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Elementary Physical Education Teachers' Content Knowledge and Pedagogical Content Knowledge Of Overhand Throwing

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ELEMENTARY PHYSICAL EDUCATION TEACHERS' CONTENT KNOWLEDGE

AND PEDAGOGICAL CONTENT KNOWLEDGE OF OVERHAND THROWING

by

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ABSTRACT

ELEMENTARY PHYSICAL EDUCATION TEACHERS' CONTENT KNOWLEDGE AND PEDAGOGICAL CONTENT KNOWLEDGE OF OVERHAND THROWING

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Old Dominion University, 2016
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The complexity of physical education instruction provides unique challenges for the physical education teacher. In this research, I sought to describe and examine the types of knowledge that physical education teachers use to inform their instructional practices. I also explored the relation between teaching experience and components of content knowledge and pedagogical content knowledge in overhand throwing. Specifically, what are the task representations, common content knowledge, and specialized content knowledge during an overhand throwing unit of novice, beginning, and accomplished elementary teachers? A naturalistic, qualitative approach involving three elementary physical education teachers examined the elements that they used in the instruction of overhand throwing. Data collection included field notes, semi-structured and long interview, a qualitative measure of teaching performance scale, a common content knowledge assessment, time based summary sheet, task representation coding sheet, and curricular and lesson plan information. Results indicated that longer teaching or sport experience did not confer a higher level of content knowledge or pedagogical knowledge. The scores on a common content knowledge overhand throwing assessment supported, or aligned with many of the components that made up the participants' pedagogical content knowledge. Having curricular knowledge and access to a quality curriculum, and quality task representation was critical to the appropriateness and maturity of the instructional practices. This research adds to the body of work of pedagogical content

knowledge in the field of physical education and in other educational disciplines. The findings

alluded to opportunities for future research of pedagogical content knowledge in physical

education.

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CHAPTER I

INTRODUCTION

Numerous funding cuts and the increased prevalence of standardized, high stakes testing have led to a reduction in allotted physical education time (Collier, 2011). Physical education as a profession has also struggled in its ability to align with a common focus for physical education teacher education (PETE), which has impacted the readiness of physical education teachers entering the profession (Siedentop, 2002). Sicilia-Camacho and Brown (2008) contend that over the past two decades the content of physical education, rather than the teaching methods, is the focus of pedagogical practices. The prolonged antiquation of physical education pedagogical practices is important to identify. For example, the use of exercise in physical education as a form of either punishment or "remediation" was, and in some cases still is, a part of physical education programs (Robinson & Gleddie, 2011). Robinson and Gleddie (2011) indicate that other inappropriate pedagogical practices are still being perpetuated. In the K-12 setting they include: poor managerial planning (limits activity time for students), ineffective use of resources (students waiting for equipment or waiting in lines), and improper or incomplete demonstrations. In the secondary setting it includes the social stigmatization of student captains picking teams. Enright and O'Sullivan (2013) stated:

> …critical pedagogy understands that in order to survive, disciplines had to embrace particular features and structures at specific historical points in their development. Often such dimensions live on in new epochs of disciplinary history, serving no pragmatic purpose other than to fulfil [*sic*] the demands of unconscious tradition. (p. 217)

In other words, other disciplines undergo various restructuring and revising that provide opportunities to "shed" some traditions that no longer fit educational visions. Yet historically, physical education is not privy to such revision. Crum (2001) examined the physical education

field and stated, "there is no one generally accepted concept of physical education, by consequence, there is no one sport pedagogy paradigm either" (p. 188). This argument is certainly contentious, but the historical context of physical education provides support for a lack of consensus, which in part leads to the marginalization of physical education (Collier, 2011). One of the first texts for physical education was published in 1886, *Physical Culture: First Book of Exercises in Drill, Calisthenics, and Gymnastics*. Houghton (1891) described the text as "a practical textbook embracing nearly all the elementary exercises required to make physical education efficient, interesting and popular" (p. 1). At the time, games were played at recess to help children "alleviate" their excess energy, and German and Swedish gymnastics and calisthenics became the prevalent activities in physical education. One of the earliest physical education curriculum guides was published in 1909 to help guide this initial form of physical education. However, only 3 of 150 pages were dedicated toward games (Singleton, 2010). This previous de-emphasis toward games is different from the current physical education instruction (Kulinna, 2008). Games are used more frequently today to incorporate motor and sport skill acquisition in a fun environment.

One of the earliest attempts at defining the boundaries of health and physical education come from *Chapter VI: Health and Physical Education* (1935). The document stated that both health and physical education had areas in common with trends toward a more constructive and adequate program for "all" students. This literature is one of the earliest to identify a pedagogical focus that supports the instruction of all students. Research on effective pedagogy methods in physical education continued routinely until the late 1960s when British teachers brought to the United States a different notion of physical education. The concept of movement education (self-exploration and self-discovery) was unknown to most United States teachers

(Singleton, 2010). This new approach to physical education instruction ushered in motor learning researchers who developed various studies in laboratory settings to determine the best way to facilitate motor skill acquisition (Lee & Solomon, 2005; Singleton, 2010). However, the teaching, dissemination, and learning of motor skills are interdependent on many factors and cannot be copied and pasted from a laboratory setting to varying types of physical education settings (Lee & Solomon, 2005). Many researchers lacked a conceptual framework to help guide them in their research while attempting to transfer laboratory research in physical education pedagogy.

Researchers have long conducted studies within the field of physical education regarding curriculum and instructional practices in both elementary and secondary settings (e.g., Goellner, 1956; Goldberger, 1991; Kelsey, 1961). Historically, the concept of a multi-activity model has dominated secondary physical education settings since the 1920s (Siedentop, 2007). The characteristics of the multi-activity model are typically short sport or motor skill units that provide only a cursory level of knowledge and motor skill practice. The multi-activity model does not provide time to develop higher order knowledge of rules, skill acquisition, team cohesiveness, and tactics and strategies. Critics of the multi-activity model cite an inability to engage all learners, lack of a deeper understanding of the unit, and a lack of diversity regarding units taught (Kulinna, 2008; Siendetop, 2007).

More recent challenges facing physical education pedagogical research result from a series of complex cultural and social environments of schools and communities (Rovegno, 2008). Specifically, Rovegno identified several challenges of the physical education profession including how to improve the quality of physical education teachers and physical education, and how to address unjust opportunities to participate in physical education. Indeed, these challenges

have only increased in society as social, cultural, and technological changes continue to shape and define the future of the United States. Discussion of societal changes cannot be complete without identifying the overweight and obesity epidemic in the United States. According to Haemer et al. (2011), obesity rates of children of all ages are dramatically higher than a generation ago with more than 23 million children in the United States either overweight or obese. This national issue would support a revisiting of the physical education cuts and marginalization. Cuban (1992) spoke to the notion of "when society has an itch, the school scratches" (p. 216). For example, the need for specific career jobs (STEM) ushered in an increased focus on STEM. The changes in minutes per week for subject areas since No Child Left Behind (NCLB) do not appear to support this same concept. The average physical education minutes per week in elementary schools has dropped 40 minutes since NCLB (Rovegno, 2008). The previous challenges discussed along with reduced physical education class make the available physical education time even more valuable. The challenge of physical education pedagogy researchers is to identify the optimal way to teach the components of physical education while also providing validation to those outside the field.

The focus of physical education instruction and curriculum is different across the K-12 continuum. Physical education teachers with stronger coaching aspirations tend to gravitate toward secondary and high school settings, whereas those who desire teaching fundamental motor skills more than coaching high performing athletes tend to seek primary physical education positions. Kulinna and Silverman (2000) provide support for differences in focus and instruction of elementary and secondary physical education teachers. Their research concluded that elementary physical education teachers placed a higher value on developing motor and social skills than secondary physical education teachers who valued physical activity and fitness

more. From a general physical education curriculum perspective, motor and sport specific skills are practiced in the elementary setting much more frequently than secondary settings. However, most do so without an actual sport focus. For example, dribbling, passing, and shooting a soccer ball would be practiced quite often through the elementary setting, but the application or use of more formal soccer games would not occur until middle school or even high school.

The unfortunate fact is some elementary students fail to develop a strong background in fundamental movement, motor, and sport skills that can later be refined and applied in a secondary setting. For elementary students, the activity patterns they develop typically carry into adulthood (Janz, Dawson, & Mahoney, 2000). Social status and self-esteem can also be affected as physical competence correlates with a higher status in peers, and social value that is acquired through sporting activities increases with age (Wigfield & Eccles, 1992). Hence, if the foundational movement and motor skills are not acquired in the elementary setting, students may experience lower self-esteem and a lack of positive physical activity habits as they move into secondary education.

Content knowledge (CK), pedagogical knowledge (PK), and pedagogical content knowledge (PCK) are essential for effective instruction. CK, PK, and PCK were introduced many years ago by Shulman (1986). Since this time, the definitions of CK, PK, and PCK have been explored and sometimes vary as a function of the researcher using them. CK, PK, and PCK are addressed in more detail in chapter two. More recently, Ball, Thames, and Phelps (2008) identified CK as either common content knowledge (CCK) or specialized content knowledge (SCK). From a teaching perspective, CCK is characterized by the knowledge of content directly related to what is being taught. For example, the CCK to teach gymnastics would be different when compared to teaching lacrosse. SCK is defined as the knowledge one would need to teach

gymnastics or lacrosse. The importance of CK is not exclusive to physical education. The work by Ball et al. (2008) focused on ways to define and improve the CK needed to teach mathematics. Current research from the physical education field also supports the importance of CK. Ward, Kim, Ko, and Li (2015) examined the effects of improving physical education teachers' CK on teaching and student learning. Results indicated that as physical education teachers CK improved, teachers' PCK changed from immature to mature and students' correct trials increased in badminton. The relationship among CK, PCK, and student achievement was also investigated by Ayvazo and Ward (2011). Results indicated that experienced physical education teachers that taught weaker units demonstrated lower PCK when compared to teaching units where they had higher CK.

For these reasons, the content knowledge of physical education teachers would prove valuable for current and pre-service physical education teachers. Additional support and knowledge of the best ways to educate physical education students, namely PCK, are also needed to improve physical education pedagogy. This research sought to describe the CK, SCK, and PCK among novice, beginning, and accomplished elementary physical education teachers.

PROBLEM STATEMENT

Within physical education there has been an ongoing struggle against historically deficient curricula, teaching practices, and pedagogical studies (Richardson, 2011). One might argue that an unfortunate savior for the reconceptualization of physical education is the obesity epidemic. Regardless, the physical education profession must provide evidence to stakeholders that physical education teachers are capable of teaching students' knowledge, skills, and benefits of lifelong health and activity behaviors. This necessary reconceptualization lends support for research to define the qualities of novice, beginning, and accomplished elementary physical

education teachers. This research defined the term novice as someone who has 0-1 years of experience teaching physical education. The term beginning is defined by someone who has 2-4 years' experience teaching physical education. The term "accomplished" is defined as any physical education teacher nominated for or recognized by their peers for superior teaching performance and service. Examples would include teacher of the year nominees and awardees, previous American Alliance for Health, Physical Education, Recreation, and Dance (AAHPERD) Teachers of the Year, or most recently the Society of Health And Physical Education (SHAPE), and/or national master teacher awardees.

Early PCK research by Graber (1995) sought to identify the influence of teacher education programs on various components. Results indicated that pre-service physical education teachers have a difficult time incorporating PCK during student teaching. Specifically, the student teachers were not able to describe the best ways for teaching different physical education subject matter. Additional research by Chen and Ennis (1995) found secondary physical education teachers had similar subject CK but different PCK. It is suggested that secondary physical education teachers PCK is personally constructed and reflects individual differences.

Rovengo, Chen, and Todorovich (2003) conducted one of the first PCK studies of accomplished physical education teachers. The researchers examined PCK of accomplished physical education teachers to investigate third grade dribbling utilizing videotaped lessons to develop themes shared by the participants. One theme—teaching the cognitive processes—lends support for CK in its role within PCK. In the field of science, Abell (2008) stated that knowledge of subject matter is central to PCK, providing further evidence for the role of CK in PCK. In mathematics, Krauss, Baumert, and Blum (2008) found a positive relationship between

CK and PCK, which in some cases were independent of years of teaching experience. In other words, strong CK positively influences PCK by providing practical classroom experience in the university setting.

It appears much of the recent PCK research in the field of physical education is being produced at The Ohio State University with four recent studies. The first study examined the extent to which physical education teacher education programs teach either CCK or SCK (Ward, Li, Kim, & Lee, 2012). Results indicated that all of the South Korean physical education teacher education programs focused on CCK while 88% of the physical education teacher education programs in Ohio focused on CCK. The second study determined the validity of a basketball content knowledge test as a function of playing, coaching, and teaching experience (Li et al., 2013). Basketball CK varied by gender and league playing experience. Males and those with more playing experience scored higher on rules and etiquette, techniques and tactics, and detecting student errors. The third study examined the effect of a badminton content knowledge workshop on physical education teachers PCK (Ko, Kim, Ward, & Li, 2013). Results indicated that the SCK elements of maturity of the task and appropriateness of the task improved when physical education teachers improved their CCK during a badminton content knowledge workshop. The fourth study examined the effect of a CCK workshop on middle school soccer PCK. After the experimental group took a soccer CK workshop, they demonstrated greater PCK by using more mature and appropriate task representations (Lee, 2011). The final and most recent research by Ward et al. (2015) examined the changes in student learning and physical education teachers' PCK after improving their CK. In summary, it appears that a physical education teacher's knowledge of context and their students interact with their CCK and SCK to form their PCK (Ward, Ayazo, & Lehwald, 2014).

Although some researchers have operationally defined the components of physical education PCK for their study (see Lee, 2011), there is currently no consensus on the components of physical education PCK. This leads to difficulty when attempting to compare and analyze the findings between different studies evaluating PCK (Lee, 2011). You (2011) stated that research in physical education PCK is lacking in both quantity and diversity. Within the physical education discipline there is little knowledge about what physical education PCK is, and how the characteristics differ as a function of changing foci, students, and context.

When the literature on physical education PCK is taken as a whole, it appears evident that previous studies lack a consistent model of what PCK means within specific instructional content. Further, PCK is dependent on many factors within the physical education discipline that are unique to one another (e.g. archery versus gymnastics) and require a different PCK base. Future research on ways in which novice, beginning, and accomplished physical educators instruct their students would provide useful information for in-service physical education teachers, current physical education teachers, and physical education teacher education programs.

The purpose of this study was to describe novice, beginning, and accomplished elementary physical education teachers' CCK, SCK, and PCK during an overhand throwing unit. To provide contrast to the accomplished physical education teacher, one novice (first year teacher) and one beginning (2-4 years' experience) physical education teacher were included to increase the validity of the findings. Ward (2013) identified PCK as content and context specific, therefore various motor skills and sports skills will require different and unique PCK. Recent research on PCK identified studies on soccer (Lee, 2011), badminton (Ko, Kim, Ward, & Li, 2013), and ball game instruction (Creasy et al., 2012) demonstrating the specificity needed to

adequately assess PCK. The overhand throw was chosen because prior research was limited when examining PCK and overhand throwing, and the task of overhand throwing requires CCK and SCK to adequately teach the motor skill.

The overhand throw is a fundamental skill and important to a variety of sports (e.g., baseball, softball, football, and team handball). Three research questions sought to describe various components of PCK of overhand throwing:

1. What are the task representations of novice, beginning, and accomplished physical education teachers that guide instructional practice during an overhand throwing unit?

2. What is the CCK of overhand throwing for novice, beginning, and accomplished elementary physical education teachers?

3. What forms of SCK during overhand throwing instruction do novice, beginning, and accomplished elementary physical education teachers demonstrate?

Due to the various types of data collected methods, some sources provided qualitative data that was also able to be represented with a quantitative component. Multiple sources of data were collected to improve data triangulation. This research also spoke to the PCK of the participants as a byproduct of the data collected and analyzed. In other words, the CK and SCK of a teacher are integral components in their PCK. The use of field notes, open ended CCK assessment questions, and informal discussions and interviews all provided data in support of PCK assessment.

This research sought to provide ample data and analysis of the task representations, CK, and SCK of the participants. Multiple types and sources of data were used in a context rich qualitative investigation. The transferability of this research is framed by the content and context of the overhand throwing unit of the three participants. An obvious limitation to this research

was the small sample size. The following list of terms may prove useful to provide clarity

throughout this research.

DEFINITIONS	
Term/Concept	**Definition**
Content Knowledge (CK):	The knowledge one has for a specific discipline or topic. In physical education, it is the knowledge of motor skills, movement skills, sport specific skills, and the technical and tactical strategies.
Common Content Knowledge (CCK):	Physical education CCK is knowledge a teacher would need to instruct the movement or skill and the rules, tactics, etiquette, and safety considerations required when teaching said skill.
Specialized Content knowledge (SCK):	SCK is the ability to differentiate tasks and sequencing for different learning environments while providing developmentally appropriate learning situations (Ward, 2009a).
Pedagogical Knowledge (PK):	The definition of PK is the various instructional components or principles coming together, mitigated by the relational qualities of these interactions.
Curriculum Knowledge (CK):	This knowledge represents the teacher's knowledge of the available programs and curricular choices, as well as all of the materials available for instruction.
Pedagogical Content Knowledge (PCK):	Shulman (1987) defined PCK as "that special amalgam of content and pedagogy that is uniquely the province of teachers, their own special form of professional understanding" (p. 8).
Task Representations (TR):	The quality and sophistication of how a task (overhand throwing, free throw shot, etc.) is taught would be considered task representation (Lee, 2011).
Mature TR:	The task given is clear, utilizing descriptions, analogies, demonstrations, and metaphors when appropriate.
Immature TR:	The task is unclear in its description, and uses few descriptions, analogies, demonstrations, and metaphors.
Appropriate TR:	The task is developmentally appropriate, and meets the needs of the specific content and context of the instruction.
Inappropriate TR:	The task is not developmentally appropriate, and may or may not meet the needs of the specific content and context of the instruction.

SUMMARY

This chapter provided a brief historical perspective on physical education instruction, and situates CK, SCK, and PCK research as it relates to physical education. The following chapter first seeks to explore the various components associated with PCK. CK is broken down into CCK and SCK. CCK is the basic knowledge one needs to teach. For example, the CK of mathematics is important for successful math teachers to possess. SCK is needed to differentiate tasks and sequences for various learning contexts (Ward, 2009a). Both CCK and SCK are unique to the content taught.

One of the earliest components of PCK set forth by Shulman (1986) is curricular knowledge. The challenges associated with having a large number of physical education curricular models are discussed. Teacher expertise is not identified as a component of PCK, and defining teacher expertise is a challenging concept (Berlinger, 1986). But the role of experience in developing expertise in teaching has been conservatively estimated as 5-7 years (Berlinder, 2000).

PCK research in physical education is not a novel concept (Housner, 1992). However, several factors have limited the applicability of physical education PCK research (e.g. lack of operationally defined components of PCK, different content, and the nature of a fluid, ever-changing context). The various components of PCK tend to interact, overlap, and vary in importance based upon the instructional environment. In closing, there appears to be many opportunities left to close the research gap on PCK research and application in the physical education field.

CHAPTER II
LITERATURE REVIEW

The purpose of this chapter is to explore the various components of PCK in detail.

Shulman (1986) first identified and described the elements of PCK. Since this time, seminal

work by Grossman (1990), Lee (2011), and Ward (2013) have described the components of PCK

in slightly different ways. Through the literature review, I hope to identify the contextual pieces

that make up PCK and provide examples of the contentious relationships that PCK components

have on one another. This chapter begins with the definitions of PCK components and related

terms. The second section describes the various elements that constitute PCK. The third section

describes the factors associated with expertise in physical education teachers. The fourth section

examines the previous research and challenges associated with the examination of PCK.

The content and context of PCK is important to consider. Content specificity refers to a

particular activity chosen by the teacher; for example, creating 4 on 4 soccer games as part of a

fifth grade kicking unit. Context specificity refers to utilizing appropriate space and equipment

during instruction. Using the 4 on 4 soccer game described previously, the appropriateness of

the soccer field size and how the equipment is set up would be an example of context specificity.

In addition, the amount of students in class would also determine space and equipment concerns.

Finally, the phrase "overhand throwing unit" is used to describe elementary physical education

throwing instruction and mechanics used when throwing spherical (foam balls, tennis balls, etc.)

and non-spherical (bean bags) objects.

ELEMENTS OF PEDAGOGICAL CONTENT KNOWLEDGE

Shulman (1986) initially classified teacher CK in three terms: subject matter content

knowledge, PCK, and curricular knowledge. Pedagogical knowledge is a component of PCK

and is addressed in detail subsequently. CK is discipline specific and is defined as "the amount

and organization of knowledge per se in the mind of the teacher" (Shulman, 1986, p. 9). For example, the subject matter content knowledge one needs to teach science would be different then the content needed to teach physical education. In physical education, CK includes movement skills (Siedentop, 2002a), examples of which include sport specific skills and motor skills such as galloping and kicking.

Siedentop (2002a) argues that pre-service physical education teachers should be instructed in movement education, including how to adequately teach various movement and activity forms as well as sport-specific skills. Lee (2011) described physical education teachers CK as not optional, but mandatory for teachers to effectively teach. Curriculum knowledge is the final component of PCK. From a physical education perspective, the complexity of curriculum implementation has proved challenging. This final component of PCK is examined more closely in future sections.

Review of Content Knowledge

CK is the knowledge one has for a specific discipline or topic. From a physical education perspective, it may be the amount of soccer knowledge one has on teaching penalty kicks. Of the various components of PCK, CK is often the most easily assessed due to its explicit nature and definition. In physical education, CK is comprised of movement skills (Siedentop, 2002a) including movement-based (e.g., pathways, yoga, and dancing), sport-based skills (e.g., ultimate Frisbee, basketball, softball, flag football, orienteering, volleyball, etc.), and cognitive understanding of the technical and tactical strategies of the sports/movements.

Support for the role of CK in relation to PCK is provided in disciplines other than physical education. While examining previous PCK research concerning science, Abell (2008) contended that knowledge of the subject matter is central to PCK. German mathematics teachers

(n=198) took part in a study to evaluate the differences between those teachers that were trained

and qualified to teach at the academic track (similar to a gifted program) compared to those

teaching in other types of secondary schools (of which there are a total of four) (Krauss,

Baumert, & Blum, 2008). CK was assessed through 13 items while PCK was assessed through

knowledge of mathematical tasks, knowledge of students' misconceptions/difficulties, and

knowledge of instructional strategies in mathematics. Those teachers at the academic track

scored statistically higher on knowledge of mathematical tasks, knowledge of students'

misconceptions/difficulties, and knowledge of instructional strategies in mathematics.

In the field of physical education, Rovengo, Chen, and Todorovich (2003) investigated

third grade dribbling utilizing accomplished elementary physical education teachers to develop

themes shared by the participants. In support of the importance of CK, one of three themes that

emerged was teaching the cognitive processes. These processes were described as "learning

orientation, self-regulation, movement and tactical analysis, and making decision" (Rovegno et

al., 2003, p. 426). Research on CK assessment in the physical education teacher education field

can help aspiring physical education teachers gauge their CK on a variety of content needed to

teach physical education. As previously identified, Li et al. (2013) utilized a basketball content

knowledge test and reported that that CK varied significantly by gender and organized basketball

league experience. From a physical education teacher education perspective, the results can help

facilitate training and interventions to those perspective physical education teachers who lack

appropriate CK in basketball.

In more recent analyses of the components that make up PCK, CK has been differentiated

into two different but related forms. Two studies, one in mathematics by Ball et al. (2008) and

another in physical education by Ward (2009a), describe how this component is expanded to

meet the challenges of teacher instruction. The first element is common content knowledge

(CCK). Physical education CCK is the knowledge one would need to instruct the movement or

skill followed by the rules, tactics, etiquette, and safety considerations when teaching said skill.

From a mathematics perspective CCK is the knowledge and skills needed to do math. In other

words, CCK is the ability to solve mathematical problems. From a physical education

perspective, CCK would occur when one knows the rules, tactics, etiquette, and safety

considerations associated with a particular activity. Although CCK is an important construct for

mathematics, physical education, and other discipline specific teachers, it is incomplete because

teachers need to be able to *teach* this respective content. In other words, the ways in which the

content is presented, or taught, is needed as well. This component is SCK, and is a more difficult

element to assess. Specifically, SCK is the ability to differentiate tasks and sequences for

different learning environments while providing developmentally appropriate learning situations

(Ward, 2009a). Bell et al. (2008) defined SCK as the mathematical skills and knowledge that are

unique to teaching mathematics. In other words, SCK in mathematics provides teachers with

alternative ways of looking at problems and solutions that are more critical when attempting to

diagnose student errors. The difference between CCK and SCK can be somewhat confusing. To

clarify, knowledge in a specific content area that is classified as more factual is CCK (e.g., rules,

tactics, etiquette). The knowledge needed to present appropriate tasks for student learning as

well as identify student errors is classified as SCK.

Following is an example of the difference between CCK and SCK. The knowledge of

soccer rules and critical elements—components needed to be successful (e.g., non-kicking foot

beside ball)—would be referred to as CCK. SCK would include the ability to differentiate

instruction when teaching a 4th grade and 9th grade class, the context (inside or outside, three or

nine available soccer balls), child specific (what works for one child may not work for another), and content specific (soccer compared to gymnastics). A physical education teacher may have high SCK in soccer but be woefully inadequate in teaching elementary gymnastics or dancing.

Support for increased SCK is provided by Ko, Kim, Ward, and Li (2013) through a badminton content knowledge workshop. Results indicated that when badminton CCK improved, SCK and associated PCK also improved. Lee (2011) examined the effect of a soccer content knowledge workshop on PCK by identifying changes in PCK after the content knowledge workshop. The three components of PCK being evaluated were classified into two variables. The first component was maturity and appropriateness. The second component was verbal representations and visual representation. The final component was a measurement of task adaptations that the teacher made. Results indicated that differences were present between the control group and the experimental group, specifically more mature PCK followed the soccer content knowledge workshop. The author acknowledged that the results of improved PCK were descriptive in nature despite using a quantitative study design. This research example demonstrates the difficulty in asserting quantifiable PCK improvements when the components of PCK are largely qualitative in nature.

Review of Pedagogical Knowledge

The definition of PK can be expressed as the various components or principles coming together, mitigated by the relational qualities of these interactions. Shulman (1986) defined it as "…the ways of representing and formulating the subject that makes it comprehensible to others" (p. 9). Other scholars have similar definitions for PK. Van Manen (1994) proposed that pedagogy is more than the act of teaching; it entails "distinguishing between what is appropriate

and inappropriate, good or bad, right or wrong, suitable or less suitable for children" (p. 139).

He continues by addressing the many constructs that make up effective instruction.

> Teaching, as a pedagogical interaction with children, requires not only a complex
>
> knowledge base but also an improvisational immediacy, a virtuelike normativity, and a
>
> pedagogical thoughtfulness that differs from the reflective wisdom (phronesis) of other
>
> practitioners. The classroom life of teachers is difficult especially because it is virtuelike,
>
> improvisational, and pedagogical. (p. 139)

In recent years it appears that the definition of PCK has subsumed PK with regard to research foci. In other words, PK is one of the components evaluated through PCK research but cannot be isolated from the other components that are found when researching PK. For example, several studies by Ward and fellow researchers in 2012-2015 examined the defining features of PK within their research on PCK in physical education. The PK component of PCK should not be overlooked however as its utility in effective teaching provides the impetus for the inclusion into the various PCK definitions addressed previously.

Review of Curricular Knowledge in Physical Education

As one of the components of Shulman (1986), Grossman (1990), Ward (2009b), and You (2011), the inclusion of curricular knowledge as one of the PCK components is adequately supported. Although Shulman's account of curriculum being the least studied field is over 25 years old, the discipline of physical education still may be the best example of Shulman's statement. For the physical education teacher there are numerous curriculum models to focus on. Kulinna (2008) identified the various types of physical education curriculum foci presently available for physical education teachers: (1) games and sports; (2) teaching games for understanding; (3) personal-social responsibility; (4) updated multi-activity model; (5) individual

and social development; (6) movement education; (7) outdoor recreation/adventure education; (8) health-related physical education; (9) conceptual physical education; (10) interdisciplinary physical education; and (11) *Be Active Kids*! There is certainly overlap with several of these curricular models and it can be argued that these are merely the foci of the physical education curriculum. These models are multifaceted and include a variety of activities, policies, and teaching strategies. Student characteristics provide further challenge to the identification of consistent and appropriate components of curricular knowledge (Ennis, 2011).

Review of Pedagogical Content Knowledge

While Shulman (1987) considered PCK a subcomponent of CK, other researchers provide different concepts of PCK. Grossman (1990) proposed four components of PCK: (1) concepts and purposes for teaching subject matter, (2) knowledge of students' understanding, (3) curricular knowledge, and (4) knowledge of instructional strategies. Similar to Grossman's (1990) view of PCK, Marks (1990) stated that PCK comes from both subject matter knowledge (e.g. CK) and general pedagogical knowledge. Thus, a definition of PCK involves three concepts: knowing what to teach, how to teach, and how students learn in a variety of conditions. The ability to discern student knowledge, learning preferences, and provide accurate assessment with appropriate remediation of task representations would also be represented by teacher PCK.

In a physical education context, Ayvazo (2007) defined PCK as "the act of selecting content from one's knowledge base for the purpose of teaching in a specific context" (p. 77). Initial research by Ayvazo (2007) was conducted through focus groups and interviews to determine variables related to PCK that could be observed and to learn more about the teaching history of effective teachers. Two teachers were observed teaching two instructional units through descriptive investigation and functional analysis. One unit was reported to be a strong

unit, one that they felt confident to teach. The other unit was classified as a weak unit; one that they had less confidence in teaching. Ayvazo (2007) concluded that PCK is specific in regards to the content and learners' ability level. Following Ayvazo's (2007) work exploring PCK, Ward (2009b) explained the influences on PCK from a pre-service context, and defined PCK as:

> A focal point, a locus, defined as such as an event in time (and therefore specific contextually) where teachers make decisions in terms of pedagogy and content based on their understandings of a number of knowledge bases (e.g., of understanding students, of pedagogy, of content, of curriculum). (p. 13)

This PCK definition attempted to blend content and pedagogy through the teachers' knowledge base. Additionally, Ward (2009b) suggested that the teachers' knowledge of students, pedagogy, content, context, and curriculum will affect their PCK.

You (2011) presented a definition of PCK by identifying six components of PCK. The first component is knowledge of physical education as a subject and its relationship among other subjects. The second component is knowledge of physical education curriculum. This knowledge facilitates proper scope and sequence planning as well as designing appropriate task representations. The third component is knowledge of teaching methods in physical education. Teaching models (Metzler, 2005) and Mosston's teaching styles (Mosston & Ashworth, 2002) provide examples of this component. The fourth component is knowledge of students learning in physical activity and knowledge of the student as an individual. Important student information includes their ability and developmental level and common sources of student errors during physical tasks (Schempp, Manross, Tan, & Fincher, 1998). The fifth component is knowledge of physical education assessment. Unlike standardized assessments seen in many core classes, the context and teaching practices can be dramatically different for the same unit. Physical

education teachers should be familiar with various methods of assessment, including the advantages and disadvantages associated with the implementation of each (Fernandez-Balboa, 1997). The final component is knowledge of instructional environments in physical education. This knowledge can vary greatly depending on the type of unit and task representations. Examples include managing instructional space and equipment, providing instructional strategies, including demonstrations, interactive learning activities, monitoring student activity, and providing feedback for teachers and students (Fernandez-Balboa, 1997).

Researchers have sought to define PCK in both an educationally generic concept (Grossman, 1990; Shulman, 1986) as well as discipline specific (Rovegno, 2008). PCK encompasses many qualities and attributes, including a perception of what makes the learning of certain topics easy or difficult, and an intuitive sense of what background the students bring with them to the various instructional settings. Additional support for physical education PCK is provided by Griffin, Dodds, and Rovegno (1996), who indicated that teachers need PCK to be able to "package" their knowledge of activities, instructional strategies, the school, the community, and the learners. Other disciplines such as science have identified that PCK is important. By examining PCK research from the science discipline, Abell (2008) conceptualized PCK to include four important components: (1) separate categories of knowledge utilized synergistically while teaching, (2) PCK is fluid and changes as teachers gain experience, (3) subject matter knowledge is central to PCK, and (4) PCK facilitates the alteration of subject matter knowledge into an understandable form of knowledge for students. Additional research in the field of science education sought to develop models to try and ascertain the PCK of science teachers (van Dijk & Kattmann, 2007). Other research in the field of physical education utilized Grossman's (1990) model for PCK to determine the effect of subject matter knowledge on

teachers PCK. Data were collected through four interviews of 10 physical education teachers focusing on comparing the differences between weak and strong content areas. The physical education teachers in the strong content areas identified student motivation as the biggest pedagogical problem, while the non-experts identified a lack of knowledge of activities during instruction. Further, physical education teachers with strong content knowledge were more enthusiastic regarding pedagogical duties (Schempp et al., 1998). McCaughtry (2005) and Tsangaridou (2006) both identified that PCK is important for educators to possess but includes various knowledge and interactions that coalesce and vary as a function of myriad factors.

Previous Research on Pedagogical Content Knowledge

Despite physical education PCK research from the mid-1990s (Chen & Ennis, 1995; Graber, 1995; Housner, 1992), the lack of operationally defined components of PCK has prevented comparisons between different studies evaluating PCK (Lee, 2011). Future research on PCK within the physical education discipline has been suggested by several researchers (You, 2011; Ward, 2013). When the literature on PCK is taken as a whole it appears that previous studies have not fully examined what PCK means in specific disciplines and context. Specifically, within physical education there is little knowledge about what physical education PCK is and how the characteristics differ as a function of changing foci, students, and context. Further, PCK is dependent on many factors within the physical education discipline that are unique to one another (e.g. archery and gymnastics) and require a different PCK base.

Due to concomitant PCK research foci, studies will be addressed in the section that best align with their research study questions. Research questions will also be clarified with examples and supporting research when available. Specific study design limitations will be addressed immediately following the research to provide organization and clarity.

Instructional Methods and Task Representations

The instructional methods and task representations in a physical education setting are similar but distinctly different. Instructional methods are various types of communication between teacher and students that confers some type of instruction (Graber, 2001). An example would be direct instruction, whereby the teacher provides instruction in small steps, giving specific instructions on tasks that students are to perform (Rink, 2003). The quality and sophistication of how a task (e.g., overhand throwing, free throw shot, etc.) is taught would be considered task representation. An appropriate task representation would include developmentally appropriate activities that are also content specific and context specific. An inappropriate task representation occurs when the task is not developmentally appropriate and may or may not meet the needs of the specific content and context of the instruction (Lee, 2011). It appears one of the earliest forms of task representation research emerged from the dissertation of Dr. Ayvazo while attempting to identify the measureable components of PCK through interviews and focus groups. The concept of mature and immature task representations grew out of work by Ward (2009a) and Lee (2011) when attempting to assess PCK in physical education. Mature task representations provide clear tasks through demonstrations, descriptions, and when appropriate, analogies, metaphors, etc. Immature task representations lack clear, specific, descriptions of the task, and typically do not use demonstrations, analogies, metaphors, etc. For example, I suggest that an appropriate, mature task representation for the overhand throw in a second or third grade elementary school might look like this:

> Today we are going to continue working on our overhand throwing. We are going to
> focus on stepping with our non-throwing side leg. This means if you are best at throwing
> with your right hand, you are going to step with your left foot as you make your throw. If

you are best at throwing with your left hand, you are going to step with your right foot when you make your throw. Make sure you do not step too far or you may become unbalanced. If you step too short it will be hard to get a lot of power on your throw, so it will not go as far. Can someone show me what a short step would look like? How about a long step? Great, when you start throwing I want you to try stepping out short, medium, and far to find out how the length of your step affects your throw. When you step with your opposite foot, it is called the principle of opposition. A great way to remember this is to think about the principal for our school, they are important right? Stepping forward is also important when you throw. So when you think of principle of opposition, you can remember it by it being important, like our principal. Please find your assigned spot on the floor across from your assigned partner approximately 25-30 feet and when I say 'go', practice overhand throwing your tennis ball toward your partner's chest working on using the principle of opposition.

The appropriateness of the task is demonstrated by the correct use of a smaller ball for the students to grip and a distance of 25-30 feet. If the distance was shorter, the principle of opposition may not be needed to produce the power needed to reach the thrower's partner. If the distance was 40-50 feet, students may not be able to produce sufficient force to reach their partner. If this same set of instructions were given to a 5th or 6th grade class, they would have been classified as an inappropriate task representation. The task would typically be well below the level of 5th and 6th graders, and would not be aligned with some of the often cited components of PCK; knowledge of the student, knowledge of content, and knowledge of context. The maturity of the task is demonstrated by the quality and sophistication of the task. A clear

description of the task is provided, along with demonstrations, and a mnemonic device to help remember the principle of opposition.

I would suggest that an example of an inappropriate, immature task representation for the same age group might look like this:

> Today we are going to practice our overhand throwing by stepping with our opposite
> foot. I want everyone to find a partner, then half of the class to get a football and line up
> on the end line of the basketball court. Your partner will be on the other end line of the
> basketball court. When I say 'go', start throwing to your partner while also stepping
> forward.

The inappropriateness of the task is evidenced by the choice of the throwing implement and the distance to throw. Those students in 2nd or 3rd grade would have a difficult time throwing a football due to both the size of the ball and the complexity associated with wrist pronation to create rotation and a spiral. The distance of the throwing task is also inappropriate. The end line to end line in a typical elementary school gym would be 70-80 feet in length. That distance would be too long for most students to be successful. The immaturity in the task is evident by the lack of sophistication and demonstrations, along with clear and precise instructions. It is assumed that as the physical education teacher creates more mature task representations for students, their PCK is seen as higher when compared to the example of the immature task representation.

Due to the complexity of instructional and task representation assessment, many research studies located had unique research designs and assessment strategies. For example, Strand and Bender (2011) utilized a questionnaire for self-assessment of physical education teachers on whether certain instructional strategies were appropriate or inappropriate, and how often they use

said strategy. Results indicated that most physical education teachers identified the instructional strategies accurately, and many indicated that they used these strategies in their practice. Although this research provided a large sample size, self-reported measures of instructional appropriateness and individual acknowledgement of appropriate instructional strategies limits the validity of the results. Senne and Strand (2009) developed a 36 statement questionnaire for pre-service physical education teachers, administering it to freshman, sophomores, juniors, and seniors. Surprisingly, only five of the statements were statistically different by grade level. It may be that there was not enough practical experience gained by the upperclassmen to make a meaningful difference in the results.

Common Content Knowledge and Specialized Content Knowledge

The importance of CK and its role in education has been demonstrated by numerous studies (Ball, Thames, & Phelps, 2008; Ward, 2009a, Ward et al. 2014; Werner and Rink, 1989). Recently, Ball et al., (2008) and Ward (2009a) contend that CK might be better described as CCK and SCK. From a physical education perspective, CCK would occur when one knows the rules, tactics, etiquette, and safety considerations associated with a particular activity. SCK is the ability to differentiate tasks and sequences for different learning environments while providing developmentally appropriate learning situations (Ward, 2009a). The role of CCK and SCK in physical education is a relatively novel one with few studies evaluating its role within PCK. Ward (2011) illustrated the components of CCK and SCK in Figure 1. The first two components, rules and etiquette and techniques and tactics, can typically be acquired through participation in the particular sport or activity and is more aligned with CCK. The next two components, ability to detect student errors and appropriate task representations, are typically acquired by learning to teach the activity and are more aligned with SCK. By examining Figure

1, it would appear that one could assess CCK with a questionnaire to assess teacher CK in the

specific task or sport. To assess SCK, more qualitative measures might prove easier in collecting

those behaviors and task representations that physical education teachers demonstrate during

instruction.
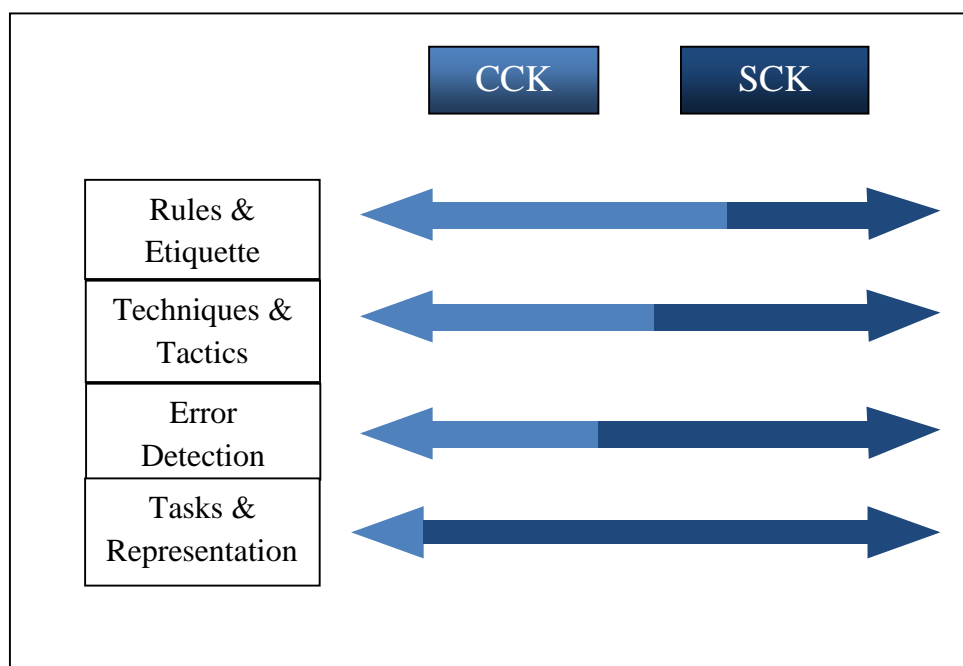
Figure 1. The relation between common content knowledge and specialized content knowledge. Reprinted from "Paper presented at the American Association for Health, Physical Education, Recreation, and Dance, Charlotte, N.C." by P. Ward, 2011, p. 5. Reprinted with permission.

Challenges of PCK Research and Associated Components

Although the importance of CK has been presented, a clear definition as to what exactly

it is remains elusive. In the realm of physical education, CK for overhand throwing is distinctly

different from gymnastics. Ward (2009a) stated there is a "lack of conceptual clarity relative to

what is the subject matter knowledge (i.e. CK) that best serves a teacher" (p. 346). A

challenging question related to the CK of overhand throwing might then be: What is the CK of overhand throwing that physical education teachers need to know in order to effectively teach their students? To do this, CK needs to be clearly defined and will vary as a function of the task or sport. Although there is support that CK informs PCK (Grossman, 1990; Grossman et al., 2005; Jenkins, Garn, & Jenkins, 2005; Jenkins & Veal, 2002; Kutame, 2002; Rovegno et al., 2003; Sebren, 1995), there is a scarcity of empirical research providing a direct relationship between CK and PCK in the discipline of physical education.

The various components of PCK along with different definitions of PCK provide a challenge for PCK assessment. From a researcher perspective a valid question might be: what components of PCK should be studied, and what is the best method to accomplish it? Research on PCK has used qualitative studies utilizing videotaped lessons of accomplished physical education teachers (Rovegno et al., 2003), direct measurement and observation of teachers' teaching practices (Ayvazo, 2007), and a multifaceted methodological approach through student behaviors and activity levels, physical education enjoyment, and teacher values, behavior, and dialogue (Creasy, Whipp, & Jackson, 2012). McCaughtry and Rovegno (2003) sought to organize the concept of PCK by examining the changes in four preservice physical education teachers PCK through interviews, observations, and analysis of documents. Several themes emerged from their research. The first theme identified an ability to understand the importance of matching students' tasks to their skill level. Predicting student ability levels is an important concept that is made more evident when the skills that a physical education teacher requires of students are beyond the scope of their ability. This second theme identified a lack of understanding in the finer details of motor skill development. The third and final theme included the impact of student emotion during physical education. This theme has implications for future

research. If physical education teachers are not able to assess and manage student emotion in an often emotionally intense environment, no amount of PCK may stave off student withdraw.

The challenges of varied physical education curriculum models and educational theories—even from the same districts and/or states within the United States—illustrate a less than glamorous proposition for relevant PCK research. Even if one were to look at only the role that assessment and curriculum have on physical education pedagogy, as Penny, Brooker, Hay, and Gillespie (2009) articulate, the curriculum outcomes and content can never be seen as independent of pedagogy. Further, one cannot judge physical education to be "of" quality or "not" without PCK and engagement in a curriculum that supports those pedagogical strategies used by the physical education teacher. In other words, curriculum, assessment, and pedagogy must all function together to develop quality physical education. But as readily evidenced, with such a wide varieties of curricular frameworks, independent of assessment incongruences, it is extremely difficult to try and define one definition of PCK in physical education. This analysis is supported by Crum (2001) who stated that there is not one commonly accepted notion of physical education, nor a sport pedagogy standard. The field of physical education is aligned only in its inability to define a clear pedagogical focus for the future.

The challenges of pedagogical and PCK research may be a significant reason why Macdonald et al. (2002) suggested that physical education pedagogy researchers are scarce. Further challenges facing physical education pedagogical research come from a complex cultural and social environment of schools and communities (Rovegno, 2008). Indeed, this challenge has only increased as social, cultural, and technological changes continue to shape and define the future of the United States. A quote that is ubiquitous within the physical education literature

would seem to capture the saliency of PCK research: "Teaching physical education is not rocket science, it is much harder!"

It appears that two of the greatest challenges to physical education PCK research are the lack of a clear vision, or definition of PCK, as well as no apparent theoretical model to guide the research foci. In order to gain knowledge on PCK, it seems appropriate to incorporate accomplished physical education teachers as their knowledge would provide examples of best practices with regard to the respective CK studied. To increase validity and provide a comparison, a novice and beginning elementary physical education teacher were used as part of the research protocol. Indeed, Tinning, Macdonald, Wright, and Hickey (2001) state that high quality physical education teachers provide meaningful, enjoyable and purposeful lessons, and utilize reflection on both instruction and student learning. These components of effective teaching can be broadly classified as PCK (Creasy et al., 2012). This research focused on the PCK model of Grossman (1990), as well as the work by Ward and colleagues from The Ohio State University. Namely, how the participants organize, define, and instruct utilizing task representations, SCK, and CK.

Components of PCK that were used during this research are identified here along with the mode of assessment. The Grossman model utilized four unique subcomponents. The first was the teacher's knowledge regarding teaching or their pedagogy. Although this component was not specifically assessed, participant pedagogy was captured through their SCK, observations, and interviews. The second component includes how well the teacher recognizes student learning of the content. This component was captured through interviews and observation. The third component refers to the instructional strategies of the instructor. In this research this was the instructional strategies utilized for overhand throwing instruction. The instructional strategies

were assessed through the qualitative measures of teaching performance scale (QMTPS), observation, interviews, and participant SCK gleaned through observation and interviews. The final component addressed the curriculum content knowledge as well as the specific content needed for instruction. This knowledge was assessed through interviews and a participant CCK assessment on overhand throwing. Support for the utility of CCK within a teacher's PCK is provided most recently by Lee (2011) and Ward (2009a). A final component of PCK research is related to student learning outcomes (Creasy et al., 2012). Ward provided further support stating that what works for one student may not work for another.

By collecting multiple types of data on several purported components of physical education PCK, it was surmised that the participants teaching practices and thoughts would provide relevant themes related to PCK of overhand throwing instruction and will add to the body of research on elementary physical education PCK.

In summary, it would appear that certain components—CK, knowledge of student learning, curricular knowledge, and effective instructional practices—of PCK are more supported in physical education and other disciplines and are necessary components of study within PCK research. The CK of elementary physical education teachers during overhand throwing instruction seems a critical and assessable component within PCK. Its utility can be seen in many sports and activities, such as football, baseball, softball, team handball, as well as being a fundamental motor skill for students to learn. This was assessed through a written assessment of the participants CK on overhand throwing. Ward (2009a) described CCK and SCK as the elements of task representations that provide a lens through which overhand throwing knowledge and instruction might be evaluated. That is to say, the type of instruction

that the participants provide, including the type of tasks that are introduced, would determine if the tasks were mature or immature, appropriate or inappropriate.

EXPERTISE IN THE FIELD OF PHYSICAL EDUCATION

Defining expertise is not always simple. In the field of teaching and education, some commonly evaluated components are experience, lesson plan evaluation, administrator observation, and perhaps more recently, student achievement. Assessing physical education teachers on student achievement is a challenging goal due to the variety of curriculum models (and outcomes) available, the lack of uniformity in physical education content taught, as well as disparity in allocated physical education classes. Further, defining a teacher as an "expert" is a longstanding problem (Berlinger, 1986). Various terms such as exemplary, experienced, expert, and accomplished are often used interchangeably in the literature. In many research communities these terms are not adequately quantified. But how does one reach an accomplished status or an expert status? One common characteristic identified by Rovegno, Chen, and Todorovich (2003) is that experience and expertise are related in some way. How much experience is needed to be classified as an expert? Several researchers have asserted that it requires 10 years of experience in ones' field to develop expertise (Ericsson, Krampe, & Tesch-Romer, 1993; Hayes, 1981; Kalinowski, 1985). More recent estimations of time needed to reach expert status are 5-7 years (Berlinder, 2000). Thus, the limited experience of novice physical education teachers will have an impact on their ability to reach the elusive expert status. For clarity, this study used the term accomplished so that the accomplishments of the participants can be used to quantify their contributions within their field. However, experience cannot be deemed the sole factor for teacher expertise. Schempp (1997) indicated that when studying experts, those that reach the proverbial top never stop learning; never stop trying to improve their practice. It

would seem that experience alone will not lead to expertise: continuous work to improve one's practice is vital to reach an expertise level.

Many researchers have identified qualities associated with expertise when defining what constitutes a highly qualified physical education teacher. Others have identified broad categories in which these qualities would be included. Napper-Owen, Marston, Van Volkinburg, Afeman, and Brewer (2008) identified three broad categories: (1) preservice preparation, (2) designing and delivering the physical education program, and (3) professional development. In addition, Schempp (2003) identified the following stages one reaches when they would be considered an expert teacher: extensive knowledge, intuition from knowledge and experience, automatic behavior (automaticity), attenuation of the unusual, forward thinking to solve problems, and self-monitoring to continue to improve learning.

Prior to Napper-Owen et al. (2008) and Schempp (2003) it appears that a great deal of research occurred in the 1990s identifying the qualities or characteristics of teacher expertise. Tan and Bell (1997) identified several such characteristics. The first is that experts make a significant investment in learning all they can about their subject matter. Second, they are highly knowledgeable of the skills needed in their particular field. Third, they differentiate critical cues in the teaching environment that allows them to anticipate and—if needed—deviate from previous plans. And fourth, experts objectively assess their knowledge base and deficiencies, and are better able to analyze the causes when lessons go awry. Additional identification of the attributes of expert teachers by Manross and Templeton (1997) included seven characteristics of expert teachers in physical education: (a) plan thoroughly and completely, (b) focus on individual student performance by trying to meet the needs of every one of their students—because students have different needs and abilities, (c) possess heightened perceptual abilities,

(d) demonstrate automaticity (characterized by fluid and intuitive teaching performance), (e) provide creative response feedback, (f) possess command of their subject matter, and (g) consistently search for new and fresh methods for teaching.

A key aspect of expertise in teachers is what Bloom (1986) defined as "automaticity." This concept is described as the ability of a teacher to quickly and effectively respond to changes in instructional situations that may arise. Other authors describe it as the ability to foresee problems before they arise (Siedentop & Elder, 1989). Bell (1997) characterized automaticity as expert teachers developing routines and repetitive activities that seemingly occur with little to no planning. In addition, Bell identified expert teachers as: in command of the instructional activities and learning environment, seeking out activities that can help students in need, and recognizing and altering an activity that is not achieving its purpose. It would appear that the characteristics of automaticity provide obvious advantages in an instructional setting.

In summary, the research in teaching expertise seems to support that CK and PCK are important characteristics that serve to distinguish novice and experienced teachers. The CK of pre-service physical education teachers are typically evaluated through assessments in various physical education classes, successful completion of Praxis tests, or both. This research sought to determine the relationship between the level of experience and CK. Additionally, SCK and PCK are postulated to rely on more advanced types of knowledge (Ward, 2009b; Ward et al. 2014). The SCK and PCK knowledge of physical education teachers would seem to increase commensurate with experience. This research sought to describe teachers' CK, SCK, and PCK of different expertise during overhand throwing instruction.

CHAPTER 3

METHODOLOGY

The purpose of this study was to describe novice, beginning, and accomplished elementary physical education teachers' CCK, SCK, and PCK. This chapter first described the rationale for the qualitative study design and design specifics. The second section defined the participant selection and recruitment. The third section described the various sources of data, including collection procedures and data analyses. The fourth section defined the methods used to provide trustworthiness. The final section addressed the limitations within the methodology.

RATIONALE FOR QUALITATIVE RESEARCH

The nature of PCK has been described by leading scholars like Shulman (1987), as "…that special amalgam of content and pedagogy that is uniquely the province of teachers, their own special form of professional understanding" (p. 8). Following Shulman's work, Grossman (1990) identified four components of PCK: the teacher's knowledge about teaching (pedagogy), the teacher's knowledge of the students' understanding of the subject matter, knowledge of instructional strategies for specific situations (context), and the knowledge of curriculum content that can be utilized to inform instruction. When these definitions of PCK are examined, the notion of multiple types of knowledge coming together to inform PCK can be seen. Such a large and complex amount of PCK variables presents a challenging construct to research. The ability to assess these multiple types of knowledge within the same research study does not lend itself to utilizing a large sample size or a strictly quantitative research design.

Much of the current research on PCK is of a quantitative design (Ayvazo, 2007; Lee, 2011; Ward el al., 2015). Specifically, some component of PCK is targeted for improvement (mainly through content knowledge workshops) while pre and post data were collected and

analyzed. With regards to PCK studies utilizing a qualitative design, Rhoades (2010) examined

six national board certified physical education teachers task presentations (using the QMTPS)

and learning environments. Perhaps the most similar qualitative research design was conducted

by Rovegno, Chen, and Todorovich (2003). This study helped to inform my research strategy

and design methodology. The researchers examined how four accomplished physical education

teachers taught dribbling. Their qualitative research methodology was rooted in the descriptive

tradition. In essence, they identified common themes of the four participants related to their

instruction over three consecutive class periods.

> The use of a qualitative approach to study PCK is supported by You (2011), who stated,
>
> …preserving and passing on expert teachers' physical education PCK using qualitative
>
> approaches will be useful to beginning teachers as they come to understand the multiple
>
> components of physical education PCK and how they function in various teaching
>
> contexts and in guiding the acquisition of correct and workable ways to apply this
>
> understanding. (p. 110)

Ward (2013) provided further support for utilizing a qualitative study when he described the

components of PCK as context specific, content specific, and child specific. Thus, making

generalizable conclusions about PCK is difficult. The strength of a quantitative study most often

lies in its generalizability. Because this focus did not fit this study design, a quantitative study

design was not chosen.

   Due to the variety of contextual differences among students (even of the same age), the

context of overhand throwing instruction must be taken into account. The collection of data

occurred as unobtrusively as possible to allow the participants to present their typical

instructional pedagogy and task representations. The amount of data collected typically

associated with quantitative research precluded the inclusion of a large number of participants. For this research, three elementary physical education teachers from the southeastern United States were selected.

To describe the components of CK and PCK during overhand throwing instruction by a novice, beginning, and accomplished elementary physical education teacher, three research questions were addressed:

1. What are the task representations of novice, beginning, and accomplished elementary physical education teachers that guide instructional practice during an overhand throwing unit?

2. What is the CCK of overhand throwing for novice, beginning, and accomplished elementary physical education teachers?

3. What forms of SCK during overhand throwing instruction do novice, beginning, and accomplished elementary physical education teachers demonstrate?

PARTICIPANT SELECTION AND RECRUITMENT

A nonprobability sampling design was used due to the nature of this research. Probability sampling (e.g. random sampling) would not be appropriate because generalization of the results is not a goal of this study and due to the qualitative study design (Merriam, 2009). A unique sampling strategy was used to select an accomplished elementary physical education teacher. A thorough search was completed to identify those nominated for or recognized by their peers for superior service in the field of elementary education (e.g., Teacher of the Year nominees and awardees, previous National Association for Sport and Physical Education (NASPE) teachers of the year, and/or national master teacher awardees). Participants were sought within the

southeastern United States. An initial screening was done to identify at least four qualified participants to prepare for any attrition issues.

Novice physical education teachers were identified through local university physical education programs to find those who had just graduated and may be starting their career as elementary physical education teachers. To find beginning elementary physical education teachers, local private school websites were searched to identify any possible physical education teachers that fit the "beginning" criteria. Initial work on participant identification and selection was met with opposition from many of the local public school systems. Specifically, they did not allow student observation to occur. The search for an established (beginning) elementary physical education teacher from the private school system was in response to the bureaucratic challenges of the public school system. Potential novice, beginning, and accomplished participants were initially contacted through email with a follow up phone call if the potential participant expressed interest.

Once participants had given verbal consent to participate in the study their respective school districts and/or principals were contacted for further permission for the study to take place at the participant's school site. Participants were provided an informed consent form in person, and instructed to sign and date it. The location procedures were a function of where the novice, beginning, and accomplished elementary physical education teacher currently taught. Permission to use school facilities for post observation interviews was also obtained from each respective school district.

Participant Background and Context of Instructional Settings

It was the first year teaching for the novice participant. From hereafter she will be referred to as "Nancy." Due to the spring data collection time, Nancy had approximately seven

months of experience. She grew up and still lived in the area surrounding her school site, which was stated as being a contributing factor to her seeking the job. She stated that she knew she wanted to work with children, but did not know in what capacity. Eventually she stated that it all "clicked" when she decided to become a physical education teacher. She recently graduated from a large public university with a degree in health and physical education PK (pre-kindergarten) -12. The student population was approximately 72% Black, 21% White, and 7% other. Student's eligible for free or reduced lunch was 58%. The total student population was approximately 770 from PK to 6th grade with a student to teacher ratio of 21.5:1. The 2nd grade students were seen only one time per week for about 35 minutes during physical education class. The average class size was about 24 students.

The beginning participant was in his third year teaching and was in a faith based private school setting. From hereafter he will be referred to as "Benjamin." Benjamin received his degree in K-12 health and physical education from a small, division II private school. He stated that he became a physical education teacher because he saw how much fun his 11th grade physical education teacher was having and that he played sports his whole life. The student population was approximately 66% White, 12% Asian, 8% Hispanic, 6% Black, and 8% other. Since the school is a private institution no federal aid for lunches occurs. There were roughly 500 students from PK-8th grade with a student teacher ratio of 16:1. Second grade students at this school had physical education for 45 minutes twice a week. In addition, two classes were combined for the purposes of physical education instruction. An assistant was present during instructional times to assist Benjamin.

The accomplished participant was in her 22nd year teaching and was in a more affluent part of the state. From hereafter she will be referred to as "Allison." Allison holds a bachelor's

degree in Health and Physical Education K-12 and a master's degree in human resource with an emphasis in educational leadership. The student population was predominantly Whites 70%, Blacks 13%, and 17% other. There was roughly 15% of students eligible for reduced or free lunch. There were 760 students from PK-5th grade with a student teacher ratio of 17.7:1. Second grade students at this school had physical education for 35 minutes once a week. In addition, two classes were taught at the same time for the majority of physical education instruction. Another fully licensed physical education teacher taught one class while Allison taught the other class. For the purposes of some activity lessons they combined both classes and team taught.

Each of the participants had a different supervisory capacity within their classes. Nancy taught independently and had on average 24 students in her physical education classes. Benjamin had a student population from a low of 25 to a high of 62 students. However, he typically taught about 40-42 students with an assistant. The assistant did not have a degree in the health or physical education field. Allison taught by herself and also co-taught two classes combined. Her co-teacher did possess a teaching degree in health and physical education.

DATA COLLECTION

The data collection procedures were developed to collect the majority of data within the first two days of the overhand throwing instruction. The amount of data varied as a function of the participants' instructional practices, interview answers, and other variables outside of my control. This was particularly evident with the length of the overhand throwing unit. Nancy devoted three days to teaching the overhand throw. Benjamin devoted four days to teaching the overhand throw. Allison only devoted two days to the overhand throw. Ideally, all three participants would have provided the same duration of overhand instruction for a more valid

comparison amongst the participants. This research sought to identify the ways in which various types of physical education teachers planned for and taught lessons on overhand throwing in a naturalistic setting. Therefore, I did not attempt to manipulate the participant's prescribed overhand throwing unit length. I did plan for this shortened overhand throwing unit by Allison by collecting all of the more quantifiable type of data (QMTPS, CCK assessment, task representations) on days one and two for all participants. Table 1 provides the type of data collection and the specific day of collection during each of the participants' overhand throwing unit.

Table 1

Data collection protocol

	Nancy	Benjamin	Allison
Observation	Day 1-3	Day 1-4	Day 1-2
Field notes	Day 1-3	Day 1-4	Day 1-2
QMTPS	Day 1	Day 1	Day 1
Interview	Day 1	Day 1	Day 1
CCK assessment	Day 1	Day 1	Day 1
Task representations	Day 1-2	Day 1-2	Day 1-2
Time based summary sheet	Day 3	Day 4	Day 2

The QMTPS occurred on the first day of the unit. A task representation sheet was also filled out for each of the participants on the first and second day of the unit. This was performed due to Allison only having a two day overhand throwing unit. Fortunately, the task representation sheet and the QMTPS have similar points of data so that I was able to complete both during the first observation. To further improve the data collection process, I took the next teaching period to ruminate and fully complete both the QMTPS and the task representation sheet.

The second, third, and fourth day (if applicable) included the interview, task representation data collection, ancillary data collection, and field notes. The data collection procedures occurred in the prescribed order for several reasons. First, many elementary physical education teachers only see their students one day a week. Given this limitation the standardized observation protocols were completed during the first day or two of the overhand throwing unit. Additionally, the first day of instruction usually entails more teacher instruction in physical education settings. The QMTPS was chosen for the first day to more readily assess teacher behavior.

To adequately explore participant's PCK during the overhand throw numerous types of date were collected as part of the research. The ability to use triangulation with qualitative research is of utmost importance in attempting to meet a high level of research validity (Patton, 2002; Yin, 2003). As Patton (2002) aptly states, triangulation enables one to "build on the strengths of each type of data collection while minimizing the weaknesses of any single approach" (p. 307). The types of data collected were in the form of field notes, a semi-structured and long interview, QMTPS, CCK throwing assessment for the participants, a coding sheet collecting task representations (maturity and appropriateness), time based summary sheet,

and document collection—to include lesson plans, curricular guides, and various sample student assessments.

Interviews

Seidman (2006) described in-depth interviewing as seeking to understand the experiences of other people by making meaning of their experiences. The context of the participants' practice does not allow for transferability, but do provide researchers a unique perspective into their lives and behaviors. For the interview protocol it was important to take into account the time demands and constraints of the participants. Emotional costs were also taken into account. Probing for details through open-ended and exploratory questioning can be stressful for both participant and researcher (Warren, 2001). Individual interviews were used as this aligned best with the goals of this research. For example, a focus group might have been dominated by Allison due to her purported knowledge base, causing both Nancy and Benjamin to either remain stoic or side with Allison in discussions.

A semi-structured and long interviews (see Appendix A) were employed with the participants utilizing closed, semi-structured, and open-ended questions. McCracken (1998) provided support for the long interview and Hancock and Algozzine (2006) supported semi-structured interviews, stating that semi-structured interviews are often well suited to qualitative research. Researchers can ask predetermined questions, but also are able to ask follow-up questions to probe more deeply into issues or interests of the interviewee. Weiss (1994) indicated that two interviews establish a greater rapport with the participants, which can increase the reporting or elaboration of data. A specific set of questions served as the basis for the interview questions with additional questions to follow up on the participant's answers (Patton, 2002).

The interview questions were provided to the participants prior to the interview to allow contemplation and synthesis. This was particularly needed due to the large number of definitions and acronyms (PCK, SCK, CCK) and the amount of reflection the participants might have needed to answer more thought provoking questions. Some participants were provided examples when needed to provide clarity for the concept of maturity and appropriateness during the interview. Also, the scale (see semi-structured interview question one within Appendix A) that was provided for the participants to rate their overhand throwing tasks provided a bit more flexibility with regard to how they were able to rate themselves. For example, a "one" was inappropriate or immature, a "two" was a little inappropriate or a little immature, a "three" was somewhat appropriate or somewhat mature, and a "four" was appropriate or mature. Each participant was asked to describe a task and then to rate themselves on the maturity and appropriateness using the scale described previously.

Several researchers have explored the components that make up PCK in physical education (Grossman, 1990; Ward, 2013; You, 2011). Interview questions were segmented into categories based on work by You (2011) with support from Grossman (1990) and Ward (2013). The interview questions first gathered demographics (working experience, education, etc.). The subsequent interview categories were used to gather overhand throwing PCK data on elementary physical education teachers. Please see Table 2 for the interview categories.

Table 2

Interview questions segmented by components of PCK.

Background (education and teaching experiences)
Knowledge of physical education as a subject
Knowledge of physical education curriculum,
Knowledge of teaching methods in physical education
Knowledge of student learning in physical education
Knowledge of physical education assessment
Knowledge of instructional environments in physical education

The interviews were held in a quiet office or room away from loud noises and distractions and were recorded and transcribed verbatim. Completed transcripts were emailed to participants as a part of member checking of the interviews. Participants were given one week to read over the interview and make changes or expand upon their answers if they wished.

Observation

The inclusion of observation methodology in qualitative research has been used for over a century (Kawulich, 2005). Observations can provide data sources that help contribute to data triangulation, and can allow the researcher to familiarize themselves with the normal and daily instructional activities of the participants. At least four observations were initially planned for each participant during overhand throwing instruction. This was only accomplished for Benjamin. Allison was only observed twice because she only had two lessons to teach the skill.

It was assumed that beginning overhand throwing instruction would not be sport specific, for example: throwing footballs.

Field notes can be descriptive and also reflective. Descriptive field notes capture what occurs during the observation time. Informal conversations with participants, recording of activities, and other times that the researcher cannot question the participant are all examples of opportunities to take field notes (Kawulich, 2005). Reflective field notes were written before, during, and at the conclusion of the observation. They are often used to end the descriptive field notes by reflecting on certain themes that may be emerging, or points that may need clarification in the future (Ortlipp, 2008). Field notes were taken during all observations except during times in which other observation tools were being used.

To record participant's instruction while reducing the chance of recording student comments an omni-directional voice recorder was planned. To reduce the impact of the hand held device the use of a headset with a built in microphone was examined. It was found to have a very low incident rate with picking up external noise outside of the participant's instruction. Therefore, each of the participants was instructed to put the headset with microphone around their neck but without the headset over the ears. This allowed the microphone to be adjusted upward toward the mouth of the participant to further help with clear voice recording. The recorder device was then kept in a pocket by the participant during data collection. Overall, this voice recording design provided clear participant voice recording with very minimal background noise by students. All recordings were then transcribed verbatim for data analysis.

Mixed Methods

The QMTPS was first introduced by Werner and Rink (1989) to examine 2nd grade students in physical education through case studies. The QMTPS is separated into four major

categories: (a) type of task, (b) task presentation, (c) student responses, and (d) teacher congruent feedback. The first major category (type of task) is separated into five types: (a) informing, (b) refining, (c) extending, (d) applying, and (e) repeating. Each task that was presented was classified into one of the five types. The type of task is descriptive and was not used in the overall scoring of the QMTPS (Gusthart et al., 1997). The second major category (task presentation) has five categories: (a) clarity, (b) demonstration, (c) appropriate number of cues, (d) accuracy of cues, and (e) qualitative cues provided (Darst, Zakrajsek, & Manchini, 1989). The qualitative cues category is a challenging construct to define. Gusthart et al. (1997) described it as the verbal information given to the learner on the mechanics or process of the task. The third major category (student responses) identified if the students were on task or off task. The final major category (teacher congruent feedback) identified the extent to which the participants used more than two, one or two, or no congruent feedback to students. The QMTPS focuses on the teacher and has been found valid and reliable and aligns with this research (Gusthart et al., 1997). The QMTPS was completed for each participant in order to assess the components of the participant's instruction (see Appendix B).

Three sections (task presentation, student responses, and teacher congruent feedback) were included in data analysis. The QMTPS occurrences for each section were converted into a percentage of the total tasks of the lesson in order to adequately compare instructional differences by the participants. For example, if six tasks were presented during a lesson and three used a full demonstration, the percentage for that section would be 50 percent. The percentage for each component of the QMTPS and an overall percentile average were calculated for each participant. However, the percentage results were synthesized and discussed as part of the overall data analysis due to the small sample size.

The first step of researcher training on the completion of the QMTPS was to become familiar with the instrument and clarification of instrument variables. Second, coding sheets and observation protocols were introduced and discussed with an experienced university professor (instructor). Several examples for each category were identified to further familiarize myself with the categories. Third, coding practice occurred with practice videotapes in short bouts with verbal collaboration between the instructor and me. The multiple, short bouts of video analysis allowed any discrepancies to be identified early with opportunities for remediation if necessary. During the training, verbal feedback was followed by separate silent coding on a 10-20 minute video of elementary physical education instruction to determine researcher and instructor agreement. After the training, an inter-observer rating of 92% was achieved, which met the self-selected inter-observer rating of 80% or greater. The instrument was live coded. Live coding is characterized by the coding of behaviors and events as they happen in real time. It was surmised that some decisions or actions would not fall under any of the coded categories. These situations were recorded under field notes and labeled as a QMTPS source. Further analysis was then able to occur at the conclusion of the live coding (Van der Mars, 1989).

Other data collection tools are available in physical education. Academic learning time in physical education (ALT-PE) determines the type, quality, and time the learner is actively engaged during physical education, and has been found to be valid and reliable (Silverman, 1991). A time based summary sheet was used in lieu of the ALT-PE tool. It was loosely based on Siedentop (2002a) and included time spent on managerial, directions, transitions, instructional tasks, and student engagement. This tool provided data on students' activity quotient and the amount of time spent in other instructional endeavors.

The CCK on overhand throwing was assessed through the use of closed and open questions seeking to define the participant's knowledge (see Appendix D). Ward (2013) aptly described the transformation of the previously described content knowledge into three distinct components: CCK, SCK, and PCK. The questions sought to demonstrate the participants' knowledge of the critical elements, or components of overhand throwing instruction. No questions addressed participant's task representations, but several questions did ask for participants to provide cues or hints appropriate to 2nd grade overhand throwing instruction. The assessment was provided to the participants before the start of any data collection. This protocol time frame was chosen to reduce unwanted researcher interaction effects on the participants. Specifically, I did not want observations or interviews to provide an impetus for participants to improve their current overhand throwing knowledge. The CCK assessment was administered during the participants' planning bell, before, or after the school day. It was collected after completion and no outside resources were allowed during the assessment.

Documents

The use of document collection and analysis in qualitative research can help to elicit meaning and gain understanding of the phenomena being examined (Corbin & Strauss, 2008). The analysis of documents often involves an initial skimming of the documents followed by a reading of and subsequent interpretation (Bowen, 2009). Bowen (2009) described two types of analysis; content analysis and thematic analysis. Content analysis refers to the organization of the information as it relates to the research questions. Thematic analysis is used to identify patterns within the data to create new themes or support existing ones. This research primarily utilized content analysis for the collected documents as the majority of documents specifically addressed one of the three research questions.

During the observation, various materials were collected for synthesis and analysis. Some examples included lesson plans, curricular guides, and various sample student assessments. The overhand throwing lessons were examined for developmentally appropriate task representations. Curriculum guide use and/or knowledge examination was used to help support the notion that curriculum is a component of PCK (Grossman, 1990). Other collected data allowed for a deeper understanding of the practices, communication, and collaboration of the participants. These pieces of data were analyzed and used alone or combined with other data sources to support data triangulation.

DATA ANALYSIS

This study accumulated multiple sources of data including field notes, interviews, QMTPS, a CCK throwing assessment for the participants, teacher task representation data, time based summary sheet, and ancillary documents—lesson plans, curricular guides, and sample student assessments. The data were individually analyzed in a holistic manner to examine the ways in which the data informed the overhand throwing instruction of Nancy, Benjamin, and Allison. The QMTPS, CCK assessment, task representation data, and time based summary sheet data were analyzed to produce descriptive statistics.

To begin the process of data analysis on field notes, interviews, and ancillary documents, open coding was performed. This process allowed for common data categories to be developed as themes emerged from multiple data sources. This research also used pre-established data categories with the long and semi-structured interview questions. For example, the long interview examined the participant's knowledge of physical education curriculum, teaching methods, student learning, assessment instructional environments, and physical education as a subject. These data categories and the semi-structured interview provided a theoretical

framework of connected concepts and theories related to SCK and PCK (Fram, 2013). The use of a constant comparison analysis for the interview data is supported by Fram (2013) and Patton (2002).

The open and axial coding was performed to identify all themes. Some of these themes did not address the research questions, and as such, were not included in these findings. In the following paragraph a sense of the coding process employed is provided for a theme found that was not used for this research; reflection for action. Reflection for action is the extent to which one uses a reflective thought process to improve or take action on one's instructional practice. The italicized phrases spoke to this notion of reflection for action.

One interview question asked the participants what went well with their lesson and what did not go well. Both Nancy and Allison discussed something that they would change to make their lesson more understandable. When reflecting on what did not go well Benjamin stated: "Um, *other than one or two students that were not really goofing around but* just did not understand the correct way of doing it, *I think everything went pretty well*." I coded this first example as "realities of the individualized instructional process." Benjamin understood his lesson to go pretty well because only one or two students were goofing off. However, he was unable to reflect upon the lack of practice opportunities afforded his students.

When addressing what went well he stated:

Um, well obviously the kids had fun but it was more from the competitive side I think. *They really enjoyed the competitiveness and trying to be first instead of last*. They learned the fact that throwing the correct way gets them further distance. Um, there was one girl who threw it almost all the way across the gym and there were a couple of boys who got it really far as well.

I coded this second example as "enthusiasm does not confer appropriateness." The students having a good time may have contributed to Benjamin not engaging in a more thorough reflective process.

When Nancy and Benjamin were asked if their classroom environment changed since they first started teaching to the present Benjamin stated: "*Um, actually it has not to any extent.* Um, very little things but nothing, nothing worth noting." Nancy stated:

> U*m, I think so*. It is my first year and I came in with them not knowing me. T*hey tried to get away with things at first so I think they understand that I like to you know joke around with them but I am going to do what I say*.

For this question I coded Benjamin as "perfectly content." Nancy received a code of "playful but serious" for her answer. This example spoke to a lack of change in Benjamin's classroom environment or reflection for action. Nancy was able to identify the students testing her as a first year teacher, but also indicated that the rapport she developed was through a mutual respect with her students.

Allison provided numerous examples of reflective practice. Initial reflection dealt with her desire and motivation to enter the education field. She stated that her teaching philosophy was informed by her parent's support of her. In this same vein she indicated that…"as a teacher, *all children can learn. It is all in how it is presented and nurtured*." This statement was coded "no child left behind" by Allison believing that with adequate support, any child can learn. She also demonstrated a reflective approach when discussing her early knowledge in physical education. For example: "I am more of an individual sports type. Those are my strong suits. I *have to work very hard at team teaching and playing team sports activities like basketball*." This final code spoke to Allison's recognition of her instructional inadequacies and addressing them.

The ways in which reflection shaped the participant's instruction would be an example of the selective coding process. As Corbin and Strauss (2008) suggested, this is the most complex type of coding with patterns, sequences, and processes identified that will help form, or generate a theory about a phenomenon.

A previous doctoral dissertation on PCK by Lee (2011) provided a graphical representation as well as a task representation coding sheet. Figure 2 shows the various ways that tasks can be represented during instruction. This study incorporated the combined coding categories found in previous work by Lee (2011).
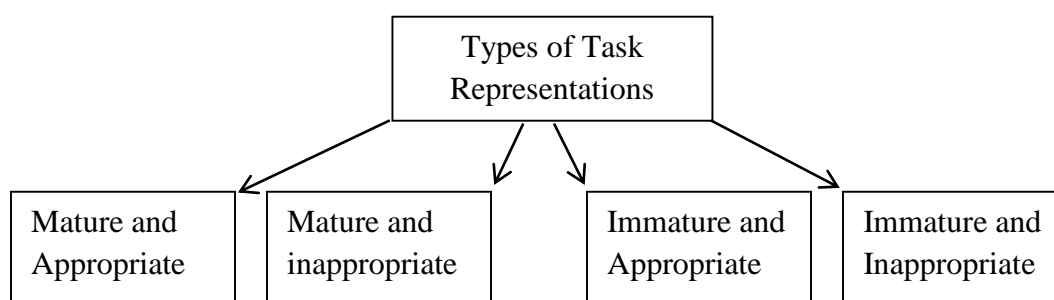
Figure 2. Coding categories for task representations. Adapted from "The effects of a content knowledge workshop on teachers' pedagogical content knowledge and student learning in a soccer unit in middle school Physical Education," by Y. Lee, 2011, January 1. *ProQuest LLC,* p. 51.

A task representation coding sheet was used to analyze the various types of representations of tasks including whether the task was given to the whole class, a small group of students, or a single student, including pairs. Providing differentiated tasks for diverse students could signify more mature and appropriate task representations and was identified as part of the data collection. Figure 3 shows the coding sheet that was used to organize and analyze the task

representations of the participants. This study utilized a similar coding scheme found in previous work by Lee (2011).

Overall coding efforts focused on the task representations and components of SCK. Other documents were compared among participants to either identify new themes or solidify themes identified by other data collection procedures. Finally, data were analyzed across participants and data sources to assist in triangulation of data, further strengthening themes developed (Merriam, 2009).

Researcher: Participant: Date: Class:

Task	Verbatim representation of task	Maturity and appropriateness	Audience
1			
2			
3			
4			

| Maturity and appropriateness	Audience
Mature and appropriate: # 1	Whole class: WC
Mature and inappropriate: # 2	Small groups (3 or more): SG
Immature and appropriate: # 3	Individual or pairs: I/P
Immature and inappropriate: # 4	

Figure 3. Abbreviated task representation *c*oding sheet. Adapted from "The effects of a content knowledge workshop on teachers' pedagogical content knowledge and student learning in a soccer unit in middle school Physical Education," by Y. Lee, 2011, January 1. *ProQuest LLC,* p. 51.

The data analysis procedures are provided in both a written and table form (see Table 3) to provide clarity to the multiple sources of data while also providing a condensed version for ease of reading. The following data sources were used to adequately address the first research question: 1. What are the task representations of novice, beginning, and accomplished elementary physical education teachers that guide instructional practice during an overhand throwing unit? The main data source were the task representation coding sheets used by Lee (2011) to determine the maturity and the appropriateness of the overhand throwing tasks. Additional supporting information was also gleaned from the field notes that were completed on each lesson observed.

The following data sources were used to adequately address the second research question: 2. What is the CCK of overhand throwing for novice, beginning, and accomplished elementary physical education teachers? The CCK overhand throwing assessment (see Appendix D) specifically assessed Nancy, Benjamin and Allison's overhand throwing content knowledge through both closed and open questions. Field notes were used to provide support for the CCK assessment analysis. The total possible points were 13 for the close ended questions. Each of the eight short answer questions were worth three points each for a total of 24 points. The cumulative score for the CCK assessment was 37 points.

The following data sources were used to adequately address the third research question: 3. What forms of SCK during overhand throwing instruction do novice, beginning, and accomplished elementary physical education teachers demonstrate? To categorize data into CCK or SCK can be challenging without a concrete description due to the complexity and pervasiveness of the components of SCK. Following is an example of the difference between CCK and SCK. The knowledge of soccer rules and critical elements—components needed to be

successful; example given, non-kicking foot beside ball—would be referred to as CCK. SCK

would include the ability to differentiate instruction when teaching a 4th grade and 9th grade

class, the context (inside or outside, three or nine available soccer balls), child specific (what

works for one child may not work for another), and content specific (soccer compared to

gymnastics). A physical education teacher may have high SCK in soccer but be woefully

inadequate in teaching elementary gymnastics or dancing.

To adequately answer question 3, the open ended interview questions and field notes

were the main sources of data. The open ended interview questions were segmented by question

to allow comparison between participants as well as cumulative responses by all participants.

Field notes were typed and analyzed for components related to SCK—as this component was not

specifically addressed within the standardized observation protocols or the CCK assessment.

Additional data was also gleaned from a time based summary of an instructional lesson. It

included data on the following components: managerial, directions, transitions, instructional

tasks, and student engagement. To summarize, with each change in focus or task of the

participant, notes were taken on the applicable components of managerial, directions, transitions,

instructional tasks, student engagement, and if needed, additional comments were made. An

example from one participant notes looked like this. "2:22-2:25pm: Directions included straight

down and to each side for stretching while leaning over with legs in a V. Most students were

engaged. No warm up was provided before stretching." No transition or managerial type of task

occurred during this period of instruction so these categories were left blank.

Table 3

Research questions, data collection, data sources, and analysis.

#	Research Question	How Data Were Collected	Data Sources	Data Analysis
1	What are the task representations of novice, beginning, and accomplished physical education teachers that guide instructional practice during an overhand throwing unit?	• Observation • Voice recording • Written field notes	• Task representation coding sheets • QMTPS (day 1) • Semi-structured interviews (day 1) • Field notes (every day)	• Descriptive statistics • Coding of Data
2	What is the CCK of overhand throwing for novice, beginning, and accomplished elementary physical education teachers>	• Observation • Completion of the CCK assessment • Written field notes	• CCK assessment (day 1) • Field notes (every day)	• Descriptive statistics • Coding of Data
3	What forms of SCK during overhand throwing instruction do novice, beginning, and accomplished elementary physical education teachers demonstrate?	• Observation • Voice recording • Written field notes	• Long interview (day 1) • Semi structured interview (day 1) • Field notes (every day) • Curricular resources (various days) • Time summary sheet (day 2, 3 or 4)	• Descriptive statistics • Coding of Data

TRUSTWORTHINESS

The criteria for defining trustworthiness and rigor in quantitative and qualitative studies are different, but comparable. The four main criteria by which quantitative studies have typically been judged on rigor are internal validity, external validity, reliability and objectivity (Schwandt, Lincoln, & Guba, 2007). To establish rigor with qualitative studies, parallel criteria have been postulated (Lincoln & Guba, 1985; Schwandt, 2000; Schwandt et al., 2007). The four comparable criteria for qualitative data by Lincoln and Guba (1985) are credibility (internal validity), transferability (external validity), dependability (reliability), and confirmability (objectivity). Several measures were implemented to ensure trustworthiness. Credibility was established through triangulation, member checks, and frequent observations. Transferability was established through a copious amount of data collection and analysis to adequately describe the context of the overhand throwing instruction. Dependability was addressed by engaging in sufficient training in the observation and data collection procedures associated with this research study. Confirmability (objectivity) was a difficult construct to demonstrate. However, during data collection and analysis every effort was made to remain impartial and unbiased during the research study.

The practice of triangulation has been utilized in previous PCK studies (McCaughtry & Rovegno, 2003; Rovegno, Chen & Todorovich, 2003) to provide multiple forms of evidence that can be compared and contrasted to better describe and detail findings (Stake, 2005). For this study triangulation occurred among the field notes, interview data, QMTPS, the CCK throwing assessment, and ancillary data. Jones (1985) stated that data sources should come from different methodological approaches. It is suggested that the greater the difference between the data collection methods, the lesser the chance of confronting the same methodological biases. Thus,

any conclusions made could be identified as a valid outcome and not an outcome of instrument bias.

In order to validate the trustworthiness of the interviews and teacher student interaction data, member checking occurred to further strengthen credibility. To facilitate this process each of the participants was provided the transcribed interviews. This afforded the participants the ability to clarify, expand, or reframe their interview answers for reflection or analysis (Stake, 2005).

When examining the components of PCK, support for the importance of context within instructional settings was provided early in physical education research settings by Siedentop (1986). Ward et al. (2014) have continued to support the importance of context even today. In order to help frame the context of each visit, contextual notes were placed in the field notes journal under "contextual information" after each site visit. Support for utilizing contextual notes was provided by Rhoades (2010) who stated the importance of contextual descriptions in the transferability of qualitative research. Much like quantitative analysis seeks to inform generalizations through statistical methods, qualitative research should provide adequate context to support transference of qualitative research.

RESEARCH SUBJECTIVITY

During any qualitative research it is necessary to acknowledge potential research bias or subjectivity (McCusker & Gunaydin, 2015). The investigator for this research was a doctoral student at a division I university in the southeastern United States. Previous research was performed in this geographical area examining the PCK of accomplished physical education teachers. This prior research served as a type of pilot study for this research on overhand throwing instruction. During data collection prior to this research Nancy was observed and

interviewed to find the commonalities of accomplished physical education teachers regarding their PCK. However, it did not examine a specific motor or sport skill as this research did. Although no contact occurred after the PCK research, the previous relationship with Nancy may be interpreted as researcher bias.

An additional previous relationship existed with one of the schools used for this research. An accomplished physical education teacher was previously employed at the same school where Nancy worked. There was no interaction with the school and me except for gaining permission to observe, but again researcher subjectivity may be a threat.

A final researcher bias is the fact that I chose the research design and sport skill (overhand throwing) to examine. When creating the CCK assessment and interview questions, I first drew upon my own personal experience and knowledge regarding overhand throwing. In addition to using relevant motor learning and motor development theories, I have developed a general script of overhand throwing instruction through years of teaching of what I believe to be "quality" instruction. This preconceived notion of quality overhand throwing methodology was also researcher subjectivity.

GENERALIZABILITY

In order to address generalizability, an often used analogy is the casting of a wide net with regard to data collection. This general qualitative research sought this approach with various collection strategies to provide multiple types of data to help with triangulation. Similar to Bromley (1986), it also attempted to get close to the object of interest: overhand throwing instruction. This notion of a "narrowed" generalizability concurred with Merriam and Ward. As Ward (2013) reminded us, the components of PCK are content and context specific. As such, this research focus and generalizability clearly align with Merriam (2009) and Ward (2013). For

these reasons, the results of this research are only generalizable to overhand throwing instruction in a primary setting.

SUMMARY

In this chapter, I describe the rationale for the use of a general qualitative approach to overhand throwing research. Three types of elementary physical education teachers were recruited; novice (0-1 years teaching experience), beginning (2-4 years teaching experience), and accomplished (identified by awards or recognition given). With the use of three different experience levels, I sought to report and analyze any differences in the way they represented the task of overhand throwing.

Data collection occurred during each observation for each participant. The quantifiable type of data such as the QMTPS, CCK assessment, and the task representation sheets were completed on the first two days of observation. This was done early in the overhand throwing unit as it was surmised that more instruction would occur in the beginning of the unit. As the students developed the basics of the overhand throwing form, most physical education teachers incorporate more practice and game like play to facilitate students overhand throwing. The following data were collected: QMTPS, task representation coding sheets, CCK assessment, interviews, time based summary sheet, lesson plans, curricular guides, sample student assessments, and field notes that included contextual data from each observation.

The data sources were used to specifically address one of the three research questions while also supporting other research questions when applicable. To address the task representations of novice, beginning, and accomplished elementary physical education teachers the task representation coding sheet was used. To address the CCK of overhand throwing for novice, beginning, and accomplished elementary physical education teachers, the CCK overhand

throwing assessment was employed (see Appendix D). To address what forms of SCK during overhand throwing instruction do novice, beginning, and accomplished elementary physical education teachers demonstrate; the open ended CCK assessment answers and field notes were the main sources of data. Additional data were also gleaned from a time based summary of an instructional lesson loosely based on research by Siedentop (2002a).

The chapter concluded with trustworthiness, research subjectivity, and generalizability. The main evidence for trustworthiness was triangulation. The practice of triangulation was utilized in previous PCK studies (McCaughtry & Rovegno, 2003; Rovegno et al., 2003), and provides multiple forms of evidence that can be compared and contrasted to better describe and detail findings (Hays & Singh, 2012). This research used multiple forms of data to address trustworthiness. Perhaps the biggest threat to research subjectivity was the fact that I have partly developed my own conception about what quality overhand throwing instruction should include. Additionally, I was familiar with one school location and the accomplished physical education teacher, which presented a threat to researcher subjectivity. As with both qualitative and quantitative research, the ability to generalize results can be challenging. Although generalizability cannot be used within this research design, the qualities and attributes that contributed to best practice during overhand throwing instruction was an overall goal.

CHAPTER IV

RESULTS

It appeared from Benjamin's perspective that the class size was a major impediment to effective instruction in physical education. When asked specifically what way is the most effective way to teach physical education he replied: "Um, hopefully with less than 40 kids per class." When asked what he thought the best method of teaching physical education he stated: "and probably the most effective way of teaching is in group settings."

Allison had a good rapport and working relationship with her co-teacher. During observation prior to scheduled data collection students seemed on task and focused on the learning objectives being taught. However, she expressed a desire to have her class "to herself." She stated: "It is so much easier when I only have one class. I feel like with two classes three times every two weeks, like I am not getting everything. Um, it is nice to have them by myself so I can see and make sure that they are all where they need to be."

Nancy did not comment on the number of students she had in class during any informal discussions, interview questions, or in any field notes analyzed. Her attention to organizational details, like having the same color beanbags with the same cones for partner work, provided a sense of uncomplicated structure with which the students seemed to work well in. Unfortunately, physical education class sizes can vary greatly, which can create instructional challenges—as evidenced by this research.

Curricular Resources and Instructional Support

Although the utility and priority of physical education has been reexamined due to the childhood obesity epidemic, the widespread availability and alignment regarding curriculum guides and student objectives remain elusive. The resources available for the participants varied

greatly. When examining lesson plans and curriculum guides, only Allison had a comprehensive curriculum guide available. This was not surprising given the fact that she was in charge of its development and implementation for the county in which she taught. The curriculum guide was broken down into throwing, catching, and rolling. Each grade level included between four and five objectives related to the throwing, catching, and rolling commensurate with the grade level. For example, 2nd grade included: "demonstrate the fundamental movement skills such as; throwing, catching, kicking, and striking." In 4th grade the concept of overhand throwing has progressed to include: "Demonstrate and combine skill themes in physical activity including throwing, catching, and striking with control in an authentic setting." In this case, the authentic setting would include activities such as keep away and small sided games that incorporate throwing in a more dynamic environment.

Nancy was not provided a curriculum guide, but did request one after our initial interview. Benjamin had available a rudimentary two page curriculum guide for 2nd grade. Interestingly, there was no mention of overhand throwing within the 2nd grade curriculum. Further, one surprising objective was: "Participate in basketball, volleyball, softball, & soccer skills with modified equipment." As noted by Pangrazi (2004), the inclusion of team sports is not an age appropriate activity for this age range. The inclusion of team sports with the omission of any type of throwing objectives demonstrated a lack of developmentally appropriate goals for students to achieve. This lack of a developmentally appropriate curriculum by the committee effectively encourages a team sports objective as a goal for all elementary physical education teachers under their supervision.

When Benjamin described the curriculum guide and what influenced his overhand throwing instruction he provided these statements.

…second does not include overhand throwing um but it does, it kind of like, if you want

to touch base on it you are more than welcome to do it…I kind of mix it all together.

Obviously I have to follow a certain curriculum but I also bring in my, you know,

background knowledge of overhand throwing and use that and mix it with the school

curriculum.

After analyzing field and contextual notes, time based summary sheets, and direct observation of Benjamin, there was a woven theme throughout. An overall lack of purposeful planning seemed to dominate his overhand throwing instruction. The lack of a developmentally appropriate curriculum guide may have further hampered his efforts to create quality lesson plans. There was no mention of other written or electronic resources used for overhand throwing instruction.

As previously stated, Nancy was not provided a curriculum guide for physical education. However, that did not prevent her lesson plans from being developmentally appropriate, detailed, and addressing the main components of a quality lesson plan (warm up, introductory set, objectives stated, demonstration, guided practice, independent practice, formative or summative assessment, and closure). Although Nancy had played softball since she was five years old, she stated that: "sometimes you get so used to it that you have to break it down." She continued by stating: "So I went…I did research online and where to start from…I wanted to know where to start from." This example of revisiting the overhand throw for the purposes of teaching was not identified by Benjamin. Nancy also stated that she used personal experience but also other resources as well. "I use the internet, PE Central (physical education website) has some pretty good games on it. Um, and then we have books in here as far as assessments so."

Perhaps the most advantageous support for quality overhand throwing lesson planning came in the form of previously created lesson plans: "Um, luckily the PE teacher before me, Mr.

"Red" left me all of his lesson plans so it is nice to be able to look back on his lesson plans, pull ideas." As described previously, the former physical education teacher was one of three finalists for teacher of the year for the state. The ability to utilize lesson plans that (presumably) are developmentally appropriate and detailed is an advantage that most novice physical education teachers do not have access to.

Allison provided the most detailed lesson plans and demonstrated the most curricular guide knowledge. Interestingly after 22 years of teaching she still sought out the latest instructional practices stating: "And the thing is, and I know that I have done it for many years and just double checking to make sure that nothing has changed in how you deliver the instruction. But PE Central is a wonderful resource." Lesson planning content that focused on infusing a fitness component into the lesson with a skill theme included the author George Graham. Additionally, she stated:

Pangrazi is a little bit more compartmentalized where you have an introduction to the fitness, you have a skill development, and then you always end up with a game. And it doesn't necessarily match the skill you taught. So then if I use that model I like to try and make that game more looking at the skill that was taught to reinforce, ah actually to apply. We know they know it but can they apply it in a different situation?

The curricular support she used included personal experience, the skill theme approach, and the book, Children Moving. Perhaps most integral was her experience in curricular development for the district in which she taught. When speaking about the curriculum she helped create that aligned to the national physical education standards she stated:

I was on the committee that did it and basically we took the overall curriculum and cut it down to bits and pieces based on what we felt was most important based on the time

that we had to teach it. And then we developed that into units. One problem there is that when you develop it into units people think that you only teach it once and you don't re, or you don't readdress it throughout the school year…So you have to understand that you have units. We put them there, but we sure hope you don't teach in isolation.

The instructional philosophy of teaching a skill, and then returning to said skill several different times throughout the school year can perhaps best be described as weaving it through the curriculum. This approach is also espoused and supported by Kovar (2011). With regards to curriculum guides, usage, and structure, Allison provided the most information and knowledge. This knowledge and curricular philosophy also was clearly evident in her lesson plan structure.

The lesson plans used by Nancy and Allison were highly detailed. The lesson plan outline for Allison includes (listed in order of appearance):

1). Formative assessment: What ongoing processes will be used to gauge student progress toward mastery, and summative assessment: What product, performance task, or formal assessment will be used to determine student mastery?

2). Fitness focus: What will students do that will help improve their physical conditioning? 10-15 minute minimum observed at the start or during the lesson.

3). Focus question: What students should think about while focused on their learning.

4). Anticipatory set: How will you capture student's attention, stimulate their thinking, and help them access their prior knowledge?

5). Whole group/teacher guided instruction: How will you introduce and model new skills or concepts? What procedures will be used during the activity?

6). Exploration/explanation: What strategies will students use to assist them in learning new skills and concepts? How will students analyze their exploration/assignment/activity?

7). Extension, interdisciplinary, and homework activities: What will students do outside physical education class to help improve their performance or knowledge related to the class objectives?

8). Differentiation: How will you differentiate for students of varied abilities?

9). Closure: How will you revisit the class objectives and gauge student achievement? How will you guide students to reflect on the focus question and next steps?

Nancy had a similarly constructed lesson plan outline. The outline will be listed here to examine any differences among the two. If the lesson component matched Allison it will state such.

1). Warm up: No description was provided.

2). Set: It was consistent with Allison's lesson plan guide.

3). Objectives: It was not clearly aligned with Allison's lesson plan outline; this objective must have both content and performance. For example: Student demonstrates the knowledge of the contralateral step by stepping with their non-throwing side foot while throwing.

4). Instructional methods: This component incorporates content such as activating prior knowledge, identifying similarities and differences, reinforcing effort and providing recognition through checklist type method.

5). Input/Modeling: It was consistent with Allison's lesson plan guide.

6). Guided practice: It was consistent with Allison's lesson plan guide.

7). Independent practice: Provide students with opportunities to develop fluency through practice.

8). Assessment: Formative and summative components were consistent with Allison's lesson plan guide.

9). Closure: Consistent with Allison's lesson plan guide.

10). Differentiation instruction included the various methods of instruction (auditory, visual, and kinesthetic) as well as varying ability levels and grouping methods (individual, pairs, groups, etc.)

Lesson plan usage for Benjamin was not observed during any of the observations, nor did he have any lesson plans to provide when asked. Field notes for his April 4th lesson included, "winged it." This simple phrase encompassed a lack of sophistication and planning that was observed.

The available equipment observed for overhand throwing instruction seemed appropriate in the amount and quality for effective instruction for both Nancy and Allison. Nancy used fluff balls for inside throwing instruction and beanbags for outside throwing instruction. She also effectively utilized color matched cones and bean bags to help students get to the correct spot and for organizational purposes throughout her overhand throwing unit. Allison had a sufficient amount of quality equipment even for the times that two classes were being taught simultaneously. In addition, she incorporated laminated sheets of paper for her warm up and an iPad to film student's overhand throwing form. Benjamin had the least amount of available equipment among the participants, including for overhand throwing instruction. However, he had access to enough throwing implements (bean bags, whiffle balls, etc. to have one for each

pair of students. Unfortunately, this equipment was only used on the last day of the unit for an overhand throwing game.

TASK REPRESENTATION OF PARTICIPANTS

To include all data related to how overhand throwing tasks were presented, task representation coding sheets, scores from the QMTPS, relevant interview questions, and field notes written during each lesson were collected and analyzed for each participant. For Nancy, Benjamin, and Allison the process of categorizing their tasks was inexorably linked with the field notes taken during instruction and the contextual environment of the instruction. Therefore, the field notes were utilized to support the categorizing of the task representations. The determination of the maturity and appropriateness of the task was surprisingly more challenging than I expected. Several task representations for each participant are described to help elucidate the categorizing of the maturity and appropriateness of the tasks presented. The figure below provides the outline for how the tasks are categorized. The scoring system is as follows:

Category 1 is for mature and appropriate task;

Category 2 is for mature and inappropriate task;

Category 3 is for immature and appropriate task;

and Category 4 is for immature and inappropriate task.

For day one of the overhand throwing unit, as indicated in Figure 4, Nancy and Allison's task representations were all mature and appropriate. Nancy had 10 distinctly different tasks and Allison had 13. Benjamin had three immature and appropriate tasks, 19 mature but inappropriate tasks, and three immature and inappropriate tasks. When excluding the warm up periods during class instruction, all participants used approximately the same amount of class time on overhand throwing instruction.
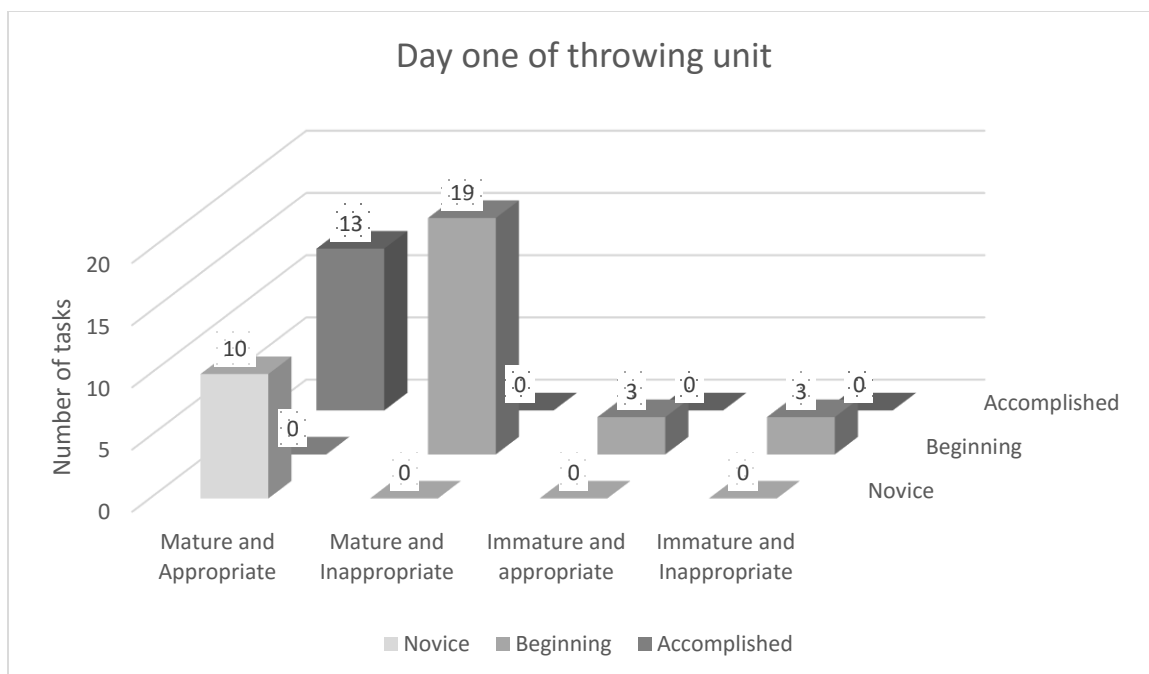
Figure 4. Day one of all participants' task representations

For day two of the overhand throwing unit, as indicated in Figure 5, Nancy and Allison's task representations were all mature and appropriate. Nancy had 21 distinctly different tasks and Allison had 18. Benjamin had eight mature but inappropriate tasks. Benjamin and Nancy used approximately the same amount of class time on overhand throwing instruction. Allison utilized a slightly longer warm up period compared to the other two participants (seven minutes) so her actual overhand throwing instruction was roughly two minutes shorter.
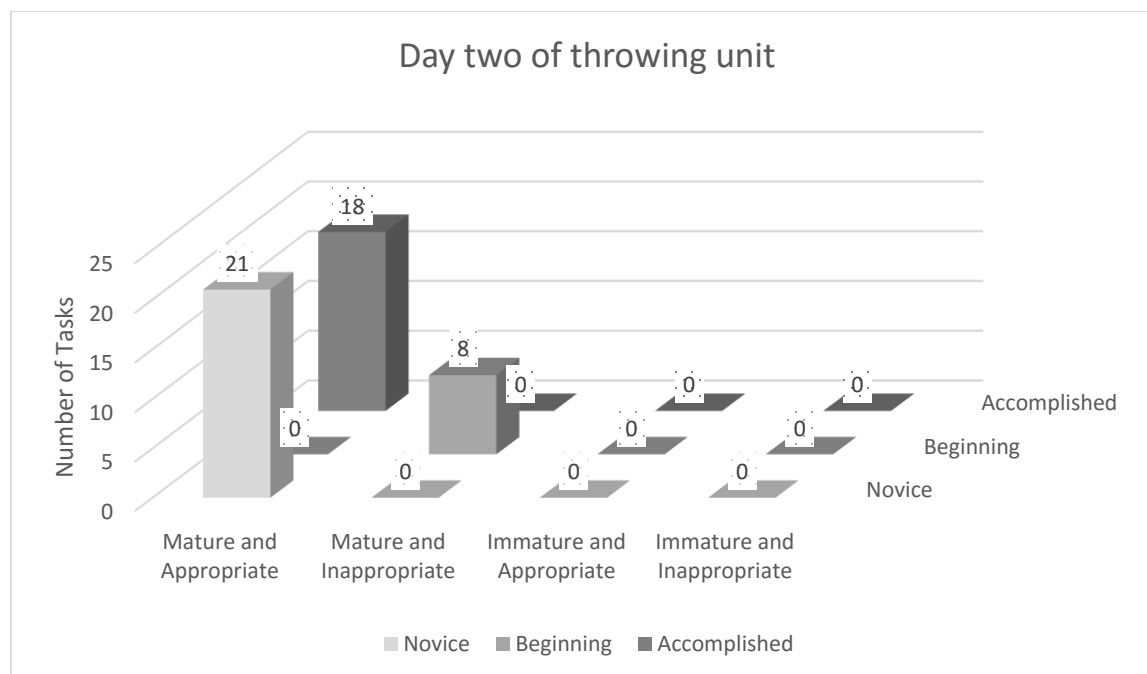
Figure 5. Day two of all participants' task representations

Task Representations of the Novice Participant

The task representations for Nancy were all mature and appropriate (see Figure 6). The maturity and appropriateness of the first task on day one of the overhand throwing unit was supported by the quality of the task and the adherence to the developmental stage of the students. Nancy stated:

Whatever hand you are most comfortable with; I want you to raise it in the air…do you have a hand that you feel more comfortable with? As you are figuring it out, I am going to come around with stickers and whatever hand you do not write with I am going to put a sticker.

To further reinforce the correct hand, Nancy stated: "So am I going to put a sticker on the hand that you write with? No, it's going to go on the opposite hand."

Upon the completion of the lesson, Nancy was asked why she had chosen their non-throwing hand as opposed to their throwing hand to determine if she understood the quality and appropriateness of the task representation. She stated: "Because so they are looking that way so that if it was on their throwing hand they would be looking backwards instead of looking forward."

Two further tasks on day one that clearly demonstrated both mature and appropriateness were the second and last tasks presented. Overhand throwing tasks that focus on close distances can create inefficient or immature throwing patterns as students do not need to use critical cues such as the principle of opposition, follow through, and at a more experienced level, differentiated trunk rotation. Similarly, including targets during initial overhand throwing instruction shifts the students focus from cues such as: "step, swing, cross" as delivered by Nancy, to immature movement patterns to accomplish the task. Support for these assertions is provided by Graham, Holt/Hale, and Parker (2013) who state: "Generally, longer throws (or harder throws) to a large target elicit mature throwing patterns" (p. 436).

The second task presented was a simple partner passing activity with three important criteria that made it both mature and appropriate. First, the throwing implement (nugget) used was a semi dense yarn ball that had a limited flight capacity. Second, the distance the students were throwing to one another was 20-25 feet which required the students to utilize moderate amounts of force to get the nugget toward their target. The final component was that the throwing student's partner was instructed to not attempt to catch the nugget. The throwing students were simply instructed to throw it toward their partner without an expectation of accuracy. This shifted the focus of the throwing task from accuracy to the critical elements of the step, swing, and cross. One final demonstration of maturity was in the way the task was

teacher directed during the first few times of partner throwing. Students were informed to wait for Nancy's instruction before they threw the nugget back. This allowed Nancy to reinforce the three cues of step, swing, and cross. After several attempts by each student at throwing, Nancy then allowed the students to throw back and forth at their own pace as she came around and provided instruction and reinforcement when needed.

The final task utilized a game format that included four scoring lines where students received more points for throwing the nugget farther. This task representation of having students throw for distance encouraged more mature overhand throwing forms as supported by Graham and colleagues.
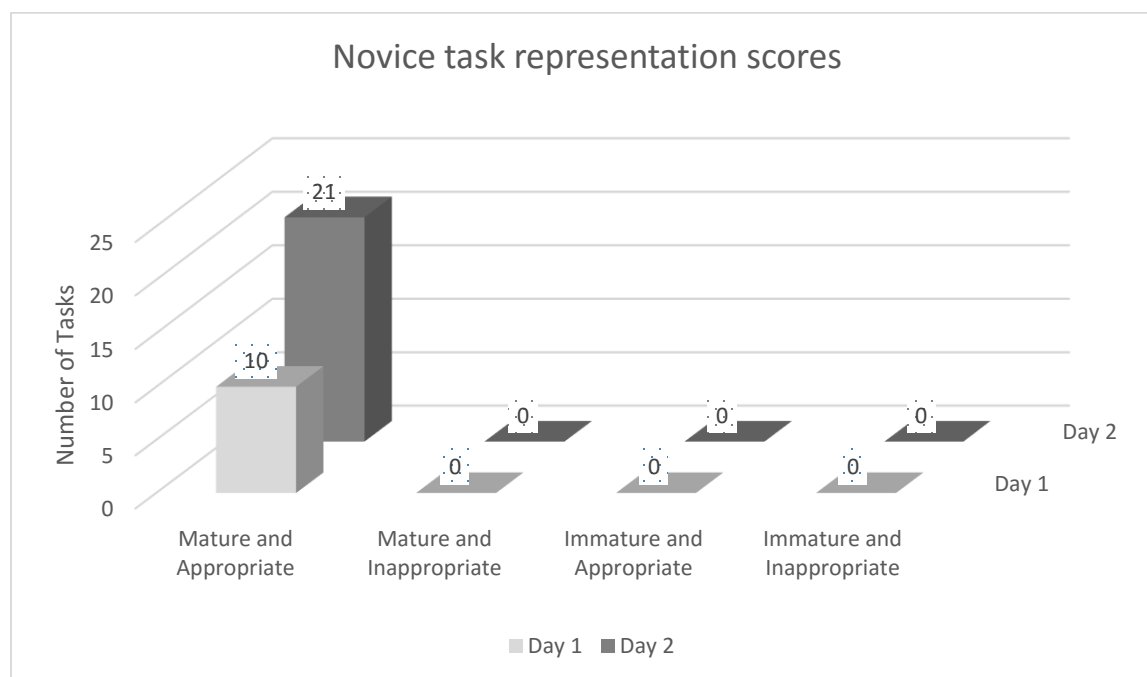
Figure 6. Novice task representation scores

During day two Nancy's task presentations were again mature and appropriate. This lesson occurred outside so the context of the lesson had several challenges that had to be taken into account. The first possible challenge was wind. The second included the many distractors that had to be overcome when teaching second graders outside. The final challenge was utilizing space and equipment properly with a lack of meaningful boundaries for students. To address these issues, Nancy utilized beanbags that had a heavier weight, and when they landed they tended to stay in place—which was an important component of the task of balloon pop played at the end of the lesson. To address the second and third issues, Nancy had the partner passing and the balloon pop game equipment set up before the class came out. In addition, the cones used during the warm up coordinated with the cones used for student placement during the partner passing task. This use of colored cones with organization greatly reduced time needed for directions and helped to maintain students focus through the increased activity time.

Task Representations of Benjamin

During day one of the overhand throwing unit, Benjamin had 19 mature but inappropriate task representations, three immature but appropriate task representations, and three immature and inappropriate task representations (see Figure 7). Benjamin split the students into two smaller groups based on gender. He took one group of 24 and the remainder of the students went with the assistant. It appeared during my observation that both instructors were doing approximately the same thing with their group of students. However, I focused on Benjamin's group for adequate data collection.

The numerous task representations were a function of the lesson. The participant had the students spread out on a line approximately 25 feet from a stage with a curtain across the front. During the first "round" he asked each student to demonstrate the overhand throw for him

without a nugget with the cues of "feet square, step, throw, and follow through." The second

round had one attempt for each student to throw the nugget toward the stage if they did it

correctly, and between 2-3 attempts if the task needed to be represented again. Out of 25 task

representations all 25 were determined to be inappropriate. The inappropriateness of the tasks

were due to the low activity quotient of the students. The activity quotient is the amount of time

a student spends engaged in moderate to vigorous activity during a physical education class.

Within all instructional periods students spent some time listening to directions or engaged in

other non-movement based activities. However, the activity quotient should ideally be roughly

50% for a typical physical education lesson (Pangrazi, 2004). Further, standing in one spot for

the majority of the class was not conducive to the limited attention span of 2nd grade students.

     The majority of all of the tasks represented were mature as Benjamin provided short and

clear cues to the students. For example, the following quote occurred when the students were in

one line shoulder to shoulder approximately 25 feet from a curtain in the gym:

> Good job, oh bring your foot forward. Remember you can't just finish like this
>
> (student stayed perpendicular to the target and did not rotate their trunk). In order
>
> to get a lot of power you need to bring your whole trunk forward, OK? Follow
>
> through with your leg, OK?

Three mature but inappropriate task representations were delivered to the whole class with two

being delivered before students began to simulate overhand throwing and one being delivered

during the lesson. They were determined to be inappropriate because the final cue emphasized

was above the developmental stage of the students. In the beginning of the lesson Benjamin

stated:

Feet together, ball in the hand that you color with…you take one step forward with your opposite foot, your arm back. When you throw, you throw forward with your arm going through on the other side and your leg coming forward. So you start square and you end square."

The final cue of start square and end square emphasized to the students to point your non-throwing shoulder toward the target (square) and when the overhand throw is completed the throwing shoulder will be facing the target. This final cue of having the trailing leg come forward at the conclusion of the throw was also expressed to all of the students during the lesson with the phrase: "Guys, don't forget to follow through with your leg." The cue would be clear and sophisticated to those with advanced overhand throwing skill but was inappropriate for 2nd graders just learning the basics of overhand throwing.

During the lesson, three tasks were categorized as immature and inappropriate. All three tasks were directed to individual students while they were in line practicing their overhand throwing. The inappropriateness was due to the low practice opportunities available to the students. The immature classification occurred because the three tasks were unsophisticated and unclear. For example: "I want to see the correct motion. We just went over this. Alright?" This statement does not inform the student what they need to do better to demonstrate the correct motion. Another example included: "Ah, you've got to follow through with your leg. Go get the ball. Follow through with your leg." Again, the phrase 'follow through with your leg' is an unclear and unsophisticated way to represent the task because most second graders do not know what it means.

Day two of Benjamin's overhand throwing unit was characterized by eight mature but inappropriate task representations. The tasks provided to the students were clear and detailed as

demonstrated by the students' adherence to the task. However, as indicated in the first lesson, there was a continued lack of a high activity quotient by the students. The lesson consisted of an elimination style overhand throwing game. The boys and the girls were separated and each of the two groups had one opportunity to see how far they could throw. The proper form was stressed and students who did not use the proper form were given a second chance to throw. The top five went into a second elimination round until only one boy and one girl were left. The conclusion of the lesson was to see which student could throw the farthest, the boy or the girl. For those students that did not make it past the first round they had 1-2 throwing opportunities for the entire lesson. If Benjamin's overall tasks were examined closely, they were all based on the overhand throwing challenge. Graham et al. (2013) recommended physical education teacher be prepared with 10-15 tasks in a lesson; not just one or two. Being prepared with multiple ways to represent a task to the different learners is a critical component in the arsenal of a quality physical education teacher.

Beginning task representation scores

	Mature and Appropriate	Mature and Inappropriate	Immature and Appropriate	Immature and Inappropriate
Day 1	0	19	3	3
Day 2	0	8	0	0
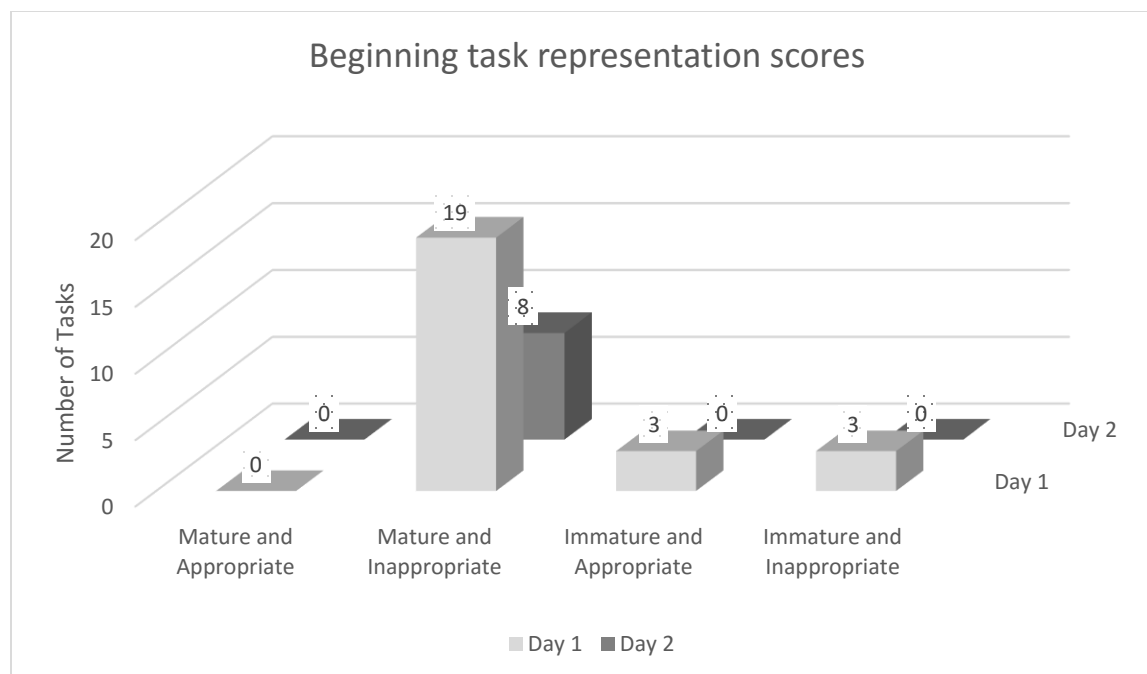
Figure 7. Beginning task representation scores

Task Representations of the Accomplished Participant

The quality and sophistication of Allison's task representation was quite apparent throughout the overhand throwing unit (see Figure 8). During day one, the students were taught simple cues to remember during overhand throwing. The cues of: "T, muscle, step, throw" were easily reproducible by the students and provided an appropriate focus for the introduction of the overhand throw.

The tasks were developmentally appropriate for 2nd graders and provided superior demonstrations. Some physical education teachers provide demonstrations from a mirror perspective or from the side to their students. Although multiple demonstration angles can increase student's visual representation of the overhand throw, research has identified that demonstrations that face the same way as the learner support the learning of new skills the best

(Mosston & Ashworth, 2002). This type of demonstration was precisely what Allison did during the first day of the overhand throwing unit. Students were also given a peer assessment sheet with simple completion directions that included circling or checking prescribed overhand throwing cues of their partners.

The use of technology in physical education is not a novel concept. However, to use it effectively while also maintaining control in a dynamic physical education setting can be challenging. Allison was able to videotape many students during their overhand throwing practice and replay the videos to the students. This allowed the students to see their form while also allowing Allison the ability to point out exactly what can be improved to the students.

During the second day of overhand throwing instruction the tasks were again mature and appropriate. After reiterating the throwing cues—T, muscle, step, throw—students were provided the opportunity to use as much force as they wanted to throw from one side of the gym to the other. The focus also shifted to having the students demonstrate what they had learned. Allison stated: "You are trying to show me what you remember from last week based on the overhand throw. What are those things that I have to do to throw the ball? Don't tell me about it, show me." During this portion of the lesson she also stopped the activity and had a student with advanced overhand throwing form demonstrate for the class. The appropriateness of this task was that she also let the student demonstrate 4-5 times for the class. This provided multiple opportunities for the class to see a peer overhand throw with a more mature throwing form.

One example of maturity and appropriateness was in the final activity of the lesson: clean out your backyard. Briefly, the game required two even teams with half on one side of the gym and half on the other side of the gym. Nuggets were spread out on both sides on the area, and when the game started, the students picked up a nugget and threw it to the other side: essentially

cleaning out their backyard. Two issues often reduce the effectiveness of the game. The first is that students grab as many nuggets as they can and throw them over at the same time. The second issue involves utilizing the proper form. Many students do not use the appropriate form because it is relatively easy (and faster) to get it to the opponent's side without using the proper form. To address these issues, Allison instituted two modifications. The first was that a student could only throw one nugget over at a time. The final modification involved a volleyball net. She used the net across the dividing line between the two teams so that the nuggets had to go over the net to get into the opponent's side. This simple modification provided an increased challenge to the students and forced them to use a mature overhand throwing form in order to get the nugget to the other side.
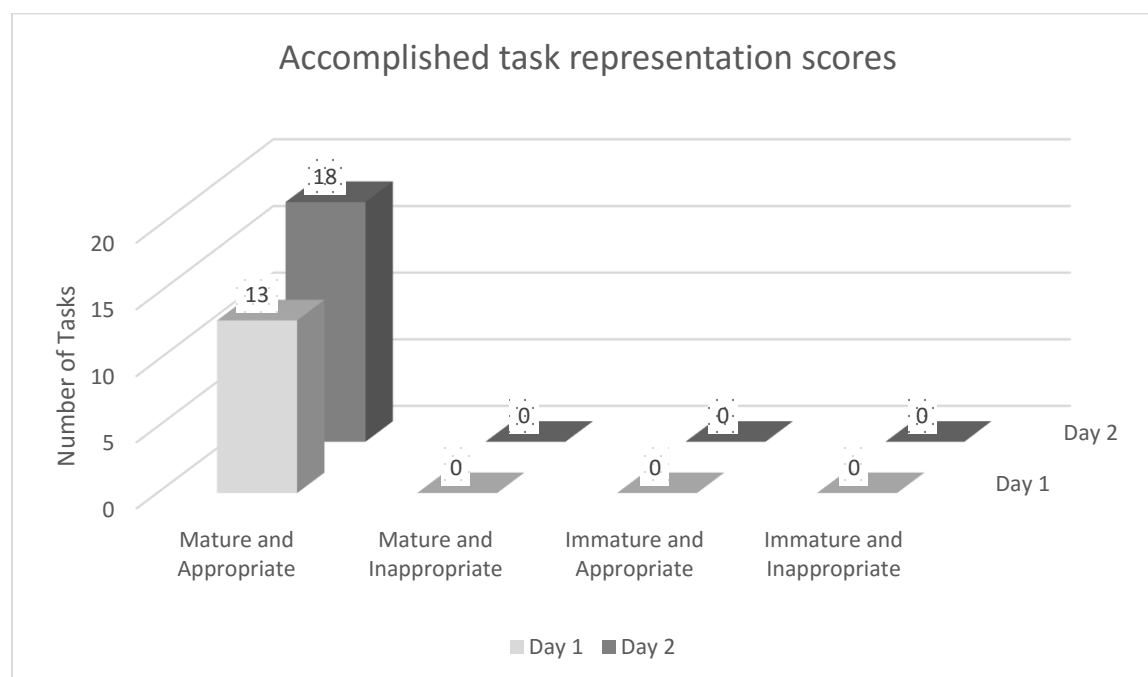
Figure 8. Accomplished task representation scores

QMTPS Results

QMTPS was completed during the first day of each participant's overhand throwing unit. Although the type of task component within the QMTPS (informing, refining, extending, applying, and repeating) was part of the QMTPS, it was not used in the overall scoring (Gusthart et al., 1997). The remaining sections (including clarity, type of demonstration, number of cues, accuracy of cues, qualitative cues, student response appropriate to focus, and specific, congruent feedback) are reported here for each section. The data were converted as a percentage of the total number of tasks during the lesson in order to demonstrate the instructional differences by the participants. For example, if six tasks were presented during a lesson and three used a full demonstration, the percentage for that section would be 50 percent. The percentage for each component of the QMTPS and an overall percentile average were calculated for each participant. The aggregated QMTPS are presented in Figure 9.
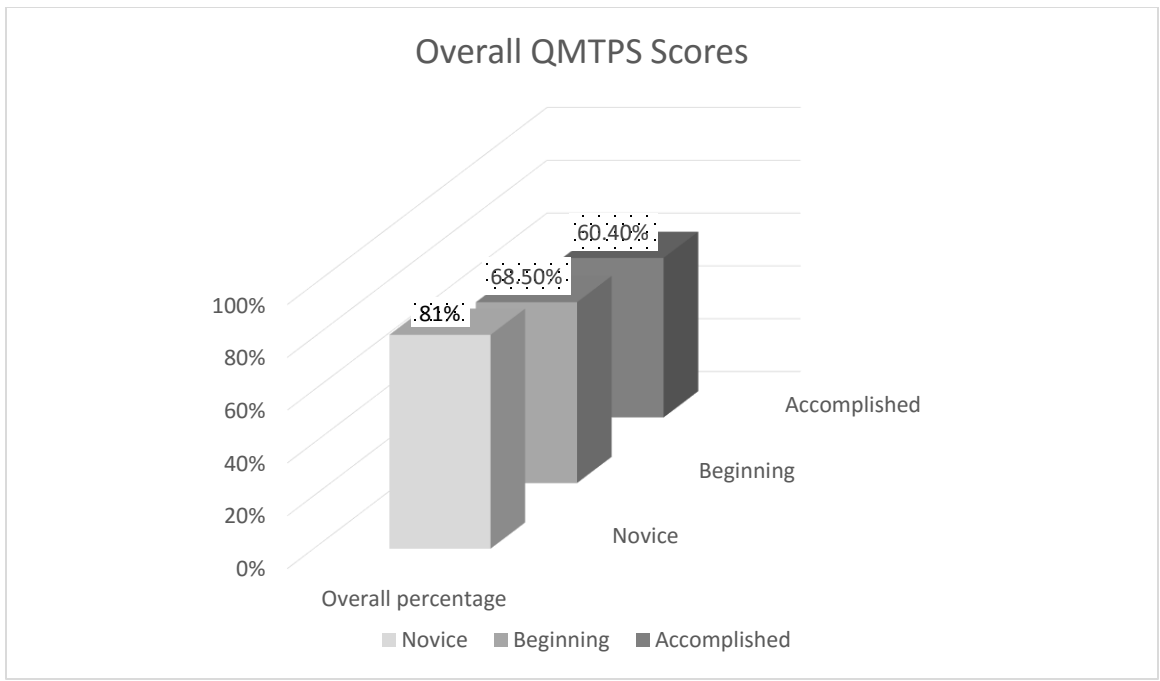
Figure 9. The aggregated QMTPS scores

The clarity of the tasks presented by the participants is presented in Figure 10. The clarity of all participants was 100%. Clarity is identified as the teacher providing clear directions and is confirmed by the movement responses of the student based upon the teacher's explanation. A lack of clarity is identified if students exhibit confusion, questions, or off-task behavior (Rink & Werner, 1989).
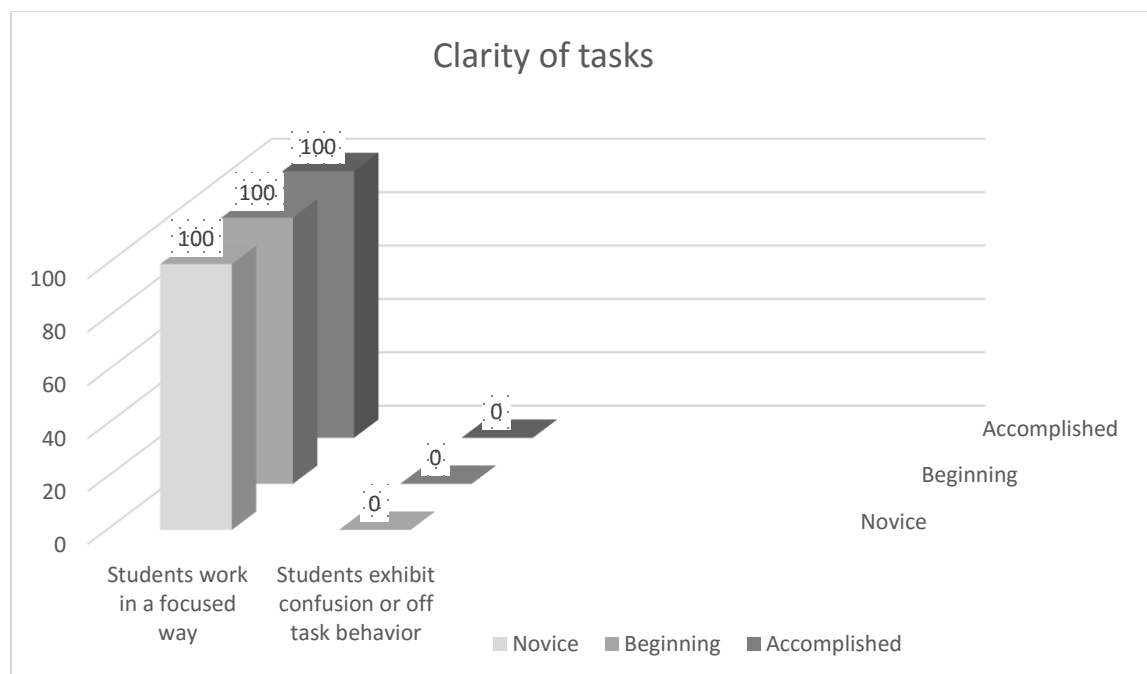
Figure 10. Clarity of tasks

The types of demonstration by the participants are presented in Figure 11. The demonstration can be performed by the teacher, student, or a visual aid. The three categories were yes, partial, and no. The yes category indicated a full model of the overhand throw occurred. The partial category indicated that the overhand throw task was partially modeled. The no category indicated that no attempt to model the overhand throw occurred (Rink & Werner, 1989). Nancy, Benjamin, and Allison's percentile scores for the yes category were 20%, 40%, and 56%, respectively. Utilizing a demonstration or modeling has been shown to improve the coordination of novice overhand throwers (Horn, Williams, Hayes, Hodges & Scott, 2007). However, experience and observation have shown that some students need a demonstration on just one component of the overhand throw. For example, they need to get their non-throwing shoulder facing their target before they start, or they need to get their throwing arm

up and back (making the letter L) before they throw. Therefore, a low percentile score on the type of demonstration does not necessarily mean that the demonstration of the overhand throw was in some way ineffective. When Nancy's overhand throwing cues were examined she focused on the "step, swing, and cross" method. Field notes collected during the QMTPS data collection indicated that over 80% of the students were successfully utilizing the correct fundamental overhand throwing movement form and body positioning by the end of the class. It appeared that when the novel skill of overhand throwing was first introduced (day one), the use of partial demonstrations allowed students to see the isolated component with which they found challenging.
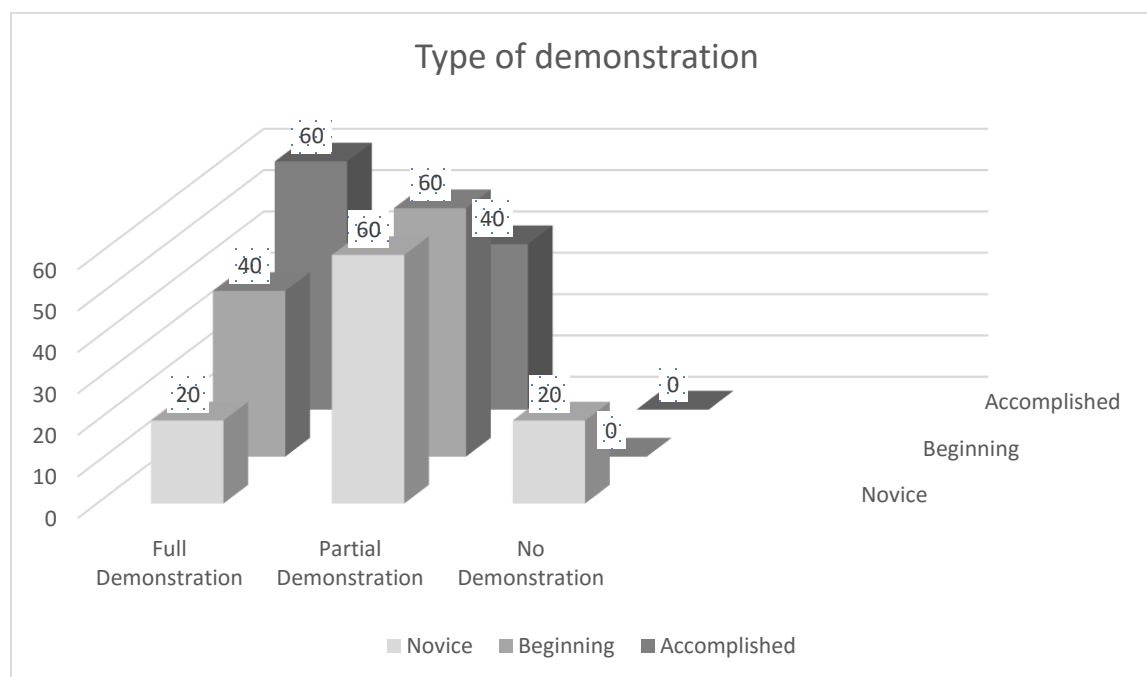
Figure 11. Type of demonstration

The number of cues provided by the participants was presented in Figure 12. The three categories were appropriate, inappropriate, and none given. The appropriate category indicated three or fewer cues related to the overhand throw were used. The inappropriate category indicated either more than three were presented or no new cues related to the overhand throw were used. The none given category indicated that no attempt to provide cues related to overhand throwing were used (Rink & Werner, 1989). Nancy, Benjamin, and Allison's percentile scores for the appropriate category were 100%, 40%, and 30%, respectively. Nancy, Benjamin, and Allison's percentile scores for the inappropriate category were 0%, 40%, and 30%, respectively. Nancy, Benjamin, and Allison's percentile scores for the none given category were 0%, 20%, and 40%, respectively. The classification of inappropriate for providing more than three cues to the learner is predicated upon not overloading the learner with too many cues at one time.
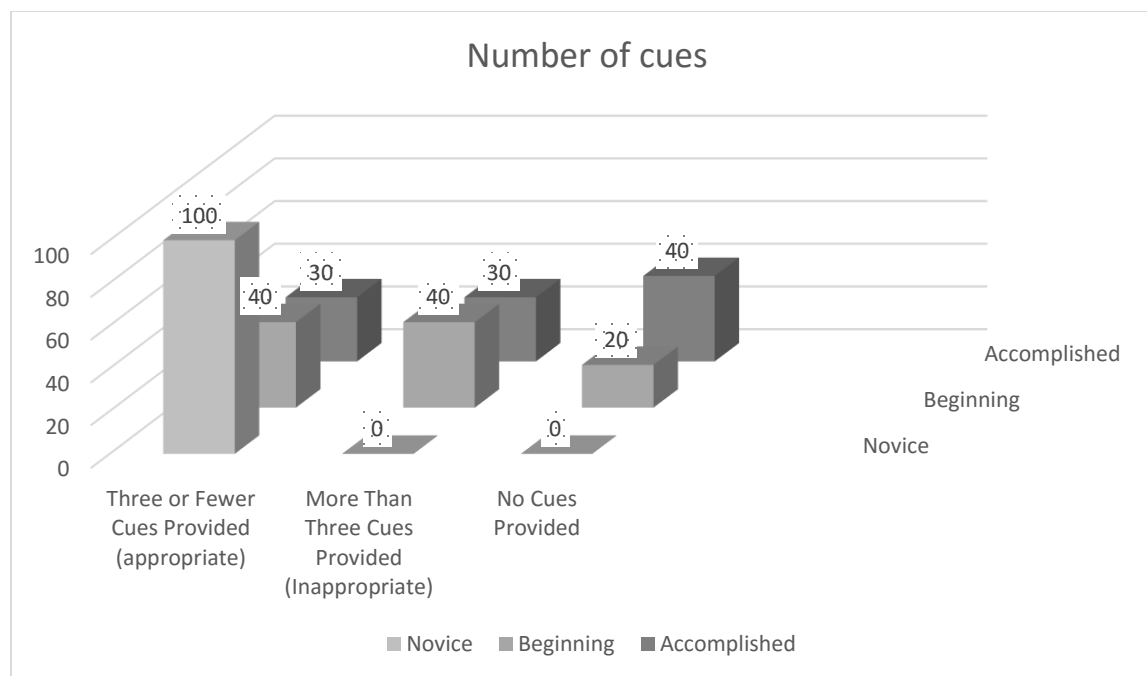
Figure 12. Number of cues

The accuracy of cues by the participants is presented in Figure 13. The three categories were accurate, inaccurate, and none given. The accurate category indicated that all of the cues presented were accurate. The inaccurate category indicated that one or more of the cues were incorrect. The none given category indicated that no cues were presented to the students (Rink & Werner, 1989). Nancy, Benjamin, and Allison's percentile scores of the accurate category were 100%, 80%, and 60%, respectively. Nancy, Benjamin, and Allison's percentile scores of the accurate category were 0%, 0%, and 0% respectively. Nancy, Benjamin, and Allison's percentile scores of the none given category were 0%, 20%, and 40%, respectively. As surmised by the participation of overhand throwing activities by Nancy and Benjamin, all cues that were stated were accurate. Allison also stated all accurate cues, but only utilized cues 60% during the overhand throwing tasks. Field notes that were collected during the QMTPS noted that cues

were provided to the students during the first four overhand throwing tasks. No cues were provided for the following four tasks. These tasks had the students choose different locomotor movement like skipping, jumping, etc. to travel from one side of the gym to the other after having thrown their nugget across the gym. The students also attempted to hit the opposite wall at varying heights. Allison focused her cues on the locomotor movement accuracy and on how well the students were able to vary their throwing height against the wall. It appeared that cues directed at the overhand throw were absent due to the inclusion of an additional focus within the overhand throwing tasks. Neither Nancy nor Benjamin utilized an additional focus within their overhand throwing tasks.
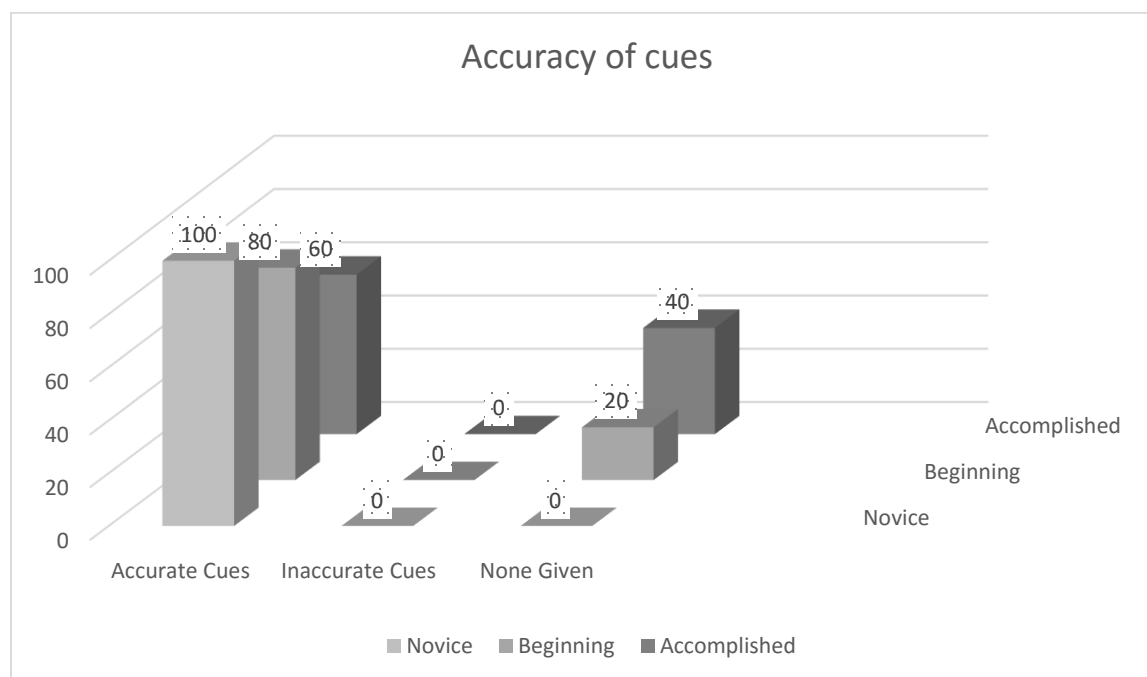
Figure 13. Accuracy of cues

The qualitative cues used by the participants are presented in Figure 14. The two categories were yes and no. The yes category indicated that the participant presented at least one aspect of the process or mechanics of the performance. The no category indicated that the participant did not present an aspect of the process of the performance (Rink & Werner, 1989). Nancy, Benjamin, and Allison's percentile scores of the yes category were 100%, 80%, and 33%, respectively. Nancy, Benjamin, and Allison's percentile scores of the no category were 0%, 20%, and 67%, respectively. For Allison's QMTPS on the fifth through the eighth task, the number of cues and qualitative cues were both scored none given and no respectively. From observation and field notes Allison provided the appropriate demonstration and cues at the beginning of the lesson. She then switched to a combined overhand throwing task while incorporating students self-selecting different locomotor movements; as discussed previously. It appeared that she favored letting her students practice their overhand throwing as opposed to focusing on feedback cues.
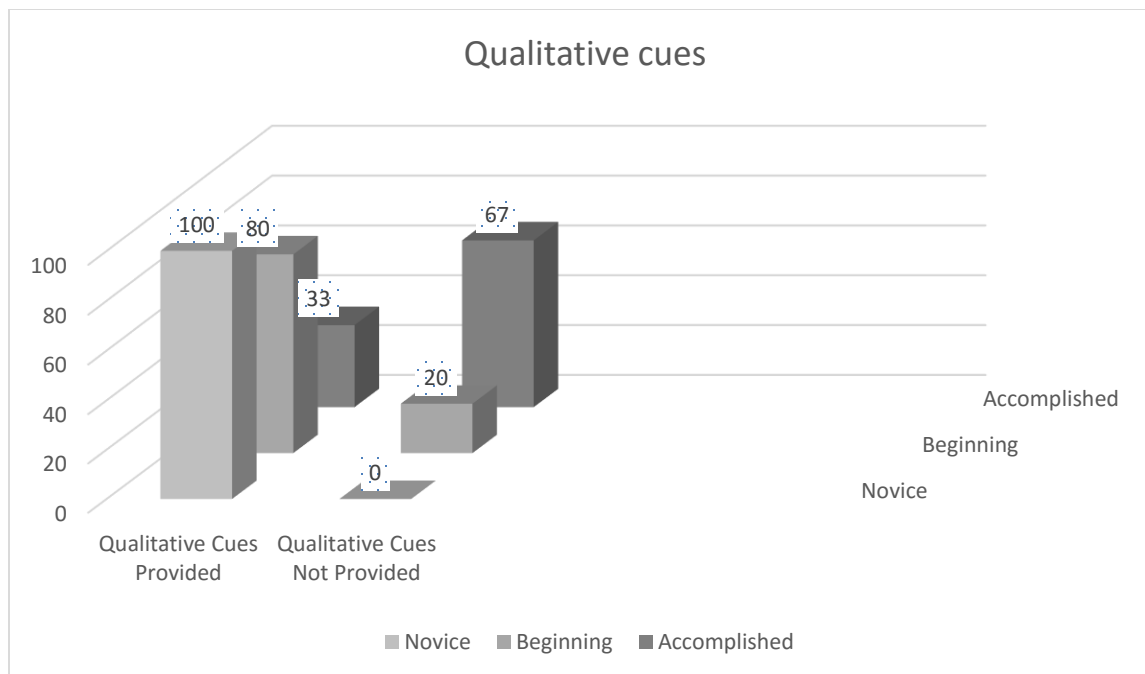
Figure 14. Qualitative cues

The student responses appropriate to focus by the participants are presented in Figure 15. The three categories were all, partial, and none. The all category indicated that no more than two students were off task. The partial category indicated that three or more students were off task. The none category indicated that no students demonstrated appropriate behaviors (Rink & Werner, 1989). Nancy, Benjamin, and Allison's percentile scores of the all category were 100%, 80%, and 100%, respectively. Nancy, Benjamin, and Allison's percentile scores of the partial category were 0%, 20%, and 0%, respectively. Nancy, Benjamin, and Allison's percentile scores of the none category were 0%, 0%, and 0%, respectively. Several variables were identified that seemed to determine the degree to which the student's behavior aligned with the objective of the task. From analysis of the QMTPS, all three participants had 100% for clarity of the task.

However, the QMTPS scores the clarity of the task presentation on the basis of student's purposeful movement in response to the presentation of the task (Rink & Werner, 1989).

Students on task behavior were examined by the way in which the lesson plan was presented and through my field notes. The lesson plan structure for both Nancy and Allison included very little time devoted to instructions or wait time. In other words, the task was presented in a short and purposeful way and most to all students were active during practice opportunities. Benjamin had the longest wait time for students due to the nature of the lesson structure. Field notes indicated that he: "Had 24 students on a line and went to each student to assess/correct their overhand throwing form. Used one nugget and went down the line to each student. After they threw they went and retrieved it." The extended wait time seemed to be the reason that several students did not respond appropriately to one of the tasks presented.
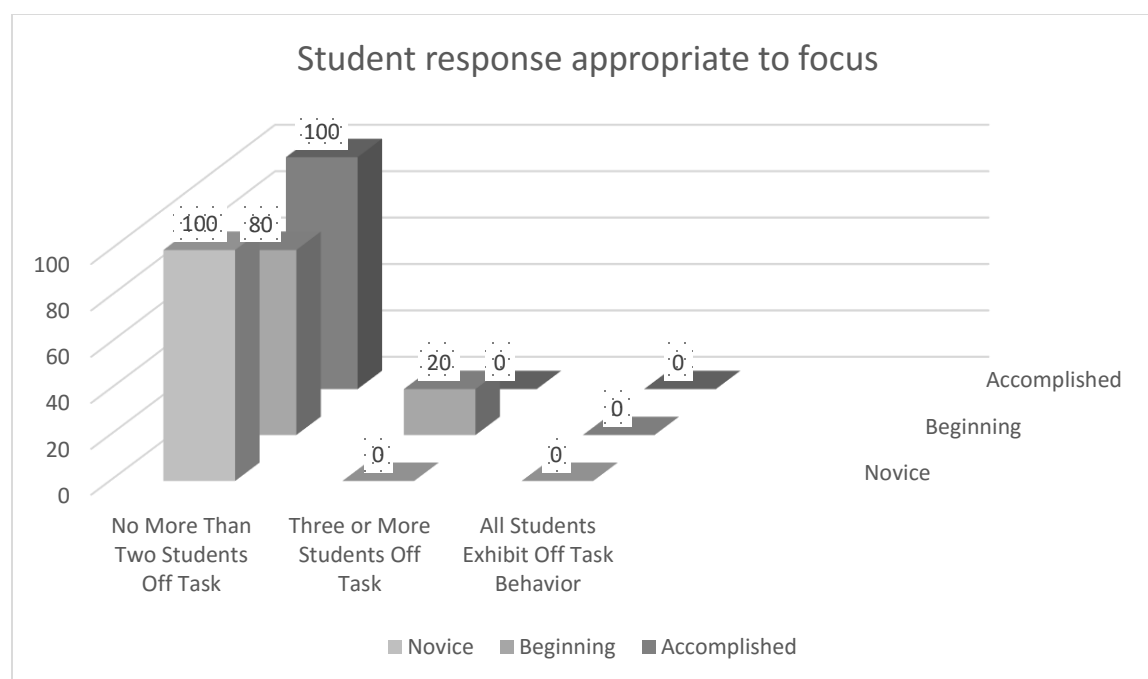
Figure 15. Student response appropriate to focus

The specific, congruent feedback by the participants is presented in Figure 16. The three categories were yes, partial, and no. The yes category indicated that more than two incidences of teacher feedback corresponded with the task. The partial category indicated that one or two incidences of teacher feedback corresponded with the task. The no category indicated that no teacher feedback corresponded with the task (Rink & Werner, 1989). Nancy, Benjamin, and Allison's percentile scores of the more than two instances of congruent feedback category were 50%, 60%, and 60%, respectively. Nancy, Benjamin, and Allison's percentile scores of the one or two instances of congruent feedback category were 10%, 0%, and 0%, respectively. Nancy, Benjamin, and Allison's percentile scores of the no congruent feedback category were 40%, 40%, and 40%, respectively.

The specific, congruent feedback category is similar to the qualitative cues category of the QMTPS. However, the specific, congruent feedback seeks to identify the extent to which the teacher provides feedback that reinforces the cues presented to the learner. When the data were examined, three interesting relationships were found: (1) The amount of time spent on a task and the relationship to specific, congruent feedback instances, (2) The type of task and the occurrence of the specific, congruent feedback, and (3) The relationship between the timing of specific, congruent feedback and the overall lesson duration.

Although the amount of time devoted to a task is not part of the QMTPS, Benjamin's length of time on a specific task was related to his specific, congruent feedback percentile score. Field notes revealed that the length of the task was six minutes or more on all three tasks that classified as more than two specific, congruent feedback instances. Nancy and Allison both presented twice the amount of tasks during their lesson. Although the specific length of time of

each of their task presentations were not recorded, the lack of time within each task may have contributed to the lack of specific, congruent, feedback instances.

The type of task (informing, refining the quality, extending the variety of it, repeating, and apply self-testing) is a component of the QMTPS but are not used in percentile calculations. For Nancy and Allison, all nine tasks that did not provide more than two or more instances of specific, congruent feedback were classified as repeating tasks. A repeating task is simply repeating the same task as previously done. Although purely a causal relationship, the rate at which specific, congruent feedback occurs would appear to diminish as it is disseminated to the learners through the repeating of the same task. In other words, instances of student feedback would be higher in the initial task, and then diminish as students begin to improve by utilizing the specific, congruent feedback.

The final interesting relationship occurred between when the specific, congruent feedback was used within the lesson. For example, Nancy used specific, congruent feedback during the first five tasks presented. Benjamin did not use specific, congruent feedback until the last three tasks presented. Allison used specific, congruent feedback during the first four tasks and the last two tasks. When field notes were examined, the majority of all of the students observed were having some difficulty with a major component of the overhand throw. For example, their body was not positioned properly, there was no step with the opposite leg, and the throwing arm was not way back (like the letter L). These pronounced errors were easy to identify. Nancy and Allison both had a high rate of specific, congruent feedback within the first half of their lesson, but a low rate of specific, congruent feedback within the second half. Arguably, two reasons are postulated for the timing of these feedback instances. The first reason is that the overhand throwing errors during the beginning of the lesson are more glaring and thus,

easy to spot and take action. The second reason postulated is that the rate of overhand throwing errors detected diminishes as the lesson proceeds, thereby reducing the need for frequent feedback.

Specific, congruent feedback
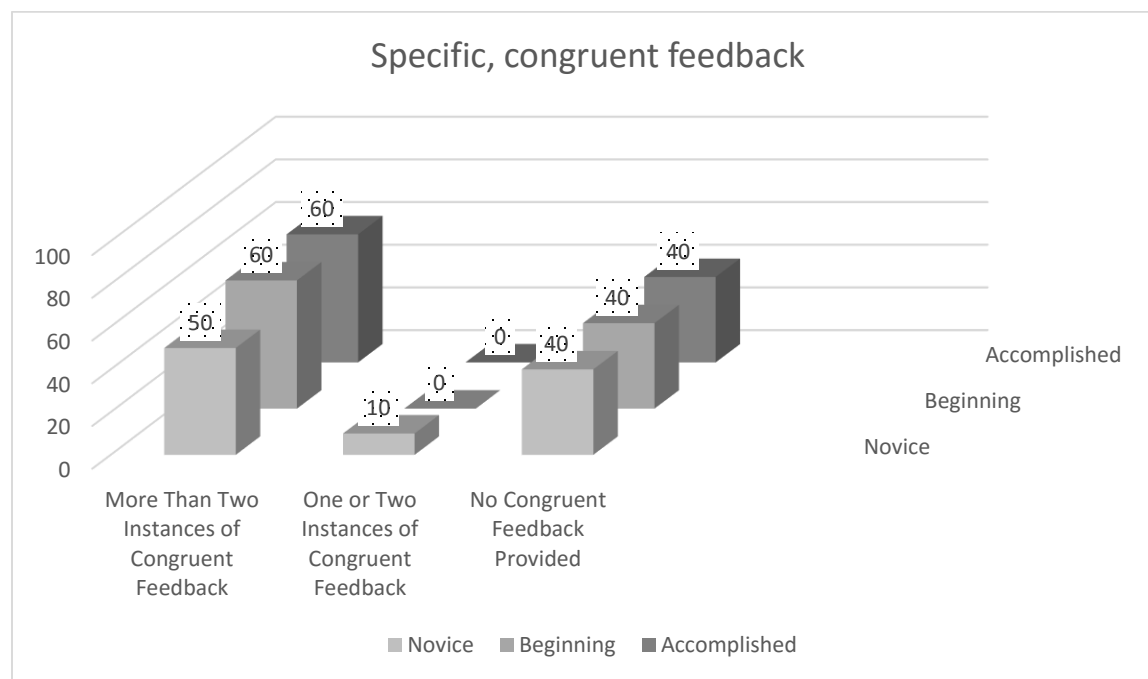
Figure 16. Specific, congruent feedback

Specific interview questions were provided to all participants regarding task representations during their overhand throwing lesson. Participants were asked: "How familiar are/were you with the phrase task representation?" All of the participants were unfamiliar with the theory despite having an example included in the interview questions prior to the interview process. Allison stated: 'I was looking at it like it would be…like a rubric looking at the different phases of um…immature pattern you know where do they fall in that rubric based on their, what they can demonstrate." This lack of understanding concerning the maturity and appropriateness was not surprising given the complexity. Therefore, all participants were

provided with examples to provide clarity during the interview. The scale that was provided for the participants to rate their personal overhand throwing tasks allowed for maturity and appropriateness to be assessed separately. In addition, instead of rating their task as simply mature or immature, the participants were able to provide a level of maturity and appropriateness. A "one" was inappropriate or immature, a "two" was a little inappropriate or a little immature, a "three" was somewhat appropriate or somewhat mature, and a "four" was appropriate or mature. Each participant was asked to describe a task and then to rate themselves on the maturity and appropriateness using the scale described previously. Each participant's task was briefly described here as well as his or her self-assessment.

Nancy described one of the first throwing tasks represented that used partner passing incorporating the cues she described in the beginning of the class. The focus, however, was not on the students throwing it directly to their partner. In fact, students were given time to collect the nugget between each throw and prompted to throw back toward their partner once all students were ready. Nancy gave herself a "three" because the students were a bit confused in getting to the correct spot. She gave herself a four for appropriateness because the throw did not have to go directly to the partner. For her overall maturity for the lesson she gave herself a 3/4. For the appropriateness she gave herself a four. All self-selected scores seemed accurate and were stated with supporting examples of different parts of the lesson.

Benjamin described the task of the longest throw competition. Briefly, this was where he separated the boys and the girls and eliminated students in two rounds until the longest boy and girl thrower competed to determine which once threw the nugget the farthest. Benjamin gave himself a "two" for both maturity and appropriateness for this task. For the overall lesson he gave himself a "three" for maturity and a score of two for appropriateness. The quality and

sophistication of the initial task that was represented was fairly clear with most students understanding the components of the longest throw competition. Interestingly, this type of competition seemed to be done previously. He stated that this was the same type of competition that they did for football and soccer. Allison chose the task of throwing from one side of the gym to the other side. Once the students threw they were to wait for the direction to "go." While moving from one side to the other they were to choose any locomotor movement that they wanted to get from one side to the other. Allison initially gave herself a "three" for maturity and appropriateness. She stated that she: "got a little controlling. Again trying to let go you know. Give them a bit more leeway." Her style of instruction would best be categorized as direct instruction. However, during initial motor skill practice this type of instruction can be argued as more important as the learner was developing the basic principles of the task. After a bit of deliberation, she settled on a score of 3/4 for her maturity and appropriateness. For the overall maturity of the lesson she gave herself a "three." and for the appropriateness she gave herself a "four." She stated:

> Not only could they demonstrate it but they could tell me about the power and the turning and a little bit more conceptual than just: I don't know what I am doing…I have to make sure even the non-experienced understand that idea. Yeah, and can apply the concept.

CCK OF PARTICIPANTS

The second research question used the CCK overhand throwing assessment (see Appendix D) to assess Nancy, Benjamin, and Allison's overhand throwing content knowledge. Additional information was gleaned through the interview questions that specifically addressed the content knowledge of the participants overhand throwing. The CCK assessment was broken

down into closed and open ended questions. Each open ended question was worth three points.

Figure 17 presented the scores on each category of the CCK assessment as well as the overall

score for each participant. Nancy scored 13 out of 13 on the closed ended question and 19 out of

24 on the open ended questions. Her overall score was 32 out of 37 possible points. Benjamin

scored seven out of 13 on the closed ended question and 15 out of 24 on the open ended

questions. His overall score was 22 out of 37 possible points. Allison scored 10 out of 13 on the

closed ended question and 19 out of 24 on the open ended questions. Her overall score was 29

out of 37 possible points.
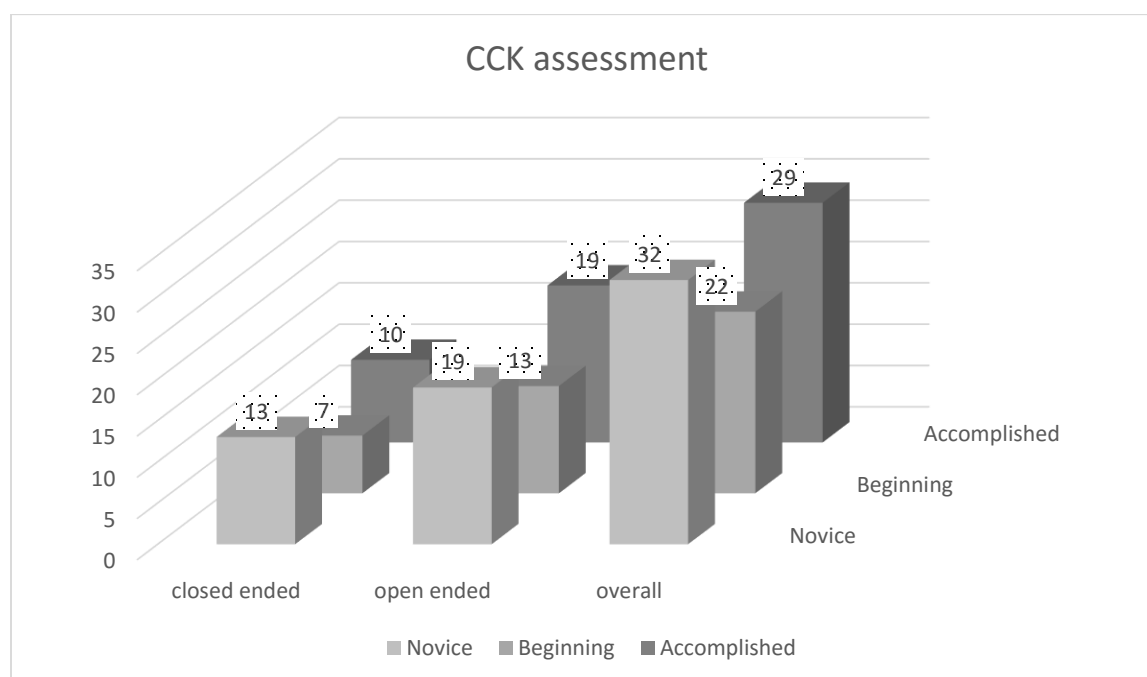
Figure 17. CCK assessment

All of the open ended questions were worth three points. The full points were given if

the response addressed the question completely. Two points were given if the question was

addressed but not completely. One point was given if a portion of the question was not addressed or if the answered lacked detail and/or accuracy. No points were given if the question was not addressed or if the answer was not accurate. Although SCK was not intentionally assessed within the CCK assessment, several questions asked the participants to identify 1-2 cues or hints that they would provide to a novice thrower. This portion of the question aligned itself slightly more with SCK as opposed to CCK. However, the answers provided were presented here for two reasons. First, there was a distinct component of CCK in the answers provided. Second, the third research question was devoted exclusively to SCK. Each of the open ended questions is provided here. Examples of participant's answers were provided to support or validate the scores they received where appropriate.

Question eight asked the participants to describe what the principle of opposition is regarding overhand throwing, all participants received full points. Question nine asked participants to describe differentiated trunk rotation regarding overhand throwing. Haywood (2009) described this process as the lower torso leading the upper torso to produce maximal force (p. 145). Allison received full credit while Nancy and Benjamin received two out of three points. Both participants did not include the element of the hips or lower torso initiating the "differentiated" rotation of the throw.

Question 10 asked the participants to break down the overhand throw into five components; stepping action, arm preparation/backswing action, trunk action, forearm action, and follow through for the following questions. For each component, the participants were asked to describe how an accomplished overhand thrower would step, their arm preparation, etc. In addition, the participants were asked to provide one to two cues or hints that could be provided to an inexperienced thrower for each of the five components.

The stepping action of a beginning thrower is often a step on the same side as the throwing arm (homolateral). As the thrower progresses the step becomes contralateral and longer, often at a distance of more than half of the throwers height (Haywood, 2009). Both Nancy and Benjamin did not identify the length of the step changing from beginning to accomplished thrower. Additionally, Benjamin's cue for the stepping motion was not clear: "hold the ball with the hand you color with and step opposite." Therefore, Nancy received two out of three points, Benjamin received one out of three, and Allison received three out of three.

Question 10.2 assessed the participants arm preparation/backswing action knowledge of an accomplished overhand thrower. The backswing of the accomplished thrower is identified by either a circular, upward backswing (Step 3) or by a circular, downward motion that brings the throwing hand below the waist (Step 4). Both types of backswing are designed to elicit more power (Haywood, 2009). All of the participants provided at least one cue for the inexperienced thrower. But they only received two out of three points for not including either of the more accomplished overhand throwing backswing actions.

Question 10.3 assessed the participant's trunk action knowledge of an accomplished overhand thrower. The trunk action of an accomplished thrower would include differentiated trunk rotation. Both Nancy and Allison described the appropriate trunk action. But Nancy and Allison did not receive one point for the cue or hint for the inexperienced thrower. For example, Nancy stated: "follow through crossing your body." For the inexperienced thrower it is conceivable that they can follow through across their body without any significant hip or trunk rotation. When describing the accomplished overhand thrower, Benjamin stated: "For a right handed thrower, your left hip will be facing forward and as your arm comes forward, your right

hip comes forward." The correct trunk action has the hips lead the upper torso and the arm. The arm and hip do not come forward at the same time.

Question 10.4 assessed the participants forearm action knowledge of an accomplished overhand thrower. A challenging component of teaching the overhand throw is the concept of the delayed forearm lag. The forearm lag (Step 2) has the forearm and nugget appear to remain stationary behind the thrower as the thrower begins to face the target. The delayed forearm lag (Step 3) is a more pronounced form of the forearm lag where the forearm delays reaching its final point until the front facing movement (Haywood, 2009). The only participant to get three out of three points was Benjamin. The portion of his answer that stated: "When the arm is coming forward, the ball will be behind the elbow" is a visual representation of the forearm lag. Nancy discussed how the forearm controls the wrist action but did not provide a cue for the inexperienced overhand thrower. She received two out of three points. Allison did not explain the forearm action accurately of an accomplished overhand thrower and did not provide any cues for the inexperienced thrower. She received zero out of three points.

Question 10.5 assessed the participants follow through of an accomplished overhand thrower. The follow through is dependent upon wrist flexion. Haywood (2009) states:

> The follow through dissipates the force of the throw over distance. The greater portion of wrist flexion comes during follow through, after the thrower releases the ball. Dissipating force after release allows maximal speed of movement while the ball is in the hand (p. 145).

Nancy was the only one who identified wrist flexion within the follow through component of the overhand throw. She received three out of three points. Benjamin received two out of three

points for not providing an accurate cue for an inexperienced thrower. Allison received two out of three for not providing a cue for an inexperienced thrower.

Question 11 asked the participants the following question. "If you are teaching novice students the overhand throw, what would you have them practice first, accuracy of throws or distance of throws? Explain your answer." When teaching children to use the overhand throw, it is important to have them practice the elements of a mature movement pattern. When using throwing tasks that focus on hitting targets or reduced throwing distances, the novice thrower may regress to a throwing pattern that often is immature (Graham et al., 2013). Therefore, novice throwers should practice distance of throws so that they may work on mature throwing patterns that allow for distance throwing. Both Nancy and Allison received three out of three points for answering the question correctly with supporting rationale very similar to that identified here. Benjamin stated that accuracy and proper mechanics are the most important things for novice throwers. For this reason, he received one out of three.

A summary of each participant is provided here to enhance the clarity of each participants CCK assessment. Nancy had the highest score of 32 out of 37. She received full points for all closed ended questions. Overall, her open ended responses to the various components of the overhand throw included accurate cues for the inexperienced thrower. She lacked some sophistication when describing some of the components of an accomplished overhand thrower. Benjamin had the lowest overall score of 22 out of 37. He received a score of six out of 13 for the closed ended questions and 15 out of 24 for the open ended questions. Perhaps the most interesting closed ended response was for question one. It asked the participants to choose all of the manipulatives from a list that would be appropriate for overhand throwing practice in a second grade setting. Benjamin chose two inappropriate objects (playground balls and floor

hockey pucks) and omitted koosh balls (rubber filaments attached to a soft rubber core). Several

open ended responses that asked to describe cues for the novice overhand thrower lacked clarity.

In addition, a critical focus of beginning overhand throwing instruction was incorrect. The focus

on accuracy was chosen as opposed to the correct answer of distance of throws. Students that

focus on distance more aptly demonstrate advanced overhand throwing when they focus on the

power of their throw. Allison's score of 29 out of 37 reflected three points deducted from closed

ended questions and five points deducted from open ended questions. Allison provided the most

feedback on the open ended questions, particularly when describing the cues for the novice

overhand thrower. She received full points when she stated that the distance of throws is more

important for novice overhand throwing students.

SCK OF PARTICIPANTS

Not every interview question sought information that would fall under SCK. Thus, only

interview questions that elicited or received data on SCK are included here. Field notes were

typed and analyzed for components related to SCK—as this component was not specifically

addressed within the standardized observation protocols or the CCK assessment. The

background of each of the participants is reiterated to provide the context for synthesis of the

SCK of the participants.

Background

Both Nancy and Allison identified ways that they tried to present tasks to their students.

Nancy stated: "I try to find out their interests and what they like to do and enjoy doing and

incorporate that into what I teach also." Allison believed all children can learn, stating: "And as

a teacher, all children can learn. It is all in how it's presented and nurtured." Benjamin indicated

that his 11th grade physical education teacher influenced him, stating: "I saw how much fun he

was having and the activities we were doing and um, I can do that so…" Nancy was in her first year teaching, Benjamin was in his third year teaching, and Allison was in her 22nd year teaching.

Knowledge of Physical Education as a Subject

Both Nancy and Benjamin indicated that they were involved with sports all their life, specifically, softball and baseball respectively. Allison stated that she was more of an individual sports person. Nancy indicated that she was also knowledgeable about physical activity, exercises, "and everything that goes along with that." Benjamin indicated that it is more than just sports, it is: "knowing your physical well-being, your mental, and social well-being as well." Allison stated her content knowledge in physical education was good to excellent, but she also stated: "I can always learn more, and that is why the professional development is so important with the changing trends. Overall, all three participants indicated that their content knowledge was good to very good.

Knowledge of Physical Education Curriculum

All three participants discussed resources that they used for instruction but only Allison indicated that she used a curriculum guide. Nancy did not have a curriculum guide and Benjamin's curriculum guide was a basic outline with few specifics on developmentally appropriate activities. Benjamin provided a typical process for teaching:

> It usually takes about four weeks. We try to do a unit in about a month. Basically we
> do ah, the first two weeks will be the basics, the mechanics. And the next two weeks I
> like to do a tournament setting just to get the kids into, you know, the competitiveness of
> the sport…I do the tournament settings for grades three through eight.

The use of tournament settings in primary grades (3-5) suggested a developmentally inappropriate instructional design. Students in primary grades require multiple opportunities to practice motor and sport skills without the constraints of rules, keeping score, and less frequent chances to practice.

> Allison had much more exposure to physical education curriculum. She stated:
>
> I was on the committee that did it (wrote the original curriculum several years ago)…We took the overall curriculum and cut it down to the bits and pieces based on what we felt was most important. Based on the time we had to teach it. And then we developed that into units. The problem there is that when you develop it into units people think that you only teach it once and you don't re, or you don't readdress it throughout the school year.

When addressing the SCK of overhand throwing Allison stated:

> So you have to understand that you have these units. We put them there; we sure hope you don't teach in isolation. Um, especially in elementary school. You introduce it, you review it, you go along the continuum so that they are um you know they grow up to be proficient throwers. But that its required that you address it probably four different times, you know, on top of warm ups and constantly going over these cues and skills.

This type of "weaving" of core content (like overhand throwing) into the curriculum on multiple occasions was supported by Garcia and Garcia (2005) who suggested that teaching throwing throughout the year provided more practice opportunities through the revisiting of important motor skills like overhand throwing.

Knowledge of Teaching Methods in Physical Education

Knowledge of instructional methods in physical education are often dependent upon variables that are outside the control of a physical education teachers. Variables such as equipment and facility availability, weather, and class size are just a few. Context is an important component of SCK. Both Allison and Benjamin had occasions where 40 or more students were in the gym during typical instruction periods. One difference was that Benjamin only had an assistant while Allison had a degreed and licensed physical education teacher. This afforded Allison the ability to teach only her class or to co-teach both classes together. This was identified as a significant challenge by Benjamin. When asked: "What do you think is the most effective way to teach physical education?" He replied: "Um, hopefully with less than 40 kids per class. But no um I personally like to work individually but having a lot of kids in one class…it's tough." This teaching method was evident in the first and second lesson observed. The first lesson he went to each of the 24 students he was working with and individually went over the proper throwing form. The second lesson he again was observing each one of the boys individually as they attempted to have the longest throw. He seemed to understand the most effective way to teach 40-42 second graders. "So usually I have 40-42 like I did today for the second grade class. And probably the most effective way of teaching is in group settings." However, a lack of preparatory work in college and arguably a lack of seeking out best teaching methods contributed to the inappropriateness of most of the tasks presented during the overhand throwing unit. He continues:

> That's, I mean when I was getting my degree and going through the classes we really didn't have to worry about having 40, 50, 60 kids in a class. We basically taught 15-30 in a class so…it's a learning process for me as well.

Nancy enumerated her overhand throwing instruction during the interview, and stated:

Um, first I get them to figure out which way they wanted to stand so they knew which part of the body or which side of the body is pointing to which direction. And then I break it down and had the step, swing, cross…

Allison described the overhand throw being addressed, practiced, then readdressed.

They were pointing toward the target. The arm was way back, maybe not so much and we had to stop, readdress. Maybe it wasn't real clear that the shoulder…do you know which one it was? Opposite foot; as much as we say it a lot of time…sometimes we are putting the rubber bands on the toes so…or that my hand is on top of the ball, so things like that.

Interestingly, Nancy also used visual reminders to her students in the form of stickers on the student's non-throwing hand. This important and often challenging component of placing the non-throwing shoulder facing the target was addressed in a mature and appropriate way by Nancy.

Perhaps the most informative answers came from question 12, in which the participants were asked about the percentage of practicing time. The practice time should arguably be even higher for those in the beginning stages of learning a new skill. Nancy stated that she tried for about 50-75% activity quotient. Benjamin stated: "Well our classes are 45 minutes long. So it does vary. Most of the time they get about 15-20 minutes each class. I think today's lesson was roughly 10-15 so it wasn't as much but about 15 minutes on average." With 15 minutes of activity in a 45 minute class it averages out to roughly 33% activity quotient. With the elimination style of the longest throw competition, most students only practiced the overhand throw 1-2 times. After excluding 3-4 minutes of arm stretching pre activity, an honest evaluation of the average student's overhand throwing practice would be closer to 30 seconds; with an activity quotient

closer to 1-2%. Allison demonstrated her knowledge when she stated: "Well at least 50%, which we know is the guideline." Conversely, she also stressed the continual challenge to not be too "wordy."

> Ah, we have to sometimes be careful that we are not too wordy, blah, blah, blah…you know like Charlie Brown: Womp, Womp, Womp. I personally would like to see 80%. However, that is something that we need to work on.

Knowledge of Students Learning in Physical Education

Both Benjamin and Allison identified a need to get to know your students. Benjamin stated:

> Obviously you have to know your students. Which ones, you know, have thrown overhand before? Which ones are knowledgeable of it, which ones don't know, or really don't want to do it. Umm, so sometimes yes I give them the opportunity to tell me; sometimes no.

When asked if other factors contributed to student success in the overhand throw Allison stated: "Sure, it is their life experience. Are they baseball players? Are they softball players? Do their families play with them or not?" She also provided ways for students to practice various skills outside of school…

> one of our favorite things to do is to give our students…it's probably in the gym; is *ask me*. And what it says is 'ask me to show you what we learned today'. And then it gives the cues for the overhand throw, and then it gives a space for the parent comment, and then they sign it and bring it back. So it engages the parent and helps them understand what we are doing and then to practice.

Nancy seemed to identify the amount of time that would be required for her students to "get" the overhand throw.

Um, I don't think I am going to be able to get them this year…it's going to take a year

or so. Some of them obviously play outside of school and they get it but I think it will

take a couple years for them to get the handle of throwing overhand.

Knowledge of Physical Education Assessment

The process of student assessment in physical education is inherently more challenging

than in a classroom setting due to infrastructure limitations (e.g. desks, chairs). These challenges

increase when the assessment involves younger students. General grading guidelines in physical

education suggest that students in primary grades (K-5) should be assessed using scales such as:

needs improvement, emerging, and proficient (Pangrazi, 2004). The ability to adequately and

accurately assess overhand throwing is certainly a component of SCK. However, both formative

and summative assessments are needed to monitor and verify that instructional approaches are

working and learning objectives are being attained.

All three participants described ways in which they utilize formative assessments. Both Nancy

and Benjamin stated they do a lot of simple recall. Benjamin also stated he used a talking rubric.

He described this stating:

Most of the time I talk to them after class and kind of give them a little five quiz out loud.

What have you learned today? What can you do to better improve yourself? You know,

certain topics like that.

When Nancy was asked how she knows when her instruction is being understood by her students

she stated: "I do a lot of simple recall. You know, raise your hand if you can tell me the

answer." She also stated that she will "walk around, try and do corrections right there on the

spot; but for the most part it is verbal." Allison demonstrated many different formative

assessments while being observed. When asked how she assessed student learning she stated:

"We do it informally through question and answer, paper and pencil, we do it through performance based." The use of an iPad to provide students with video of their overhand throw not only gave her students the ability to watch their overhand throwing form, but also provided Allison the ability to slow the video playback speed down to help detect and thus correct errors during class. Field notes taken indicated that she also asked questions at the end of the class while students were in line waiting for their classroom teacher to pick them up. These questions were phrased in a way to assess the students' knowledge of key elements or critical elements of the day's lesson. Overall, Allison utilized more formative assessment within her instruction than either Nancy or Benjamin.

The use of written summative assessment was less evident by all of the participants. Nancy and Allison both mentioned completing paper and pencil assessments while Benjamin did not.

Despite the lack of student instruction more than one day a week, Nancy did state that she had done some written summative assessments. She stated:

> Very short and brief so they can fill it out and turn it back in really quick. I don't do
> them all the time but I've done a few written assessments and I think that it holds them
> accountable for what they have learned.

She also described her summative assessment on an overhand throwing lesson plan by writing: "Students demonstrate proper throwing motion at the end of the class while I watch." The desire to have students be able to demonstrate the "correct" overhand throwing motion at the end of a lesson or unit is certainly a more summative assessment. She also had available an example of her checklist sheet to assess her students. The overhand throwing criteria being assessed were:

"standing in correct direction, arm in L, step w/front leg, swings are above head, and crosses body."

Benjamin's overall assessment strategy did not seem established during the interview process. When Benjamin was asked how he assessed student learning he stated:

> Obviously I don't have a basic rubric. Um yeah, I obviously don't have a basic rubric that we go through. I have a grading scale and if they do a certain activity they get the top notch grade. If they don't do it or they don't…I don't assess them on if they get it right or not. I assess them on, you know, if they try their best, if they want to get better. That is how I assess their responsibility there.

The overall perception that he provided was that the students were grading on "effort" and "participation." The challenges faced with large class sizes seemed to be the biggest deterrent to utilizing written or formal summative assessments.

Allison demonstrated her use of a peer based summative assessment during the final day of her overhand throwing assessment. Students were in groups of 3-4 and utilized a checklist form to assess their peers on how well they were performing the overhand throw. Support for checklist use and on what the grading and assessment differences with older and younger students are identified here.

> With the older kids it is a lot easier if we give grades…With the younger kids we have skillfulness and our options are either progressing; wait proficient, in progress, needs improvement, not taught (PINT). So we have to look at all of those…how it fits the lines, and what we do is a lot of checklists. What can they do and what they need to work on and then we can give those reports to the parents so they can help them. But it is not a letter grade where it is real clear that this is why.

All three participants mentioned some type of an overhand throwing rubric or a checklist for overhand throwing. Nancy stated that she was going to use a check sheet "to make sure they took in what I said this week and then next week I will have a check sheet." Both Benjamin and Allison mentioned an overhand throwing rubric. However, Benjamin's rubric was more informal… "as I said earlier at the end of class I will, you know, basically have a talking rubric. Obviously, I don't have a basic rubric. Um yeah, I obviously don't have a basic rubric that we go through…" Allison stated: "You can do an overhand rubric, an underhand rubric can be developed and it is very clear what can, you know what it looks like."

Assessment is certainly a challenging with 40 plus students in class such as the Benjamin's and on occasion Allison's. As previously mentioned, Allison recorded and utilized student's overhand throwing form to allow students to see exactly how their body was moving during the overhand throw, and also provided Allison a teachable moment as they watched the overhand throwing form together on the iPad.

Knowledge of Instructional Environments in Physical Education

When the participants were asked to describe an effective learning environment for teaching the overhand throw, all of the participants provided a slightly different focus. Nancy focused on a safe environment.

> Um, well they have to feel comfortable and they have to, I think feel safe. We use the yarn balls…you know we have the girl who comes up to you and says the ball hit me in the face and I think, it's a yarn ball. It is not going to hurt you, you know.

She also stated that clear instructions were vitally important so that students knew how to perform the task and felt more comfortable and not confused.

Benjamin emphasized student interaction and opportunities to throw more. "Obviously if, and I'm very interactive with my students…If I interact with them, um, I feel like they have the ability and the possibility to learn more." The more one on one approach he demonstrated during his overhand throwing unit supported this interaction emphasis. Perhaps contradictory was the emphasis on more opportunities to throw.

> For the overhand throw obviously if the weather is nice and you go outside you get them enough um, you know, enough baseballs or footballs or wiffle balls or whatever you need to try an effective throw. And just give them more opportunity to throw.

The inclusion of baseballs and footballs here aligns with the participants CCK answer when asked what types of nuggets were appropriate for novice overhand throwing.

> Allison valued a supportive environment, corrective feedback, and trust with her students. …children should feel that they can take risks. That they can make mistakes; that through their mistakes and risks is how they learn. Um, teachers are here to help and that if you are not understanding that, you would, um, if they might not recognize (pause) that they are open for suggestion.

Feedback was expressed as being important by Allison, but more importantly was specific feedback. "Again, the feedback has to be meaningful and that is what we try to teach to when they are peer coaching. Um, you can say, oh that was good. You have to be specific. What was good?"

A final example of her SCK was her willingness to express a sense of vulnerability related to certain sport skills. For instance, the lacrosse pass and shot can be extremely challenging for someone who has not played: like Allison. Allison discussed how she dealt with challenging content during teaching.

Um, and…especially with older kids, credibility. If you don't know something, especially with the older ones, let me tell you it is hard to teach lacrosse. And we have a lot of good lacrosse players. I don't hesitate to, and I'll ask them in front (of the whole class).

Time Based Summary Sheet

The inclusion of the time based summary sheets sought to provide another data source to support data triangulation. An important criterion of the time based summary sheet was the amount of time the participant spent on the various tasks. The total time and percent are reported for each category: managerial, directions, transitions, instructional tasks, and student engagement. The warm up was not included in the analysis as no overhand throwing practice was performed. All categories were clearly distinct among one another with the exception of managerial and instructional tasks. To make each of the categories distinct, the instructional task designation was used only for overhand throwing instructional cues and instruction. The managerial category was used to identify the tasks that facilitated an overhand throwing task or helped the task take place. For example, Benjamin utilized an overhand throwing game (clean out your backyard) that required students to count how many beanbags were on each of the two sides. The task was labeled managerial as no overhand throwing cues were being provided.

Figure 18 presented the amount of time each of the participants spent of the five categories during their overhand throwing lesson. The managerial time for Nancy, Benjamin and Allison were five, 17, and two minutes, respectively. The time on directions time for Nancy, Benjamin, and Allison were three, three, and six minutes, respectively. The transitional time for Nancy, Benjamin, and Allison were six, three, and three minutes, respectively.   The instructional task time for Nancy, Benjamin, and Allison were seven, one, and 13 minutes, respectively.   The

time students were engaged for Nancy, Benjamin, and Allison were 13, 14, and 14 minutes, respectively.
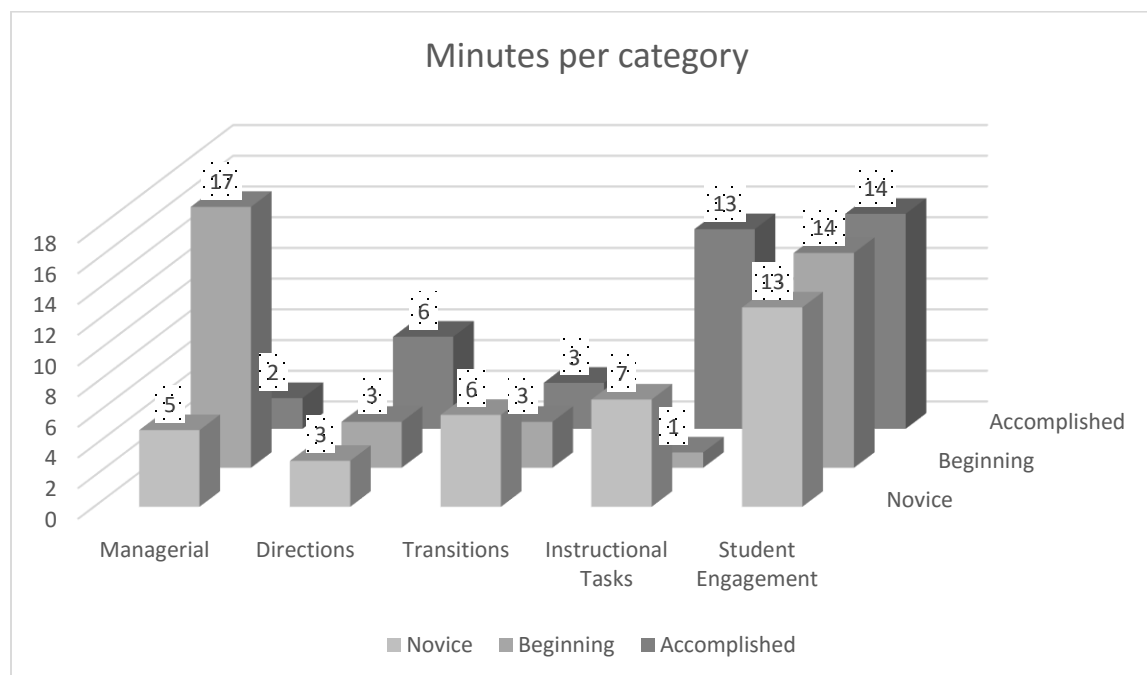
Figure 18. Minutes per category

To provide a visual representation of the amount of time each of the participants spent on each category, pie charts were presented for each of the participants. The percentage for each category was rounded to the nearest whole number. Figure 19 presents Nancy's instructional percentage for each of the categories. The managerial percentage was 13%, the directions were 8%, the transitions were 16%, the instructional tasks were 18%, and the student engagement percentage was 34%.
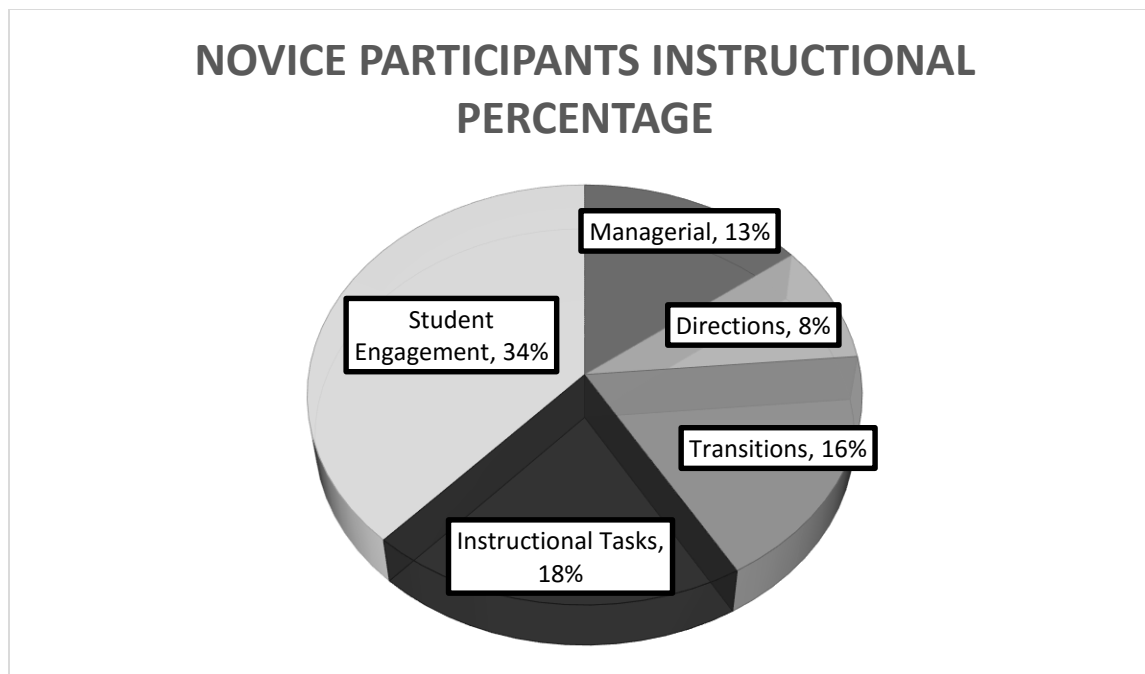
Figure 19. Novice participants' instructional percentage

The percent for each category was rounded to the nearest whole number. Figure 20 presents Benjamin's instructional percentage for each of the categories. The managerial percentage was 45%, the directions were 8%, the transitions were 8%, the instructional tasks were 3%, and the student engagement percentage was 37%.

BEGINNING PARTICIPANTS INSTRUCTIONAL PERCENTAGE
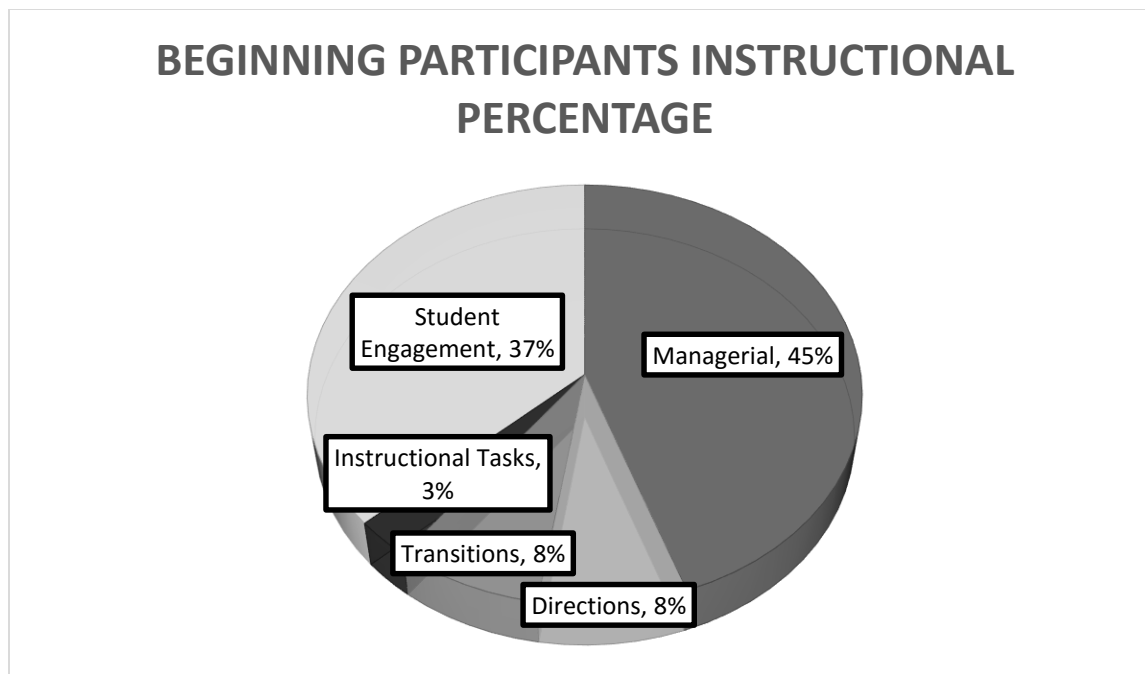
Figure 20. Beginning participants' instructional percentage

The percent for each category was rounded to the nearest whole number. Figure 21 presents Allison's instructional percentage for each of the categories. The managerial percentage was 5%, the directions were 16%, the transitions were 8%, the instructional tasks were 34%, and the student engagement percentage was 37%.

ACCOMPLISHED PARTICIPANTS INSTRUCTIONAL PERCENTAGE

Managerial, 5%

Directions, 16%

Student Engagement, 37%

Transitions, 8%

Instructional Tasks, 34%
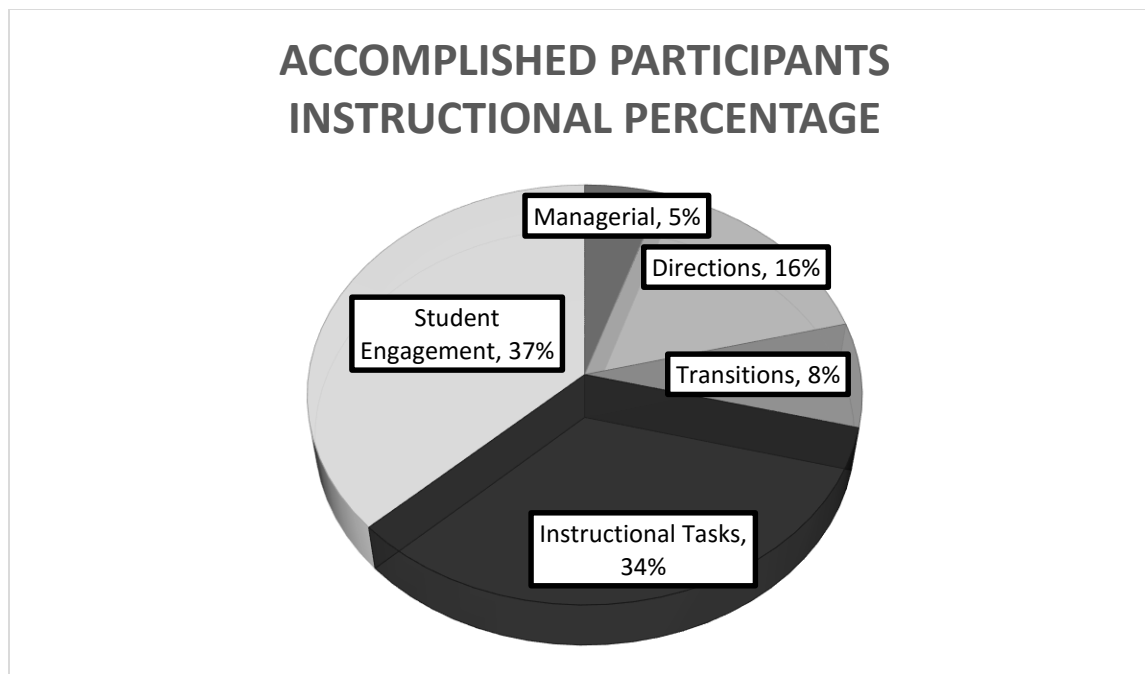
Figure 21. Accomplished participants' instructional percentage

Data revealed that all three participants had similar student engagement time. Student engagement is similar to student activity quotient, or at what percent are students engaged in activity. If the warm up component was included in the participant's student engagement percentage, the accompanied student engagement would have been close to 50% for all three participants. The threshold of 50% is often the goal for student's activity quotient (Pangrazi, 2004). However, not all student engagement was determined to be age appropriate. Data written under the comments section revealed that four minutes (11%) of the student engagement for Benjamin were students running "suicides." Its utility and appropriateness were incongruous with a 2nd grade physical education class.

The managerial category was fairly similar for Nancy and Allison; five and two minutes, respectively. However, Benjamin spent 17 minutes engaged in managerial tasks. The majority of this time (13 minutes) occurred when students were counting up their beanbags at the end of

each of the clean out your backyard games. Ostensibly, time was needed to complete this component, however the process appeared to take longer than needed in order to reset for a new game.

Two categories provided similar instructional time devoted to them by each of the participants. Time engaged in directions and transitions combined were nine minutes for Nancy, six minutes for Benjamin, and nine minutes for Allison. These categories are not discussed as they are similar in duration and no associated comments were written.

The final category was instructional tasks. The time in this category was distinctly different for all three participants. Time spent for Nancy, Benjamin, and Allison was seven, one, and 13 minutes, respectively. The context of the lesson within the overhand throwing unit plan was also taken into account. Allison was on her second day of the overhand throwing unit. Nancy was on her third day of the overhand throwing unit. Benjamin was on his fourth day of his overhand throwing unit. The overhand throwing cues, as they related to the instructional tasks category, tend to be administered less frequently as the learner begins to incorporate them into their throwing form (Schmidt & Wrisberg, 2008).

SUMMARY

The overall findings are summarized here as they relate to the three research questions. Other important findings conclude this chapter. Research question one examined the task representations of overhand throwing by the three participants. Nancy and Allison provided all mature and appropriate tasks during day one and day two of their overhand throwing instruction. Benjamin provided mostly mature tasks during day one and day two of the overhand throwing unit. However, he did not provide any appropriate tasks. The inappropriate of the tasks were mainly due to the lack of practice opportunities afforded the students. He relied on a teacher

centered instructional approach that aligned with his desire to work with students individually. This approach combined with having a high number of students in class contributed to the lack of appropriate overhand throwing tasks.

Research question two examined the CCK of the three participants. Interestingly, the CCK assessment scores indicated that Nancy scored the highest on the overall assessment. She scored 13 out of 13 on the closed ended questions and 19 out of 24 on the open ended questions for a total score of 32 out of 37. Benjamin scored 7 out of 13 on the closed ended questions and 15 out of 24 on the open ended questions for a total score of 22 out of 37. Allison scored 10 out of 13 on the closed ended questions and 19 out of 24 on the open ended questions for a total score of 29 out of 37.

Research question three examined what forms of SCK were used during overhand throwing instruction by the three participants. The SCK data were collected from interview questions, field notes, and a time based summary sheet. To reiterate, SCK is the ability to differentiate tasks for various learning environments with developmentally appropriate activities (Ward, 2009a). Both the Nancy and Allison demonstrated a high level of SCK by providing their students with developmentally appropriate activities and a high activity quotient. Nancy used appropriate organizational methods (color coded cones and bean bags, lines, etc.) and included three appropriate overhand throwing cues. She also included the use of stickers to facilitate the appropriate way for students to stand in preparation to throw. Field notes confirmed that her students were active for at least 50% of class time. Allison demonstrated her high SCK through her organization, lesson plan structure, curriculum usage and creation for her district, and by incorporating video recording and playback technology to allow students to see their overhand throwing form while in class. Field notes also identified subtle instructional

approaches that demonstrated her high SCK. For example, the use of a volleyball net for students to throw over forced the students to use more power and a more mature method of throwing to generate the power necessary to get the nuggets over the net. Benjamin's use of tournament settings begins in 3rd grade indicating a low level of SCK. Pangrazi (2004) supported lead up games (for sports) at the 5th and 6th grade level. Additional support for his low SCK was in his activity quotient. He stated that he attempted to have his students active for at least 15 minutes (out of a 45 minute class), which calculated to a 33% activity quotient. Unfortunately, his second lesson was considerably below even this threshold. Students spent an average of 1-2% actively engaged during the lesson.

The curricular support and lesson plan use and availability for each of the participants were distinctly different. Nancy was not provided a curriculum guide when hired, but had access to lesson plans from the previous physical education teacher. The lesson plans provided for data analysis were effectively structured as supported by Pangrazi (2004). Benjamin was provided a rudimentary, developmentally inappropriate curriculum guide and did not have any lesson plans for the overhand throwing unit. Allison was on the physical education curriculum committee and had available a well-developed curricular guide. In addition, her lesson plans were effectively structured as well.

The findings pertaining to the QMTPS indicated that Nancy had the highest overall score (81%) followed by Benjamin (68.50%) and Allison (60.40%). The scoring of the QMTPS components of the type of demonstration (full, partial, and none provided) and the use of qualitative cues negatively affected Allison's overall score. However, the results should be interpreted with caution as Rink and Werner (1989) suggest using the QMTPS over multiple instructional sessions to provide any sort of generalizability.

CHAPTER V

DISCUSSION

During the inception, planning, data collection, and analysis of this research, the implications for teaching and teacher education have been at the forefront. The components of PCK include various type of knowledge (CCK, SCK, task representations, and curriculum) along with other ancillary data that all coalesce to ultimately shape the way a teacher provides instruction. To provide more clarity, the components that align most with the pedagogy of instruction (PCK) were discussed first. Subsequent headings are delineated to best organize the discussion of the multiple sources of data and their implications related to overhand throwing instruction. Themes that were identified during data analysis were discussed within the appropriate heading. The discussion of delimitations, limitations, implications, and future research opportunities conclude this section.

PCK

The literature examining physical education PCK does not yet have an empirically supported framework of what exactly constitutes PCK. Further, when examining the PCK of a teacher we also must consider the content and the context (Lee, 2011; Letwould, 2013). Figure 22 is a graphical representation of one framework of the components of PCK. Other variables of PCK postulated include pedagogy, context, and students (Grossman, 1990). This research used the graphical representation of figure 5 for data collection and analysis. However, the variables that make up PCK in a physical education setting are challenging to assess through quantifiable means (You, 2011). To examine the utility of qualitative and quantitative data as it related to PCK, both types of data are discussed within each heading. The findings pertaining to the components of PCK support the current notion that myriad factors make up a teacher's PCK. The overhand throwing task representations of Nancy and Allison were distinctly different when

compared to those of Benjamin. This pattern also appeared when examining CCK overhand throwing assessment scores of the participants. The use of developmentally appropriate and specific overhand throwing lesson plans by Nancy and Allison seemed to contribute to higher activity quotients found when the time summary sheets were analyzed. In summary, the data collected for each component of PCK seemed to support the overall PCK of each of the participants.

Task Representations

CCK

SCK

PCK

Ancillary Data

- Time summary sheet
- Student assessment data

Curriculum

- Lesson plans
- Throwing unit plans
- Curricular guides
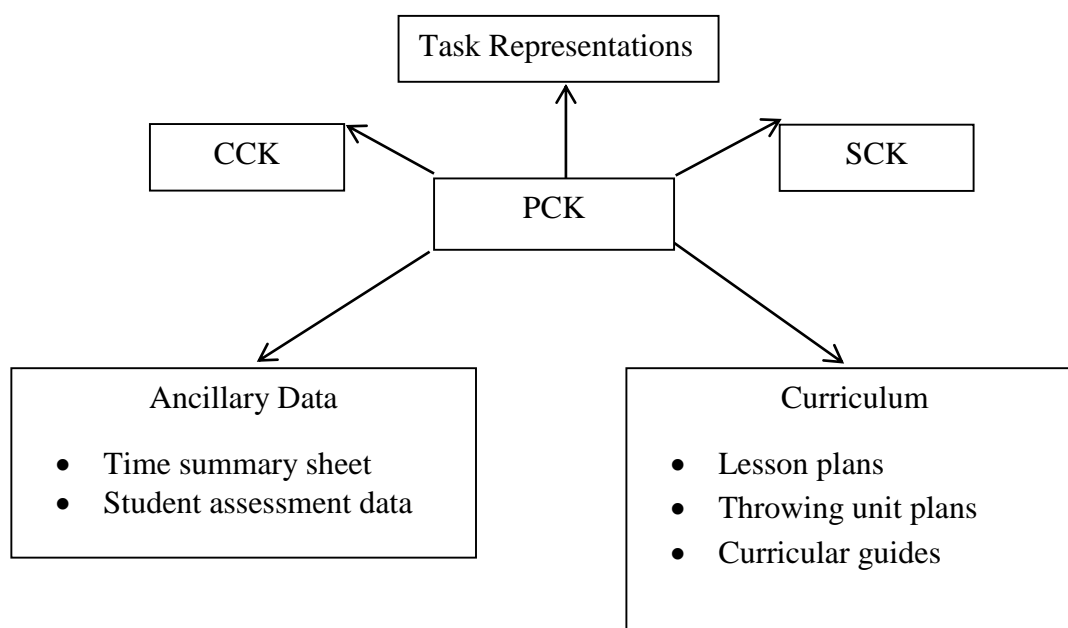
Figure 22. Components of PCK collected for data analysis.

Knowledge of Curriculum

The curriculum guide, its usage, and lesson plan usage were found to be an important variable in the use of developmentally appropriate activities during overhand throwing instruction. As indicated, Nancy did not have a curriculum guide at her school. Her use of

personal experience to help guide curricular offerings and unit planning was similar to Benjamin.

Perhaps the reason why Nancy's unit planning and lesson plans were so well developed had to

do with the previous physical education teacher who left all of the lesson plans that he used.

Benjamin had a very limited curriculum guide that omitted overhand throwing as an objective,

but included participation in sports like basketball, soccer, volleyball, and softball. The use of

sport specific objectives in a 2nd grade setting speaks strongly to the inadequacy of the

curriculum guide and lack of relevant curricular knowledge afforded Benjamin. Work by

Kulinna and Silverman (2000) support this contention as they suggest elementary physical

education teachers' focus should be on developing motor and social skills as opposed to sport

specific skills and games. Finally, the school system he worked in did not require lesson plans to

be turned in. This lack of accountability may have also contributed to his lack of curricular

planning.

Allison not only had a developmentally appropriate curriculum guide, but she was one of

the main contributors to its development. She also provided several examples of curricular

models and lesson development structure during the long interview. Neither Nancy nor Benjamin

were able to discuss curricular information. For both of these teachers, they appeared to lack

knowledge related to curriculum. This may also be a result of either not having printed

curriculum materials available—Nancy—or in the case of Benjamin; an inadequate curricular

guide. Peiró-Velert, Molina-Alventosa, Kirk, and Devís-Devís (2015) cite the need for printed

curriculum materials as they contribute to the enacted curriculum and to the social construction

of pedagogical knowledge. It appeared that the pre-established lesson plans available to Nancy

served as a type of curricular model. In other words, her lack of curricular knowledge was

mitigated by the availability of assumed quality lesson plans. During data collection and

observations, Nancy demonstrated components of an updated multiactivity model and an interdisciplinary curricular model within her instructional approach. Perhaps, Nancy demonstrated these curricular models because the lesson plans being used focused on components aligned with these models.

Benjamin had no such lesson plans afforded to him and did not produce any for the overhand throwing unit. Recent research examined the effect of enacting a curriculum proposal on physical education teachers' PCK through the use of semi structured interviews (Gomes & Betti, 2014). Results indicated that the teachers made adjustments to their previous activities presented but still had difficulties with relating the theory to practice. The participants seemed to challenge the notion that all of the curriculum changes were in their best interest. Specifically, the knowledge of students and the knowledge of educational contexts were given by the authors as reasons for the challenges associated with theory to practice. Through data analysis of both Nancy and Benjamin, neither discussed or intimated that they had received any instruction of the many types of curricular models in physical education as identified by Kulinna (2008).

It appeared that access to either quality lesson plans or a well-developed curriculum guide is important to the development of a teacher's CK and unit plan structure. Benjamin lacked planning and organization during his overhand throwing unit which was compounded by his lack of curriculum knowledge and access to a quality curriculum guide. The notion that there is a curriculum-context knowledge necessary seemed to relate directly to Nancy. Choppin (2009) examined the curriculum-context knowledge (curriculum materials that function as a way to engage students in a specific context) and found that as mathematics teachers enacted components of a standards based mathematics curriculum, their ability to adapt the task representations improved. Unfortunately, the curriculum guide of Benjamin was not standards

based or developmentally appropriate due to the emphasis on sport specific skills in 2nd grade. It appeared that the poor curriculum model and the lack of lesson plan accountability created a sense of mediocre status quo. Support for this contention comes from this study. Under the section, knowledge of instructional environments in physical education, he was asked if his classroom environment has changed since he first started teaching. His response was: "Um, actually it has not to any extent. Very little things but nothing, nothing worth noting."

Nancy seemed to unknowingly enact a curriculum model focus by her implementation of previous lesson plans. Allison had both a well-developed curriculum guide and quality lesson plans for her overhand throwing instruction. Her knowledge of curricular models, and how they contributed to student learning, was far superior to Nancy and Benjamin.

CK and CCK

Current research in the field of PCK has proposed that the original concept of CK by Shulman (1986) be broken into CCK and SCK (Ball et al., 2008; Ward, 2009a). The components of CCK (rules, procedures, techniques, tactics, error detection, etiquette, and safety) postulated by Ward (2011) appears to be more important when teaching individual and team sport skills, but have utility in an elementary physical education setting. When examining the participants CCK assessment, it was surprising that Nancy had the highest score of 32 out of 37 followed by Allison (29 out of 37) and Benjamin (22 out of 37). This was not consistent with Kim and colleagues (2015) who examined the movement CK courses in PETE programs. They found that CCK is not a significant component of many PETE courses. Through field notes and unstructured discussion with Nancy it was learned that she had done some research on overhand throwing prior to data collection. The extent to which this affected her overall score was unable to be identified. The CCK assessment focused on both closed and open ended factual questions concerning overhand throwing and on the critical elements of it. Five questions focused on the

participants providing cues or hints to help an inexperienced overhand thrower. Overall, the structure of the questions did not address the how with regard to representing overhand throwing tasks to the students. However, other data sources (task representation coding sheet, time summary sheet) provided support for the CCK scores that each of the participants received.

Previous research on CK examined the effect of some type of course or workshop on the variables related to appropriate instruction. For example, how did the increased CK affect PCK, task representations, etc. Most recently Ward, Kim, Ko, and Li (2015) identified that physical education teachers PCK increased as a function of a badminton CK workshop. Specifically, the PCK components of appropriate and mature tasks, verbal and visual tasks, and modifying tasks for individuals and small groups were improved. Unfortunately, no similar research study was found that examined CCK among other variables of PCK without the experimental component cited previously.

Lee (2011) utilized a quantitative design to examine the effects of a content knowledge workshop on teachers' PCK and student learning in a middle school soccer unit. Results indicated that those that completed the content knowledge workshop produced a greater number of mature and appropriate tasks when compared to the control group. Support for higher PCK in content areas that teachers know best is also provided by Ayvazo (2007) and Kim and colleagues (2015). Both Nancy and Benjamin participated in overhand throwing sports throughout their childhood and into their adult lives. Allison had no prior sports participation in such sports. From a content only perspective, one might assume that CCK and PCK of Benjamin would be higher. Results of the CCK assessment and data from various components of PCK showed otherwise. When examining the maturity of the tasks presented and field notes taken during the first day of the overhand throwing unit, Benjamin seemed to struggle to provide age appropriate

overhand throwing cues. At several points he included overhand throwing cues into his task

representations that were above the age level of the 2nd grade students. Field notes indicated

that he played baseball at the college level. This level of competition would be associated with

the autonomous stage of motor development whereby the thought process is greatly reduced and

performance improvements are difficult to quantify (Schmidt & Wrisberg, 2008). It may be that

he no longer thinks about the processes involved and may then have difficulty reducing the

overhand throw to its elementary components for beginning learners. This would also provide

support for the poor task representations. Specifically, he did not spend much time on practice

opportunities before he moved on to tasks that sought performance outcomes (such as the longest

throw contest). It does appear that his low CCK assessment score supported his low PCK and

task representations.

Class Size as a Contextual Limiter

From observations, field notes, and interview answers, the high number of students per

class (42 students on average) seemed to be the main challenge during instruction for Benjamin.

Nancy had class averages ranging from 20 to 28. Allison taught her overhand throwing lessons

by herself with one class, but she did note that she also had combined classes that she taught with

another licensed physical education teacher. Both Nancy and Allison did not exhibit or indicate

a challenge with their class sizes.

I was able to observe a team taught lesson by Allison that was outside the scope of this

research, but served as an interesting comparison to Benjamin. Allison was able to "hand over

the reins" to her coworker fairly seamlessly throughout the lesson. Her coworker demonstrated a

high level of CK and task representations through the use of correct cues and mature and

appropriate tasks. Benjamin had an unlicensed assistant available to him for all classes. In both

the first and second lesson he used her to split the class into two groups. Her CK of overhand

throwing was observed as a byproduct of the observation of Benjamin. It appeared that she would reiterate to the students what Benjamin told her. It did not appear that she was able to contribute much more. For example, detecting or correcting errors during the overhand throwing unit. The way in which Allison and Benjamin utilized their coworker was distinctly different.

One apparent reason for this was a lack of CK by Benjamin's coworker. But more importantly, it did not appear that Benjamin utilized his coworker properly. His high number of inappropriate tasks could have been reduced by incorporating his coworker into a supervisory role that would result in his students receiving more overhand throwing practice opportunities while he provided more individualized instruction for those struggling with the overhand throw. He appeared to understand a better way to teach large classes when he addressed having 40-42 2nd graders in class by stating: "And probably the most effective way of teaching is in group settings." It may be that he did not know how to effectively teach in group settings. This was supported when he discussed his educational experience during student teaching by stating:

> When I was getting my degree and going through the classes we really didn't have to worry about having 40, 50, 60 kids in a class. We basically taught about 15-30 in a class so…it's a learning process for me as well.

He did not discuss the use of his coworker at any time during data collection. Overall, the context of Benjamin's overhand throwing instruction appeared to have a negative influence on factors related to PCK.

SCK not Directly Related to Sport Experiences

How one provides overhand throwing instruction to a class of 17 2nd graders with unlimited equipment would arguably be different than how one would provide instruction to a class of 42 2nd graders students with six throwing objects. The ability to modify the lesson plan structure for each is an element of SCK. An overarching model related to PCK came from

Ayvazo (2007) who stated that PCK: "is the act of selecting content from one's knowledge base for the purpose of teaching in a specific context" (p. 77). Ward (2009b) supported this assertion when he stated that the current context of the instruction influences, or defines the PCK that is used when faced with different contextual teaching and learning environments. During data collection, Benjamin demonstrated a lack of SCK and also PCK when he routinely utilized individualized instruction and elimination style activities. The use of individualized instruction would be analogous to teaching the multiplication tables in a one on one fashion in a classroom. From a physical education experience, individualized instruction is best used while students are engaged in practice opportunities. For example, while students are with partners engaged in overhand throwing the physical education teacher can walk around and provide individual feedback and instruction to those that are struggling. The use of elimination style activities in physical education are in direct opposition to quality instruction and high SCK. Essentially, those students that were eliminated were often the ones who need the most practice on the focus of the elimination activity. In Benjamin's day two activity, the weakest throwers received the least amount of throwing opportunities as they were the first to get eliminated.

Nancy and Allison did not identify significant obstacles early on in their teaching careers that influenced their SCK. Nancy did state that the students seemed to be "testing" her early on in the school year. The main challenge for Allison was a low CK of organized sports and team sports. She stated that she worked very hard to increase her CK on the various topics that she would be teaching in a physical education setting. Allison's specialized knowledge on overhand throwing was rated high due to her quality of demonstrations, task representations, and knowledge of overhand throwing.

Nancy demonstrated a high level of SCK during overhand throwing instruction that further supported her high level of PCK. Support for a high SCK was her CCK assessment score, task representations, and the quality of her demonstrations and use of simple cues for overhand throwing. Her attention to detail was supported through observations and field notes. For example, including a sticker on the non-throwing side hand allowed the students to position their body in the correct way before attempting to start throwing. As previously stated, the availability of a quality lesson plan appeared to support her demonstrated high level of SCK. However, the way in which she organized the tasks, presented start and stop signals, addressed appropriate and inappropriate behavior, and the rapport she had with the students were contributing factors to her high level of SCK as a first year teacher.

In summary, many factors appeared to mediate the level of the participants SCK. The curriculum knowledge, CCK, attention to organizational details, and the context of the instruction all support the notion of low, medium, and high SCK. Some of these factors were outside the control of the participants, such as a quality curriculum guide for Nancy and Benjamin. Nancy's access to well-established lesson plans certainly helped mitigate the lack of a curriculum guide, but her detailed attention to class organization and to mature and appropriate task presentations were key to her high level of SCK. Even though Allison did not have a high level of sport experience, her continual learning and personal adaptations of the components of SCK made her an exemplar. Benjamin was characterized as having low SCK. The two components that most directly affected his SCK were low practice opportunities through his task presentations and his use of elimination activities.

Task Representation: Quality Matters

One challenge that became evident during data analysis was the determination of what is considered a "task?" The work by Lee (2011) defined maturity and appropriateness but did not clearly define what constitutes a task. Two specific examples are provided here. The first example included a task that was subtly changed from the original task. The second example included more than one task presented to the students within the same general set of instructions. For the first example, if the task involved a change in location, movement, or a stoppage by the participant during the task, it was coded as a separate task. The second example followed the same procedure provided in example one. Further, warm-up tasks were also presented by the participants to their students. I contemplated the inclusion of these tasks within the task representation coding. However, with the specific focus of this study, I decided to not include these tasks as no participants utilized the overhand throw during their warm-up. In summary, only specific overhand throwing tasks were used in the task representation coding sheet. The criteria for what define a specific task in a physical education setting may need further delineation to more easily calculate the amount. Additionally, a high number of tasks presented did not seem to be a predictor of mature and appropriate tasks, and quality of instruction. For example, Benjamin had the highest amount of tasks represented (25) compared with Nancy (10) and Allison (13) during day one of their overhand throwing unit. The high number of tasks by Benjamin was a function of how he represented the overhand throwing task to each student on an individual basis. To clarify, he used one nugget and went to each student individually in the line and had the student overhand throw toward a curtain. His SCK (needed to differentiate tasks for various learning contexts) and thus PCK were low due to only providing 1-3 practice opportunities for the entire class. This low activity quotient was the reason the tasks were rated mature but inappropriate. Research by Garcia and Garcia (2005) support the notion that students

learning new tasks need many practice opportunities in order to improve. During day one of Benjamin's overhand throwing unit, half of the class (24) was directed to stand on a line until Benjamin came to them and provided them between 1-3 opportunities to throw. Not only did this lead to a low activity quotient and a lack of throwing practice, but it also provided students with unstructured time that may lead to misbehaviors.

Both Nancy and Allison had fewer tasks presented, but all were deemed appropriate and mature. Both participants were within the recommended amount of tasks by Graham et al. (2013) who state physical education teachers should be prepared with 10-15 tasks in a lesson. Upon reflection and examining contextual notes of each participants' lesson one complexity, it was apparent that Nancy spent more time on the critical elements of overhand throwing. In addition, the initial tasks were more rudimentary when compared to Allison. A cursory review of the qualitative cue percentages indicated that Nancy (100%) and Benjamin (80%) scored higher than Allison (33%). This may be inferred that Allison's qualitative task presentation was in some way deficient when compared to Nancy and Benjamin. When examined more closely, the context of each of the participant's prior overhand throwing became useful. Nancy and Benjamin had not visited the overhand throw prior to this research. Field notes indicated that Allison had used overhand throwing in a game prior to the overhand throwing unit. As with most novel skills, there should be a higher rate of instructional cues and feedback during the initial learning process. Once the learner becomes more familiar with the novel skill, the feedback and instruction can be reduced as the practice opportunities are increased (Schmidt & Wrisberg, 2008). This student exposure to the overhand throw by Allison prior to her planned overhand throwing unit may have contributed to her low qualitative cue percentage.

Another factor related to initial task complexity might have been the amount of physical education time students had. Students of Allison would have 24 more physical education classes per year than Nancy's students. This increased amount of physical education classes would suggest that students of Allison had more practice opportunities in a wide variety of fundamental movement skills that support specific motor skills like overhand throwing.

For day two of the overhand throwing instruction Benjamin did not present an appropriate task to his students. As previously reported, this was due to the elimination style throwing challenge he used during day two of his overhand throwing unit. If we examine the two lessons more carefully, we see that a student might only have been afforded 2-3 overhand throwing practice opportunities for two days of overhand throwing instruction. On day one of his overhand throwing unit the practice opportunities ranged between one to three times. On day two during the longest throw competition, if a student's first throw was a legal throw but was not one of the five finalists for the boys or the girls group, the student was eliminated after one throw.

Both Nancy Allison's task representations were all mature and appropriate. Interestingly, even though Benjamin had been active in overhand throwing sports his whole life, he had difficulty in providing appropriate tasks for his students. His student's activity quotient was 33% for day one and 1-2% for day two. Pangrazi (2004) has prescribed an activity quotient of 50% or more to be the goal for physical education teachers. This low activity quotient suggested that a high level of sport involvement does not guarantee that a physical education teacher can provide appropriate tasks to students. This finding was not consistent with previous research (Arvazo, 2007; Hall, Heidorn, & Welch, 2011). The level of experience or involvement in a motor or sport skill typically confers more mature and appropriate task representations. This phenomenon

is seen in preservice physical education teachers as well. Hall et al. (2011) identified units that

the participants had more CK in (team sports and striking) elicited better task representations

than a unit on dance, which the participants had lower CK in. The notion that CK and a high

level of sport involvement are directly related is a tenuous one. For example, just because a

person has a high level of sport involvement does not mean that they will have an equally high

level of CK in movements associated with that sport. More research in this area may help to

determine the relationship among CK and sport involvement.

The high percentage of mature overhand throwing tasks seemed to reaffirm the overhand

throwing background knowledge of Nancy and Benjamin. Allison also had a high percentage of

mature overhand throwing tasks despite stating that she did not participate in any overhand

throwing sports while growing up. It appears that the knowledge to provide mature task

representations may be produced with experience in either participation, instructional practice, or

both. Field notes support this contention. Allison stated that she had never played lacrosse

before they started looking into the feasibility of inclusion in the curriculum. When they decided

to include lacrosse, she discussed practicing, looking at YouTube videos, etc. to prepare herself

for teaching it. Overall, her devotion to utilizing best practices and staying current regarding

instructional practices and curricular changes was an overarching theme within data analysis.

Recent research has used motor skill practice of the participants as a component of a CK

workshop on badminton. Ward et al. (2015) utilized a four-hour workshop that focused on

improving the participants CCK and SCK of badminton. The participants were asked to

demonstrate correct techniques after each of the six badminton skills taught. Although not a

significant component of the CK workshop, it does support the notion that motor skill

improvement is important when attempting to improve a physical education teachers CK. This

study provided support for more research on the extent to which instructional practice should be performed to afford task representation improvements. Future research might also seek to examine the amount of prior content knowledge needed in a motor or sport skill to confer an improvement in the task representation of the physical education teacher. In the same vein, how much instructional practice does a physical education teacher need in teaching a novel motor or sport skill to elicit improvements in the maturity and appropriateness of the tasks represented?

DELIMITATIONS

The use of a naturalistic, qualitative design allowed the participants to plan for and conduct their overhand throwing unit and individual lesson plans as they saw fit. Multiple data sources with rich context were used to address the research questions. Various components of PCK were examined within an overhand throwing unit. The number of participants were kept low (three), similar to PCK research by Rovegno et al. (2003), due to the high volume of data produced by a qualitative design. The influence of an elementary physical education teachers experience level on overhand throwing was the primary objective of this research. As such, this study is delimited to the study of overhand throwing instruction of novice, beginning, and accomplished elementary physical education teachers in the southeastern United States.

LIMITATIONS

Participant reactivity can affect the everyday or commonplace behavior of the instructor when observations of teacher practice occur. Specifically, it is when "the person being observed is aware of the observer's presence and purpose" (Cooper et al., 2007, p. 55). In order to collect more accurate or natural data by the participants, every effort was made to "blend" in to the background during observation, essentially, to be as inconspicuous as possible during observations. Although the purpose of this research was to collect data representative of a

"normal" overhand throwing unit and teacher CCK, participant reactivity appeared to occur with regard to Nancy. Nancy stated that she went online and looked at some information on overhand throwing. It was unclear if she researched overhand throwing for her normal teaching duties or if it was due to the forthcoming research on her overhand throwing instruction. Regardless, this was a limitation within this research.

To examine the various PCK research designs, many researchers utilize videotaped classes for observational coding. This can provide greater assurance that all actions that occurred during the standardized observation protocols were identified. Rhodes (2010) described in detail the trials and tribulations that were endured attempting to videotape participants and students for a similar type of research, citing permission slip return rates and most importantly, access to schools that allowed students to be videotaped. This research focused on how one 2nd grade class was taught the overhand throw by the novice, beginning, and accomplished participants. Live coding was chosen due to the challenge of attempting to have 100% permission slip return rate for each of the three classes. Live coding is when behaviors and events are coded in real time. The obvious limitation is that there was no ability to revisit previous observation times. Researchers must also be proficient and have experience with live coding. To mitigate this limitation, significant practice was completed on all observation protocols and procedures with a final inter-observer rating of 92%, which met the self-selected inter-observer rating of 80% or greater.

This research design process sought to collect data that included the overall scope of overhand throwing instruction. How would novice, beginning, and accomplished physical education differ in the length of their overhand throwing unit, direct or indirect teaching, individual, partner, group, or even game type practice, number of cues, etc. An unfortunate side

was that each overhand throwing unit was not the same length. A final limitation was that there was no control over what prior knowledge of the overhand throw was taught by the respective participants. For example, Allison had stated that she had briefly introduced the overhand throw earlier in the year. This research did not control for overhand throwing experiences that students may have had outside of the school setting.

IMPLICATIONS FOR PHYSICAL EDUCATION

The impetus for this research was to determine if experience is a necessity for quality instruction. To investigate this, the components of CCK, SCK, PCK and ancillary data were collected, analyzed, reported, and discussed. Initially, this research seemed straightforward and appropriately delineated. However, the scarcity of qualitative research on physical education PCK and the multiple components within PCK proved a challenge. Perhaps the most important implication of this research is that experience alone does not improve a physical education teachers CCK, SCK, or PCK. Further, these components of instruction will vary as a function of the lesson focus. As discussed previously, the knowledge one has in gymnastics may be much higher than in tennis. The typical elementary physical education teacher may be responsible for teaching 8-12 different movement and motor skills. The knowledge needed for each is unique to one another. When the various sport offerings provided in the secondary physical education setting are included, the magnitude of knowledge one must possess to provide quality physical education is quite staggering.

A high level of CCK, SCK, and PCK in math and science teacher education programs is important for quality teacher instruction (Ball et al., 2008). Due to the educational standardization of students in core classes, most students have some basic knowledge of the subject matter or are grouped together as a function of their respective knowledge (Rubin &

Kazanjian, (2011). Physical education classes have no such grouping mechanisms. Further, some elementary physical education programs see students five days a week, while others see students only one day a week. The prior knowledge of a third grader who had physical education every day compared to a third grader who had physical education once a week will be distinctly different. These two students might also matriculate to the same middle school having very different movement and motor skills. The physical education teacher now needs a high level of PCK to differentiate instruction to keep both students equally challenged. Further, this can influence the decision to assess students. The novice participant only saw her students one day a week and stated that she rarely provided assessment opportunities because she only saw the students one day a week.

A final challenge of physical education is both the limited resources and class size. Both can affect the way a physical education teacher approaches their instruction and how they represent tasks to students. Benjamin stated fairly emphatically that it was a real challenge for him to teach 40 plus students. The use of an assistant who typically does not have adequate training in physical education is not a novel concept. This same strategy is used at a major school district near where this research occurred. A routine class size of approximately 100 students is the norm for each class period. Primary school students are able to have physical education every day but do so with one physical education teacher and 3-4 assistants. This is a concern for the future as well due to shrinking school budgets having to do more with less.

These challenges are very real and often affect novice physical education teachers at both the elementary and secondary settings. Perhaps the most important change agent will be physical education teacher education (PETE) programs. To address the CCK challenges of multiple movement units, the concept of a knowledge packet identified by Ward et al. (2013)

would provide perspective physical education teachers with pre-established unit plans to guide their instruction. If we use overhand throwing as an example, the knowledge packet would contain the appropriate form for the overhand throw, two or three cues for success, developmentally appropriate lesson plans, assessment ideas, and a list of common error seen in novice overhand throwing.

To address the implications of various abilities in a physical education class and increase SCK and PCK, preservice physical education teachers need exposure to such disparities in their methods classes. Too often the preservice physical education teacher practices their teaching on college age peers that often have a higher motor skill set than even the average college student.

With regard to large class sizes, Benjamin stated he did not have any training to deal with class sizes larger than 20-24 during his teacher candidate instruction. PETE programs can address this issue by advocating teaching strategies that might work best with larger class sizes such as: station work, peer feedback activities and assessment, and more simple low organized activities to suit the class size. These PETE programs can also provide several teaching experiences that use large class sizes to expose the physical education teacher candidates to the challenges of such classes.

The utility of reflective practice has been shown to improve components of SCK and PCK (Sebren, 1995). It was also demonstrated by Allison on numerous occasions. However, a lingering question, or perhaps association remained at the conclusion of this research. Benjamin reflected on his lesson approach of having 24 students stand in one line while individually showing the students the overhand throw. This was rated a one out of four on appropriateness due to the extremely low activity quotient by me, but a three out of four by Benjamin. If he does not have the CK related to teaching strategies for creating a developmentally appropriate and age

appropriate lesson, how effective is utilizing a reflective practice? This relationship was also

supported by the fact that he stated his classroom management had not changed since he first

started teaching. As those in the realm of teaching and instruction can attest, the first year of

teaching is a challenge. It is a time in which you try and figure out what works, and what does

not. It is a time in which you try to pull elements from the various classroom management

strategies you were exposed to while preservice teaching into "your" classroom management

style. Overall, support for utilizing reflections in practice with adequate CK and SCK instruction

in teacher education programs is suggested.

FUTURE RESEARCH

The context of the instruction has been shown to be a significant component of SCK,

PCK, and can directly affect the ways in which a teacher has to provide instruction to the learner.

Future research may examine novice, beginning, and accomplished participants overhand

throwing instruction in a different part of the US. Although we know that overhand throwing

instruction is both content and context specific, future research might also examine other motor

or sport skills. This research could involve the notion of the novice, beginning, and

accomplished participants again or could utilize three participants with the same teaching

experience level.

The ability to control for students' prior experience (related to research) in fundamental

motor skills like overhand throwing is a challenge. Being able to mitigate this issue would prove

useful in that student outcomes could be more attributable to the instruction and tasks presented

as opposed to previous knowledge. Future research might look at motor and sport skills that are

not common to the population selected. For example, lacrosse is a sport played heavily in the

northeast portion of the US. Selecting the lacrosse throw in the Southeast or Midwest may reduce the effects of previous lacrosse experience.

This research did not include student learning assessment specifically. The influence of task representations on student learning would prove valuable in determining the type of tasks that students learn best with. Even if a task was deemed mature and appropriate, are there other ways to represent the task for the learner that would elicit increased student knowledge? An obvious challenge to collecting student data is the often stringent rules, requirements, and hurdles needed to overcome to receive school access.

Although this research did not examine this component of SCK, the ability to detect and correct student errors while performing motor or sport skills is a valuable instructional skill. Elementary physical education teachers predominantly work on the foundation of basic motor and sport skills while secondary physical education teachers focus on the refinement of said skills. The ways in which elementary and secondary physical education teachers go about this process would add to the body of work related to SCK. Specifically, to what extent is CCK and SCK needed at the elementary and secondary setting?

In conclusion, it appears that the components that make up PCK are beginning to be agreed upon. As these components become more defined and recognized, the scope of PCK research can expand. With this delineation of the components of PCK, the ability to compare research findings will become less challenging.

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Appendix A

The following interview questions were used as the basis for the long interview. Some additional questions were included based upon previous answers to questions, and after observation of the participant during instruction. The long interview was grouped into the six components of PCK as described by You (2011), with some questions addressing content in more than one category. The semi-structured questions were asked at the end of the instructional session, with both pre-established questions and questions that varied as a function of developments within the lesson.

Long interview

Background (education and teaching experiences)
1. Explain why you chose to teach physical education.
2. Where have you taught, and how long have you taught health/physical education?
3. What degree or degrees do you hold and from which universities?

4. Is there anything in your background that you feel informed or shaped your teaching philosophy?

I. Knowledge of physical education as a subject

5. Describe your overall content knowledge in physical education?

6. Describe your content knowledge in overhand throwing?

II. Knowledge of physical education curriculum

7. Describe the physical education curriculum guide at your school/district?

8. Describe your knowledge regarding curriculum models, including what model you think your instructional practices align with most closely.

9. What type of curricular information do you follow for instruction in the overhand throw? For example, is it your school's curriculum guide, personal experience, other resources, etc.

III. Knowledge of teaching methods in physical education

10. What do you think is the most effective way to teach physical education?

11. How do you know or determine that your instruction is being understood by your students?

12. What are the teaching methods you employ while teaching the overhand throw? For example, what are the typical strategies you use when presenting the overhand throw?

13. During an average overhand throwing lesson, what percent of class time do students spend in throwing practice?

IV. Knowledge of students learning in physical education

14. Can you describe your role in students learning in your physical education class?

15. How does the amount of overhand throwing practice time affect student learning?

16. Are there other factors that contribute to student success in the overhand throw? If so, what are they?

17. Do you give your students opportunities to be responsible for learning experiences during overhand throwing? If so, how do you accomplish this?

 V. Knowledge of physical education assessment

18. Do you provide opportunities for your students to feel vested, and or accountable in physical education? If so, how?

19. How do you assess student learning?

20. During the overhand throwing unit, what is counted as "evidence" of student learning?

VI. Knowledge of instructional environments in physical education

21. Do you think teacher student interactions, or feedback influence student learning? If yes, in what way?

22. How would you describe an effective learning environment for teaching the overhand throw?

23. Has your classroom environment changed since you first starting teaching to the present? Is so, in what way?

Semi-structured interview

1. Can you describe a typical class when you are teaching the overhand throw, from start to finish? Examples of components might include warm up, introduction, demonstration, main lesson, wrap up, etc.

The term task representation is defined as the quality and sophistication of how a task (overhand throwing, free throw shot, etc.) is taught (Lee, 2011). Within the task, there can be mature, immature, appropriate, and inappropriate. The level of task maturity represents the clarity of the descriptions, analogies, demonstrations, etc. used to present a task to students, with immature task representation representing poor descriptions, demonstrations, etc. Appropriateness of the task is assessed by the task being developmentally appropriate, and appropriate for the content and context of the instruction.

2. How familiar are/were you with the phrase task representations?

Please answer the following questions utilizing a scale of 1-4. One indicates immature/inappropriate task representation, two indicates a little immature/inappropriate, three indicates somewhat mature/appropriate, and four indicates mature and appropriate task representation.

3a. Please choose one task that was presented during instruction and briefly describe it?

3b. For this task, please rate your score for the maturity and appropriateness of your task representations.

3c. From the lesson today as a whole, what would be your overall score for the maturity of your task representations? For the appropriateness of your task representations?

4. What part of today's lesson went well?

5. What part of today's lesson did not go as planned?

6. When teaching the overhand throw, what strategies do you utilize that you feel are most effective for student learning?

7. Are there any suggestions or advice regarding overhand throwing instruction that you would provide to future physical education teachers?

8. Is there any other content or pedagogical knowledge of teaching the overhand throw that you feel is important for other physical education teachers to possess?

Appendix B
Qualitative measure of teaching performance scale

Teacher _____   Coder _____

Focus of lesson _____

Lesson number _____

Task		Presentation of task					Student response appropriate to focus	Specific congruent feedback	
Number	Type of task	Clarity	Demonstration	Number of cues	Accuracy of cues	Qualitative cues			**Type of task**
									I – Informing
									R – Refining (quality)
									E – Extend (variety)
									Re – Repeat (repeat same task)
									A – Apply self-testing
1									**Clarity**
2									1 – Yes
3									2 – No
4									**Demonstration**
5									1 – Full
6									2 – Partial
7									3 – None
8									**Number of cues**
9									1 – Appropriate
10									2 – Inappropriate
11									3 – None given
12									**Accuracy of cues**
13									1 – Accurate
14									2 – Inaccurate
15									3 – None given
									Qualitative cues
									1 – Yes
									2 – No
									Student of responses
									1 – All
									2 – Partial
									3 – None
Total		1- 2-	1- 2- 3-	1- 2- 3-	1- 2- 3-	1- 2-	1- 2- 3-	1- 2- 3-	**Specific congruent feedback** 1 – Yes 2 – Partial 3 – No
Percent for each category		1- 2-	1- 2- 3-	1- 2- 3-	1- 2- 3-	1- 2-	1- 2- 3-	1- 2- 3-	
Percent most desirable									Total QMTPS:

Appendix C
Overhand throwing assessment for elementary physical education teachers

This assessment is designed to measure your overhand throwing knowledge that can be accessed from your working memory, so no outside help or materials are to be used while answering the questions. For each of the following questions, please circle the letter(s) that correspond with the BEST answer provided.

1. In a second grade setting, choose **all** of the manipulatives that would be appropriate for overhand throwing practice?
A. playground balls
B. beanbags
C. footballs
D. tennis balls
E. floor hockey pucks
F. koosh balls
G. regulation 12" softballs

2. Which of the following demonstration models would BEST support student learning of the overhand throw at the emerging, or beginner level?
A. A demonstration model from the side
B. A demonstration model facing the students; also known as mirroring
C. A demonstration facing the same way as the students (away from them)
D. They are all equally beneficial

3. When initially teaching the overhand throw, students should be directed to place their body how?
A. With their non-throwing shoulder facing the target
B. With their throwing shoulder facing the target
C. Whatever position they are most comfortable in
D. With their shoulders square and their chest facing the target

4. What is the approximate practice and instructional time that it takes for an average child to successfully execute an advanced overhand throwing pattern?
A. 6-12 months
B. 12-18 months
C. About two years
D. 4-5 years

5. When performing an advanced overhand throw, stepping with the opposite foot of the throwing arm is called _____.

A. concurrent step

B. independent step

C. contralateral step

D. None of the answers are correct

6. Please choose the correct order of the stages of learning, from beginning to advanced.

A. autonomous…verbal-cognitive…motor

B. motor…verbal-cognitive…autonomous

C. verbal-cognitive…autonomous…motor

D. motor…autonomous…verbal-cognitive

E. verbal-cognitive…motor…autonomous

7. Which of the following stages would a novice thrower spend the most time in reaching an expert status?

A. Autonomous

B. verbal-cognitive

C. motor

D. The novice thrower would spend approximately the same amount of time in each.

For each of the following questions, please answer to the best of your ability.

8. Please describe what the principle of opposition is regarding overhand throwing.

9. Please describe differentiated trunk rotation regarding overhand throwing.

10. Let us break down the overhand throw into five components; stepping action, arm preparation/backswing action, trunk action, forearm action, and follow through for the following questions.

10.1 Please describe the stepping action of an accomplished overhand thrower. Then provide one to two (1-2) cues of hints that could be provided to an inexperienced overhand thrower.

10.2 Please describe the arm preparation/backswing action of an accomplished overhand thrower. Then provide one to two (1-2) cues of hints that could be provided to an inexperienced overhand thrower.

10.3 Please describe the trunk action of an accomplished overhand thrower. Then provide one to two (1-2) cues of hints that could be provided to an inexperienced overhand thrower.

10.4 Please describe the forearm action of an accomplished overhand thrower. Then provide one to two (1-2) cues of hints that could be provided to an inexperienced overhand thrower?

10.5 Please describe the follow through of an accomplished overhand thrower. Then provide one to two (1-2) cues of hints that could be provided to an inexperienced overhand thrower?

11. If you are teaching novice students the overhand throw, what would you have them practice first, accuracy of throws or distance of throws? Explain your answer.

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