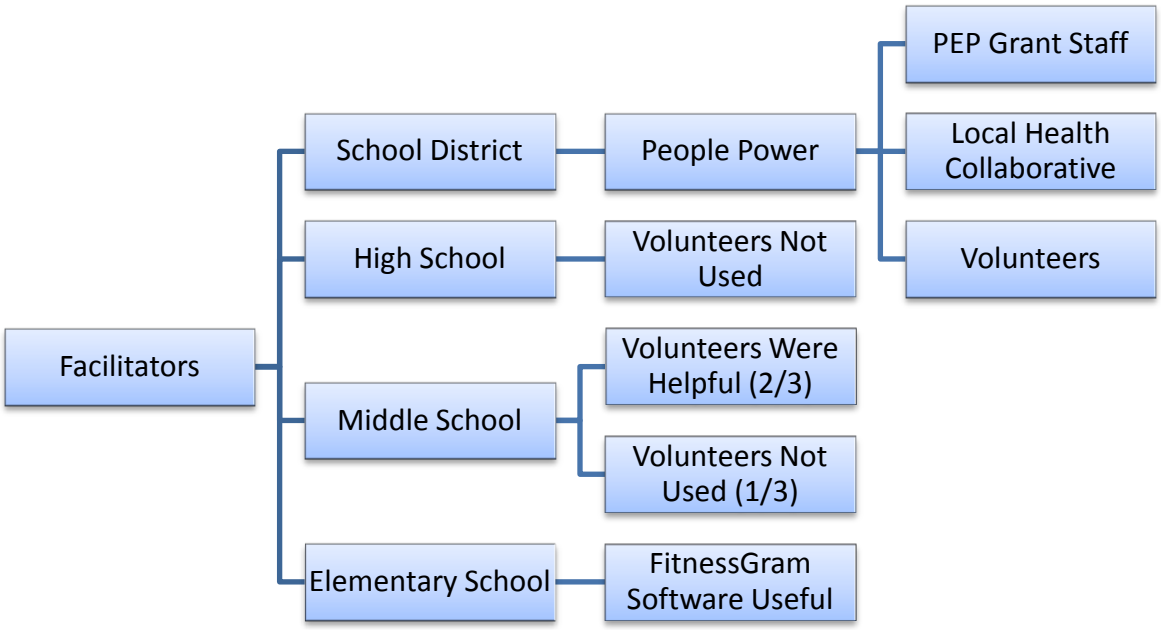

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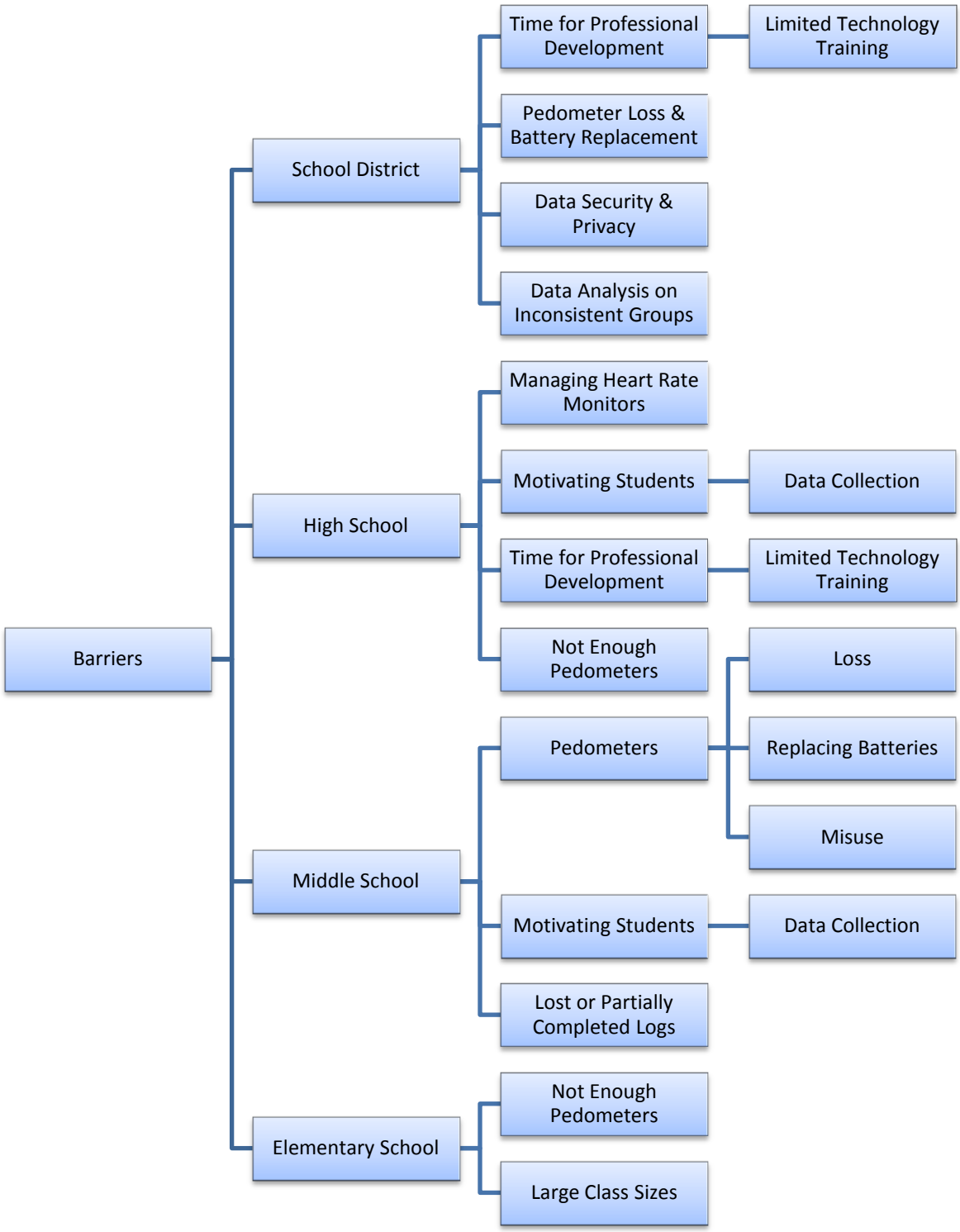
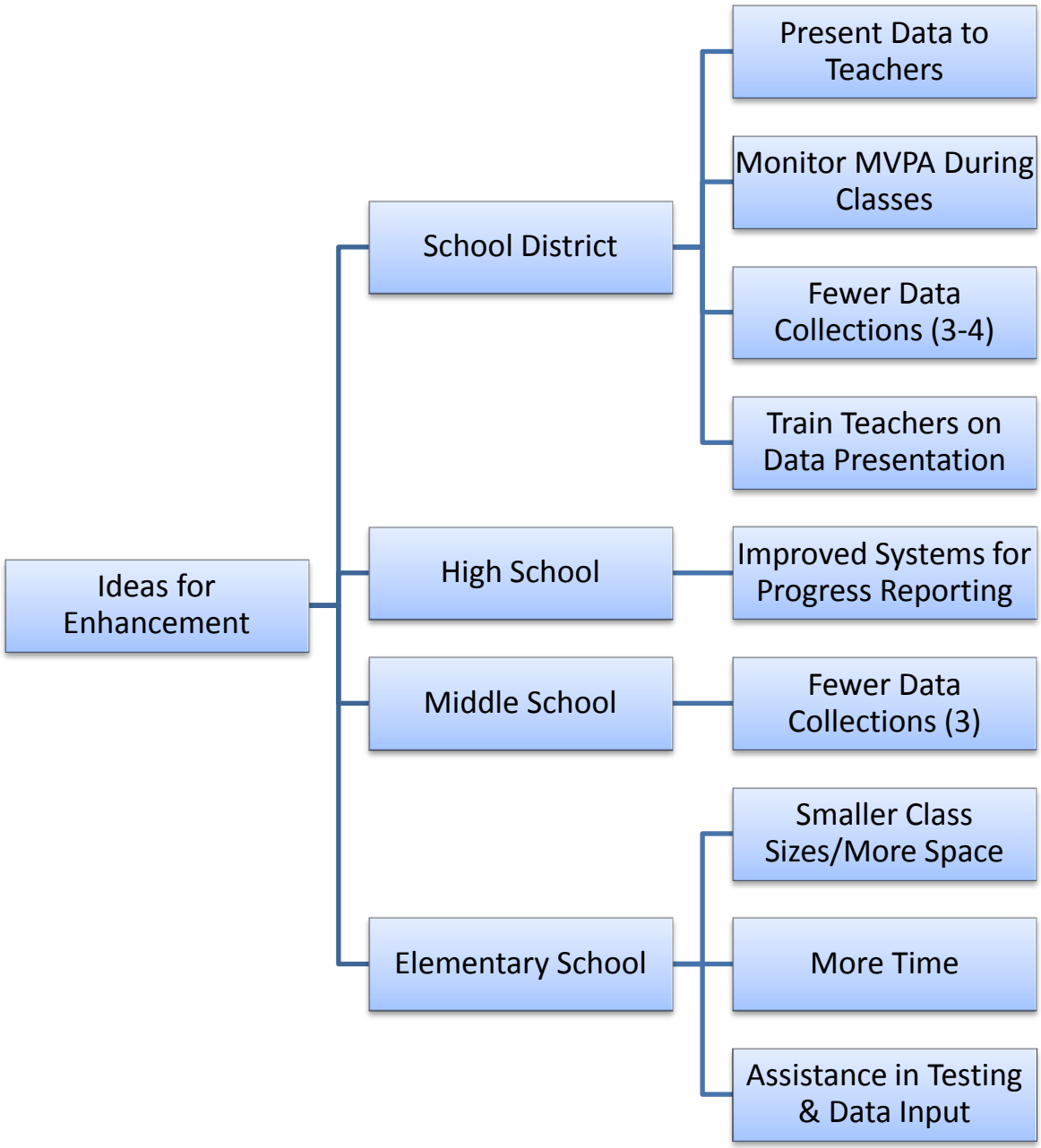
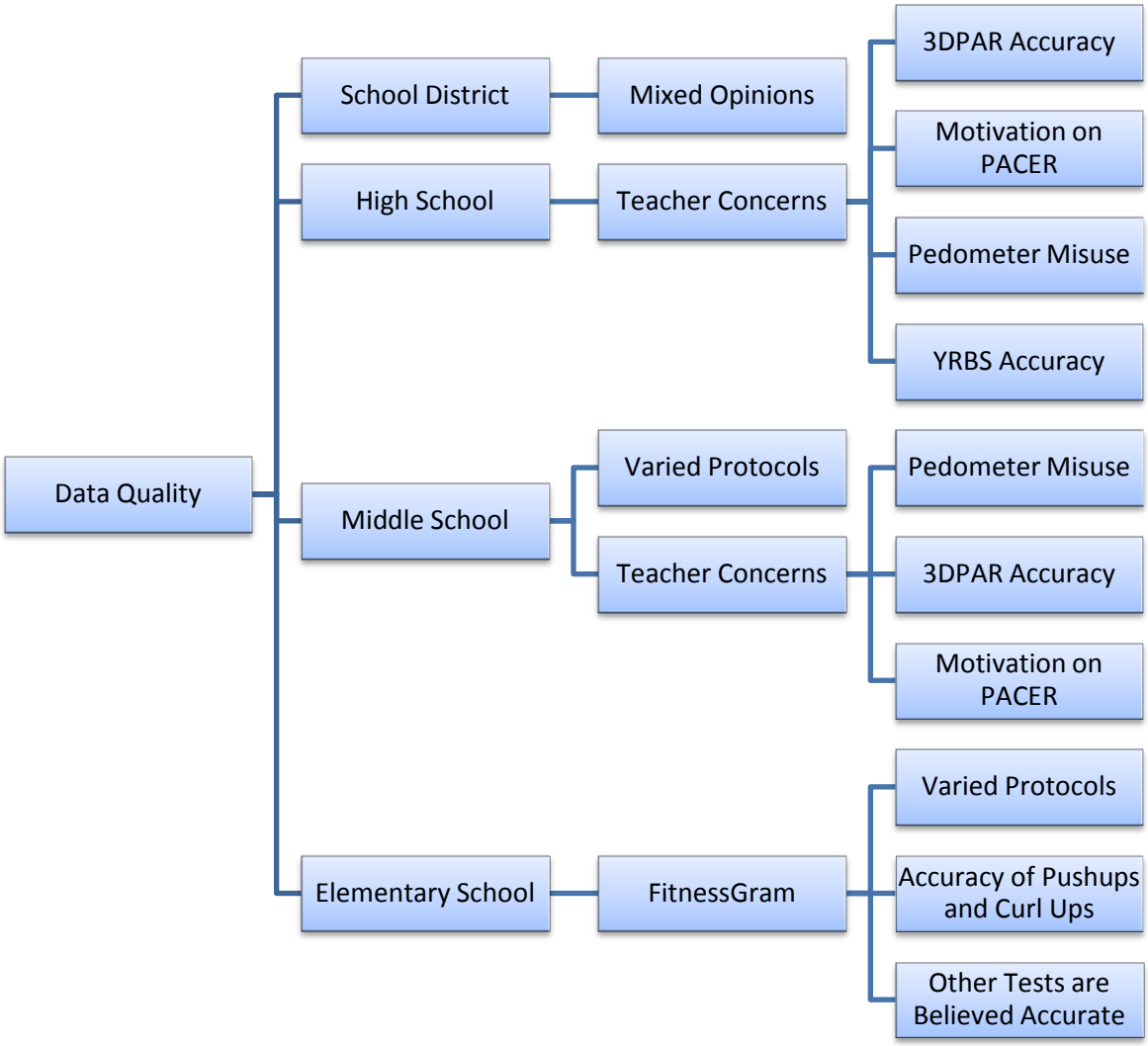


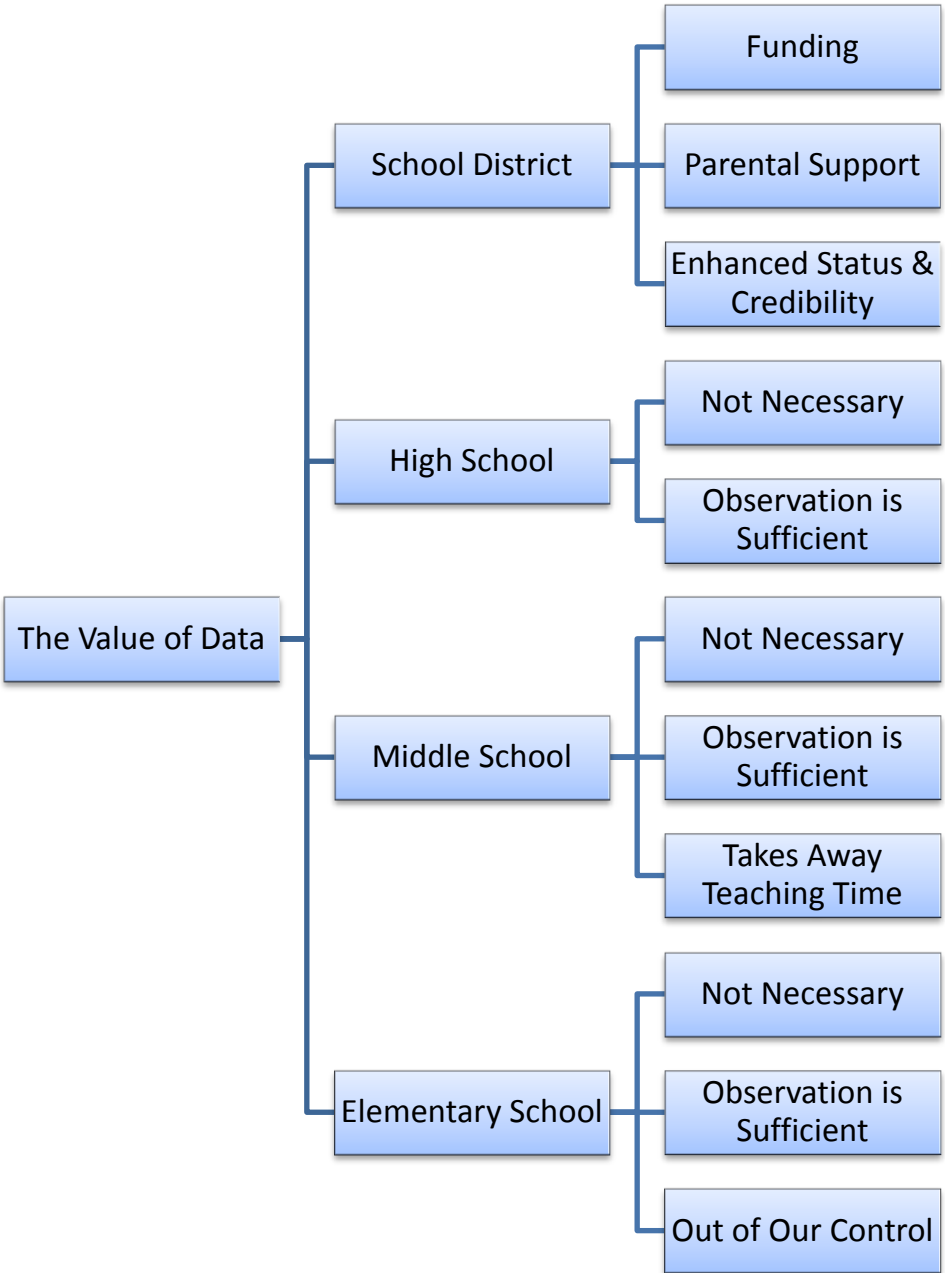
Case Study Question #4D



Data Quality



The Value of Data



References

Abbott, D. V. (2008). A functionality framework for educational organizations: Achieving accountability at scale. In E. B. Mandinach, M. Honey, & M. C. Linn (Eds.), *Data-driven school improvement: Linking data and learning* (pp. 257–276). New York : London: Teachers College Press.

Ackoff, D. (1989). From data to wisdom. *Journal of Applied Systems Analysis*, *16*, 3–9.

American Alliance for Health, Physical Education, Recreation, and Dance. (2013). *Grade level outcomes for K-12 physical education*. Reston, VA: Author. Retrieved from http://www.aahperd.org/whatwedo/upload/OutcomesChartFinal-10-8-13.pdf

Barroso, C. S., McCullum-Gomez, C., Hoelscher, D. M., Kelder, S. H., & Murray, N. G. (2005). Self-reported barriers to quality physical education by physical education specialists in Texas. *Journal of School Health*, *75*(8), 313–320.

Bernhardt, V. L. (2004). *Data analysis for continuous school improvement* (2nd ed.). Larchmont, NY: Eye On Education.

Bertfield, J., & Merrill, M. (2008). The challenge of adoption in implementing comprehensive data-driven decision-making solutions. In E. B. Mandinach, M. Honey, & M. C. Linn (Eds.), *Data-driven school improvement: Linking data and learning* (pp. 191–208). New York : London: Teachers College Press.

Blink, R. J. (2007). *Data-driven instructional leadership*. Larchmont, NY: Eye On Education.

Booher-Jennings, J. (2005). Below the bubble: Educational triage and the Texas accountability system. *American Educational Research Journal*, *42*(2), 231–268. doi:10.3102/00028312042002231

Breiter, A., & Light, D. (2006). Data for school improvement: Factors for designing effective information systems to support decision-making in schools. *Journal of Educational Technology & Society*, *9*(3), 206–217.

Brener, N. D., Kann, L., McManus, T., Kinchen, S. A., Sundberg, E. C., & Ross, J. G. (2002). Reliability of the 1999 Youth Risk Behavior Survey Questionnaire. *Journal of Adolescent Health*, *31*(4), 336–342. doi:10.1016/S1054-139X(02)00339-7

Carrigg, F., & Kurabinski, M. J. (2008). The role of comparative data in changing the educational reform conversation. In E. B. Mandinach, M. Honey, & M. C. Linn (Eds.), *Data driven school improvement: Linking data and learning* (pp. 55–70). New York : London: Teachers College Press.

Centers for Disease Control and Prevention. (1999). Framework for program evaluation in public health. *Morbidity and Mortality Weekly Report (MMWR)*, *48*(RR-11). Retrieved from ftp://ftp.cdc.gov/pub/Publications/mmwr/rr/rr4811.pdf

Centers for Disease Control and Prevention. (2006). Physical education curriculum evaluation tool (PECAT). Retrieved from http://www.cdc.gov/healthyyouth/PECAT/pdf/PECAT.pdf

Centers for Disease Control and Prevention. (2012a). Health education curriculum evaluation tool (HECAT). Retrieved from http://www.cdc.gov/HealthyYouth/hecat/

Centers for Disease Control and Prevention. (2012b). School health index: A self-assessment and planning guide. Retrieved from http://www.cdc.gov/healthyyouth/shi/

Cho, J., & Trent, A. (2006). Validity in qualitative research revisited. *Qualitative Research*, *6*(3), 319–340.

Collier, D. (2011). Increasing the value of physical education: The role of assessment. *Journal of Physical Education, Recreation & Dance*, *82*(7), 1–58.

Confrey, J. (2008). Framing effective and fair data use from high-stakes testing in its historical, legal, and technical context. In E. B. Mandinach, M. Honey, & M. C. Linn (Eds.), *Data driven school improvement: Linking data and learning* (pp. 33–51). New York : London: Teachers College Press.

Conkle, M. T. (1997). In-service programs: What do physical educators want? *Journal of Physical Education, Recreation and Dance*, *68*(8), 50–55.

Cox, A., & Williams, L. (2008). The roles of perceived teacher support, motivational climate, and psychological need satisfaction in students' physical education motivation. *Journal of Sport & Exercise Psychology*, *30*(2), 222–239.

Creighton, T. B. (2007). *Schools and data: The educator's guide for using data to improve decision making* (2nd ed.). Thousand Oaks, CA: Corwin Press.

Creswell, J. W. (2008). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (3rd ed.). Upper Saddle River, NJ: Pearson Education, Inc.

Creswell, J. W., & Miller, D. L. (2000). Determining validity in qualitative inquiry. *Theory into Practice*, *39*(3), 124–130.

Data Quality Campaign. (2012). Data quality campaign: Using data to improve student achievement. Retrieved October 18, 2012, from http://dataqualitycampaign.org/

Data Quality Campaign. (2014). Privacy security and confidentiality. Retrieved March 7, 2014, from http://dataqualitycampaign.org/action-issues/privacy-security-confidentiality/

Dauenhauer, B. D. (2012). Applying response to intervention in physical education. *Strategies: A Journal for Physical and Sport Educators*, *25*(5), 21–25.

Dauenhauer, B. D., Keating, X. D., & Lambdin, D. (2010, March). *Promoting physical activity and preventing obesity using response to intervention*. Presented at the American Alliance for Health, Physical Education, Recreation and Dance National Conference and Exposition, Indianapolis, IA.

Dauenhauer, B. D., Keating, X. D., & Lambdin, D. (2011, April). *A case for using response to intervention to address childhood obesity*. Presented at the American Educational Research Association, New Orleans, LA.

Dauenhauer, B., & Knipe, R. (2012, March). *Data-driven instruction within a response to intervention framework*. Presented at the American Alliance for Health, Physical Education, Recreation and Dance National Conference and Exposition, Boston, MA.

DerVanik, R. (2005). The use of PDAs to assess in physical education. *Journal of Physical Education, Recreation & Dance (JOPERD)*, *76*(6), 50–52.

Emerson, R. M., Fretz, R. I., & Shaw, L. L. (1995). *Writing ethnographic fieldnotes*. Chicago, IL: The University of Chicago Press.

Freedson, P. S., & Miller, K. (2000). Objective monitoring of physical activity using motion sensors and heart rate. *Research Quarterly for Exercise and Sport, 71*(2 Suppl), S21–29.

Gallo, A. M., Sheehy, D., Patton, K., & Griffin, L. (2006). Assessment benefits and barriers: What are you committed to? *Journal of Physical Education, Recreation & Dance (JOPERD), 77*(8), 46–50.

Gersten, R., Beckmann, S., Clarke, B., Foegen, A., Marsh, L., Star, J. R., & Witzel, B. (2009). *Assisting students struggling with mathematics: Response to intervention (RtI) for elementary and middle schools* (No. NCEE 2009-4060). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Educational Sciences, U.S. Department of Education. Retrieved from http://ies.ed.gov/ncee/wwc/PracticeGuide.aspx?sid=3

Gersten, R., Compton, D., Connor, C. M., Dimino, J., Santoro, L., Linan-Thompson, S., & Tilly, W. D. (2008). *Assisting students struggling with reading: Response to intervention (RtI) and multi-tier intervention in the primary grades. A practice guide* (No. NCEE 2009-4045). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Educational Sciences, U.S. Department of Education. Retrieved from http://ies.ed.gov/ncee/wwc/PracticeGuide.aspx?sid=3

Good, R. H., Gruba, J., & Kamninsky, R. A. (2001). Best practices in using dynamic indicators of basic literacy skills (DIBELS) in an outcome-driven model. In A. Thomas &

J. Grimes (Eds.), *Best Practices in School Psychology IV*. Washington, DC: National Association of School Psychologists.

Government Performance and Results Act (GPRA) of 1993 (1993). Retrieved from http://www.gpo.gov/fdsys/pkg/BILLS-103s20enr/pdf/BILLS-103s20enr.pdf

Graber, K. C. (2012). PE Metrics: Valid and reliable physical education assessments. *JOPERD: The Journal of Physical Education, Recreation & Dance*, *83*(5), 15–33.

Guba, E. G., & Lincoln, Y. S. (1998). Competing paradigms in qualitative research. In N. K. Denzin & Y. S. Lincoln (Eds.), *The landscape of qualitative research: Theories and issues* (pp. 195–220). Thousand Oaks, CA: Sage Publications.

Gubacs-Collins, K., & Juniu, S. (2009). The mobile gymnasium using tablet PCs in physical education. *JOPERD: The Journal of Physical Education, Recreation & Dance*, *80*(2), 24–31.

Hamilton, L., Halverson, R., Jackson, S., Mandinach, E. B., Supovitz, J., & Wayman, J. (2009). *Using student achievement data to support instructional decision making*. Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. Retrieved from ies.ed.gov/ncee/wwc/pdf/practice_guides/dddm_pg_092909.pdf

Hastie, P. A., & Saunders, J. E. (1991). Effects of class size and equipment availability on student involvement in physical education. *Journal of Experimental Education*, *59*(3), 212–24.

Hemphill, M. A., Richards, K. A., Templin, T. J., & Blankenship, B. T. (2012). A content analysis of qualitative research in the Journal of Teaching in physical Education from 1998 to 2008. *Journal of Teaching in Physical Education, 31*(3), 279–287.

Henninger, M. L., & Carlson, K. B. (2011). Strategies to increase the value of physical educators in k-12 schools. *Journal of Physical Education, Recreation & Dance, 82*(6), 1–58.

Herman, J. L., & Haertel, E. H. (Eds.). (2005). *Uses and misuses of data for educational accountability and improvement*. Hoboken, NJ: Wiley-Blackwell.

Hoerr, T. R. (2008). Data that count. *Educational Leadership,* 93–94.

Holt/Hale, S. A. (1999). *Assessing and improving fitness in elementary physical education*. Reston, VA: National Association for Sport and Physical Education.

Hopple, C. J. (2005). Managing the assessment process. In C. J. Hopple (Ed.), *Elementary Physical Education Teaching & Assessment: A Practical Guide* (2nd ed., pp. 23–39). Champaign, IL: Human Kinetics.

Hughes, C. A., & Dexter, D. D. (2011). Response to intervention: A research-based summary. *Theory Into Practice, 50*(1), 4–11. doi:10.1080/00405841.2011.534909

Hupert, N., Heinze, J., Gunn, G., & Stewart, J. (2008). Using technology-assisted progress monitoring to drive improved student outcomes. In E. B. Mandinach, M. Honey, & M. C. Linn (Eds.), *Data driven school improvement: Linking data and learning* (pp. 130–150). New York : London: Teachers College Press.

Ikemoto, G. S., & Marsh, J. A. (2007). Cutting through the "data-driven" mantra: Different conceptions of data-driven decision making. *Evidence and Decision Making: Yearbook of the National Society for the Study of Education*, *106*(1), 105–131.

Jacobs, J., Gregory, A., Hoppey, D., & Yendol-Hoppey, D. (2009). Data literacy: Understanding teachers' data use in a context of accountability and response to intervention. *Action in Teacher Education*, *31*(3), 41–55.

Keating, X. D., Lambdin, D., Harrison, L., & Dauenhauer, B. (2010). Changes in K-12 physical education programs from 2001 to 2006. *Research Quarterly for Exercise and Sport*, *81*(2), 180–188.

Kelly, L., & Melograno, V. (2004). *Developing the physical education curriculum: An achievement-based approach*. Champaign, IL: Human Kinetics.

King, S. P., & Amon, C. (2008). Assessment data: A tool for student and teacher growth. In E. B. Mandinach, M. Honey, & M. C. Linn (Eds.), *Data driven school improvement: Linking data and learning* (pp. 71–86). New York : London: Teachers College Press.

Kowalski, T., & Lasley, T. J. (2008). *Handbook of data-based decision making in education.* New York, NY: Routledge.

Kronholz, J. (2012). Teaching the teachers. *Education Next*, *12*(3), 8–15.

Lambdin, D. (1997). Computer organized physical education. *JOPERD–The Journal of Physical Education, Recreation & Dance*, *68*(1), 25–29.

Lambert, L. T. (1999). *Standards-based assessment of student learning: A comprehensive approach*. Reston, VA: National Association for Sport and Physical Education.

Light, D., Wexler, D., & Heinz, C. (2005). Keeping teachers in the center: A framework for data-driven decision-making. In *Society for Information Technology & Teacher Education International Conference* (Vol. 2005, p. 128-133). Retrieved from http://www.editlib.org/p/18964/

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage Publications Ltd.

Long, L., Rivas, L. M., Light, D., & Mandinach, E. B. (2008). The evolution of a homegrown data warehouse: TUSDstats. In E. B. Mandinach, M. Honey, & M. C. Linn (Eds.), *Data-driven school improvement: Linking data and learning* (pp. 209–232). New York : London: Teachers College Press.

Love, N., Stiles, K. E., Mundry, S., & DiRanna, K. (2008). *The data coach's guide to improving learning for all students: Unleashing the power of collaborative inquiry*. Corwin Press.

Lund, J. L., & Kirk, M. F. (2002). *Performance-based assessment for middle and high school physical education*. Champaign, IL: Human.

Lund, J., & Tannehill, D. (2005). *Standards-based physical education curriculum development* (1st ed.). Boston, MA: Jones & Bartlett Publishers.

Mandinach, E. B. (2012). A perfect time for data use: Using data-driven decision making to inform practice. *Educational Psychologist*, *47*(2), 71–85. doi:10.1080/00461520.2012.667064

Mandinach, E. B., & Gummer, E. S. (2013). A systemic view of implementing data literacy in educator preparation. *Educational Researcher*, *42*(1), 30–37. doi:10.3102/0013189X12459803

Mandinach, E. B., Honey, M., & Light, D. (2006). A theoretical framework for data-driven decision making. In *EDC Center for Children and Technology, paper presented at the Annual Meeting of the American Educational Researchers Association (AERA), San Francisco, Calif*. Retrieved from http://www.cct.edc.org/admin/publications/speeches/DataFrame_AERA06.pdf

Mandinach, E. B., Honey, M., Light, D., & Brunner, C. (2008). A conceptual framework for data-driven decision making. In E. B. Mandinach, M. Honey, & M. C. Linn (Eds.), *Data driven school improvement: Linking data and learning* (pp. 13–31). New York : London: Teachers College Press.

Mandinach, E. B., Honey, M., & Linn, M. C. (Eds.). (2008). *Data-driven school improvement: Linking data and learning*. New York : London: Teachers College Press.

Mandinach, E. B., & Jackson, S. S. (2012). *Transforming teaching and learning through data-driven decision making*. Thousand Oaks, CA: Corwin Press.

Marsh, J. A., McCombs, J. S., & Martorell, F. (2010). How instructional coaches support data-driven decision making policy implementation and effects in Florida middle schools. *Educational Policy*, *24*(6), 872–907. doi:10.1177/0895904809341467

Marsh, J. A., Pane, J. F., & Hamilton, L. S. (2006). *Making sense of data-driven decision making in education*. RAND Corporation. Retrieved from http://www.rand.org/pubs/occasional_papers/2006/RAND_OP170.pdf

Marshall, C., & Rossman, G. B. (2011). *Designing qualitative research* (5th ed.). Thousand Oaks, CA: Sage Publications Ltd.

Martin, S. B., Ede, A., Morrow, J. R., Jr., & Jackson, A. W. (2010). Statewide physical fitness testing: Perspectives from the gym. *Research Quarterly for Exercise and Sport, 81*, s31–s41.

Maxwell, J. A. (1996). *Qualitative research design: An interactive approach*. Thousand Oaks, CA: Sage Publications.

McCaughtry, N., Oliver, K. L., Dillon, S. R., & Martin, J. J. (2008). Teachers perspectives on the use of pedometers as instructional technology in physical education: A cautionary tale. *Journal of Teaching in Physical Education*, *27*(1), 83–99.

McKenna, M. K., & Millen, J. (2013). Look! Listen! Learn! Parent narratives and grounded theory models of parent voice, presence, and engagement in K-12 education. *School Community Journal*, *23*(1), 9–48.

McKenzie, T. (2007). The preparation of physical educators: A public health perspective. *Quest*, *59*, 346–357.

McMurray, R. G., Ring, K. B., Treuth, M. S., Welk, G. J., Pate, R. R., Schmitz, K. H., … Sallis, J. F. (2004). Comparison of two approaches to structured physical activity surveys

for adolescents. *Medicine & Science in Sports & Exercise December 2004*, *36*(12), 2135–2143.

McNamara, E., Hudson, Z., & Taylor, S. J. C. (2010). Measuring activity levels of young people: the validity of pedometers. *British Medical Bulletin*, *95*(1), 121–137. doi:10.1093/bmb/ldq016

Means, B., Padilla, C., DeBarger, A., & Bakia, M. (2009). *Implementing data-informed decision making in schools: Teacher access, supports, and use*. U.S. Department of Education, Office of Planning, Evaluation and Policy Development. Retrieved from http://www.dataqualitycampaign.org/resources/details/500

Means, B., Padilla, C., & Gallagher, L. (2010). *Use of education data at the local level: From accountability to instructional improvement*. U.S. Department of Education, Office of Planning, Evaluation and Policy Development. Retrieved from http://www.dataqualitycampaign.org/resources/details/500

Mears, D. (2010). Physical activity monitoring: Gadgets and uses. *Strategies: A Journal for Physical and Sport Educators*, *23*(3), 28–31.

Melograno, V. J. (1997). Integrating assessment into physical education teaching. *JOPERD–The Journal of Physical Education, Recreation & Dance*, *68*(7), 34–37.

Melograno, V. J. (2000). *Portfolio assessment for K-12 physical education*. Reston, VA: National Association for Sport and Physical Education.

Mertens, D. M. (2010). *Research and evaluation in education and psychology* (3rd ed.). Thousand Oaks, CA: Sage Publications Ltd.

Metzler, M. W., & Blankenship, B. T. (2008). Taking the next step: Connecting teacher education, research on teaching, and program assessment. *Teaching and Teacher Education*, *24*(4), 1098–1111. doi:10.1016/j.tate.2007.02.014

Metzler, M. W., & Tjeerdsma, B. L. (1998). PETE program assessment within a development, research, and improvement framework. *Journal of Teaching in Physical Education*, *17*(4), 468–492.

Metzler, M. W., & Tjeerdsma, B. L. (2000). The physical education teacher education assessment project. *Journal of Teaching in Physical Education*, *19*(4). Retrieved from http://journals.humankinetics.com/jtpe-back-issues/jtpevolume19issue4july

Mohnsen, B., & Mauch, L. (1998). Physical education assessment using handheld and Palm computers. *Teaching Elementary Physical Education*, *9*(6), 24–26.

Moody, L., & Dede, C. (2008). Models of data-based decision making: A case study of the Milwaukee public schools. In E. B. Mandinach, M. Honey, & M. C. Linn (Eds.), *Data-driven school improvement: Linking data and learning* (pp. 233–254). New York : London: Teachers College Press.

Morrow, J. R., Martin, S. B., & Jackson, A. W. (2010). Reliability and validity of the FITNESSGRAM: Quality of teacher-collected health-related fitness surveillance data. *Research Quarterly for Exercise and Sport*, *81*(3), S24–S30.

Mosier, B. (2012). FITNESSGRAM administration: Tips for educators. *Strategies: A Journal for Physical and Sport Educators*, *25*(8-), 6–7.

Murnane, R. J., Sharkey, N. S., & Boudett, K. P. (2005). Using student-assessment results to improve instruction: Lessons from a workshop. *Journal of Education for Students Placed at Risk (JESPAR), 10*(3), 269–280. doi:10.1207/s15327671espr1003_3

National Association for Sport and Physical Education. (1992). *Outcomes of quality physical education programs*. Reston, VA: Author.

National Association for Sport and Physical Education. (1995). *Moving into the future: National standards for physical education: A guide to content and assessment*. Reston, VA: McGraw-Hill.

National Association for Sport and Physical Education. (2000). *2000 shape of the nation report: Status of physical education in the USA*. Reston, VA: Author. Retrieved from http://www.aahperd.org/naspe/publications/Shapeofthenation.cfm?cid=00007

National Association for Sport and Physical Education. (2004). *Moving into the future: National standards for physical education* (2nd ed.). Reston, VA: McGraw-Hill.

National Association for Sport and Physical Education. (2006a). *2006 shape of the nation report: Status of physical education in the USA*. Reston, VA: Author. Retrieved from http://www.aahperd.org/naspe/publications/Shapeofthenation.cfm?cid=00007

National Association for Sport and Physical Education. (2006b). *Teaching large class sizes in physical education guidelines and strategies* (Guidance document). Retrieved from http://www.aahperd.org/naspe/publications/teachingTools/upload/Teaching-Large-Class-Sizes-in-PE-2006.pdf

National Association for Sport and Physical Education. (2007a). *Physical education teacher evaluation tool* (Guidance document). Reston, VA: Author.

National Association for Sport and Physical Education, & Education, P. (2007b). *What constitutes a highly qualified physical education teacher* (Policy statement). Reston, VA: Author.

National Association for Sport and Physical Education. (2008a). *Advanced standards for physical education teacher education* (Guidance document). Reston, VA: Author.

National Association for Sport and Physical Education. (2008b). *National standards for initial physical education teacher education* (Guidance document). Reston, VA: Author.

National Association for Sport and Physical Education. (2009). *Appropriate instructional practice guidelines* (Guidance document). Reston, VA: Author. Retrieved from http://www.aahperd.org/naspe/standards/nationalguidelines/upload/appropriate-practices-grid.pdf

National Association for Sport and Physical Education. (2010a). *2010 shape of the nation report: Status of physical education in the USA*. Reston, VA: Author. Retrieved from http://www.aahperd.org/naspe/publications/Shapeofthenation.cfm?cid=00007

National Association for Sport and Physical Education. (2010b). *Opportunity to learn guidelines* (Guidance document). Reston, VA: Author. Retrieved from http://www.aahperd.org/naspe/standards/nationalGuidelines/upload/Opportunity-to-Learn-Grid-June-2010.pdf

National Association for Sport and Physical Education. (2010c). *PE-metrics: Assessing national standards 1-6 in elementary school*. Reston, VA: Author.

National Association for Sport and Physical Education. (2011). *PE-metrics: Assessing national standards 1-6 in secondary school*. Reston, VA: Author.

National Association for Sport and Physical Education. (2012). *2012 shape of the nation report: Status of physical education in the USA*. Reston, VA: Author. Retrieved from http://www.aahperd.org/naspe/publications/Shapeofthenation.cfm?cid=00007

National Commission on Excellence in Education (NCEE). (1983). *A nation at risk: The imperative for educational reform*. Retrieved from http://datacenter.spps.org/uploads/SOTW_A_Nation_at_Risk_1983.pdf

No Child Left Behind Act (NCLB) of 2001. , Pub. L. No. 107-110 § 115 (2002). Retrieved from http://www2.ed.gov/policy/elsec/leg/esea02/index.html

Nye, S. B. (2010). Tablet PCs: A physical educator's new clipboard. *Strategies: A Journal for Physical and Sport Educators*, *23*(4), 21–23.

Pate, R. R., Ross, R., Dowda, M., Trost, S. G., & Strard, J. R. (2003). Validation of a 3-day physical activity recall instrument in female youth. *Pediatric Exercise Science*, *15*(3), 257.

Patton, K., & Griffin, L. L. (2008). Experiences and patterns of change in a physical education teacher development project. *Journal of Teaching in Physical Education*, *27*(3), 272–291.

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

Petray, C. K. (1989). Organizing physical fitness assessment (grades K-2). Strategies for the elementary physical education specialist. *Journal of Physical Education, Recreation and Dance*, *60*(6), 57–60.

Picciano, A. G. (2006). *Data-driven decision making for effective school leadership*. Upper Saddle River, NJ: Pearson Merrill Prentice Hall.

Reed, J. A., Beighle, A., Phillips, D. A., & Pangrazi, R. P. (2007). Promoting lifelong physical activity in physical education: What should physical educators be accountable for in the 21st century? *ICHPER – SD Journal*, *43*(3), 5–9.

Rink, J., Jones, L., Kirby, K., Mitchell, M., & Doutis, P. (2007). Teacher perceptions of a physical education statewide assessment program. *Research Quarterly for Exercise and Sport*, *78*(3), 204–215. doi:10.5641/193250307X13082490460986

Rink, J., & Mitchell, M. (2002). High stakes assessment: A journey into unknown territory. *Quest*, *54*(3), 205–223.

Rink, J., & Mitchell, M. (2003). State level assessment in physical education: The South Carolina experience. *Journal of Teaching in Physical Education*, *22*(5), 471–472.

Rittner-Heir, R. M. (1999). What's coach doing with that computer? *School Planning and Management*, *38*(11), 44–46.

Ronka, D., Lachat, M. A., Slaughter, R., & Meltzer, J. (2008). Answering the questions that count. *Educational Leadership*, *66*(4), 18–24.

Rubin, H. J., & Rubin, I. S. (2005). *Qualitative interviewing: The art of hearing data* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Sallis, J. F., & McKenzie, T. L. (1991). Physical education's role in public health. *Research Quarterly for Exercise and Sport, 62*(2), 124–137.

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*(2), 125–135.

Scherer, M. (Ed.). (2008). Data: Now what? [Special Issue]. *Educational Leadership, 66*(4).

Schiemer, S. (1996). Efficient and effective assessment techniques. *Journal of Physical Education, Recreation and Dance, 67*(9-), 26–28.

Schmoker, M. (2008). Measuring what matters. *Educational Leadership, 66*(4), 70–74.

Skala, K. A., Springer, A. E., Sharma, S. V., Hoelscher, D. M., & Kelder, S. H. (2012). Environmental characteristics and student physical activity in PE class: Findings from two large urban areas of Texas. *Journal of Physical Activity & Health, 9*(4), 481–491.

Steele, J. L., & Boudett, K. P. (2008). The collaborative advantage. *Educational Leadership, 66*(4), 54–59.

Stephens, T. L., Silliman-French, L., Kinnison, L., & French, R. (2010). Implementation of a response-to-intervention system in general physical education. *Journal of Physical Education, Recreation & Dance (JOPERD), 81*(9-), 47–53.

Strauss, A., & Corbin, J. (1998). *Basics of qualitative research* (2nd ed.). Thousand Oaks, CA: Sage Publications Ltd.

Trost, S. G. (2004). School physical education in the post-report era: An analysis from public health. *Journal of Teaching in Physical Education, 23*(4), 318–337.

Trost, S. G. (2006). Public health and physical education. In D. Kirk, D. Macdonald, & M. O'Sullivan (Eds.), *The handbook of physical education* (pp. 163–188). London: Sage Publications Ltd.

U. S. Department of Education. (2009). Race to the Top. Retrieved from http://www2.ed.gov/programs/racetothetop/executive-summary.pdf

U. S. Department of Education. (2012). Carol M. White Physical Education Program. Retrieved from http://www2.ed.gov/programs/whitephysed/index.html

Wayman, J. C. (Ed.). (2005a). Data-use beyond accountability [Special issue]. *Journal of Education for Students Placed at Risk (JESPAR), 10*(3). doi:10.1207/s15327671espr1003_1

Wayman, J. C. (2005b). Involving teachers in data-driven decision making: Using computer data systems to support teacher inquiry and reflection. *Journal of Education for Students Placed at Risk (JESPAR), 10*(3), 295–308. doi:10.1207/s15327671espr1003_1

Wayman, J. C., Conoly, K., Gasko, J., & Stringfield, S. (2008). Supporting equity inquiry with student data computer systems. In E. B. Mandinach, M. Honey, & M. C. Linn (Eds.), *Data driven school improvement: Linking data and learning* (pp. 171–190). New York : London: Teachers College Press.

Wayman, J. C., & Stringfield, S. (2006). Technology-supported involvement of entire faculties in examination of student data for instructional improvement. *American Journal of Education, 112*(4), 549–571.

Wayman, J. C., Stringfield, S., & Yakimowski, M. (2004). *Software enabling school improvement through analysis of student data* (No. 67). Johns Hopkins University: Center for Research on the Education of Students Placed At Risk (CRESPAR). Retrieved from http://www.csos.jhu.edu/CRESPAR/techReports/report67.pdf

Wechsler, H., McKeena, M. L., Lee, S. M., & Dietz, W. H. (2004). The role of schools in preventing childhood obesity. *The State Education Standard*, 4–12.

Wegis, H., & van der Mars, H. (2006). Integrating assessment and instruction: Easing the process with PDAs. *Journal of Physical Education, Recreation & Dance (JOPERD), 77*(1), 27–34,.

Yarbrough, D. B., Shulha, L. M., Hopson, R. K., & Caruthers, F. A. (2011). *The program evaluation standards: a guide for evaluators and evaluation users*. Thousand Oaks, Calif.: SAGE.

Yin, R. K. (2009). *Case study research: Design and methods* (4th ed.). Thousand Oaks, CA: Sage Publications.

Zhu, W., Rink, J., Placek, J. H., Graber, K. C., Fox, C., Fisette, J. L., … Raynes, D. (2011). PE Metrics: background, testing theory, and methods. *Measurement in Physical Education & Exercise Science, 15*(2), 87–99.

Zullig, K. J., Pun, S., Patton, J. M., & Ubbes, V. A. (2006). Reliability of the 2005 middle school Youth Risk Behavior Survey. *Journal of Adolescent Health, 39*(6), 856–860. doi:10.1016/j.jadohealth.2006.07.008