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## **Fifth-Grade Students' Tactical Understanding, Decision-Making and Transfer of Knowledge in a Tactical Games Model Net/Wall Sampling Unit**

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**FIFTH-GRADE STUDENTS' TACTICAL UNDERSTANDING, DECISION-  
MAKING AND TRANSFER OF KNOWLEDE IN A TACTICAL GAMES  
MODEL NET/WALL SAMPLING UNIT**

A Dissertation Presented

By

HEIDI R. BOHLER

Submitted to the Graduate School of the  
University of Massachusetts Amherst in partial fulfillment  
of the requirements for the degree of

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## DEDICATION

This work is dedicated to my family.

## ACKNOWLEDGMENTS

I would like to acknowledge all of my family, friends and colleagues for your support and encouragement throughout this endeavor. Thank you for believing in me. I could not have done this without you! I especially want to thank Mom, Dad, Jamie, Randy, and Deb for your unconditional love and understanding. You have been a much needed support network and a source of strength. I want to thank my dear friends Ruth Arnold, Deb Fox, and Diana Demetrius for all you have done! I want to thank my friends and colleagues Karen Meaney, Kent Griffin, Melanie Hart, Sandy Reeve, and Karen Pagnano-Richardson for your friendship and wisdom. I also want to thank my classmates and colleagues at UMass who have cheered me on: Suzanne Scallion, Tara Nappi, Linda Rhinehart Neas, Kirsten Helmer, Eric Carpenter, Kent Divoll, Brian Boisvert, and Barbara Madeloni. Patt Dodds, thank you for your sincere guidance, support, and feedback, and thank you for challenging me and pushing me! I would like to thank Linda Griffin for chairing my committee and seeing this difficult process through. Dan Gerber, thank you for joining my committee and reading my papers in the final phase! I would also like to thank all the students and teachers at the school where these data were collected for their involvement and participation.

## **ABSTRACT**

### **FIFTH-GRADE STUDENTS' TACTICAL UNDERSTANDING, DECISION-MAKING AND TRANSFER OF KNOWLEDE IN A TACTICAL GAMES MODEL NET/WALL SAMPLING UNIT**

SEPTEMBER 2011

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The Tactical Games Model (TGM) is an instructional model in which the primary assumption is to facilitate students' tactical understanding of games (i.e., response-selection and execution processes). Additionally, there is speculation that tactical understanding of one game transfers to other tactically similar games (Mitchell, Oslin & Griffin, 2006, p. 20). Limited research has been conducted regarding student response selection processes, problem representations, knowledge base development, or transfer of learning in this model. Griffin and Patton (2005) called for examination of TGM through an information processing lens. Examining action, condition, and goal responses of novice physical education students could provide significant insight to students' improved game performance. Also, examining students' engagement in particular tactical problems across diverse activities in a single game category could provide insight into how and which knowledge structures transfer. The purpose of this study was to examine fifth-grade students' tactical understanding and decision-making in a net/wall unit. A second purpose was to analyze the transfer of knowledge structures across the unit.

Participants included an elementary school physical educator and purposively selected students (n=16; M=8, F=8) from a fifth-grade physical education class (N=50) at a suburban elementary school in the northeastern United States. Appropriate permission was obtained from the university's Institutional Review Board. The unit consisted of 20 lessons (50 minute classes). Select students remained in a cohort, participating with and against each other throughout the unit. Data was collected using multiple sources: (a) game performance (pre-post-unit), (b) situational knowledge quiz (pre-post-unit), (c) formal, semi-structured teacher interviews/written response to structured questions (pre-post-unit), (d) descriptive field notes, (e) video-taped and audio-taped teacher/student performances, (f) student think-aloud reports during the second game of each lesson (McPherson & Thomas, 1989), and (g) student focus group interviews (post-unit). Interviews were transcribed, open, axial, and selectively coded, then triangulated to develop categories. Situational quizzes, verbal recall data, and focus group interviews were micro-analyzed using a protocol analysis developed by McPherson and Thomas (1989) to examine action, condition, and goal orientations of students. Video taped game performances were analyzed using the Game Performance Assessment Instrument (Griffin, Mitchell, & Oslin, 1997). Results contribute to the empirical support for TGM, as well as contribute to what is known about knowledge structure development and transfer of learning for 5<sup>th</sup> grade novice games players.

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# CHAPTER 1

## INTRODUCTION

The content of American school physical education has consisted primarily of sport-related games. Since the mid 1900's games have been widely taught from the perspective that students need to be competent in their physical skills in order to play the game; specifically, the focus of games has traditionally been on skill development (Oslin & Mitchell, 2006). Bunker and Thorpe (1982) posited that a focus on skill development merely teaches skill in isolation, separate from the context in which it will be used. Learning skills in isolation poses issues in meeting objectives for learning to play the game well or the understanding of tactics and game awareness. Learning skills in isolation does not present all the requisite skills for actual game play.

For Bunker and Thorpe (1982), this was the impetus for creating alternative ways of teaching and learning of games that would capture students' interest and promote game understanding with learning skill in the context of the game. Bunker and Thorpe (1982) developed the Teaching Games for Understanding (TGfU) approach to help students learn the cognitive aspects of games, such as decision-making and response selection, by having students play the game first. TGfU proponents assume that the model promotes game appreciation, tactical awareness, decision-making capabilities, skill execution for game contexts, and enhances all-around game performance. Additionally, there is an assumption that learning tactics may provide students with a transfer of understanding from one game to another in like categories (i.e., net/wall games). In this model, Bunker and Thorpe's (1982) vision was to reach a wider variety of

students and encourage them to be active through their own motivation to play and to develop an appreciation for skills needed in the authentic game context.

Griffin, Mitchell, and Oslin (1996) delineated and then reconstructed the TGfU approach with the intent of helping teachers understand and use the sequencing, complexity levels, and tactical problem progressions that could be presented through this game-centered approach. Their delineation, known as the Tactical Games Model (TGM), provided a structured framework for teachers to better understand and implement the approach. TGfU and TGM are often used as interchangeable identifiers for this approach. Assumptions of this model have primarily lacked theoretical underpinnings and are not supported by any substantial descriptive studies.

Early examinations of the model were conducted in comparison studies. The content variability, instructional roles and methods, as well as teachers and instructional environment in these comparisons posed such diversity, especially in learning objectives, it is possible the results were flawed. These admittedly weak studies also lacked description regarding the use of the model, making generalizability of the studies and validation of the model unlikely. Though early investigations were methodologically weak, these studies showed positive reports regarding the model's contribution to improved skill, cognition, and game performance.

Only one study (Mitchell & Oslin, 1999) has attempted to examine the transfer of learning in a TGM unit. In their study of 9<sup>th</sup> grade students learning pickle ball and badminton, Mitchell and Oslin (1999) noted significant improvement in decision-making in badminton, which was continued in pickle ball instruction. Inquiry responses showed that the students understood, to a degree, that deciding where to place the ball to make it

difficult for the opponent to return it had similar effects in game performance in each game. This study mirrored evidence in other fields of education that have provided support for transfer of learning (Benson, 1970; Berman, 1994; Harvey & Anderson, 1996).

Collectively, these studies have provided limited information about how students learn and come to understand game play and tactics in this model. There is insufficient evidence to support the assumptions of the model regarding student cognition and the learning of games. Though there have been no sound, supportive data, prior research has provided insight into the complexities of teaching and learning games, as well as the complexities of the research strategies to be used. The TGM research community now needs more holistic examination of the student, the teacher, the environment, and the how the model is used. Considering multiple theoretical perspectives in examining this model, such as information processing, will provide deeper insight to the teaching and learning of games.

Griffin and Patton (2005) proposed that an information processing lens could be used to better understand student cognition during the learning of games and game play with TGM. Information processing is a theory for understanding how individuals select, use, store, and interpret information (Starkes & Allard, 1993). From a teaching perspective, this theory has been used to explain the types of information provided to the learner and how it is conveyed (Rink, 1999). Though limited information regarding student cognition related to TGM instruction exists, several studies have explored knowledge structures related to game play in sport using an information processing lens.

Extensive research exists regarding expert cognition in sport; less research exists regarding cognition of the novice games player. Comparing experts and novices in the sport domain has provided a framework for understanding constrictions, barriers and activities compulsory for establishing appropriate teaching methods that promote learning in physical education (French & McPherson, 1994). Expertise studies have shown that experts and novices vary greatly in their knowledge base. Abernethy, Burgess-Limerick and Parks (1994) found distinctions between experts' and novices' motor execution and response selection processes. Their results revealed that adult sport experts exhibit superior tactical decision-making and motor skill execution. Several studies have detailed that child experts' performances rarely attain the highly developed response selection and motor skill execution planes achieved by adult experts (French & McPherson, 1999; Nielson & McPherson, 2001; McPherson, 1999). In tennis studies (McPherson, 1999, 2000; McPherson, French & Kernodle, 2002; McPherson & Thomas, 1989; Nielsen & McPherson, 2001) and baseball studies (Nevett & French, 1997; Nevett, 1996), knowledge and content retrieved were examined. Extreme differences arose in conditions and actions that were accessed by novices and experts.

Overall, these cognition studies in sport have shown that in motor skill performance and in response selection processes (a) sport experts are automatic, consistent, adaptable, perceptive, self-monitoring, fast and accurate, knowledgeable, and they anticipate and plan in advance, while (b) novices are self focused, attend to irrelevant conditions, and have limited retrieval strategies. Also, novices retrieve a limited number of actions, mostly primary actions, and access single movements without planning. Novices typically do not reflect on their actions and rarely reflect on the

opponent. Moreover, novices lack consistency and are passive in assessing the game (see French & McPherson, 1994).

Understanding characteristics of play at diverse levels can provide physical educators with insight to set reasonable performance expectations that can support students' desire to play. French and McPherson (2004) suggested that further research be conducted to determine ways to promote student learning of response selection-processes and to determine types of engagement activities that facilitate the development of their game play knowledge bases.

Since games are a primary part of physical education curriculum, understanding how students can best learn and understand game play is highly relevant. Research which explores the ways in which novice students think about games and learn tactics can be useful in the understanding of curriculum events that influence tactical and strategic knowledge development, help students make connections to previous knowledge, support appropriate motor skill selection and execution, and promote students' ability to make decisions in game contexts (Griffin, Dodds, Placek & Tremino, 2001).

Investing TGM as a learning model would provide insight into the ways in which students learn response-selection and develop their knowledge base. Since the model's primary assumption is to facilitate students' tactical understanding of games, this type of research could support or question the model's notions about how students learn games. Additionally, such investigations would inform models-based instruction. Metzler (2000) asserted that the development of guidelines for inquiry into models such as TGM is still in the initial stages. He highlights the complexity of models as comprehensive and extensive means to outline instruction, and he purports that researching models must be

just as extensive and comprehensive. Understanding the positive aspects of TGM for contributing to student learning, as well as the limits of the model, will aid in setting parameters for the model's use for student development in understanding and playing games.

The purpose of this study is to examine fifth-grade students' tactical understanding and decision-making in a TGM net/wall sampling unit. Additionally, this study will examine fifth-grade students' transfer of knowledge structures among the games of pickle ball, badminton, and volleyball in a TGM net/wall sampling unit.

### **Research Questions**

An information processing lens will be used in a case study research design to provide a rich description of students' tactical understanding, decision-making, and transfer of knowledge in a TGM net/wall sampling unit. The specific research questions I will address are

1. What are students thinking as they play in a TGM net/wall sampling unit?
2. To what extent are students engaged in decision-making during a TGM net/wall sampling unit?
3. What are students' perceptions of the similarities and differences among games?

### **Significance of this Study**

This study is significant for several reasons: First, this study will add to the knowledge base of response-selection processes, to provide a better understanding of how to develop knowledge base and to facilitate the learning of those processes in TGM. Second, French and McPherson (2004) noted that future research is needed to describe developmental changes in cognition and motor processes in various sports, particularly in

young people. This study would describe how 5th<sup>th</sup> grade females' and males' cognitive processes change in net/wall games. Third, it would describe knowledge structures and concepts that are used from one game to the next (i.e., transfer of knowledge). Fourth, in spite of the importance of decision-making and knowledge for game involvement, little research has examined student decision-making during game play, especially during the implementation of TGM (Grehainge, Richard, & Griffin, 2005). Finally, further models-based research would (a) add strengths to research processes by using new methods and paradigms, (b) help refine and advance models-based research, (c) foster a greater understanding of how models act as significant mediation tools in the performance of students and teachers, (d) provide an improved examination of the instructional and student outcome association, and (e) encourage an enhanced research-practice transfer.

## **CHAPTER 2**

### **REVIEW OF LITERATURE**

#### **Introduction**

Much of the content in American school physical education has focused on sport-related games, which have been taught using various modes of instruction. Since games are such a big part of the curriculum, physical educators' understanding of how students learn and think about tactics is highly relevant; such tactics often play a pivotal role in game outcomes. Research that examines how students learn tactics and think about games can aid in the design of curriculum tasks that (a) foster the development of tactical and strategic knowledge, (b) help students make connections to their previous knowledge, (c) assist in appropriate responses for motor skill selection and execution, and (d) cultivate decision-making ability in the contexts of games (Griffin, Dodds, Placek & Tremino, 2001). Teachers want their students to be able to understand sport-related games and play them well. It is theorized that if the type of play is meaningful and ensues a "just right" challenge (Kretchmar, 2006; Csikszentmihalyi, 1977), activity is more likely to become a part of students' identities and lifelong pursuits. Numerous approaches to teaching sport-related games have been created and are becoming increasingly popular (Griffin & Butler, 2005; Metzler, 2000) for helping students to play games well. A particular model of interest to me, Teaching Games for Understanding (Bunker & Thorpe), assumes to develop students' tactical awareness and the understanding of games through authentic game play. Limited research exists regarding how young novices in physical education learn tactics and think about games.

This review of the literature will focus on relevant aspects of sport-related games teaching in three major sections. First, I will discuss the relevance of play in physical education and distinguish among play, games, sport, and athletics. Secondly, I will examine games education. This examination explores three models associated with sport-related games teaching (mastery learning, Sport Education, and Teaching Games for Understanding), along with the research associated with each model. In the final section, I will introduce information-processing theory as a framework for understanding game knowledge and will examine the complexity of games and the cognitive aspects of game play. Then I will survey the research on sport expertise and its impact on sport-related games instruction.

### **Let's Play the Game**

Bunker and Thorpe (1986) suggested that playing the game first is an important, meaningful way students learn about sport. Siedentop (1972, p. 176) described the request for both young and old is always “let’s play”. No one ever says, “let’s move”, “let’s have activity” or “let’s have sport”. Play is at the heart of activities, games, sport and athletics; it is play that provides meaning in movement (Siedentop, 1972). Siedentop (1972, p. 176) suggested that physical education is best distinguished as a genre of play because play engenders the meaning-making capability of physical education.

The terms play, games, sport and athletics however have been interchanged and thus their meanings and purposes tend also to be confounded by organizers of activities and even participants themselves (Kretchmar, 2005; Siegel, 2008). Thus it is important to recognize the distinctions among the terms. Activities from these genres may look the same across different age levels to the observer, but the participants may make different

meaning in their participation (Kretchmar, 2005; Siegel, 2008). For example, some individuals may participate for social reasons and may not be concerned about outcomes while others may participate to maintain a scholarship and are preoccupied with getting better. For physical educators in particular, understanding the differences among levels of participation can provide a frame from which to make informed choices about how to implement meaningful games for physical education students. In the following section, I will briefly situate play, games, sport and athletics based on a social view. Then, I will expand upon on each term, highlighting distinct characteristics and conceptions.

### **Play, Games, Sport and Athletics**

The concepts of play, games, sport and athletics have been studied and written about by many scholars (Huizinga, 1950; Loy, 1969; Siegel, 2008; Kretchmar, 2005a, 2005b). Particular characteristics of each have been identified. Siegel (2008) used a continuum (see Figure 2.1.) which positioned play against work to identify commonalities and differences among all of these concepts. Play, at the left end of the continuum, has the characteristics of amusement, trifle, “flow”, carefree, spontaneous, intrinsically rewarding, of high use value, and is a process. Work is at the opposite end of the continuum with the characteristics of serious, organized, structured, planned, externally rewarding, of high exchange value, and is a product. Conversely, Siegel (2008) also noted that the concepts cannot absolutely be defined, as the meaning of each term can be different for different individuals and societies.

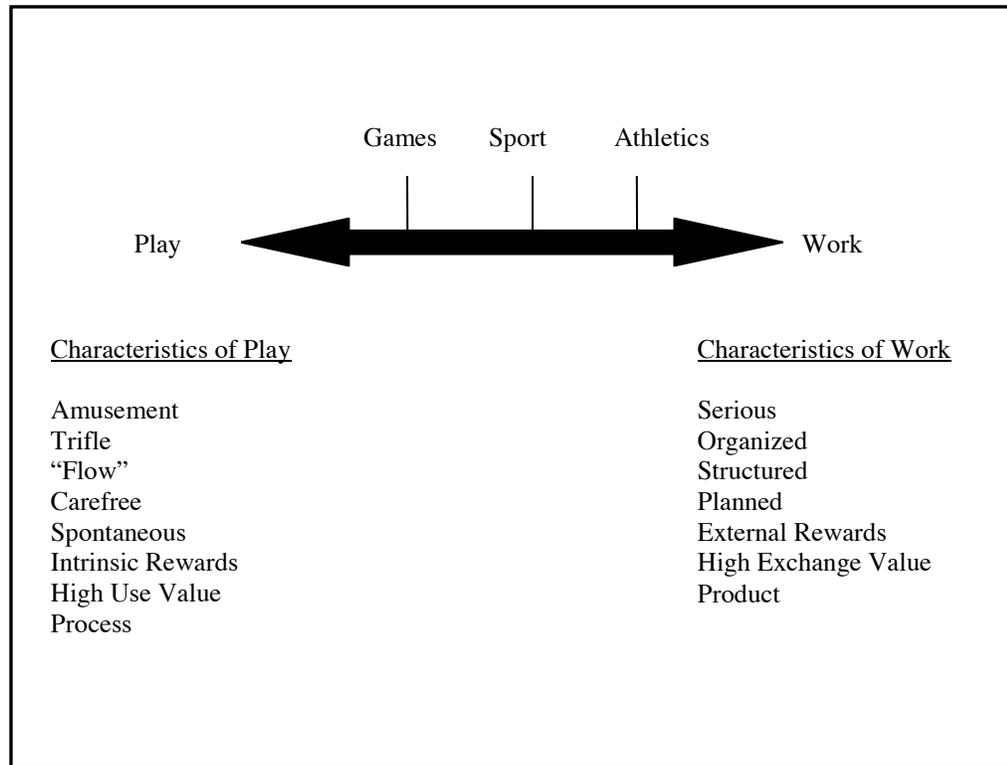


Figure 2.1. Play-Games-Sport-Athletics-Work Continuum (Siegel, 2008, p. 7)

He contended that the terms play, games, sport and athletics are “in essence theoretical constructs...they only take on meaning by how we commonly, and conventionally comprehend them (p. 7)”. Though play, games, sport, athletics and work lie in this respective order on Siegel’s continuum, it is important to recognize that the terms that are closer together have more characteristics in common and those that are farther away from each other are less related. The next few sections will explore deeper definitions of these terms and highlight how these terms have been identified and used.

### **Play**

Huizinga (1950), a prominent scholar on the topic of play, concluded that play (a) is depicted as participation in an activity for which the circumstances are entirely voluntary, (b) encompasses a time and space distinctive from usual life, (c) has an

unquestionable obligatory rule structure that is accepted by all participants, and (d) is characterized by an unusual awareness coupled with tension, joy, and complete involvement. What follows is an examination of these four qualities of play.

### **Voluntary**

Wenz (1985) explained that play can only exist when “exchange value” and coercion are not present. By exchange value, Wenz (1985) referred to participation in an activity in exchange for infamy, wealth, and personal improvement intentions. Siegel (2008) noted that that participation for the sake of solely amusing oneself is autotelic, or inspired by psychological rewards that are innately part of the activity. The rewards, for example, could include sensations of fun, challenge, tension, exhilaration and the multitude of feelings associated with mental and physical toil.

### **Fixed Time and Space**

Huizinga (1950) also indicated that play has fixed limits of time and space. Play has a beginning and an ending, and is often psychologically and/or physically estranged from typical living spaces. The length of engagement in play can have many factors. Time for play in essence could be gauged in accordance to level of exhaustion. For example, children engaged in a game of tag might play until they are too tired to continue. Among other factors, participants’ relative conditioning might play a role in how long the activity will last. In a pick-up basketball game, participants may choose to play until one team reaches a predetermined score, where the duration of the game could be long or short depending on how long it takes for a team to score 20 points. On the contrary, a high school basketball team might play two twenty-minute halves with intermittent time outs and a half-time, resulting in two hours of engagement.

Also, play typically encompasses unique space. “Playgrounds” come in all shapes, sizes and locations (Kretchmar, 2006). Society typically designates play spaces that are different from spaces where people work and live. Siegel (2008) argued that play space may refer more to an attitude, making location of play more ambiguous. For instance, is a desk top computer used at job site considered play space or work space if the worker amuses himself/herself to play a game of Peggle during the work day? Was France a work space or a play space for Lance Armstrong in the Tour de France? As noted earlier, the definitions may be contingent on the player himself/herself, depending on whether or not the value for engagement is autotelic. Examples of typical play spaces might include but are not limited to basketball courts, football fields, velodromes, backyards, campgrounds, roof tops, rodeo arenas, clover fields, and rock faces.

### **Rule Structure**

Play has an unquestionable obligatory rule structure that is accepted by all participants (Huizinga, 1950). These rules postpone normal living routines for the length of the activity. Play rules can vary in stringency. Rules may range from informal rules established by children playing “the old west” to very formally structured rules in a Las Vegas poker game. Rules for sport and athletic contests can also range from informal to formal. For example, a one-versus-one basketball game may take place in the confines of a drive way slab and have less structure than an official athletic contest overseen by the National Collegiate Athletic Association (NCAA). Nonetheless, the rules maintain the existence of play.

## **Unusual Awareness: Complete Involvement**

Captivatingly, play is also characterized by an unusual awareness coupled with tension, joy, and complete involvement (Huizinga, 1950). Many have described these sensations as flow (Csikszentmihalyi, 1977) or deep play (Kretchmar, 2005a). Others have debated whether the sensations were an un-awareness (Singer & Lidor, 1993) or rather a deeper, heightened awareness (Ross, 1995). Still others have theorized that the sensation is also a result of the perception of the possibility to succeed (Episto, 1979) and the strife to make the incomplete self better (Kretchmar, 2005a).

“Flow” state has been used to describe the perceptual and cognitive absorption property of play (Csikszentmihalyi, 1975; Kretchmar, 2006; Jackson & Csikszentmihalyi, 1999; Lloyd & Smith, 2006). Specifically, participants are “psychologically closer to being a part of the activity, aware of actions executed, but not of awareness” (Siegel, 2008, p. 10). Csikszentmihalyi (1977) defined flow as “the holistic sensation that people feel when they act with total involvement” (p.36). When people are in flow, they:

...shift into a common mode of experience when they become absorbed in their activity. This mode is characterized by a narrowing of the focus of awareness, so that irrelevant perceptions and thoughts are filtered out, by loss of self-consciousness, by a responsiveness to clear goals and unambiguous feedback, and by a sense of control over the environment (Csikszentmihalyi, 1977, p.36).

Flow has been portrayed as an experience in which the involvement is perceived to be one of the best possible happenings that could occur. The perception of flow can be attained in many pursuits (e.g. physical activities, computation of symbolic systems like computer languages, and even work; Csikszentmihalyi, 1977).

Csikszentmihalyi and LeFevre (1988) and Massimini and Carli (1988) typify flow as the sense of balance between challenges (or action or opportunities) that are present in

the setting and the capacity of the individual or group to meet those challenges. This balance can be viewed in the Flow Model (see Figure 2.2.; Csikszentmihalyi, 1977).

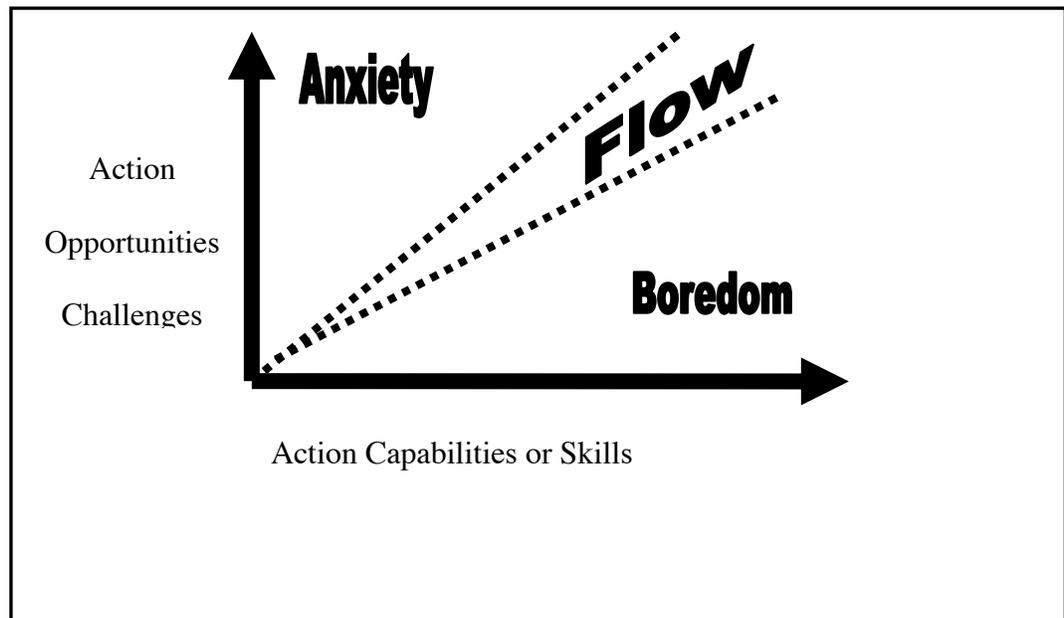


Figure 2.2. “Flow” Model (Csikszentmihalyi, 1977).

Csikszentmihalyi (1977) developed the flow model to represent his hypothesis that “just right challenges” (Kretchmar, 2006, p. 348) produce flow. If an individual does not have the capacity to meet a challenge, or rather the challenge is too difficult, anxiety is the result. If a person’s capacity to meet the challenge is above what is necessary, or rather the challenge is too easy, boredom is the result. To perceive flow, the challenge and the capability have to be somewhat equal. This model helps to recognize that not all play is the same.

Kretchmar (2005a) indirectly highlighted the concept of flow in his view of play. Kretchmar (2005a) suggested that individuals should relate to diverse variations of play because not all play is the same. Play may be weak, shallow, good, better or deep. From a play perspective, the type of play a person engages in is critical to the length of play and

continuation of play. Deep play is what sustains a person in an activity because it is personal and becomes engrained in a person's self identity. "Play becomes part of who we are and, perhaps even more important, who we are in the process of becoming" (Kretchmar, 2005a, p. 151). Hence, deep play would distinguish a cyclist from someone who merely rides their bike. Deep play results in falling in love with an activity and developing a relationship with that movement. Deep play provides "just right challenges", is sustainable, and ultimately leads to healthful benefits (Kretchmar, 2005a).

Deep play is opposite of shallow play. Shallow play, a weaker form, does not delight, arouse the senses or imagination, or motivate individuals to continue participation. Shallow play can be marked by fun, but fun eventually becomes stale and monotonous. Kretchmar (2005a) proposed that fun can happen anywhere and is not necessarily a special event like the events that stimulate the deep kinds of play that often result in flow. Shallow play is limited in its impact to sustain an activity for a lengthy period of time (Kretchmar, 2005a).

The flow state or deep play has been described as an altered state of consciousness, spiritual transcendence, or being in the zone (Kretchmar, 2005a). Singer and Lidor (1993, p. 10) reported that highly skilled players, after very successful performances, frequently stated they were "unaware of what they were doing". Singers and Lidor's conclusion was that extensive practice allowed a player's body to direct the performance, without consistent cognitive monitoring. They stated, "After initiating the activity, the body seems to take over and everything happens as if in a state of automaticity" (p. 12).

Other performers have noted that the more they thought about what they were doing, the less successful they were (Herrigel, 1953). Ross (1995) claimed that by stating that the “body takes over” infers that the mind and body are two distinct entities. Thus, if the mind and body are then separate, then the body has not a mind to think and thus cannot “take over”. Ross (1995) contended that “it is hard make the assertion that an individual can know without thinking” (p. 15):

Thinking pervades all of our activities. We have the ability to direct our thoughts, either towards the movements involved in the skill we are about to execute or away from the movements towards cues in the environment or to the scenery about us (p. 16).

Ross (1995) provided an excellent example of the thought processes involved as a basketball player attempts a shot at the basket while being challenged by a defender:

As I leap to start my shot I must take into account the position of the opponent guarding me: how close the defender is to me, how much taller or shorter, leaping ability, and the actual position of the outstretched hands. As I monitor the changing situation I start my shot – please note that my attention has been, and is directed away from the movements I am making to the cues in the environment – yet as I place the ball in my shooting hand and move it above my head decisions are being made on how to avoid the defender, when to release the ball, which arc to use, and what angle to employ, amongst many other factors I need to consider in order to execute the skill. Depending on the position of the defender I will either shoot at the basket or, at the very last moment decide to pass it to a teammate cutting to the basket for an easy lay-up.

Ross advised that these decisions and results can not occur without thinking. Perception precedes interpretation and interpretation requires thought. If one does not think while playing, then what is seen, heard, and how the game unfolds has no meaning and thus provides no source for action.

Practice in effect aids in the selection of environmental cues quicker and more shrewdly, which in turn facilitates decision-making speed and accuracy. Practice additionally permits individuals to direct thoughts toward the environment as well as to

physical movements. Ross's argument opposes a separation of the body and mind, or dualism, in which the "body takes over" and the "mind is unaware". Rather, he notes there is always intentional action, otherwise depicted as:

...direction, a goal, an end, which is the agent's purpose or intention to bring out or attain. To act intentionally is to move one's body at will in order to attain a desired goal. To move one's body at will implies that one controls it when one acts" (p. 14).

Thus, to conclude and incorporate Ross's argument regarding "awareness", flow can actually be described as a profound awareness derived from focused thinking.

Siegel (2008) proposed an interesting concept to add to the notion of flow. He included Eposito's (1979) idea of experiencing possibility. Eposito identified the experience of possibility as an appealing feature of sport. Meriam-Webster's (2008) definition of possibility is "implying that a thing may certainly exist or occur given the proper conditions". In other words, the determination and enthusiasm an individual has in attempting to control the outcome of success in a challenging activity via his/her cognition, emotions, and physical skill is a conjecture of possibility. People have the predisposition to fall short of perfection, but the possibility of being successful in a single attempt is enough to try again. Though people are determined and are driven by the possibility of success, paradoxically, success in activity is as abundant as rain in the desert. For example, thus far in the 2008 Women's National Basketball Association (WNBA, 2008) season, the Houston Comets have only made 659 field goals out of 1,585 field goal attempts (42% successful). Though the New York Giants beat the New England Patriots in Super Bowl XLII, Eli Manning only had 297 completions out of 529 passing attempts in the entire 2007 season (56% successful) (National Football League,

2008). L.J. Jenkins, currently ranked fifth in Professional Bull Riding (PBR, 2008) has ridden 34 bulls out of 61 attempts (55% successful).

Kretchmar (2005a) describes the human state as somewhat unfinished and in progress. Humans are compelled to improve upon their incompleteness (Kretchmar, 2005a; Siegel, 2008). Because of this, individuals seek out challenges to be and do better. Ultimately, the Houston Comets will play again, seeking to make more baskets than they miss each time up the court; Eli Manning will seek to complete all his passes in the next possession; and L.J. Jenkins will do everything in his power to finally stay on “Copperhead Slinger” the next time he rides in St. Louis. Conceivably the incentives of possibility and psychological rewards cause individuals to work long hours to improve their craft, yet do not call it work, but rather think of the time spent as play (Siegel, 2008).

### **Social Relevance of Play**

Play is a distinct term that characterizes games, sport and athletics (Siedentop, 1972). The word play is well-known in activity language, and has often been identified as opposite of work (Siegel, 2008). Since play is typically associated with a variety of game forms, either before or after work, play is often regarded, in a social sense, as a self-indulgent venture which lacks functional and practical qualities. Additionally, play results in intrinsic rewards that are personal and seemingly displaced from the larger social context (Siegel, 2008).

Play, not typically considered socially imperative, is viewed as most appropriate for children, for elderly adults, or those in retirement. In our culture, work production has long been considered to be hindered by individuals who play. Work traditionally has been

viewed as more important than play in a social and economical sense (Stone, 1972). Harris (1980) noted that the capacity to play is a characteristic that is necessary in the development of culture and technology. In play, individuals implement different goals and different ways to achieve goals in order to test out new ways of accomplishing tasks.

Terr (1999) noted that play therapy provides a means for individuals to play out situations to discover solutions to life problems that otherwise are difficult to overcome. Play provides a way to elicit options, instill hope in a situation, and relieve stress (Marano, 1999). In the workforce, a person's ability to elicit options, be hopeful, and reduce stress are considerably important. Thus, play may be an important aspect in helping people accomplish what society portrays as work. Kretchmar (2005a) opposed the notion of pitting play against work, as work can be a play form in and of itself.

Play has contributed to the technological advancement of the world. Play, a form of recreating goals and experimenting with different ways to achieve goals, also influences possible resources an individual may use, alter or create to aid in the process. Often, play technology is associated with sports instruments or techniques (e.g. carbon fiber bicycles, heart rate monitors, or the shot put glide versus rotational style). Play has also infiltrated the work force and the world outside play, as it is typically viewed. Many industrial businesses engage in play-like experimentation to expand and develop. These new developments are indeed utilitarian and socially important (e.g., solar powered cars, the iphone, the lap top computer and Stealth fighter jets). Siegel (2008, p. 12) surmises, "...without activities having this experimental quality, normally associated with play, whether they be sports oriented or industrial in nature, culture and technology become stagnant and, in time, fail to serve a society's need for innovation".

Play has been described as part of human nature, and a fundamental activity (Huizinga, 1950; Ellis, 1973; Ackerman, 1999) that has existed since people have existed (Kretchmar, 2005a, p. 148). The qualities of play represent a cultural phenomenon that has permeated societies from the beginning of civilization. These same qualities exist today, remaining immutable throughout time (Huizinga, 1950, p. 4). Thinking of play merely as an opposite of work denies the importance of play in human existence (Vanderzwaag, 1972).

Fink (1960, p. 77) wrote that play is “a fundamental phenomenon of existence, just as original and basic in itself as death, work and domination”. Play is a vast provider of quality of life more than it is anything else (Harris, 1980). Several researchers suggest that we should refrain from distinguishing between play and work and contrast play with innate qualities of life, such as love, knowledge, art, and beauty (Furlong, 1976; Harris, 1980; Kretchmar, 2005a; Siegel, 2008).

Wideman (2001) purported that play reflects the individual state of being. Roberts also suggested (1995) that play reflects the social tenets of a culture. Play has multiple layers of meaning that only the participant can know (Wideman, 2001). Those that engage in play not only can experience personal flow and/or be engaged in deep play, but can commune in “shared space, shared aspirations, the shared shuffling dance, the depth and weight and heat of the shared spirit...” (Wideman, 2001, p. 239).

### **Games**

“A game is any form of playful competition whose outcome is determined by physical skill, strategy, or chance employed singly or in combination” (Loy, 1968, p. 1; Loy, 1969, p. 56). Games are fundamentally organized play (Caillois, 1969). Rules

govern the organized character of games and distinguish games from play (Caillois, 1969; Loy, 1969; Vanderzwaag, 1972). “Rules are inseparable from play as soon as play acquires what I shall call an institutional existence (Caillois, 1969, p. 50).” Rules have four fundamental functions in games (Kretchmar, 2005a, p. 161):

1. Game rules set the challenge or present the problem to be solved.
2. Game rules establish the start and finish time of the game as well as how the game will proceed.
3. Game rules lay out procedure for dealing with out of the ordinary events.
4. Game rules afford a means for “sharing tests and competing”.

Rules regulate what action may be done to achieve the goal/s of the game. A player/s may develop strategy, tactics, refined skill, and develop body efficiency to overcome game obstacles. Rules can be unique to the group that establishes the game. For instance rules for a “pick-up” tennis match may be very different from a formally structured match, with predetermined, sustaining rules held at Wimbledon. The rules in games are deliberate to make actions inefficient (Guttman, 1978). This inefficiency is challenging for participants. This logic of games is derived from the intellectual demand they present; this intellectual requirement is what truly distinguishes games from play (Kretchmar, 2005a). Games are more intellectually challenging than play.

Rules in games place constrictions on how or what individuals can do. The rules force individuals to reach a goal by taking the more difficult route, such as running 200M in a lane around a track, to get from point A to B, instead of taking the shorter way (Kretchmar, 2005b). Suits (1972) expressed the nature of games in the following:

To play a game is to engage in an activity directed toward bringing about a specific state of affairs, using only means permitted by specific rules, where the means permitted by the rules are more limited in scope than they would be in the absence of the rules, and where the sole reason for accepting such limitation is to make possible such activity (p. 22).

Rules for games are separate from everyday living (i.e., rules restrict movement for a brief period in time), suggesting when, where, and how the game will proceed. For example, in a 50-meter butterfly swim race, competitors are limited to swimming in a specified pool, in an individually assigned lane. Competitors must stay in the water for the entire 50 meters, and they must use a two beat kick with a butterfly stroke.

Additionally, when the race is over, after all competitors have touched the wall and have placed, the rules are cast aside until the next competition. People do not use these rules in their daily living (Loy, 1969).

Just as in everyday life, games have mishaps. Mishaps include rule violations, equipment failure, imposing weather conditions and irrelevant interruptions. Rules in games provide directives in the instance of unforeseen circumstances. Rules specify penalties for game violations and provide contingency plans for events that compromise the game (Kretchmar, 2005a).

Rules allow for more than one person to share the game and to compete. Because rules can maintain a consistency for how a particular game is played, comparison of scores (by a single individual or across several individuals) can provide meaning. Meaning can be derived from the improvement of a personal score, from out performing

the opposition, and just plainly from tension and uncertainty derived from ethical, fair play (Kretchmer, 2005a).

Additionally, games provide multiple deliberate purposes in culture. Games have been noted to reflect what a society values. Hence, particular game playing experiences have been implemented to encourage qualities such as character, self-control, teamwork, humility, personal responsibility, and determination to a society's youth. Siegel (2008, p. 14) provided that:

...in hunting cultures games of physical skill predominate. In cultures where religion is perceived to be an important factor in overcoming survival uncertainties, games of chance are prominent. In societies characterized by advanced technology and large industrial-military complexes, games of strategy come to the fore.

Guttman (1978) depicted the relationship of play and games (see Figure 2.3.). Play ranges from a spontaneous to an organized structure. Spontaneous play is more childlike and less structured. Organized play has more structure and considered a more formal type game which teenagers and adults might engage in. These games can be non-competitive to highly competitive. Competitive games can be intellectual contests, which are more cognitively characterized. Competitive contests can also be contests of physical aptitude, such as speed, endurance, strength, and/or agility, also known as sport.

Collectively, games consist of artificial situations, bound by unconditional rules that are accepted freely by participants, and are developed in such a manner that the goals are intentionally inefficient. Many times luck plays a role the final results of a game. Play can basically be considered an all encompassing concept. Though play and games are two

distinct entities, games contain one or more qualities of play (Loy, 1969). Additionally, play is believed to be a necessary component of sport (Schmitz, 1972).

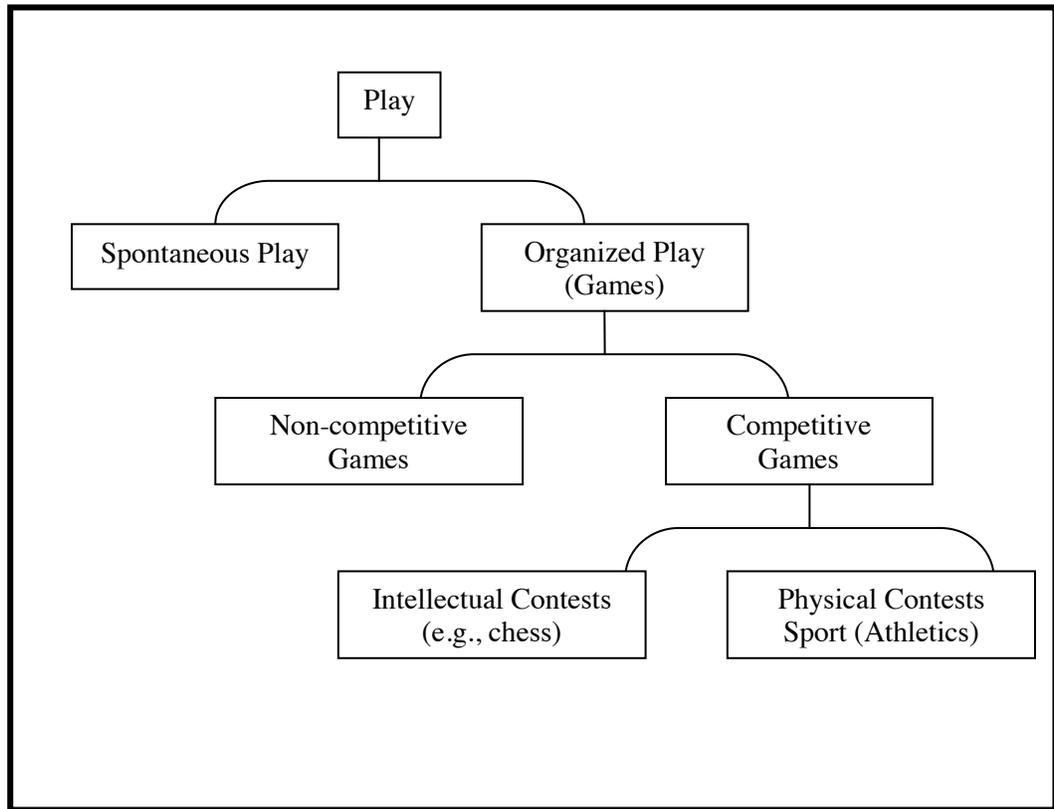


Figure 2.3. Guttman’s Classification of Games (Guttman, 1978)

### **Sport**

Loy (1969) identified sport as a specific game event. Sport consists of the many known “sports” in which individuals compete (e.g., basketball, hockey, tennis, bowling). Different games have different official rules that stay the same from contest to contest or event to event. The consistency of the rules allows individuals to repeat physical forms of play and develop sport specific skill and tactics. Sport also contains one or more of the characteristics of play (Loy, 1969; Schmitz, 1972). Schmitz (1972) contended that sport is entered into freely, has unknown outcomes, and has a distinct space and time that is different from everyday life. Persons who have participated in sport have often reported

“flow” or the feelings of tension, joy and total involvement that Huizinga described as a result of play (Siegel, 2008). The fundamental nature of sport is essentially to pass time with an end purpose of immediate “fun, pleasure and delight and is dominated by a spirit of moderation and generosity” (Keating, 1964, p. 28). Sport in the purest form offers a healthy play experience (Siegel, 2008) because the experience is more about the delight in the process rather than the final outcome of the game (Siegel, 2008).

### **Athletics**

Sport and athletics have often been conceived as synonymous by observers and media (Siegel, 2008). Though the game technicalities may be the same, sport and athletics are different in the mind-set, training, and aim of the participants (Siegel, 2008). As sport is a diversion for fun, pleasure and delight, athletics is for contest and victory. At the heart of athletics is winning. Athletics is “characterized by a spirit of dedication, sacrifice, and intensity” (Keating, 1964, p. 28). Because winning is the ultimate goal, great planning, training, scheming, and direction occur prior to the event/s. Team composition is very selective and rewards for participation and excellence are given (e.g. college scholarships, NBA salary, etc.).

Additionally, athletics brings sport to the magnitude of a social institution (Boyle, 1963) or *sport order* (Loy, 1969), “where its use emphasizes important social phenomena; relationships of strategic structural significance” (Schneider, 1964, p. 338). The *sport order* consists of all of societies’ social organizations that manage, promote, and standardize action of sport situations. The *sport order* effectively consists of primary, technical, managerial and corporate levels of impact. Boyle justified sport as a social institution:

Sport permeates any number of levels of contemporary society, and it touches upon and deeply influences such disparate elements as status, race relations, business life, automotive design, clothing styles, the concept of the hero, language, and ethical values. For better or worse it gives form and substance to much of American life (1963, p. 3-4).

Huizinga (1950), as well as others (Michener, 1976; Schmitz, 1972) have noted that institutionalized sport (athletics), with an emphasis on such things as winning, on extreme efficiency of technique (specialized positions), and attainment of social and economic objectives can hinder the play experience. When the play experience is corrupted, the game becomes sterile. Huizinga (1950) pointed out that to rightly grasp the function of play in our sport and athletic games, it is necessary to go beyond examination of explicit structures and consider the motivation for the event and the spirit of participants' involvement. Ultimately, the threat to the play element concerns freedom and control of participation. A true player participates at will for the essence of play, not to oblige a contract or achieve social or monetary gain.

### **Games in Physical Education**

America's most popular sports grew and developed in the mid-1800's to early 1900's. As these competitive sports developed and became part of American culture during a period of urbanization, the value of these games as "a vehicle for promoting health and safety, the worthy use of leisure time, and ethical character development" was realized (i.e., three goals of the 1918 Seven Cardinal Principals of Education; Metzler, 2000, p. 8). "Play" was introduced into schools; sports, games, and dance were viewed as educational and were included in school curricula (Mechikoff & Estes, 2002). With

greater interests in competition and social interactions, sport-based curricular content became a dominant part of school physical education programs between 1900 and 1950, expanding the design of programs that were grounded in gymnastics (Mechikoff & Estes, 2002). ‘Games education’, also recognized as the content associated with sports, is currently the largest content area of the physical education curriculum (Metzler, 2000) and games teaching and learning has been conceptualized in various forms (Mitchell, Griffin & Oslin, 2006; Rink, 2004; Siedentop, 1994).

Initially, games were taught from a mastery learning perspective. Over time, particular issues in games instruction brought about different ways of thinking about games teaching and learning. Approaches such as Sport Education (Siedentop, 1994) and Teaching Games for Understanding (TGfU) (Bunker & Thorpe, 1982) were introduced as alternative models for games instruction. These three perspectives represent an evolution of games teaching and learning. The following section presents these three models for teaching sport-related games.

### **Mastery Learning**

Mastery learning has been the longest standing venue for teaching games and sport (Oslin & Mitchell, 2006). At the heart of mastery learning is skill development. Fundamentally, mastery learning involves the teaching and learning of particular skills in progressions (Rink, 2002). Skill progressions are outlined in a developmentally appropriate order and students are expected to gain a minimal level of competency before moving to the next movement form or skill in the sequence. A sample unit might look like the following six day outline in Table 1.

Table 2.1. Sample Mastery Learning Unit for Basketball

Class 1:	Introduction to basketball (history, legendary players and teams) Rules Equipment, court layout, playing area measurements Game rules Stretching and warm-up for basketball Passing with a partner/Skill cues Chest pass Bounce pass Overhead pass
Classes 2:	Shooting/Skill cues Two-line lay-up drills Free throws Spot shooting
Class 3:	Defense/Skill cues Defensive stance Slide drills Person-to-person defense (shell drills) Zone coverage defense (shell drills)
Class 4:	Offense/Task cues Transition rules Base line and side line throw-in Offensive positions 1 or 2 offensive set-ups
Class 5:	Review of rules Review of skill cues 3v3 half court scrimmages
Class 6:	Final test 5v5 full court games

Instruction in a mastery learning approach is typically accomplished through direct instruction. Different versions of direct instruction have been delineated and provide a frame for understanding what roles the teacher can assume in a mastery learning approach (Metzler, 2000; Mosston & Ashworth, 1994; Rink, 2002).

### **Direct Instruction**

Direct instruction has the characteristics of the teacher telling students what to do. Students do not make their own decisions, but follow the directives given by the teacher.

In a typical mastery learning lesson in games, the content and the ways in which students engage are determined by the teacher. This type of lesson is intended to be efficient in providing provide students with extensive, supervised engagement time for working on tasks and skills (Metzler, 2000; Rink, 2002). Different forms of direct instruction can be delineated from the research on instructional styles (Mosston & Ashworth, 1994). The forms of instruction that I associate with direct instruction include: command style, practice style (see Mosston, 1966) and the more recently coined models-based direct instruction (see Metzler, 2000).

### **Concepts and Theory Underlying Mastery Learning**

Mastery learning was derived from Skinner's theories of operant conditioning in behavioral psychology (B.F. Skinner Foundation, 2008). These concepts posited an evident relationship between learned behaviors and consequences (i.e., "Law of Effect"; see Human Intelligence, 2008). In essence, particular consequences reinforce or punish particular actions or responses (B.F. Skinner Foundation, 2008). If the consequence is positive, chances are the same action or response will occur when the same stimulus is presented again. If the consequence is negative, the chances are diminished for a particular action to occur. Five main concepts frame the process for behavior training in teaching: shaping, modeling, practice, feedback, and reinforcement (Cooper, Heron & Heward, 1987; Metzler, 2000; Morine-Dershimer, 1985, Rink, 2002):

1. Shaping is the breaking down of an advanced skill and then teaching the learner the skill via small sequences that lead to the final form.

2. Modeling is the presentation or vocalization of the developmentally appropriate skill and skill components that provides the student with a proficient, clear example that can be seen, read, or heard.
3. Practice is extensively structured with detailed plans for the learning task according to mastery criteria. Task structures, materials, time for each task, and precedent for engagement set the stage for multiple opportunities to respond in repetitive, accurate execution of tasks or skills.
4. Positive and corrective feedback are matched to rates of response. Positive feedback reinforces positive behavior and motivates the learner to continue engagement. Corrective feedback is used to pinpoint mistakes and inform the learner how to correct a particular mistake on the next attempt.
5. Reinforcement is used frequently as an incentive for other student behaviors, besides performance (e.g., following rules, effort, and remaining on task).

Combining the above five concepts to create a mastery learning lesson, the teacher designs the sequence of class events in a clear manner and provides a demonstration of the expected outcome. The teacher then directs students in actions that allow for high opportunities to respond. In addition, extensive rates of augmented feedback are provided. Each task has specific mastery criteria which shapes the progress toward the overall content goal (Metzler, 2000; Rink, 2002).

## **Research on Mastery Learning**

The classroom ecology paradigm has been used to examine how the program of action (i.e. order of content and management; Doyle, 1986) in physical education influences student work in physical education (Alexander, 1983; Jones, 1992; Marks, 1988; Tinning & Siedentop, 1985; Tousignant & Siedentop, 1983). This work has informed how teachers respond to classroom dynamics (Siedentop, 1988) and generally, how work gets done in classrooms (Doyle, 1977). Tousignant and Siedentop (1983) identified instructional, managerial, and transitional task systems in physical education.

Tasks associated with achievement of subject-matter goals have been identified as instructional tasks. Being present in class, conduct, and proper attire have been associated with the managerial system, and stipulated actions that lead to students accomplishing the instructional task have been described as transitional tasks (Tousignant, 1982). Other researchers have identified a student social system (Hastie, 1994a, 1994b, 1997; Hastie & Pickwell, 1996; Hastie & Saunders, 1990, 1991), as well as a 'match play task system' in coaching and 'role specific instructional tasks' for particular players that operate in sports (Griffin, 1991; Hastie & Saunders, 1992).

Doyle (1980; 1983) made important references to how accountability helps shape the ecological task systems in a classroom (a) accountability drives the task system, whether it is accountability in managerial or instructional tasks. Lack of accountability leads students to do only as much as their own interest drives them to accomplish, (b) the student responses that are accepted by the teacher are what students see at the 'real task', whether or not it was the task that was stated. Thus, consequences drive the way students ultimately engage (Alexander, 1983), (c) class events are a result of the dynamic inter-

relatedness of the ecology components. Class happenings are not linear or solely influenced by the teacher, as students often influence what the teacher does or how he/she reacts (Doyle, 1977). What follows is an examination of research detailing the ecological paradigm (i.e. instructional, managerial, and student social tasks systems) in physical education.

### **Instructional Task System in Physical education**

Task systems involve what students and teachers do within the content for learning (Hastie & Siedentop, 2006). McCaughtry, Tischler, and Flory (2008, p. 274) synthesized the literature to identify six key concepts that have traditionally explained the instructional task system in physical education: developmental sequencing, challenge, risk, ambiguity, novelty, and pace of instruction. First, task systems have been identified by determining how the task is situated (i.e. practice, scrimmage or game) and is matched to student levels to aid in skill development. Rink (2002) provided four categories of instructional tasks for mastery learning in games instruction that are widely used in physical education (e.g. informing, refining, extending, and applying; see Table 2). Rink's (2002) instructional tasks have been deemed the building blocks of successful skill development (Hastie & Siedentop, 1999) and have been used by others such as Graham, Holt-Hale, and Parker (2001) in their skill themes and movement concepts for elementary physical education content development.

Table 2.2. Rink's (2002) Task Progressions (Table Modified from Pagnano, 2004, p. 175)

<b>Category</b>	<b>Definition</b>	<b>Example</b>
<b>Informing</b>	Information about a new skill or strategy.	One-hand shooting, introduced with demo and three critical elements
<b>Refining</b>	Tasks that improve the quality of a skill, under the same conditions	Spread shooting hand behind ball or turn elbow toward basket
<b>Extending</b>	Task that increases the complexity of the skill, within task progressions	Pivot away, pivot back to square-up position, shoot
<b>Applying</b>	Tasks that use skills and strategies in authentic ways or to assess skill or strategy	2 v 1 with one-hand shots

Examination of the instructional task system can also be accomplished by viewing Rink's (2002) 'game stages'. She outlined situated tasks through 'game stages' to foster developmentally appropriate skill development in games. Rink's (2002) conception of games stages is derived from the idea that games and sports contain various motor skills that must be learned and used in combinations. These skills must eventually be learned in accordance with offensive and defensive perspectives. Rink's (2002) four games stages provides a very broad framework of progressions for developing skill and tactics in a mastery learning approach (see Table 3).

Table 2.3. Rink’s (2002) Model of Game Stages  
(Table Modified from Pagnano, 2004, p. 175)

Category	Definition	Example
<b>Stage 1</b>	Individual skill development; object control	One-hand shooting with hand behind ball
<b>Stage 2</b>	Skill combinations; working with others in cooperative ways	Receive pass from partner, shoot one-handed
<b>Stage 3</b>	Basic offensive and defensive strategies	One-on-one game
<b>Stage 4</b>	Modified game play changes to rules and boundaries; specialized positions and full sided games	5 v 5 game

Many researchers have found that tasks that are too difficult elicit student behaviors ranging from being a “competent bystander”, to changing the task, to not engaging at all (e.g., McCaughtry & Rovegno, 2003; Olafson, 2002; Tousignant & Siedentop, 1983). Tasks that are too easy can result in student behaviors of misbehavior, socializing, and changing the task (e.g., Carlson & Hastie, 1997; Hastie, 1997). Hence, developmentally appropriate instructional tasks are significant.

In a study examining student engagement and success rates using Rink’s four instructional tasks during instruction, Graham (1987) found that how a task is situated shapes students’ motor skill response patterns. These instructional tasks are sound teaching behaviors that not only represent what the teacher does, but how the teacher cultivates tasks for students to engage in developmentally appropriate activity for skill development. Few studies have reported efficient task progressions. One elementary

school physical education study (Hook & Tannehill, 1995) reported explicit refining and review tasks as an efficient task progression. Use of task progressions, extensions, and refinements have been reported in sport settings (Griffin et al., 1998; Hastie & Saunders, 1992).

Several studies have demonstrated that the usual precedent for task development is informing tasks (i.e., teacher typically explains what is expected) with application tasks (i.e., using particular skills in scrimmages or game play) that subsequently follow (Jones, 1992; Ward, Barrett, Evans, Doutis, Nguyen, & Johnson, 1999; see a review by Hastie & Siedentop, 1999). Extending tasks, which provide students with progressions of skill and refining tasks that aid in cultivating performance quality, are given little attention in the way many teachers implement games.

While game stages have been presented in teacher education programs as one means for teaching sport-related games, the theory behind game stages has not always translated into practice among in-service teachers. In Rink's 'game stages', researchers have learned that the most commonly left out stages are stages two and three (skill combinations and basic offensive and defensive strategies; Rink, 2002). Instructional tasks and game stages tend to be organized so that students engage in isolated skill practice and then move directly to the game without gaining an understanding of tactics or team collaboration. Learning skills in isolation over an extended period of time prior to full game play is quite common in physical education, but is not an appropriate manner for teaching sport-related games (Rink, 2002).

Risk, another feature identified by McCaughtry et al. (2008), has relevance to instructional tasks within mastery learning-models. The level of risk perceived by the

student (i.e., emotional, physical, or social) influences the extent to which a student will engage in an activity. Students have been more likely to disengage when the risk is perceived to be too high (Hopple & Graham, 1995; Olafson, 2002; Panicucci, Hunt, Kohut, Rheingold, & Stratton, 2002). When teachers confront such issues, they typically reduce task demands too much in order to lower the risks of participation. This has resulted in a “busy, happy, good” (Placek, 1983) atmosphere where the routine is simple and smooth, with low resistance from students (Siedentop & Hastie, 1999).

Ambiguity is another feature that McCaughtry et al. (2008) identified as associated with instructional tasks in mastery learning-models. Clear instructional tasks equate with environments that facilitate more participation than those classes where the goals are ambiguous. Ambiguous tasks that have been reported in the research are counterproductive, and have led to student off-task behaviors, too much negotiation of the task, and resistance (Hastie, 1997; Siedentop et al. 1994).

McCaughtry et al. (2008) also noted a feature of novelty. Activities that are novel can captivate and motivate students to engage, influencing the learning process. Rovegno (1995) explained that novelty motivation can enhance enjoyment and significantly influence engagement (Dyson, 1995; Hastie, 1997). Novelty can also influence momentary interest; boredom and monotony may emerge, despite the novelty, if there is not intrinsic meaning behind the activity (Kretchmar, 2006). Shen, McCaughtry, Martin, and Dillon (2006) commented that novelty can also be a distraction from learning and should be used cautiously.

The pace of the lesson or the unit has been noted to help move the lesson and the learning process along (Doyle, 1984). The speed of the lesson and progression are

important to consider. Faster-paced instruction has been shown to heighten expectations and keep students engaged (Hastie, 1997). However, monitoring student understanding is important in scrutinizing pace. Freezing and modifying tasks helps to guide students successfully when they struggle (McCaughtry & Rovegno, 2003).

### **Managerial Task System in Physical Education**

The managerial task system has been associated with the establishment and maintenance of order (Doyle, 1986). Accountability has been at the heart of the managerial task system in physical education, and has typically entailed rules, routines, expectations, consequences, monitoring, and assessment (McCaughtry et al., 2008). Classroom management is paramount in well-run classrooms (Doyle, 1986b; Romar, 1995; Siedentop, Doutis, Tsangaridou, Ward, & Rauschenback, 1994; Supaporn, 2000) and has been the primary bases to judge a teacher's effectiveness (O'Sullivan & Dyson, 1994; Supaporn, 2000). Classroom control also provides satisfaction to teachers (Luke, 1989) and aids in developing a positive learning environment where more time is devoted to instruction for learning (Siedentop & Tannehill, 2000).

In their review, Hastie and Siedentop (1999) noted that early studies of classroom ecology in physical education revealed that physical education teachers hold to the notion of establishing and maintaining order through cooperation rather than compliance. Also, many teachers acquire and maintain this cooperation in the managerial system by lessening the demands in the instructional system. Students in physical education have learned that sometimes the management system defines the tasks of the class, as opposed to instruction (Hook & Tannehill, 1995; Lund, 1992; O'Sullivan & Dyson, 1994).

Rules have been shown to support safety, participation, appropriate equipment use, proper dress, and teachers' ability to gain students' attention (Fink & Siedentop, 1989). These aspects provide an atmosphere where more learning can be achieved (Dyson, 1995). Cothran et al. (2003) suggested that teachers must invest in the time to develop and maintain order by establishing rules at the beginning of the school year, conveying them well, and consistently enforcing them.

Routines also have been noted to aid in the flow of classroom happenings (Fink & Siedentop, 1989), allowing for smooth transitions within class and assisting students in understanding appropriate behavior during particular events. Routines may include how to enter and exit the gymnasium, methods for equipment dispersal, and ways of starting and stopping an activity. Routines are constant process orientations in the classroom that students can attend to without maximum teacher attention. These constants aid in minimizing behavioral issues (Fink & Siedentop, 1989).

Teacher expectations have been shown to be more about the behavior process than learning outcomes (Fink & Siedentop, 1989). Expectations also have been more implied than directly communicated. Process-oriented expectations that teachers possess for students include tasks such as cooperation with other students, putting forth paramount effort, and playing fairly. Students have reported that the most valuable teachers have provided specific expectations early on and consistently emphasized those expectations (Cothran et al., 2003; Kulinna, Cothran, & Regualos, 2006; Tousignant & Siedentop, 1983).

Accountability in physical education has traditionally occurred through monitoring (Siedentop, et al., 1994). Active monitoring, rather than passive observation,

has contributed to higher levels of student participation (van der Mars, 1989). Feedback from the teacher facilitates students' learning more so than initial instruction (Hastie & Siedentop, 1999).

Consequences for nonconformity to the management system have been deemed crucial to student involvement in physical education (Cothran et al., 2003; Dyson, 1995; Stinson, 1993). Unfortunately, consequences have been noted as a major form of accountability in physical education and management tasks have defined what students do in physical education (Hook & Tannehill, 1995; Lund, 1992; O'Sullivan & Dyson, 1994). Teachers tend to hold students accountable for their behavior, while at the same time reducing demands in the instructional task system (Lund, 1992).

Garrahy, Cothran, and Hodges-Kulinna (2005) found that student involvement in developing appropriate behavior empowers students to take responsibility for how they behave. Consistency in acting to respond to undesired behaviors is more productive than using threats (Cothran et al., 2003). Using physical activity as punishment is counterproductive to the posited benefits of physical activity. More appropriate consequences have been reported, such as sitting a student out or discussing and reflecting on the behavior (Ennis, 1995).

Ennis (1995), however, reported that taking away a student's activity time is problematic in that it interferes with learning. Kounin (1970) suggested that rather than dealing with individual behavior through consequences, that developing and maintaining a positive, on-task climate is a pro-active approach for behavioral problem prevention, as opposed to behavioral problem management. Developing and practicing self-sufficient rules, routines, and learning expectations gives the teacher freedom to focus on

instruction as opposed to management (Kounin, 1970; Fink & Siedentop, 1989; O'Sullivan & Dyson, 1994; Siedentop & Tannehill, 2000).

Jones (1992) reported in one study that elementary students were on task in the management system, but were not as successful in the instructional activity. Additionally, time spent in management-related instruction reduces time students spend in an activity (Jones, 1992). Though the opposite can be stated, poor performance can be associated with off-task behaviors related to poor management (Jones, 1992). In examining the sport setting, students were noted to have complied to management with little or no misbehaviors, and engagement in the instructional tasks were hearty (Griffin et al., 1998; Hastie, 1993; Hastie & Saunders, 1992)

Surface level assessment is a frequent occurrence in physical education and is generally associated with participation, attendance, and dress. With these objectives, little learning occurs because students only do what is required to pass (Hastie & Siedentop, 1999; Tousignant & Siedentop, 1983). Tousignant and Siedentop (1983) suggested that to influence student effort, participation and performance, assessments should consist of a combination of performance and effort.

### **Student Social System in Physical Education**

Students' goals and behaviors have been identified as the student social system. Two main goals of the student social system were described by Allen (1986): peer socializing and passing the course (Allen, 1986). Six strategies that students use to achieve these goals were noted (Allen, 1986): figure out the teacher, give the teacher what they want, have fun, minimize work, reduce boredom, and stay out of trouble. These strategies are used in a complexity of ways to respond to teacher vectors in the

instructional and managerial task systems. When the instructional and managerial task systems make room for student socialization and include clear, straightforward instructions, students perform to meet expectations. If the student social system is stamped out with demanding instruction or management, students use strategies to lessen the work, have fun, and socialize (Allen, 1986; Carlson & Hastie, 1997; Hastie, 1997; Hastie & Siedentop, 1999; 2006). For students, socialization is placed above any learning goals (Emmers, 1981). In one reported study, when learning goals coincided with student socialization, students were engaged in the instructional task (Carlson & Hastie, 1997).

In summary, classroom ecology research has provided a useful frame for understanding how teachers can create a positive learning environment for mastery learning as well as other types of instructional approaches. From the physical education research in this area, several broad conclusions can be drawn. The poor developmental sequencing that occurs in many programs is associated with a lack of accountability for student learning, and is directly related to high risk activity, ambiguity, and irrelevant pacing. When game stages or task progressions are left out, there is little connection from skill drill to game for students, which makes playing the game very risky for many students in physical education classes. No real progressions or modifications to particular tasks are made when stages or task progressions are left out; thus pacing for learning is not considered, either. When lessons contain developmentally inappropriate tasks and the goals of the lesson are ambiguous, students struggle to find meaning in participation and many are often marginalized or simply opt out.

## **Concluding Thoughts: Mastery Learning and Associated Research**

Though the previous research provides great insight into teaching, researchers have focused too much on what the teacher does and have not thought enough about the student. McCaughtry et al.'s (2008) proposition to rethink and extend the conceptualization of gymnasium ecology makes sense as a way of turning attention towards students' experiences within the mastery learning paradigm. Research in this paradigm also needs to expand in the same manner. McCaughtry et al. (2008) suggested that we draw from physical education research on student perspectives, sociological aspects of content, and student voices.

Drawing from the research on student perspectives and sociological aspects of content, it is clear that much of the content taught is boring for students (Carlson, 1995; Olafson, 2002; Stinson, 1993). Moreover, the deep seated endeavor of sport-related games teaching has fallen short of students' learning the game (Rink, 2002). Games as taught in physical education have been recognized by many students as activities that do not provide meaning, interest or equal opportunity to a variety of groups, ability levels, or sexes (Swanson & Spears, 1995). McCaughtry et al. (2008, p. 275) echoed this critical view, recognizing that more consideration of ecology is paramount:

...many children in K-12 physical education view traditional activities as gendered, racialized, homophobic, heterosexist, taught repeatedly, year after year, during the same seasons, covering the same skills, and having little connection to their lives outside school (Azzarito & Solmon, 2005; Azzarito, Solmon, & Harrison, 2006; Carlson & Hastie, 1997; Ennis, 1995; 2000; McCaughtry, 2004a; 2006; Tinning & Fitzclarence, 1992).

Research on student voices suggests that providing real choices and opportunities for students to control and take ownership for their learning is a means for creating culturally relevant curriculum (Azzarito et al., 2006; Carlson, 1995; Condon & Collier, 2002; Dyson, 1995; Drummond, 2003; McCaughtry, 2006). Student-centered learning may be more successful than teacher-centered curriculum. Disengagement and feelings of alienation and boredom were linked to few choices and lack of ownership and control (Drummond, 2003). Azzarito et al. (2006) reported that students want real choices and they recognize the difference between important decision-making involvement and insignificant decision-making involvement.

McCaughtry et al. (2008) suggested that what we teach must change. Several researchers suggest that “we must teach content that children find ‘cool!’” (Chen, 1996, Hastie, 1997; McCaughtry et al., 2008). This is an extremely valid consideration for meaningful and inclusive student engagement. In contrast, I believe that physical education students might find games to be “cool” *if we change the way that we teach games*. Tapping into students’ inherent desire to play can instigate learning (Bunker & Thorpe, 1982; Siedentop, 1972). Other researchers have argued that the issues and challenges of games in the curriculum have little to do with the content, but rather the methods used to engage students in games (Bunker & Thorpe, 1982; Maulden & Redfern, 1969; Metzler, 2000, Mitchell, Oslin & Griffin, 2006; Oberteuffer & Ulrich, 1962; Rink, 2002; Siedentop, 1972, 1994). Light (2004, p. 129) explained that the nature of teaching games “...is a form of multivariate and dynamic human interaction that cannot be reduced to mere transmission of knowledge”. Games are complex and require a balance of skill learning and game understanding.

Poor instruction and instructional methods, lack of programmatic curriculum, limited student accountability, and minimal student input and consideration in the way mastery learning models in sport-related games have been taught, fail to help students play the game well. Additionally, the research suggests that teacher-centered instruction that is highly related to skill, does not truly develop students who are capable of successfully negotiating the fluid nature of game play. A balance of skill and understanding of tactics, encompassing a simultaneous development of physical, cognitive, social, and emotional capacities, more vividly explains the complexity of learning games. Teaching within the complexity of games requires the teacher to have significant content knowledge about games -an understanding not only of skill development, but an understanding of tactics (Romar, 1995; Rovegno, 1994; 1995; 1998).

Two other sport-related instructional models, Sport Education and Teaching Games for Understanding, have been developed that provide different core learning objectives than mastery learning approaches. Additionally, these two models are student-centered approaches that provide the learner more control and choice in learning games.

### **The Sport Education Model (SEM)**

Siedentop (1994) theorized that sport is a fundamental social endeavor and sport provides a form of play to those who participate. He contended that the traditions and formalized conceptions of sports need to be preserved and passed along, and the responsibility of conserving formal and traditional aspects of sport should be embraced by society. He noted that the social and historical importance of sport, the formality and integrity of sport, as well as tactics and skill of sport can be promoted in physical

education. Siedentop (1994, p. 4) proposed the notion of helping students to be players in the fullest sense and guiding students to develop as competent, literate, and enthusiastic sports people. These goals form the basis for Siedentop's (1994) Sport Education (SE) an alternative pedagogical model to mastery learning.

Sport Education is a curriculum model structured to meet the above stated goals by including all students in an authentic sports season. Students play in the "fullest sense" by participating in play that mirrors a sport season in natural context. Students have the opportunity to experience sport from multiple perspectives and gain an understanding of sport in a variety of venues, aside from being a player. The model is unique because it organizes and keeps the positive features of sport in order to influence learning, combat marginalization, and enhance the enjoyment of participation of games learning in physical education (Siedentop, 1994). The features of SE include:

- Season-long events (typically 20 lessons or more)
- Affiliation with a single team throughout the season-long event
- Intermittently planned practices and formal competition bouts with small sided teams
- A culminating event to highlight the ending of a season
- Detailed record keeping
- Traditional festivity and rituals embraced in the assembly of competition
- Participation in roles and tasks of the entire sporting environment (e.g., referee, record keeper, clock/score keeper, sport reporter, coach, etc.)

Sport Education is grounded in the idea that sport has a large function in American culture. The sporting event environment generates social celebrations and

customs that people embrace (Hastie, 2000). Sport has also been considered a vessel for the development of important life skills such as teamwork, communication, decision-making, character development, and appreciation for health, exercise, and fitness (Hastie, 2003).

Though sport has positive features that instill important life skills, it is important to note that sport can also contribute to violence, hostility, and marginalization of students. When a win-at-all-cost approach to sport is taken, in physical education or other environments, the game sinks to a negative level where players, fans, and other participants can become abusive. Because of these negative consequences of competing in sport, many individuals insist that physical education is not the place for competition. The term competition has been tainted with win-at-all-cost attitudes and ramifications. Siedentop (1994) argued that teaching of sport must be intentional, developmentally appropriate, meaningful, and must highlight the positive features of sport. When sport is taught apart from its natural context, its traditions, its use of developmentally appropriate skill combined with game tactics and strategy, and team affiliation, sport is virtually meaningless and the culture of sport is not appreciated. Without an appreciation of sport and sport culture, the negative features of sport can easily emerge during participation (Siedentop, 1994). Siedentop (1994) suggested that physical education programs that are partial to sport seek to develop literate, enthusiastic, competent sportspeople to promote the positive features of sport through developmentally appropriate SE.

Competent, literate and enthusiastic sportspersons have all the skills to play in games and events adequately. They understand game complexities, can make appropriate decisions within diverse tactical problems, and have ample game conceptions (Siedentop,

1994). Players also have an understanding of the rules, appreciate the integrity of the game, and can recognize appropriate and inappropriate involvement. Comprehending and abiding by the rules and traditions at all game levels is sacred to the literate sport fan, participant, or player (Siedentop, 1994). Players, participants, and fans behave in ways that bolster and sustain positive sport culture at all levels. They transfer their sport literacy into practice to conserve the game. Positive participation might include giving exceptional effort, playing fairly, honoring opponents, and accepting the final outcomes of a game. Additionally, whether a player/team wins or loses, the tactical competence level and skill allows for worthwhile participation by all (Siedentop, 1994).

Siedentop (1994, p. 4-5) outlined student objectives in the SE model as

- “Develop skill and fitness specific to particular sports”
- “Appreciate and be able to execute strategic plays in sport”
- “Participate at a level appropriate to student’s development”
- “Share in the planning and administration of sport experiences”
- “Provide responsible leadership”
- “Work effectively within a group toward common goals”
- “Appreciate the rituals and conventions that give particular sports their unique meanings”
- “Develop the capacity to make reasoned decisions about sport issues”
- “Develop and apply knowledge about umpiring, refereeing and training”
- “Decide to voluntarily become involved in after-school sport”

These objectives represent the complexity of learning in authentic, game-like situations, where cognitive, affective and psychomotor domains interact to engage the student in a

holistic learning experience. These objectives and the complexity of learning within this model require the teacher to impose several important instructional features.

### **SE Instructional Features**

Several important instructional features of SE include: (a) lengthy, in-depth coverage of content, (b) small, heterogeneous learning teams, (c) student-centered and situated learning, and (d) competitive, fair play (Siedentop, Hastie & van der Mars, 2004).

The lengthy season, typically longer than 20 lessons, provides sufficient time for students to develop an understanding of tactics and skills, and be involved in and understand multiple sport roles. Additionally an extended experience provides an opportunity to establish a sense of community within small teams and gain a sense of the sport culture within the situated environment to develop an appreciation and understanding of rituals, conventions and appropriate sport practice (Siedentop, Hastie & van der Mars, 2004).

Small teams, usually made up of 6 to 10 students, are comprised of a diverse mixture in ability and gender. The small teams allow for all students to participate extensively as players and to fulfill other duty roles. Small teams infer small sided game play, where students must rely on other team members no matter what the skill level or gender. High skilled students must engage with low skilled individuals and boys and girls in co-educational classes must cooperate with each other to achieve a common goal. This type of setting requires full participation from all students. Cohen (1994) asserted that in such settings time on task is high, and peer support and pressure serve as a function of accountability. Students with a tendency to remove themselves from participation are

responsible to a group. They are less likely to shy away from participation because they must fulfill individual roles and positions where it is necessary to be involved.

Additionally, students learn to provide and receive help from each other. All students play a part and no student entirely governs the experience (Cohen, 1994).

The learning in this model is student-centered and situated (Alexander, Taggart & Luckman, 1998; Kirk & Macdonald, 1998; Kirk & Kinchin, 2003). SE places students at the center of the learning, where they take on the majority of the responsibility for the learning process. Students use their own experiences to collaborate and assist each other to learn about multiple aspects of sport. The teacher is merely a facilitator and does not direct all of the instruction. The teacher provides specific goals and objectives, guides students toward those goals and objectives, helps in fine tuning and developing student ideas, answers and asks questions, and provides direct instruction for duty roles when needed. Students may decide what sport they wish to play during their SE season.

Additionally, they decide team names, make decisions about their own team's organization and strategy, keep their own records, organize their own brackets, and ultimately coordinate their entire season (i.e., practices, game schedule, game rules, festivity and awards banquet). Students are empowered to take ownership of the class happenings.

Competition is essential to the success of the model (Siedentop, Hastie & van der Mars, 2004). Teams work together to learn and practice skills, tactics and strategies for competition. They also practice specific duty roles that will be tried during a competition. Competition allows teams to test out and demonstrate what they have been learning in their team practices and in their duty role responsibilities. The competition provides the

impetus for learning skills, team strategies and sporting role responsibilities. Fulfilling multiple roles, taking on the responsibilities of organizing a season, and developing a community of players and learners also suggests that there is more to sport than just the outcome of a game. With all of the hard work that goes into participating in a SE season there comes a pressure from peers and even a desire among individuals to compete fairly, play hard, and enjoy and honor what they have worked so hard to accomplish (Siedentop, Hastie & van der Mars, 2004).

### **Research on SE**

The research on SE is extensive. Much of the research is case study designed, using mostly qualitative measures about a broad range of activities. Research has been conducted at the elementary, middle, and high school levels. Researchers also have examined the model's influence with "at risk" students, students in college basic instruction classes, and with students in teacher education programs. Much of the research has examined co-educational contexts; a few studies have examined all-boys programs (e.g. Kinchin et al., 2004). A broad range of inquiry has resulted in information regarding (a) the impact of the model on curricular design, (b) how SE features influence student outcomes such as enjoyment, participation, social interaction, competence/learning, and equity in participation, (c) the implementation of SE with elementary school students, (d) teachers' perceptions of SE, (e) how pre-service and in-service teachers experience learning to teach SE, and (f) variations in SE that have emerged.

## **Impact on Curricular Design**

Alexander, Taggart, and Thorpe (1996) suggested that SE does not negatively influence curricular flow. The long units are seen to provide more opportunities for students to practice, develop a continuity in learning, and provide students with a long standing ability to recall what they have learned (Qualifications & Curricular Authority, 2002). Shorter units have also been created by those on strict unit time requirements (Wardle & Kinchin, 2004). Regarding activities selected for SE implementation, there has been a broad range that extends from popular competitive sports (e.g., Ultimate [Hastie, 1998a]; softball [Bennett & Hastie, 1997]; basketball [Ormond, DeMarco, Smith, & Fischer, 1995]; volleyball [Kinchin, 2001a]) to dance (Graves & Townsend, 2000), swimming (Sciverner & Penney, 2005), outdoor and adventure activities (Penney & Wilkie, 2005), and bicycle safety (Sinelnikov, Hastie, Chance, Schneulle, 2005). Although, Siedentop (1994b) suggested that when planning a SE season, the teacher should select an activity he/she has the most content knowledge in, the studies reported did not reference the reasoning for particular activity selection.

## **Student Outcomes**

The features of sport education, such as team affiliation, longer units, roles, and peer instruction, have yielded relatively positive student outcomes. Students have been shown to view SE more positively than previous experiences in physical education (Alexander, Taggart, & Medland, 1993; Brunton, 2003; Carlson & Hastie, 1997; Grant, 1992; Hastie, 1998b). Students have reported having liked playing on the same team with the extended units because of the camaraderie with friends and the opportunity to get to know others (Hastie, 1998a; Hastie, 1996; Kinchin, 2001a; MacPhail, Kirk, & Kinchin,

2004). Students also described SE as providing more time to play, more time to learn an activity, and more time to interact socially with teammates (Alexander et al., 1996; Brunton, 2003; Carlson & Hastie, 1997; Kinchin & O'Sullivan, 2003; Kinchin, Wardle, Roderick, & Sprosen, 2004). Researchers have also reported that students developed a loyalty to their teams (Clarke & Quill, 2003), and students realized that working through differences was preferred to arguing (MacPhail et al., 2004).

Hastie (1998c) reported that the small teams helped to support the learning and involvement of lower-skilled students. Some students of lower skill valued the assistance and encouragement from their higher-skilled teammates (Kinchin, 1997). Another study reported that the help of teammates was a key to skill and tactical improvement (Hastie, 1998a). Participants in SE were more willing to attempt tasks and were less worried about their peers' reactions to an unsuccessful trial (Alexander et al., 1998; Hastie, 1998a, 1998c; Kinchin, 1997). Others have reported students' and teachers' perception of skill and tactical improvement (Grant, 1992; Carlson & Hastie, 1992; Kinchin, 2001a). A study by Hastie (1998a) provided evidence of improved competence of students in a SE unit of Ultimate. Two high-skilled students significantly improved in skill, while low-skilled students received more throws toward the end of the unit than they did during the beginning. Ormond et al. (1995) compared SE to a traditional approach to teaching basketball. They concluded that appropriate defense and offense, as well as students' abilities to share possession with teammates was an attribute of the SE group and that there were more opportunities for lower-skilled students in the SE group.

Diverse roles empowered students to take ownership for their learning and students liked the opportunity to make decisions regarding their learning (Kinchin et al.,

2004). Students engaged well with their responsibilities (Hastie, 1996). High skilled students reported that peer teaching enhanced their understanding of the game and of their duty roles (Kinchin et al., 2002a). Students have also noted that they preferred to learn from their peers as opposed to the teacher (Hastie, 1996). Wilson and Kinchin (2000) found that students had role preferences (e.g., boys tend to want to be captain or vice-captain if provided a choice; Kinchin et al., 2004).

Teachers reported that students participated more extensively (i.e. dressing out, attendance, less non-participation issues; Alexander et al., 1996; Kinchin, 2003), and both girls and boys were more enthusiastic and worked more than they did in previous units (Carlson & Hastie, 1997; Grant, 1992; Hastie, 1998a; Kinchin, Penney, & Clarke, 2002a). Girls were reported to have gained confidence and willingness to participate (Carlson, 1995b).

Though there have been reports of cooperation, enjoyment of teams, females feeling valued by males (O'Donovan, 2003), and inclusiveness about SE (Clarke & Quill, 2003), some studies have found the opposite. Hastie (1998b) concluded that the opportunities for students to participate in specific positions may in some instances result in lack of involvement by some students and very high involvement by others. In a study of an all boys SE unit, some boys reported feeling excluded (Kinchin et al., 2004). A study by Alexander et al. (1996) also reported that some boys were very dominant in participation. Other studies have reported that girls were ridiculed for their participation by boys in power roles (Curnow & Macdonald, 1995), and isolation and exclusion during competition have been observed (Hastie, 1998a).

## **Elementary SE**

SE at the elementary school level has been positive. SE has been implemented by specialists (Bell, 1998; Darnell, 1994) and non-specialists, and full versions have been implemented at 5<sup>th</sup> grade levels (McPhail & Kinchin, 2004; McPhail et al., 2003). Lewis (2001) reported that children, grades 5 and 6, were able to recognize the difference between a team that worked well together and a team that did not work well together. Children talked affirmatively about their roles and were able to execute straightforward duty roles. Positive associations with teams were carried beyond physical education. Experts have theorized that the features of SE (even in modified version) are suitable for the elementary learner in building a foundation for developmental skills such as cooperation, maintaining focus, and communication skills (i.e., physical, intellectual, social, and emotional skills; DfES/QCA; 2000; Kinchin & Kinchin, 2005; Metzler, 2000).

## **SE in Higher Education**

SE has been used in teacher preparation for practical work, teacher observation in schools and student teaching in numerous programs (Collier, 1998; Kinchin, 2003). Additionally, few studies have reported using SE in college physical education courses (Bennett & Hastie, 1997; Bennett, 2000). Regarding teacher preparation, student teachers were skeptical after lectures on SE. Skepticism was only reduced after students had the opportunity to watch a teacher in action and after student teachers were able to attempt the model with a classroom of students (Kinchin, 2003). Kinchin (2003) described how student teachers saw the positive outcomes in their own teaching and began to bridge the theory-to-practice gap. As more student teachers began to use the model in their

experiences, there has become a need and desire for in-service teacher development. Kinchin et al. (2005) reported a shared endeavor between two universities' student teachers and their cooperating teachers to develop their understanding and skills for teaching SE.

### **Teachers' Experience Learning SE**

The use of SE in higher education for pre-service experiences as well as in in-service teacher development has provided some insight into how teachers learn SE and how they perceive SE. Pope & O'Sullivan (1998) realized, in a study of one urban high school teacher, that learning SE and learning to teach SE takes significant time. Time is needed to connect ways of thinking about teaching and learning, especially since the model is quite different from traditional mastery learning approaches to games teaching. Concerns pinpointed by McCaughtry et al. (2004) from their investigation using SE with undergraduate pre-service teachers included the difficulty of tactical instruction and the idea that some duty roles are seen as frivolous and not worth using (e.g., record keeping). Teachers who lacked tactical knowledge and the ability to teach strategically did struggle and reverted back to mastery learning approaches.

Teachers' perceptions have also been reported. Those pre-service teachers who did not predict using SE after graduating claimed that SE was more work than their mastery learning approach and students' acquisition of skill suffered (McCaughtry et al., 2004). However, the majority of studies including teacher perceptions have reported approval of SE; many teachers have included SE in some aspect of their curriculum (Alexander et al., 1996; Alexander & Luckman, 2001; Grant, 1992; Hastie, 2003; Kinchin et al., 2001; Siedentop, 1995). Collectively from these studies, teachers believed

that SE increased student interest, freed them from directing to more of a facilitation role where they can provide support to more students, gave them more of an opportunity to make evaluations and assessments of students, and provides a frame for emphasize aspects such as supporting classmates and engaging in fair play.

### **Variations in SE**

Several variations have developed in relationship to SE to highlight specific student outcomes, to assess student learning, and to collect data for research. Several hybrid variations of SE focus on particular student outcomes. *Empowering Sport* (Hastie & Buchanan, 2000) attempts to promote responsible role positions and the development of leadership, fair play, and common concern for playing competence related to skill and social responsibility (hybrid of Teaching Personal and Social Responsibility by Hellison [1995] and SE). *Cultural Studies* (Kinchin, 1997; Kinchin & O'Sullivan, 1999; 2003; O'Sullivan & Kinchin, 2005; O'Sullivan et al., 1996) attempts to develop students that ask hard questions of themselves and others in relationship to social justice issues. *Sport for Peace* (Ennis et al., 1999) has been used in urban schools to promote conflict resolution by engaging students in care and concern for the self, others, and social responsibility, especially for disengaged females in PE. *Situated Learning* (Kirk & Almond, 1999; Kirk & Kinchin, 2003; Kirk & Macdonald, 1998) proposes the notion that physical education is a place where what is learned can be duplicated outside of class or school (e.g., season yields community based sport settings; roles that are useful to people and can lead to contribution in a society; and even the negative aspects and the most positive aspects of sport can transfer to societies' sport culture; Lister, 2001; Penney et al., 2002; Penney, 2003; Oslin, 2002).

Various methods for assessing student learning in SE have been proposed (i.e., checklists, quizzes/tests, journaling, portfolios, game performance summaries and statistics, and rubrics; Siedentop & Tannehill, 2000; Metzler, 2000). Few studies have reported the use of these diverse assessments. Kinchin (2001b) reported the use of portfolios as successful when teams were provided a role of portfolio manager. Journals provided significant information regarding students' perspectives on SE (Kinchin, 1997), and behavior profiling was used to account for student teamwork and responsibility (O'Sullivan & Henninger, 1997).

Variations in research design have also been used to better understand SE teaching and learning. Expanding research designs have included motivational responses to support SE (i.e., comparing approaches to attain enjoyment level and perceived competence differences of two groups; Wallhead & Ntoumainis, 2004) and the use of drawings in elementary school, which supplemented other data on student experiences and perceptions of SE (MacPhail & Kinchin, 2004).

### **Concluding Thoughts: SE**

Overall, SE has had a positive impact on students and teachers. More research is needed to determine development of player competence, learning, and cognition related to game play and/or decisions about responsibility roles. It also would be interesting to learn how several seasons, over time, influence students and teachers. Because equity outcomes in SE are somewhat contradictory, more research should be conducted regarding different roles and how the implementation of hybrid variations influences equity. Moreover, examining different ways to assess students, as well as using technology for assessment and for organizing the season's events might be helpful to

support learning and instruction. There are definite issues to explore related to teacher training and in-service. What support do teachers need in relating positively to SE and in implementing SE successfully? Lastly, studies concerning the transference of sport to places outside of physical education (i.e., other sporting community and cultural environments, and even other content areas within the school) would give further insight to SE instruction and student learning within this instructional model.

### **The Tactical Games Model (TGM)**

Understanding games requires participants to actively think, interpret game conditions, process what to do in particular game conditions, make decisions about appropriate responses, and select appropriate execution responses. “Knowledge, in the form of ‘principles of play’, is a necessary ingredient of ‘understanding’” (Kirk, 1983, p.45). Though game understanding is often assessed according to performance, Kirk suggested that assessment of cognitive action is a more appropriate measure of understanding. Kirk (1983) rationalized that someone may perform competently, but may not perform intelligently:

...an individual’s behavior provides us with evidence as to the level or degree of his understanding. However, just *any* behavior would not count as evidence of understanding. The individual’s performance must be appropriate in terms of the game itself... (p. 44).

Because games require cognitive processing, Bunker and Thorpe (1982) sought to conceptualize games teaching and learning through a problem-based approach. They recognized children’s inherent motivation to play games (Huizinga, 1950) and followed the lead of Wade (1967) and Mauldon and Redfern (1969) as these authors stated that

games could be created in a developmentally appropriate fashion and could be conditioned to emphasize specific tactical circumstances. Moreover each proclaimed that games should be the center of a lesson (as opposed to skill mastery learning) because developmentally appropriate games themselves provide an experience to learn skill.

Teaching Games for Understanding (TGfU) was developed with the intent to make games and children at the very center of learning, moving away from teacher-centeredness. Bunker and Thorpe (1982; 1986) proposed that *all* children be involved in decision-making through tactical awareness so they will gain understanding and meaning, leading to attraction to and contribution in the game. Proponents of the model seek to develop players that are skillful within the game and who have an understanding of tactical decisions to be made in games (Griffin & Patton, 2005). This constructivist model for teaching sport-related games also came to be known as the Tactical Games Model (TGM; Mitchell, Oslin & Griffin, 2006), Games Sense (Bunker & Thorpe, 1982), and Play Practice (Lauder, 2001). For this critical review, the model will be referred to as TGM.

Important aspect in the model are conditioning and modifying games to manipulate students' play. Assumptions of the model provide that conditioning the game with different boundaries and ways to score and initiating small-sided game play, while maintaining the same tactical structure of the advanced form, places students in situations to better understand game play options, use play space, and appreciate the skill needed for particular tactics. The game, which is conditioned, frames the tactical problems to be solved. Thorpe, Bunker, and Almond (1984) believe that breaking a game down into its

simplest concepts, in game form, reduces the technical demands of the game, enabling students to focus on tactics and decision-making.

### **TGM Sequence**

In a TGM lesson, the sequence is as follows: (a) game one, (b) situated practice, and (c) Game Two. The lesson is initiated with a game that is modified to represent the advanced form. The modified game is also exaggerated to present students with a tactical problem (Mitchell, Oslin, & Griffin, 2006; Thorpe, Bunker, & Almond, 1984). Starting off with a game entices students' natural motivation to play and also serves as a mechanism to foster desire to learn and appreciate skill. Students then engage in a situated, authentic practice of skill which is also needed for solving the tactical problem in the lesson.

Intermittent question and answer segments are dispersed throughout the unit. The intermittent question and answer segments are important to the model because this is how the teacher facilitates student learning and links the tactical problems to the situations of each modified game and practice. The teacher asks students questions, making connections to the tactical problem of the lesson. Students then reflect on their prior experiences, and/or tactical and skill execution experiences from each game and practice segment. Next, students play a second game, similar or more complex than the first game. The concept of playing the game again helps students to make associations from knowledge constructed in Game One, question and answer segments, and the situated practice to the final game.

## **Game Classifications**

Ellis (1983) designed the *games classification system* to situate games into like categories according to use of tactics. Using the classification system, students gain opportunities to discover variances and parallels among games. This type of understanding can be transferred across games (Thorpe & Bunker, 1989). The *games classification system* is made up of invasion games, field/run/scoring games, net/wall games, and target games. Games situated in each category share offensive and defensive ways of thinking.

The way games are classified is centered on the concept that general tactics are shared by each member of the group. For instance, in games such as team handball, basketball, football, or ultimate, players accumulate points by moving the object (or ball) by invading another team's territory and moving the object across a goal line or shooting on a fixed goal (Mitchell, Oslin, & Griffin, 2006). When a team is trying to stop the other from scoring, they must try to keep the other team out of their territory. Although skills may be different in these games, solving the tactical problems nested within them are very similar. Likewise, it is reasonable assume that affirmative transfer of tactical knowledge occurs from one game to another in like game categories (Mitchell, Oslin, & Griffin, 2006).

Though limited research exists regarding transfer in TGM (Contreras Jordan et al., 2003; Jones & Farrow, 1999; Mitchell & Oslin, 1998), researchers suggest that the potential exists for transfer of tactics among like-games (i.e., games in the same Game Category). Studies regarding transfer from generic invasion games to hockey (Contreras Jordan et al., 2003), volleyball to badminton (Jones & Farrow, 1999), and badminton to

pickleball (Mitchell & Oslin, 1999) have offered support for the use of Games Classification system within TGM to elicit transfer. Mitchell and Oslin (1999) provided that knowledge gained from these studies can aid in how we order games in the curriculum to set-up tactical transfer. Understanding specific tactical concepts that transfer among novices, as well as examining progression of overall game play, may give further insight into novices learning of tactics and provide further support for TGM.

### **TGM Framework**

The framework for breaking down and modifying games to teach the understanding of tactical problems within a particular sport or across a classification was provided in a developmental fashion by Griffin, Mitchell, and Oslin (1997) to assist teachers in using the model. Using the original model, teachers experienced considerable constraints because of the in-depth knowledge base and tactical understanding needed (Griffin, Mitchell & Oslin, 1997). The constraints (e.g., equipment, space etc.) common placed on teachers in the public school setting also prevented teachers from using the model (Oslin, 1996). The framework pinpoints conventional tactical problems for particular games and game categories as well as their solutions. The framework provides (a) *tactical problems* for scoring, preventing scoring, and restarting play, (b) *off-the-ball movements* for scoring, and preventing scoring, and (c) *on-the-ball skills* for scoring, preventing scoring, and restarting play.

Thorpe and Bunker (1989) assert the game must be matched to the developmental level of the learner. Different levels of tactical complexity leveling are implemented so that the game problems and solutions are developmentally appropriate for students. In

TGM, games progress through developmental tactics in games and skill-based practices (Griffin, Mitchell & Oslin, 1997; Mitchell, Oslin & Griffin, 2006).

### **Concepts and Theory Underlying TGM**

Proponents of TGM suggest that teaching “what to do” before teaching “how to do it” is more relevant than vice versa. Simplifying skills so attention can be given to playing and understanding the game and its tactical challenges rather than considering only skill, capitalizes on most students’ inherent motivation for playing games (Thorpe & Bunker, 1989). Based on the candid observations of students and practicing teachers implementing games lesson from a skill mastery approach, the designers of TGfU “...realized that the intrinsic motivation of the children to play the game was subjugated to the teacher’s desire to give them better techniques” (Thorpe, 1990, p. 209). What was never tapped into was the children’s desire to learn technique. Moreover, instead of playing games for the sake of having game action, possibilities exist for developing tactical knowledge and transfer among games that are mostly seen as very dissimilar (Bunker & Thorpe, 1982; Thorpe, Bunker, & Almond, 1984).

These distinctive features of TGM provide a different quality of student engagement from a skill mastery approach to teaching sport-related games. Specifically outlined, the notions behind TGM are (a) people’s inherent motivation to play games, (b) the possibility of decision-making skills to transfer across like games, and (c) games encourage decision-making and help to develop decision-makers. These particular theoretical concepts, motivation, transfer, and decision-making will be explained next, as they pertain to TGM.

## **Motivation**

In their review of games-centered approaches, Mitchell and Oslin (2006) inform readers that one of the concepts that drives TGM is young people's desire to play the game. TGM was developed around students' motivation to play (Bunker & Thorpe, 1982). Huizinga (1950) described the nature of play as a cultural experience, although play might even be considered genetic, as neither humans nor animals have to be taught how to play. Play is more than phenomena of physiology or instinct. "If we call [it] 'instinct', we explain nothing; if we call it 'mind' or 'will' we say too much" (Huizinga, 1950, p. 1). Play seems to function as an immediate need in life, thus fulfilling some meaning that is of deep quality. Though it may fulfill deep qualities, play does in fact have well-defined actions or structures. These structures separate play from ordinary life, impose limits to the time and place of occurrence, as well as give order to establish the character of play and its worth (Huizinga, 1950, p. 1-10).

Kretchmar (2005) explained play and its relationship to problem-solving by speculating about Neanderthal humans. He stated that as people we are not exclusively socialized to love games. Naturally, humans pursue games or challenge themselves. He claims as Neanderthals became smarter and had more time on their hands, Neanderthals began to simulate natural problems to solve in order to deduced boredom and enhance survival. Neanderthal's play had cognitive thought and provided a crucial means for evolution and growth. Huizinga (1950) and Kretchmar (2005) provided concepts for human motives to play that align with the central concept of playing the game first (Bunker & Thorpe, 1982).

In their review, Mitchell and Oslin (2006) provide readers with only limited information about the concept of human motivation to play. The review referenced game centered approach authors assumptions about “incentives that could potentially motivate children to play games” [i.e. Almond & Thorpe, 1988; Bunker & Thorpe, 1982; Thorpe, 1992] (Mitchell & Oslin, 2006, p. 630). Decisively so, there is much to consider about motivation and the student, opening up a line of research and a wealth of information that is beyond extensive. Pensively enough, Thorpe (1990) evaluated the approach against a psychological framework and posited that the intrinsic desire to play games can be tapped through stress or sensation, social facilitation, self direction, affiliation, achievement, and perceptual motor skills.

### **Sensation/Stress and Social Facilitation**

In *Asking teachers to research* (Almond & Thorpe, 1988), teachers provided that children desired to play games, especially when the games were not emotionally or physically threatening. Based on observations, most young children had not developed game skills, but still wished to engage in playing the game. Additionally, those who were skilled seemed to enjoy playing games (Thorpe, 1990).

Young people love to play games regardless of skill level. Children typically perceive themselves as more competent than they actually are, thus participate for the fun and exuberance of movement to engage, explore, and problem-solve in their environment (Harter, 1978; Jones & Gerard, 1967). Adults acknowledge their own lack of competence and will desire to practice skills to improve game play. As children get older they tend to become more in tune to their abilities and seek out information from social and nonsocial sources. They begin compare themselves with others, and thus recognize the need for

more skill to become more involved in the game (Cook & Stingle, 1994). This factor can be a limiting factor for future participation if the recognition is not “appreciated” as a need to practice skill and the activity is not actualized as a possibility. A young person’s perception of his/her physical competence is related to positive self-esteem (Ebbeck & Stuart, 1993), enjoyment of sport (Scanlan & Simons, 1992), motivation (Brustad, 1993; Weiss & Chaumeton, 1993), and peer relationships (Brustad, 1993; Evans & Roberts, 1987).

Much like comparative appraisal, young people also compare themselves to other’s direct behavior toward them. Whereas comparative appraisal is evaluation through social standards, this reflected appraisal involves either social or objective standards. Young people can ascertain many intentional and unintentional cues from teachers, teammates, opponents, and parents, and assign particular meaning of these cues. Students might also directly receive information because they have asked for consultation from a teacher or parent or that significant person may directly give some appraisal without being asked. Collectively, these cues of inferred evaluation and direct evaluation are potent and highly important to young people and help to weave the fabric for motivation to participate in competitive situations or not. However, the social evaluation potential must be perceived first, and then rated as threatening or non-threatening to self-esteem.

Because of comparative, reflective, and consultation appraisal that young people use, importance lies in creating a learning environment with a low social evaluation potential, where students can perceive themselves positively while participating in games. I assert that TGM has the potential to help release the tension of social evaluation that is

evident in highly competitive regulation games where an “end product” is trying to be reached. These types of games are often implemented at the end of skill mastery units. TGM is more focused on the *process* through which competition occurs. I believe TGM provides such a teaching framework where the social evaluation environment is inconspicuous and is not inherently as important to students as it might be in a skill mastery approach.

Incorporating modified games, using small sided teams, establishing particular goals or tactical problems, changing the rules for scoring, and even modifying equipment, help to provide an environment for little objective social evaluation. Modifying games means that there is still resemblance of the sport in its original form, only it has been tailored to player’s age, size, ability, state of health, level of skill, and experience, etc. (Siedentop, Hastie & van der Mars, 2004). Changing secondary rules of the game, such as boundaries, playing objects, number of players, and rules for scoring (and many more; Siedentop, Hastie & van der Mars, 2004) can assist in providing “just right challenges” (Kretchmar, 2006) in a sport-related environment that enhance and mesh with student’s inherent motivation to play games.

Modified games with specific tasks take the focus off winning and losing. Even though students are involved in a competitive situation, students focus on solving a problem or achieving a goal, which makes the game meaningful. Rules can be changed to award teams points for each time they solve the problem, thus students can compete with their own score as they collaborate with each other. The small sided teams allow students greater opportunities to participate, focusing on the problem and not what others are doing. Thus, students less likely to be put on display and have less juncture (and possibly

less desire) to evaluate other's ability because they are involved in one game in a myriad of games taking place in the gymnasium. Modified equipment, as well as the choice of equipment allows students to participate at a level at which they feel successful or challenged if they so choose. I believe TGM sets up developmentally appropriate, low social evaluative games so students are and perceive themselves as successful at their current ability level, have lots of opportunity to participate, engage, learn, and still maintain the inherent desire to play.

### **Self -Direction**

TGM supports the notion that anyone can play games and accounts for individual ability and readiness (Thorpe, 1990). Additionally, the model supports that students come to the gymnasium with many experiences that are relevant to and can contribute to what will take place in the lesson. The constructivist pedagogy behind the model puts the student at the center and the teacher as facilitator (Richard & Wallian, 2005). Students are accountable for figuring out how to solve tactical problems by using what they already know, and through engaging in small-sided-play and inquiry with their teammates. The teacher merely uses the model to set up a specific experience and asks questions to help guide students to understand the problems and many solutions within that experience. There is much to know about games, thus skill practice is viewed as secondary to tactical awareness. Skill practice is implemented as it is appreciated and seen as useful by the student in relation to the environment (Thorpe, 1990).

### **Affiliation**

Thorpe (1990) offers that another incentive to play games is affiliation. TGM places students in an opportunity to work with others to solve problems, independently of

the teacher. Additionally, students help to construct the lesson based on their own experiences, their appreciation of skill and in the evaluation of their own play during question and answer segments, making them legitimate co-creators of the lesson. Although Thorpe (1990) discusses affiliation, he does not do so in the sense of team membership.

Team membership is a characteristic of SE (Siedentop, 1994) that can be implemented along with TGM, but is not specifically claimed as a characteristic of TGM. Although SE and TGM have different objectives, the concept of team affiliation could be implemented in TGM by particular teachers in particular contexts using the model. Teachers and researchers have implemented and studied SEM and TGM dually in games centered curriculum (e.g., Bohler, 2004; Collier, 2005). I believe the concept of team affiliation can play a tremendous role in student motivation to participate in TGM games. Being part of a team can add to a student's feeling of belonging and stimulate a sense of responsibility to help teammates, as well as induce response to the problem-solving process (Siedentop, Hastie & van der Mars, 2004). The approach provides an environment for the teacher to include team membership, and as Thorpe (1990) affirms, work towards fair play, tolerance, and equity.

### **Achievement**

Because it takes ten or more years of intentional practice to gain expertise in a sport (Ericsson, 1996), and with the limited time students spend in physical education, the likeliness for students to develop skills to perform adult versions of games during physical education is not high. Ideally, physical educators have hopes that students can gain this type of expertise, but realistically these hopes are improbable (Thorpe, 1990).

Moreover, results of games are highly dependent upon whom one is playing against. Thus, teachers should not place students in adult versions of games where the risk for failure in many forms is high and the success rate is often dependent on the opponent (Thorpe, 1990). This is not to say that students cannot benefit from games.

There are ways in which students can be successful at games, no matter how feeble the technique (Thorpe, 1990, p.212). When I go skiing, my friend Will always says, “No matter how difficult the hill, there is always a way down.” Thorpe (1990, p. 212) echoed this concept when he said, “It is possible to play a ‘good’ game, with ‘poor’ techniques”. Tactic over technique is often times the best way to solve problems, and I believe requires embodied solutions where the body and mind are stressed in such a way that they must work together intently and purposefully to arrive at an answer or understanding what works for the individual.

Teachers can facilitate appropriate, meaningful challenge for students individualistically. Developmentally appropriate, small sided, modified versions of games can provide a successful, meaningful experience to develop awareness and understanding of games (Bunker & Thorpe, 1982; Griffin, Mitchell & Oslin, 1996, 2005; Thorpe, Bunker & Almond, 1984), gain an appreciation for skill (Thorpe, Bunker & Almond, 1984) and to experience embodied, meaningful movement (Kretchmar, 2006). This type of achievement could lead students to seek out opportunities to practice and improve skill and arrive at an interest for future engagement in sport and physical activity (Silverman, 2005).

## **Research on TGM**

Research on TGM has encompassed several broad categories. Initial studies compared TGM to a mastery learning approach. Over time, other studies examined tactical knowledge development, as well as student and teacher perceptions of game-centered approaches. These studies demonstrate an evolution of research design and methodologies for examining TGM, as well as display the complexities of teaching games in physical education.

### **TGM Versus Skill Mastery**

As TGM began to receive more attention, researchers wanted to determine the best approach for teaching games in physical education. The first studies regarding TGM used comparative analyses to evaluate the approach against the predominant, mastery learning approach (Allison & Thorpe, 1997; French, Werner, Rink, Taylor, & Hussey, 1996a; French, Werner, Taylor, Hussey, & Jones, 1996b; Gabriele & Maxwell, 1995; Griffin, Oslin, & Mitchell, 1995; 1997; Lawton, 1989; Mitchell, Griffin, & Oslin, 1997; Mitchell, Oslin & Griffin, 1995; Turner & Martinek, 1992; 1999). These studies took place in physical education settings in which the teachers were physical education specialists trained in TGM. The participants in these studies varied in school level from college to high school and middle school. The majority of these studies involved middle school student participants. Combined, these studies encompassed analysis in two game classifications (a) invasion games (basketball, field hockey, soccer), and (b) net/wall games (badminton, volleyball, squash).

In general, by investigating the TGM and skill mastery approaches comparatively, researchers sought to examine tactical knowledge, game performance, and skill

execution. A few of these studies also examined student and teacher affect. The affective outcomes will be presented in another section. What follows next is a synthesis of outcomes for skill execution, tactical knowledge, and game performance in these comparative examinations.

**Skill execution.** Comparative studies measuring skill execution examined: 1) performances on skill tests (Allison & Thorpe, 1997; French et al. 1996a;1996b; Gabriele & Maxwell, 1995; Lawton, 1989; Turner & Martinek, 1992; 1999), and 2) authentic skill performances, i.e., skill performances during game play (Griffin et al., 1995; Mitchell et al., 1995; 1997; Turner & Martinek, 1992; 1999). Overall, the results of these studies showed no significant differences between the two approaches for skill performance. Though not significant, in most of the studies, both groups showed improvement in skill and execution abilities (Gabriele & Maxwell, 1995; Lawton, 1989; Mitchell et al., 1995; Turner & Martinek, 1992).

The Turner and Martinek (1999) 15-lesson study in hockey was the only study that showed significant improvement in skill performance for both TGM and Skill Mastery approaches. In their study, TGM groups had significantly better scores in dribbling control and passing execution in authentic skill performance than did Skill Mastery groups. This study also revealed that TGM participants had trends of improved skill execution of shooting and dribbling in authentic skill performance. There were no significant differences in execution speed between the Skill Mastery participants and TGM participants, but the Skill Mastery group had a tendency to be a half second faster. Conversely, Skill Mastery participants were significantly faster than the softball control

group. These findings were compatible to two different badminton studies by French et al. (1996a; 1996b). Skill groups performed better on skill tests.

Turner and Martinek (1999) suggested that in their study, skill test measurements and lesson alignment may have played a role in the skill groups' better performance. They believe the Skill Mastery groups' skill tests were similar to the content of the lessons they received, possibly contributing to their success. On the other hand, the Skill Mastery groups were not able to control or pass the ball as effectively as the TGM groups during game performances. In these studies, TGM did not deter skill performance. Learning skill in game and game-like contexts may have provided students with flexibility of performing skills in authentic play (Turner & Martinek, 1999).

**Tactical knowledge.** Cognitive outcomes of games teaching were also examined in the early comparative studies to distinguish the two approaches in terms of their impact on tactical understanding and decision-making. Tactical knowledge was measured via: 1) written assessments (Allison & Thorp, 1997; French et al., 1996a; 1996b; Gabriele & Maxwell, 1995; Griffin et al., 1995; Lawton, 1989; Mitchell et al., 1997; Turner & Martinek, 1992; 1999), 2) game performance assessments involving decision-making (Gabriele & Maxwell, 1995; Griffin et al., 1995; Mitchell et al., 1995; Turner & Martinek, 1992; 1999), and 3) verbal recall interviews (French et al., 1996a; 1996b), or a combination of these measures.

**Written assessments.** Written assessments were used in much of the early comparative research. Measures in these assessments related to items such as rules, positions, skills (declarative knowledge) and distinguishing or deciding how to go about solving a particular game situation (procedural knowledge) (Allison & Thorpe, 1997;

French et al., 1996a; 1996b; Griffin et al., 1995; Lawton, 1989; Mitchell et al., 1997; Turner & Martinek, 1992; 1999).

Written assessments have provided ambiguous results in comparative research. Studies in volleyball (Griffin et al., 1995), field hockey (Turner & Martinek, 1992), and soccer (Mitchell et al., 1997) have resulted in significant improvement in declarative knowledge for tactical groups in comparison to mastery learning and control groups. Additionally, tactical groups have been noted to make the greatest strides from pre- to post- examination among all groups in procedural (Allison & Thorpe, 1997; Griffin et al., 1995; Lawton, 1989; Mitchell et al., 1997) and declarative knowledge (Allison & Thorpe, 1997; Mitchell et al., 1997). Conversely, some of these same studies, as well as others, have shown no significant differences between TGM and skill mastery approaches over time for skill related knowledge (Griffin et al., 1995) , tactical understanding (Lawton, 1989), or declarative and procedural knowledge (French et al., 1996a; 1996b; Mitchell et al., 1997; Turner & Martinek, 1992; 1999).

Lawton suggested that the test may have been too easy to begin with and may have not differentiated students' initial level of understanding. Turner and Martinek suggested that the short unit in their 1992 study may have limited the degree of knowledge participants could acquire. Paralleling Lawton's conclusion, Turner and Martinek also suggested that since the activity was novel, students' initial level of tactical understanding may have been underestimated. Thomas, French, Thomas and Gallagher (1988) noted that the procedural knowledge needed for decision-making in games requires significant amounts of practice time. French and Thomas (1987) suggested that declarative knowledge influences development of procedural knowledge. Novice players

are limited in declarative and procedural knowledge, which takes time to develop. The Mitchell et al. (1997) study follows the assertion that knowledge of game play develops quicker than the execution of motor skills (French & Thomas, 1987; McPherson & French, 1991).

**Game play decisions.** Other cognitive assessments in comparative research included observation and coding of appropriate and inappropriate decisions in game play. (French et al., 1996a; 1996b; Gabriele & Maxwell, 1995; Griffin et al., 1995; Mitchell et al., 1995; Turner & Martinek, 1992; 1999). Results from these examinations have shown inconsistent results among treatment groups and for particular aspects of games.

Gabriele and Maxwell (1995) examined college students' decision-making in a squash unit. Variables included court position, and type of shot on a first-day- last-day- examination of game play. After six weeks of instruction, the tactical group players had higher decision-making scores and were more effective based on shot selection. Griffin et al. (1995) found the tactical group in their volleyball study showed trends of improvement in decision-making.

In examination of decision-making in field hockey game play, Turner and Martinek (1992) examined tackling decisions and decisions to pass, shoot, or dribble. They found no significant differences for any of these variables for teaching approach. Decision-making for tackling got worse for both groups from pre- to post-examination, but not significantly. The tactical group made more decisions on the post-assessment. Mitchell et al. (1995) examined shooting and passing decisions of sixth-grade students in an 8-lesson soccer unit. Analysis showed no significant differences from pre- to post-test between groups.

French et al. (1996a) examined 9<sup>th</sup>-grade badminton players in game decisions regarding contact, placement, and serve placement. Treatment groups were strictly aligned to tactics only, skill only, combination, and control (softball). All three treatment groups were similar to each other in decision-making. In their second study, a 30-lesson badminton unit, French et al. (1996b) examined 9<sup>th</sup> graders' decision-making during the third week and sixth weeks. The same variables were used as in the previous study. Skill and tactical groups had similar decision-making scores and exhibited better game and serve decisions than other groups. Treatment groups in both studies made better decisions than the control group as they attempted to make opponents move and thus played more competitively. These researchers suggested that the skill groups' ability to make good decisions was because of the high correlation between forceful shots and shot selections. Additionally, they suggest that decision-making during a game can be acquired by just playing badminton.

In a second field hockey study by Turner and Martinek (1999), quality of decisions for skill selection (shoot, dribble, pass), where to pass, when to shoot, which direction to dribble, and tackling were examined. Pre- and post- observation of 6<sup>th</sup> and 7<sup>th</sup> grade students' game play revealed that the tactical group made significantly better passing decisions than technique and control groups. There were no significant differences for shooting, dribbling, or tackling decisions between groups.

**Verbal recall.** Few studies have examined cognition through verbal recall methods (French et al., 1996a; 1996b). While students play a game, they are asked to reflect on prior situations or verbalize what they will do next (e.g., *What were you thinking during that point? What are you thinking about now?*). These point interviews,

in non-flow games such as net/wall, striking/fielding, and target games, are an effective method for extracting players' knowledge during game play intervals (McPherson 1993a; 1993b; 1994). Statements players make can be analyzed for content, structure, and metacognitive processes used while playing. This method has been shown to not interfere with player performance (McPherson & Thomas, 1989; Nevett, 1996). Ericsson and Simon (1993) have found this technique to be a valid method for deducing content and processes from individual's thoughts.

French et al. (1996a; 1996b) used between point interviews in a post-treatment badminton game to examine 9<sup>th</sup> grade students' decision-making. In the first study, a sample of 6 students' interviews from each group showed that students were not sophisticated in their thinking about play. Students had relatively no condition-action links, had few conditions of game play, described a limited number of action features, had little self-regulation of skill, and small number of goal strategies. During the game, more action concepts were accessed by the tactical group than the skill or combination groups.

In the French et al. (1996b) 6-week study, data from eight students' answers from the only probe, "What strategy are you going to use on the next point?" was analyzed. The control group did not discuss plans for play, but mostly made statements about making contact with the shuttle or stated that they did not know what strategy they would use. The tactical group made general strategy plans, as well as plans for shot selection and placement. The skill groups made planning for shot selection, placement and execution statements. Additionally, the skill groups' execution statements were perceptual statements about watching the shuttlecock and hitting it harder. The

combination groups also made many of these same statements about watching and hitting the shuttle harder, and focused on general strategies, shot selection and placement, and execution. French et al. discuss that each groups' action plans were reflective of the types of activities they engaged in, as well as the language used in those settings. Language use can be considered an important factor in helping students to access particular types of information during planning processes, especially if that language is substantiated with practice tasks that validate the language. The authors suggested in both studies that longer periods of instruction are needed to better determine differences between tactical and technical approaches and their impact on cognition in games. Cultivating advanced tactical knowledge structures may take extensive periods of time.

### **Tactical Knowledge Development in TGM**

Several studies have broken away from comparing outcomes from different teaching approaches to examine tactical knowledge development in TGM and student and teacher responses to TGM. Two major references provide research information regarding student tactical knowledge development in games: 1) a 2001 *Journal of Teaching in Physical Education (JTPE)* monograph edited by Griffin and Placek, and 2) research conducted by Mahut, Chevalier, Mahut and Grehaigne (2003).

In 2001, researchers from the University of Massachusetts-Amherst and the University of Alabama published a monograph in the *Journal of Teaching in Physical Education* (Griffin & Placek, 2001). This major source is a compilation and reflection of several research studies that examined domain-specific knowledge development of physical education students. The Massachusetts and Alabama studies were primarily grounded from an information processing perspective, but used different methods for

examining knowledge development. Specifically, the 2001 JTPE monograph included research findings from the examination of student's prior knowledge of fitness (Placek, Griffin, Dodds, Raymond, Tremino & James, 2001) and student's prior knowledge of soccer (Griffin, Dodds, Placek & Tremino, 2001). Additionally, Nevett, Rovegno, Babiarz and McCaughtry (2001b) and Nevett, Rovegno and Babiarz (2001a) reported an examination of tactical understanding, skill, and problem solving ability of children before and after a 12-lesson invasion games unit. This monograph also included an examination of how students learned tactics and how teachers responded to student's learning of tactics (Rovegno, Nevett, Brock & Babiarz (2001).

A second source regarding student tactical knowledge development extended from Mahut et al. (2003). This study was designed to examine student interpretation of game play and how students develop action rules. This study was based on the combined situated and constraints perspectives. Because each of these sources provided different means for examining knowledge development, the procedures and highlights of each of these game-related studies will be presented below.

**Student conceptions of soccer.** An investigation of sixth-grade student's conceptions and tactical solutions in soccer was conducted by Griffin et al. (2001). Students were interviewed about their soccer experience and their understanding of the game. Additionally, students were asked to provide solutions to seven tactical problems by manipulating game pieces while providing verbal descriptions and reasoning. The scenarios represented situated, declarative and procedural knowledge (Griffin et al., 2001). The authors suggested that the scenarios represented such knowledge because they reflected situations that were snap shots of game contexts, the pieces had to be moved in

relationship to certain offensive and defensive conditions, and students had to explain why the pieces were being moved.

Based on the student interview questions, four levels were identified in which students described soccer: 1) how to play soccer, 2) the purpose of the game, 3) how to be successful while playing, and 4) what to do when a team has or does not have possession of the ball. The authors then categorized student responses to these four concepts into a “knowledge taxonomy” for classifying levels of complexity in students’ responses. Four levels were developed: Level I (declarative knowledge of basic rules, positions and skills with no connections), Level II (skill and reasoning for using particular skills, focusing on scoring), Level III (beyond skill, stated reasons for using skill and the positive and negative consequences for those actions in a game situation), and Level IV (rational progression of actions, provided purpose for actions, described tactical options using condition-action or if-then statements).

The students’ game piece scenarios from two tactical problems were mapped and then analyzed to develop a scoring rubric. Solutions were labeled according to tactical principles (e.g. immediate shot-on-goal, pass to a cutting player who is open) to provide a template for organizing solutions by tactical problems. All student solutions were then analyzed according to tactical problems and solutions were given a number according to the soundness in ability to solve the problem (i.e. tactically sound=3, tactically feasible=2, tactically convoluted=1). All seven tactical problems were analyzed and the scores were tallied. The highest possible score was 21.

Students’ interview responses revealed a wide span of soccer experience which ranged from formal to informal and no experience at all. Over half (60 %) of the

participants had participated in either community leagues or in physical education. Fifteen percent had limited experience. Over half the class rated themselves on skill as average (25%) or above average (30.6%) on a 5 point Likert scale. Additionally, students used multiple comparisons to demonstrate their perceived competence level. Students ranked themselves in relationship to persons in their ability level, they compared themselves to their peers, and they described themselves in relationship to how much practice they have had. Students were able to report that what they knew about soccer was achieved through family, friends, teachers, and media. These students, however, had difficulty offering specific details about what soccer information was provided from their knowledge sources.

Students reported a wide range of solutions across the seven tactical problems, within all three levels of the knowledge taxonomy. Students scored highest when relating to the offensive tactical problems of attacking the goal, and creating space in an attack. Students scored lower in maintaining possession of the ball and defensive problems such as defending space and bunching up. Students had a basic concept of offensive tactical solutions (M= 46.2% sound; 25.6% feasible; 28.2% convoluted), but had limited conceptions for defensive tactical solutions (M= 33.0% sound; 29.7% feasible; 37.3% convoluted).

Experience was not a factor in students' abilities to solve the game piece scenarios, but experience was a factor in students' ability to discuss soccer at varying complexity levels. Griffin et al. (2001) suggested that this relationship is due to the different types of knowledge being assessed and accessed. Student's soccer knowledge

taxonomy was correlated to student's ability to solve tactical scenarios ( $r = 0.47$ ;  $p < 0.01$ ).

**Tactics, skill, and problem solving in invasion games.** Researchers at the University of Alabama examined the entire fourth-grade class ( $N=54$ ) at one elementary school during physical education. The fourth graders had physical education five days a week for 40 minutes. The researchers implemented basic invasion game instruction two of the five days. During the other three days, the regular teachers taught their typical content without replicating any invasion game content. A sample of students were examined during the invasion game instruction. Invasion game instruction included three units (dribbling, 7 lessons; tag, 4 lessons; and cutting/passing, 12 lessons). The 12-lesson unit on cutting and passing was the primary focus of three separate analyses (Nevett, Rovegno & Babiarz, 2001, Chapter 8; Nevett, Rovegno, Babiarz & McCaughtry, 2001, Chapter 6; Rovegno, Nevett, Brock & Babiarz, 2001, Chapter 7).

The objectives for this research were to “provide descriptive, detailed information about learning and teaching basic invasion-game tactics in 4<sup>th</sup> grade...” (Rovegno, Nevett & Babiarz, 2001, p. 342). The researchers examined: 1) how 4<sup>th</sup> graders learned cutting to get open to receive a pass, 2) how 4<sup>th</sup> graders learned to lead the receiver with a pass, and 3) how the researchers and teachers responded to the 4<sup>th</sup> graders' learning. Multiple measures were used examine and analyze student learning and responses to student learning. Students were videotaped during participation. Tapes were viewed and coded according to a protocol for game performance, decision-making and motor skill execution (passing decisions, passing-skill execution, cutting actions, catching skill). A 20-item multiple choice assessment was used to examine student's declarative, procedural and

tactical knowledge. Students were also individually interviewed to determine their knowledge for passing and cutting. Results of the first two objectives will be discussed in this section. Responses to students' learning, the third objective, will be reported in the next section.

Game performance data are reported first. Results for student's decision-making and skill execution showed improved good passing decisions (52.9% to 66.6%) and improved cutting (45.7% to 64.1%). A majority of the students demonstrated improvement in passing decisions and cutting actions, regardless of improvement in overall scores. In examining one situation to another, high and low skilled students varied in their decision-making and skill execution. The researchers attribute this variability to the newness of the procedural knowledge that was developed. The new knowledge structures lack stability and needed to be acted on repeatedly to develop consistency and even improvement from one situation to another.

Students' decisions to use a lead pass improved (23.2% to 41.4%). On the other hand, students held the ball more, thus their decisions to throw to an open teammate that was close enough to receive a pass did not improve (13.4% to 6.0%). Based on their observations, the researchers attribute the held ball results to students not seeing the open player, not thinking they could complete the pass, or not wanting to pass to a particular player (i.e. a factor of the student social system). All three of these results demonstrate the relative nature of playing games.

Students, especially low-skilled students, were more dynamic in their cutting over time. Low-skilled students moved more and stood still less. Even though low-skilled students were slower than high-skilled students while cutting, they used more V-cuts than

did high-skilled students. Catchable passes improved after the unit (53.5% to 69.5%). Students' clean catches improved (51.5% to 70.0%) across the unit. Multiple interactions were noted among passing, cutting, and catching. Good cutting helped students make good passes and resulted in good catching. The authors suggested that these three variables pose a relationship that should be examined in the context of the game in accordance to teammates and opponents.

Some students were reported to have had poor skill execution. Though their skill was poor, students still had the ability to make positive decisions. Low-skilled students made slightly better passing decisions across the unit and scored lower on cutting skills. Overall, both high-skilled and low skilled students improved their game performance across the unit. The authors concluded that each group learned tactics and decision-making as a result of a 12-lesson unit on basic tactics for invasion games. Additionally, the authors concluded that the fourth graders acquired the knowledge and skills to construct basic tactical solutions to problems related to invasion games.

Results of the knowledge test demonstrated that the fourth grade students' understanding of cutting and passing improved (44.3% to 53.3%). Though there was improvement from pre- to post- assessment, both scores represent a low level understanding, as just over half the questions were answered appropriately.

The interview data collectively displayed that students were able to retrieve more resolutions to the tactical problems over time. The variety and total amount of concepts students accessed did not change between pre- and post- interviews, but the type of knowledge accessed differed overtime. Students used more "tactical action concepts" (47.3% to 64.2%) and included a higher percentage of "tactical action concepts" overall

(24.7% to 36.2%). As students gained more expertise, their use of tactical action plans increased. This finding typifies other studies on expertise (McPherson, 1993a, 1993b; McPherson & Thomas, 1989; Nevett, 1996).

Specific interviews also revealed instability in procedural knowledge. Procedural knowledge accessed did not involve strong action plans, but rather pieces of knowledge grappled together. The authors acknowledged the fragile state of their understanding, but concluded that students did gain knowledge of skills and tactics as a result of the unit. What follows is a report on the findings regarding objective three of the University of Alabama study, responses to student learning.

**Responses to student learning.** The teaching and learning of basic tactics was described as an implementation of combined cognitive-processing, situated and constrain perspectives. Methodology used to examine responses to student learning involved that of “teaching experiment”. The teaching experiment tradition considers student learning rather than the instructional model. Using these perspectives researchers honed in on the communal aspects of students and their environment.

The researchers, teachers, and teacher aides met after school for a “group data collection interview” (Rovegno, Nevett, Brock & Babiarz, 2001, p. 371). The meeting lasted from 30 to 60 minutes, was recorded and then transcribed. The meeting was designed to spawn descriptive, all inclusive data regarding students’ responses in hopes to obtain more information than the previous pre- post- assessments. Each participant in the meeting described the movement, cognitive and social interaction responses of students. Additionally, participants probed each other to gain more information. Last, each person critiqued the lesson and helped to plan for the next lesson. Data for this

objective also included the videotaped data (two days of assessment and 11 days of the lessons). Video tapes were used to verify movement pattern descriptions that were described in the after school meetings.

Rovegno et al. (2001) established general categories after constant comparison of the interview transcripts: 1) passing, 2) cutting, 3) offensive/defensive game play, 4) working together in groups, 5) process of designing games, 6) game rules, 7) off-task behavior, 8) class organization, and 9) management. Videotapes of the lessons were then viewed using constant comparison. All cutting, passing, and game-play patterns were coded. Categories that were developed from the game play coding were compared to the categories that were developed from the interview transcripts. All categories between the two analyses were comparable and thus data saturation was achieved. In-depth findings were arranged by what was taught and observed about cutting and passing according to the situated and constraint theories that channeled the instruction.

The researchers suggested that examining teaching and learning from the “teaching experiment” tradition helped them to understand several aspects of their teaching: 1) student learning was primary, thus the student and the environment interaction could be considered, as opposed to focusing on the model of instruction, 2) instructors had to use a “best guess” (p. 375) approach in deciding what skills to explicitly teach and what skills to implicitly teach because there was no research on the skills/tactics they were teaching, 3) researchers determined that they needed to reinforce the social aspects of play as it related to skill execution (e.g. having students consider how they throw [i.e. force, height, distance] and examine whether or not the ball is catchable by specific persons), 4) the constraints of the task, the learner and environment

were continually contemplated to inform practices that allowed the learner to gain more mature patterns of movement (e.g. use of hula hoops to constrain the passer; aiding the passer's timing to pass by teacher verbal prompt, 5) the use of hula hoops to constrain the passer also helped to take pressure off student cognition and aid in the economy of teaching (p. 388), 6) teachers realized that the defenders were helpful in providing a task constraint that allowed passers and receivers to understand the socially structured nature of invasion games. Additionally, learning cues were produced from the defensive task constraint, making them authentic and meaningful to the content, 7) teachers challenged defenders to focus on helping the offense to learn as opposed to focusing on solely competition. The teachers provided defensive levels to students and allowed students to decide an appropriate level to assist the offence's learning.

These findings from Rovegno et al. (2001) are helpful in moving teachers along the teaching continuum (Feiman-Nemser, 2001) while implementing TGM. Teachers should consider how to deliver the model in an effective manner for student learning as opposed to merely just implementing the model. Rovegno et al. (2001) were able to gain some meaningful insight to TGM instruction through a situated-constraint perspective. They offer significant aspects for teachers to take into account prior to a unit of TGM instruction.

**Student interpretation of game play.** The Mahut et al. (2003) study provided insight into students' interpretation of game play. Mahut et al. (2003) examined students' reflections about their actions and strategies. These reflections were specifically deconstructions and reconstructions as students made sense of actions and produced knowledge represented 'in' action and 'on' action (i.e. conceptual and semiotic-

processing and reflective practice; Schön, 1990). More simply, this study examined “how pictures of reality were constructed and perceived by students” (Mahut et al., 2003, p. 141).

Twenty-one beginner badminton students, age 12-13 years, participated in eight 90-minute lessons. Each lesson included a game play section that lasted 10-minutes. This game play section was videotaped. After playing students immediately observed their performance then engaged in a conversation about what they saw, the results of their actions, and the processes involved in their decision-making (*debate of ideas*; Gréhaigne & Godbout, 1998). Students then returned to game play.

The *debate of ideas* was videotaped and later transcribed. Researchers developed an “interpretive map to link the verbal reports of action rules and the motor-skill level” (Mahut et al., 2003, p. 143). This interpretive map aided analysis of game performance. Additionally, Mahut et al. used three concepts useful for context interpretation and decision-making (Sève, Durand, Saury & Avanzini, 2000) as a frame for analysis: 1) the concept of *expectation horizon*- interpreting the environment, forecasting what will possibly happen, then planning a sequence of possible solutions (Gilly, 1992), 2) the concept of *semic load*- to give meaning to the problem, significant elements are interpreted and assigned a significant weight. These “semic treats” are the basis for interpretation and response, and 3) the concept of *debate of ideas*- “situations in which students express themselves and exchange facts and ideas, based on observation or on personal activity experienced. The debate may concern the results obtained during the action situation, the process involved, and so on” (Gréhaigne & Godbout, 1998, p. 114).

After debate, the player enters the game again and has the “opportunity to validate his/her interpretations” (Oslin & Mitchell, 2006, p. 642).

Results demonstrated that students’ initial responses were non-verbal gestures. Students increasingly became more able to respond with a language describing actions near the end of the unit. Their ability to produce and even extract action rules seemed to improve throughout the unit. Students’ expectation horizon also improved throughout the course of the unit. The researchers defined three characteristics of the beginners’ expectation horizon. Not all students had these characteristics and some students had these characteristics at different points in time. The characteristics are as follows: 1) “shuttlecock centered”- the flight of the object as well as skill execution were students’ primary focus, 2) “constraint of court”- the court and positioning of the opponent were a student focus, and 3) “the opponent”- students focused on the opponent, but regulations and opponent’s strategies were virtually not considered in strategic planning.

Similar to the Rovegno et al. (2001) study, Mahut et al. (2003) reported that even as students’ game play interpretations progressed, students were not consistent as they progressed. Mahut et al. (2003) described this as a “shift” in interpretation and Rovegno et al. (2001) identified this as a “fragile” state of new knowledge structures.

Students’ game performance evolved much like their ability to verbalize actions. At first, students engaged in a cooperative mode and used underhand hits or overhand hits with the shuttle in front. Over time, students began to use more competitive hits with an intention to move their opponent. The competitive hits included cross-court shots, which moved their focus from a “frontal plane” to a “lateralized view”. Students began to consider timing and force during competitive play. Students soon began to alternate

shots. They would smash deep to move their opponent back and then use a drop shot in front of the net. This thoughtful play resulted in students moving and returning to base.

Mahut et al. (2003) summarized that verbalization helped students to recognize environmental conditions. Recognizing particular environmental conditions allowed students to understand sequences of events or the tactical problem and how to plan and anticipate actions for solving the tactical problem. Verbal responses could then be re-examined during a second bout of play, providing students an opportunity to confirm their decisions. Recognition of appropriate decisions serves as a base for applying procedural knowledge similar and new contexts as well as learning new tactical problem solutions.

### **Teacher and Student Responses to TGM**

Pre-service teachers, in-service teachers, and students have all provided insight into the implementation of TGM. Researchers have examined: 1) pre-service teacher's ability to learn tactical concepts (Howarth & Walkuski, 2003), 2) change in teacher's beliefs about TGM (Butler, 1993), 3) pre-service teacher's, in-service teacher's, and future teacher educator's perceptions, responses and attitudes toward TGM (Allison & Thorpe, 1997; Almond, 1986; Burrows & Abby, 1986; Doolittle, 1983; Gubacs, 2000; Gubacs, Carney, Griffin, & Supraporn, 1998; Light, 2003; McNeill, Fry, Wright, Tan, & Schempp, 2004; Mitchell et al., 1997; Sullivan & Swabey, 2003; Sweeney, Everitt, & Carifio, 2003; Turner, 1996), and 4) student responses to TGM (Allison & Thorpe, 1997; Burrows & Abby, 1986; Tjeerdsma, Rink, & Graham, 1996).

These studies have used a variety of methods to examine responses to TGM. Methods have included quasi-experiments as well as quantitative and qualitative

examinations (Mitchell & Oslin, 2006). Several of these studies have compared affective responses of TGM and skill mastery approaches (e.g., Allison & Thorpe, 1997; Mitchell et al., 1997). Tools that have been used include various scales, questionnaires, interview methods, and observation tools (Mitchell & Oslin, 2006). In early studies (1980's), researchers failed to report information in an objective manner, without representing the validity and reliability of their research processes (Almond, 1986; Burrows & Abbey, 1986; Doolittle, 1983). Researchers have learned from those important mistakes and are currently beginning to focus on implementing and presenting valid and reliable measurements to make research on TGM more credible (Mitchell & Oslin, 2006). In the next few sections, I will present the results regarding responses to TGM. These results will be presented in the following order: 1) pre-service teacher responses, 2) teacher and future teacher educator responses, and finally, 3) student responses.

**Pre-service teacher responses to TGM.** Research relating to pre-service teacher's (PT) responses to TGM has consisted of examining PT's ability to learn tactical concepts by participating in TGM (Howarth & Walkuski, 2003), PT's alignment of beliefs toward TGM (Sweeney et al., 2003), and perception after implementing TGM (Light, 2003; McNeil et al., 2004; Sullivan & Swabey, 2003).

Results from this research have reported that PTs enjoy being taught from a TGM perspective (Light, 2003). Additionally, examination revealed that PTs learned and could apply tactical concepts from engaging in this approach (Howarth & Walkuski, 2003). Although PT gained knowledge of tactical concepts, those who had little experience never reached a level of those with experience (Howarth & Walkuski, 2003).

PTs who taught using TGM had difficulty using the model and were not consistent with the approach at the outset. PTs wavered between TGM and a mastery learning approach (Gubacs, 1999; Light, 2003; McNeill et al., 2004; Sullivan & Swabey, 2003). PTs did however use more questioning and probed at higher cognitive levels than they did from a mastery learning approach (Sullivan & Swabey, 2003). Several factors negatively influenced the implementation of TGM in the McNeill et al. (2004) and Light (2003) studies. Facilities, equipment, scheduling (McNeill et al., 2004) and lack of support from cooperating teachers posed limitations on students' ability to use TGM effectively. The PTs in the Light (2003) study who had supportive teachers who recognized the constructivist perspective had a more encouraging encounter with TGM.

PTs needed time to adjust to the transition from a mastery learning approach, to gain the pedagogical content knowledge associated with TGM, and use deeper questioning based on student engagement, in a more unplanned manner (Brooker, Kirk, Braikua, & Bransgrove, 2001; Butler, 1993; Doolittle, 1983; Gubacs, 2000; Gubacs et al., 1998).

**Teacher and future teacher educator responses to TGM.** Teacher and future teacher educators (FTEs) were similar to PTs in that time was needed to adjust to the pedagogical content knowledge, the sequence, and the game conditions associated with TGM. Time was also a factor in overcoming skepticism about the model. Teachers and FTEs were more positive and appreciative of the student centered nature of TGM after some experience using the model (Allison & Thorpe, 1997; Almond, 1986; Brooker et al., 2001; Butler, 1993; Doolittle, 1983; Gubacs et al., 1998). Teachers gained confidence in their ability to plan a TGM unit and follow through with the implementation (Brooker

et al., 2001). Teachers were also more positive about the model because they realized that TGM gave them more time to observe and assess the performance of their students (Allison & Thorpe, 1997).

Teachers who had broad experiences with games and were responsive to the game centered philosophy were able to use the model more fluidly and successfully (Butler, 1993). One study conducted by Brooker et al. (2001), however, did report similar constraints as described by PTs. Secondary teachers described that location and condition of facilities, scheduling, lack of support from colleagues, misaligned assessment tools, as well as the low status of competitive games posed by the institution made implementation of TGM difficult.

**Student responses to TGM.** Most of the studies that have examined student perceptions of TGM are based on the teacher's perception of student affect. Teachers have reported that students participating in a TGM lesson/unit were more engaged, more enthusiastic, presented positive attitudes (Allison & Thorpe, 1997; Almond, 1986; Brooker et al., 2001; Burrows & Abbey, 1986; Butler, 1993; Doolittle, 1983; Gubacs, 2000; Mitchell et al., 1997; Turner, 1996), had overall affirmative attitudes toward physical education (Allison & Thorpe, 1997), and were encouraged to contemplate and make sense of what they were doing (i.e. to think; Gubacs, 2000; Turner, 1996). Teachers reported that low-skilled students showed greater enjoyment and effort during TGM. Additionally, low-skilled students seemed more confident in their playing ability after engaging in TGM (Allison & Thorpe, 1997; Almond, 1986; Doolittle, 1983). Once again, the Brooker et al. (2001) study showed less than positive affect toward TGM. The eighth-grade students in this study showed opposition to the modified games, and wanted to play

the “real game”. The authors suggested that these attitudes were a result of “institutionalized physical education” and the media influence on students (Brooker et al., 2001). The Brooker et al. (2001) study demonstrated the need for teachers to consider the contextual forces in a particular environment. Any approach, no matter how positive it may seem in theory, can have minimal positive influence if particular conditions (student’s beliefs, environmental conditions, institutional beliefs) are not considered during planning and implementation of TGM.

### **Concluding Thoughts: TGM**

Collectively, these studies suggest that TGM has the possibility to influence game play skill execution (e.g. Turner & Martinek, 1999); improve skills for decision-making (e.g. Allison & Thorpe, 1997; Gabriele & Maxwell, 1995; Griffin et al., 1995; Mitchell et al., 1997); enhance response selection and execution (e.g. Turner & Martinek, 1999); and increase game involvement (e.g. Mitchell et al., 1995). Though TGM may facilitate positive performances, there is no evidence to suggest that TGM is better than skill mastery methods. Overall findings suggest that, “The kinds of things students learn are a direct result of how they interact with the content...” (Metzler, 2005, p. 183 in G&B, 2005). Researchers (Metzler, 2000; Rink, 1996) have recommended that future research should examine teaching and learning processes of TGM that contribute to student understanding of tactics. Examining these models in opposition is much like comparing apples and oranges. Each of these teaching tools has different objectives and different paths for achieving those objectives. Examining how each tool contributes to student learning is much more beneficial to understanding how and when to implement each tool.

In further critiquing these studies, results may be in direct relationship to research methodology. Examining longer units may provide more insight to the impact of this model's facilitation in the development of skill, as well as declarative and procedural knowledge. Additionally, Lawton's (1989) study reflects the importance of assessing the entry level of students in order to adjust the lesson and the testing tools for appropriate measurement of skill and tactical understanding. Furthermore, for novices, language may be a limiting factor for expressing their knowledge in verbal assessments. Analyzing game play as well as written explanations, situational diagramming, and verbal explanations of game understanding may be the best means for tapping into novices' game understanding. Also, playing the game and implementing question and answer segments may serve to enhance and develop student language around game actions.

Most importantly, issues regarding the validity of the model are evident in most of these studies. For example, the French et al. (1996a; 1996b) studies discuss the use of technical, tactical, and combined groups; however, there is no explanation to verify that these tactical lessons were associated with TGM or TGfU. Not providing valid description of the use of the model limits researchers' and practitioners' ability to make associations to other literature, develop theories, and generalize results to classrooms. I believe this is one reason TGM has not evolved any faster than it has in terms of becoming a primary model used in physical education programs across the United States.

### **Research on Sport Expertise**

The study of tactics and strategy in games, as well as research on expertise in sport has influenced how TGM proponents think about the teaching and learning of games. Much of the study on expertise has been examined through an information

processing framework. The early TGM comparative studies, described in previous sections, were examined from an information processing perspective. In this section, I will first review information processing. Next, I will briefly explain the complexity of games. Finally, I will present several studies that have examined expertise in sport.

### **Information Processing**

Information processing theory is a framework for understanding how individuals select, use, store, and interpret information (Starkes & Allard, 1993). This theory has been used to explain, from a teaching perspective, the type of information provided to the learner and how it is conveyed (Rink, 1999). Information processing is rooted in Anderson's schema theory (1976, 1982). Schema theory offers that long term, intermediate, and short-term memory stores consist of intricate knowledge structures that represent our subsistence (Shuell, 1986). These internal configurations embody the external world and can be altered under varied propositions over time (Dodds, Griffin, & Placek, 2001).

Ultimately, information processing indicates that new information is gathered and combined with other types of new information to establish nodes that represent certain concepts, facts, or theories. New information that is obtained is also associated to previous knowledge that is already accumulated in long-term memory (Sternberg, 1984). Nodes are organized hierarchically to other nodes in a variety of relationships. These relationships among nodes are termed propositional networks (Anderson, 1976; Dodds, Griffin, & Placek, 2001). Cues from the external world stimulate particular elements of knowledge structures to choose and carry out apt responses. Nodes that are related to

many other nodes and have multiple links are accessed more efficiently (Anderson, 1976).

More specifically, new information is perceived and then encoded or arranged. Encoded information is then chunked together or arranged so it can be related to previous knowledge representations stored in long-term memory (Sternberg, 1984). Vosniadou and Brewer (1987) described how knowledge structures represent learning through accretion, restructuring, and tuning. Accretion occurs when new information is encoded and added to previous knowledge (e.g. an agreeable concept is added to previous knowledge making the structures wider). Restructuring occurs when new information is encoded and added to previous knowledge stores, but the new information fundamentally changes how previous information is structured (e.g. new structures and old structures do not agree, so knowledge structures are reorganized). Tuning is the refinement of knowledge structures in long-term memory by using the knowledge in different contexts (e.g. Transfer of knowledge confirms and strengthens knowledge structures and increases the pliability of the structures) (Vosniadou & Brewer, 1987).

Researchers in science education have examined restructuring of knowledge structures, providing more detail about what occurs when new concepts contradict previous knowledge (Carey, 1985; Chinn & Brewer, 1993; Nussbaum & Novak, 1976; Vosniadou & Brewer, 1986). Nussbaum and Novak (1976) identified weak restructuring as children in their study initially thought that gravity was an up-and-down force, but later moved to the notion that gravity was the pull toward the center of the earth. Vosniadou and Brewer (1986) identified radical restructuring as children in their study initially thought the earth was flat, but later concluded that the earth was three-

dimensional. Weak restructuring is minor shifts in node relationships, without changing the high relational nodes. Radical restructuring, on the other hand, consists of changes to high relational nodes. ). Aside from accretion, restructuring, or tuning, information can also be disregarded or held obscure and latent (Chinn & Brewer, 1993). The formation of knowledge structures is very complex, making the examination of what and how a person “knows” complex, too.

Knowledge has been characterized as follows: 1) declarative knowledge – knowing about something (e.g. facts or anything which can be articulated), 2) procedural knowledge- understanding a process or how to do something- viewed as production systems that are organized in condition-action pairs or “if-then” conditional propositions (Anderson, 1976), 3) conditional knowledge- knowing when and how to use certain procedural or declarative knowledge, and 4) strategic knowledge-is procedural knowledge that is goal directed and may be used at anytime in relationship to performance. Strategic knowledge helps an individual to execute, regulate, and evaluate a performance (Alexander & Judy, 1988; Anderson, 1976; Chi, 1981).

The order in which particular knowledge is acquired has been shown to move from declarative to procedural (Anderson, 1976, 1982; Chi, Feltovich, & Glaser, 1981; Chi, Glaser, & Farr, 1988). Thomas (1994), however, considers that declarative and procedural knowledge developments are not independent, but are interrelated and develop at different rates. For example, practice helps to develop procedural knowledge. As procedural knowledge is developed in a particular domain, problem solving becomes more efficient. Additionally, if new information is acquired that does not align with previous knowledge, radical restructuring can occur. This restructuring involves

compiling new procedural knowledge with declarative knowledge already acquired. When knowledge structures advance, more “if-then” pairs are available for problem solving.

Alexander and Judy (1988) discussed the interaction of strategic knowledge with domain-specific declarative, procedural, and conditional knowledge. They concluded that “those who know more about a particular domain generally understand and remember better than do those with only limited background knowledge” and that “those who monitor and regulate their cognitive processing appropriately during task performance do better than those who do not engage in such strategic processing” (p. 375). From Alexander’s and Judy’s last conclusion, we can relate to what Styles (1974) concluded; teaching method does not necessarily infer a particular level of student processing. Many other factors are involved in processing. Regulation and monitoring of cognitive processing can be influenced by motivation, previous experiences with the task or like tasks, the social context of the environment, cognitive strategies the student possesses, and even the student’s level of consciousness during processing. Thus, teaching methods must consider individual student factors to facilitate cognitive processing.

Information processing has been used as a framework for examining differences between experts and novices cognitive structures. (Abernethy, Thomas, & Thomas, 1993; Alexander & Judy, 1998; Charness, 1987; Chi, 1978; Chi, Glaser, & Farr, 1988; Chi, Glaser, & Rees, 1982; Chiesi, Spilich, & Voss, 1979; Dodds et al., 2001; Ericsson, Krampe, & Tesch-Romer, 1993; Ericsson & Smith, 1991; French et al., 1996a, 1996b; Glaser & Chi, 1988; Rovegno et al., 2001; Starkes & Allard, 1993; Sternberg & Horvath, 1995; Thomas et al., 1988; Turner & Martinek, 1995). Many of the early studies

examined the domains of chess, physics, bridge, music, and baseball. Additionally, much of this research on the differences between experts and novices has been examined with adults (Chi et al., 1988; Ericsson & Smith, 1991). Dodds et al. (2001) wrote:

If the development of expertise is conceptualized as a continuum with novices on one end and experts on the other, then we know very little about the domain-specific knowledge of child novices because they simply have not been represented in the research (p. 305).

Abernethy et al. (1993) and Glaser and Chi (1988) described that experts and novices have very different declarative, procedural, conditional, and strategic knowledge structures. The knowledge structures of experts, in a particular domain, include many nodes and have many links among the nodes than do novices. These knowledge structures are ordered hierarchically and are easily retrieved by the expert. Experts can process information quicker, more accurately, and more automatic than the novice. Additionally, experts problem solve more aptly, represent problems more abstractly, and acknowledge deeper features related to problems. Novices act in response to superficial features of problems (Abernethy et al., 1993; Sternberg & Horvath, 1995).

Ericsson et al. (1993) provided that expertise develops over a period of ten years or more, provided that practice has been deliberate and sustained. High levels of daily, motivated, deliberate, effortful practice sessions, along with support from family and excellent teachers contributes to the development of expertise understanding in a domain.

Using an information processing lens can provide insight about how learners perceive, represent, store, and access information during physical education participation. Further research should examine child novices and their cognition in particular domains.

## **Playing Games Requires Cognitive Thought**

Games require logic, tactics, and rehearsal. Playing games is intelligible and requires intentional, reasoned inquiry. Exposing students to learning technical skills in context of actual game situations provides opportunities for students to understand game play and practice making intentional, reasoned inquiry about game situations (Grèhaigne, Richard, & Griffin, 2005). Team sports have been defined by Grèhaigne and Roche (1990) as “the self-organization of a group confronted by another group with antagonistic interests.” This has also been identified as a “force ratio”, as opponents are struggling for and switching possession of a ball (or other object) (Grèhaigne, Richard, & Griffin, 2005).

In invasion games, where there are strategies of scoring and preventing scoring, players must prepare a response and adjust that response at the arrival of the ball (coincidence-anticipation). Players must also analyze the costs and benefits of actions, making informed choices from possible response selections, while concurrently making decisions based on possible actions from opponents and the speed and path of the ball (Grèhaigne & Roche, 1990). Learning skills in isolation may provide students with enhanced skill, but it does not support students’ variation of those skills or students’ cognition and response selection during authentic games. In short, students need multiple experiences practicing skills in the context of a game to enhance or increase knowledge of selection responses.

Not only does the number of selection responses players have in memory stores regulate game play, but the parameters of the game regulate what selection responses are legal and appropriate. “Coincidence-anticipation is paramount in the struggle for

territorial dominance in the constraints of the game” (Brackenridge, 1979). The game regulation constraints identify what problems are to be solved in game situations.

Brackenridge (1979) posed three main categories of problems in team sports: problems related to space and time, problems related to information, and problems related to organization.

### **Problems Related to Space and Time**

As an offensive player or team is being attacked and pressured by defensive players, he or she must find a solution to the problem of managing the ball to overtake opponents (maintaining possession), using mobile obstructions (teammates and opponents) to take away the pressure of the defense, and avoiding those obstructions as well. When a player is in a defensive mode, a team or individual must move toward forward, putting obstructions in the way of offensive players to slow down or stop the forward progress of the ball while trying to re-gain possession of the ball.

### **Problems Related to Information**

There is ambiguity in opponents’ and teammates’ productions of movement and decision-making during game situations. A teams’ ability to communicate and select explicit tactics and appropriate responses understood by the entire team reduces that ambiguity.

### **Problems Related to Organization**

Team sports require collective efforts to solve problems and achieve goals. Understanding teammates’ strengths, weaknesses, anticipating their decisions, and trusting their physical and cognitive abilities allow for organized and collective strategic responses.

## **Development of Response Selection Processes**

The high quality performance of sport experts has been attributed to the sophisticated knowledge bases possessed. These knowledge bases are also known as problem representations. French and McPherson (2004) describe these problem representations as “propositional networks of declarative knowledge or as procedural knowledge in the form of productions or condition-action procedures that are stored in long-term memory.” Productions or production systems are if-then-links, also known as stimulus-response pairs, in which knowledge can be turned into action (Anderson, 1982). Actions are produced through processing what goals need to be completed, what conditions are in effect, and what actions are available for use in current conditions that will link to the goal. Productions provide “templates” for processing information and provide an advantage of speed in processing, as well as diminished response selection errors in performance (McPherson, 1993).

Advanced propositional networks are possessed by adult expert performers. Adult experts have more depth and methodology in knowledge structures, have advanced understanding of situational possibilities, and can recognize patterns in play quicker and more precisely than the novice player. Additionally, adult experts can strategize their own actions prior to execution, can predict and prepare for opponent actions, and can examine and regulate their own tactical decisions better than the novice (Abernethy, Thomas, & Thomas, 1993; Starkes & Allard, 1993; Tenenbaum, 1999).

Biological and experiential factors have been linked to the development of response selection processes (French & McPherson, 2004). The make up of a person’s body has direct influence on motor skill development, thus indirectly impacting a

person's ability to use particular response selections (i.e. height, weight, flexibility). Processing speed, on the other hand, is age related (Salthouse, 1996). More importantly, for the conversation of this paper, experience also plays a role in the development of response selection processes. Response selection processes are learned and improved through extensive, purposeful, focused practice (French & McPherson, 2004).

Based on the research presented by French and McPherson (2004), knowledge base or problem representations for sport includes: (a) declarative knowledge for both tactics and skill, (b) procedural knowledge for response selection and implementation, and (c) sport-specific memory alterations and constructions that are stored in and available from long-term memory (i.e. action-plan profiles, current-event profiles, game-situation prototypes, scripts for competition, and sport-specific strategies). When individuals access information from their knowledge base, for responding to a tactical problem, only a small piece of that knowledge base is associated to the task. Accessing information related to a specific task must be match with what is accessible in memory stores. This is also termed problem representation.

Problem representation is a significant concern because only a small piece of knowledge base is used to perform an explicit task. Meaning, numerous and various situations must occur to elicit the entirety of a knowledge base. Also, problem representation is very difficult for the beginner and novice players. Beginner and novice players may be able to access lots of sport-related information, but that information is rarely demonstrative of the knowledge that is related to the explicit tasks needed for successful performances (French & McPherson, 2004).

### **Knowledge Accessed During Competition**

Verbal reports have been used to examine what players attend to during games and what knowledge is accessed to reconcile play. Verbal reports or knowledge statements have been examined using five major concepts: (a) *goal concepts* convey the goal of game, (b) *condition concepts* refer to the circumstances under which one should act to achieve the goal, (c) *actions* are the movements or patterns of actions selected for advancement toward the goal, (d) *regulation statements* communicate a player's capacity to complete an action and their success, and (e) *do concepts* are how-to descriptions of completing an action (French & McPherson, 2004). Several investigations have been conducted to analyze the developmental trends in knowledge content during competition. The sports of tennis, baseball, and volleyball have been used predominantly, because of the nature of the flow of these games. The start and stop nature of tennis or volleyball, and the slow pace of baseball provide opportunities to access verbal recall from players during competition (French & McPherson, 2004).

### **Knowledge Accessed in Tennis**

Verbal reports were compared from a series of studies involving expert and novice tennis players from three different age categories: 10-11 years old, 12-13 years old, and adults. Verbal reports were obtained after every point during tennis play, using the prompt, "What were you thinking about while playing that point?" Knowledge content was examined. Extreme differences occurred in *conditions* and *actions* that were retrieved by novice and expert players (McPherson, 1999b, 2000; McPherson, French, & Kernodle, 2002; McPherson & Thomas, 1989).

**Beginner and novice tennis players.** Novice players, in all age categories, paid attention to conditions in the environment that were not relevant. Most novice youth and females paid attention to characteristics of their own play, rather than the opponent, environmental conditions, or their position on the court. The novice players did not make use of retrieval strategies to seek to understand characteristics of their opponent's inclinations, strong points, or limitations. Male novice players did use rudimentary strategies to analyze conditions of self and opponent previous shots, inclinations, and limitations. Often times these strategies lead to very weak and inappropriate analysis.

Limited actions were retrieved by youth and women novice players. Primary actions included serves and ground strokes. Success and failure of a selected response by novice players were rarely reflected upon to regulate game play. Regulation of execution of skill was conducted at a minimum by novice women, but they did not make verbal statements about how to correct errors.

**Expert tennis players.** In contrast, adult experts retrieved a multiplicity of conditions. These experts accessed current environmental conditions about themselves and their opponent, including previous shots, inclinations, strong points, and limitations. Profiles of their own performances, as well of those of their opponents were built to assist with modification of personal game play throughout the game. Male experts generated more condition profiles than female experts, and youth experts developed various and more detailed conditions than their novice counterparts. Youth experts did not establish profiles of the inclinations, strong points, and limitations of their opponent, as did the adult experts.

Actions retrieved by youth and women experts were similar in that they retrieved a comparable rate of recurrence of actions, which were at a lower rate than male experts. Actions of women experts and male experts were more specific and detailed than youth experts, describing actions such as topspin, slice, speed, and specific locations on the court. French and McPherson (2004) note that as the multitude of skill options increases, as does age and expertise, actions that are accessed increase to support the development of the knowledge base of detailed actions profiles that exist. Youth experts retrieved actions concurrent to the context of present play, but adult experts were able to retrieve these and plan ahead for upcoming actions. Adult expert regulatory actions were more extensive than the regulatory actions of youth experts. Adult regulatory actions included monitoring response selection and motor execution, in addition to using verbal do statements for correcting errors.

### **Knowledge Accessed in Baseball**

Think-aloud verbal protocols of skilled shortstop players in the following age categories were examined: 8 years, 10 years, 12 years, and 15-16 years (Nevett, 1996; Nevett & French, 1997). Micro-cassette audio-recorders were worn by players to detect players' verbal thoughts between pitches to the batter during a game. Results are similar to the tennis studies described above.

**Younger baseball players.** Younger players paid attention to conditions in the environment that were not relevant. Though concepts that were accessed were baseball related, the retrieved information was not relevant to the critical game situations, demonstrating poor problem representation. In addition, young players did not keep track of critical game conditions in order to plan for future play execution. Information that

was retrieved was centered on the self instead of focused on the opponents' strengths, weaknesses, tendencies or game possibilities. Base runners were rarely discussed or reflected upon, and pitch counts and outs were inconsistently and idly monitored. The younger players who accessed action plans only accessed single alternative action, such as throwing to first base. Special plays that were introduced to 10 year olds, such as the bunt and steal, were rarely retrieved.

**Older baseball players.** Twelve year old players discussed specific conditions for certain areas of the field. They linked these conditions to action chains for game possibilities. Older players paid attention to base runners constantly, as well as monitored the pitch counts and outs over and over with each at bat. Players who were in the 15-16 year old category accessed batter's previous hit location to modify playing position and possible actions. As age and expertise increased, the number of action-plans accessed increased for particular situated game conditions. Twelve year olds were able to access special plans, like what to do in the instance of a bunt or steal, but did not retrieve other plans for the ball being hit in their area. Fifteen and sixteen year old did access special plays and other alternative plans for what to do if a ball was hit in their area.

**Reactive statements as knowledge content.** In the studies described above, other knowledge was accessed. Younger players tended to access reactive or emotional statements, both negative and positive. The older the player or the more experienced, the more likely they were to move from emotional statements to focus on cognitive aspects of play. Cognitive aspects of play centered on response selection and execution such as tactical planning, positioning, and teammate communication and motivation talk (French, Werner, Rink, et al., 1996; McPherson et al., 2002; Nevett, 1996).

## **Knowledge Accessed in Volleyball**

A study was conducted by Henninger, Pagnano, Patton, Griffin, and Dodds (2006) to examine four novice volleyball player's knowledge of games. These novices were college students enrolled in a basic instruction volleyball elective course. Analysis of verbal reports during play and strategic diagram scenarios prior to the unit revealed these novices' domain-specific knowledge about setting up to attack. The researchers reported that these college novices had a range of domain-specific knowledge regarding setting up to attack and that the domain-specific knowledge possessed by these students was clearly novice. The students talked in a general manner about conditions, actions, and goals associated with setting up to attack.

Students had difficulty attending to relevant conditions in the context of play and did not use the context of the game to adjust their responses. Condition statements were not associated to appropriate solutions in the diagram scenarios and were for the most part egocentric and not related to teammates or opponents. Conditions that were stated were often a replay of what had happened during the game and were not used to plan or predict future responses.

Action statements by students were associated with mostly on-the-ball movements and emphasized doubt in ability to perform the action. Off-the-ball movements were rarely mentioned, but included readiness, covering, communication and fake. All were aware of the three hit tactic in volleyball, but had different levels of conceptions to verbalize the three hit process. Three participants had the ability to produce appropriate actions in scenarios, but could not access that knowledge during play. Appropriate actions were often not related to goal-related changes in the game,

during play and in scenarios. Action statements were rather vague and only reflected the student's ability to perform an action, rather than specifying and appropriate actions necessary for solving the problem. Students' view of improving game performance was related to getting better at particular on-the-ball skills and lacked connection to tactical planning. These students did not reflect on using diverse shots based on strengths or weakness of their teammates or opponents.

Goals statements made by students were individually focused on skill execution, as opposed to team focused to win the point. Goals did not include off-the-ball movements. These goal statements were incomplete, stopping with the self; not including scoring. Students did not access a plan for how to win points with their teammates. Levels of knowledge regarding goals ranged from winning the point to "just keeping the ball in play". The higher skilled novice student could focus on winning the point. Goal statements also focused on personal improvement in on-the-ball skill execution.

The researchers concluded that novices do bring domain-specific knowledge into the classroom, but often have difficulty accessing that knowledge to plan for future movements during play. The scenarios offered students more time to process what they would do, and they were able to provide more condition and action responses that were more refined than the verbal reports. Verbal reports during game play were more focused on goals and actions, as they had less time to process and develop more complex responses. Novices in this study demonstrated characteristics of novices described in the previously described studies (McPherson, 1993; 1999; McPherson & Thomas, 1989; Nevett & French, 1997).

### **Concluding Thoughts: Expertise Research**

French and McPherson (2004) and Henninger et al. (2006) discuss that more research is indeed needed to better understand response-selection processes and to better understand how to develop knowledge base and to facilitate the learning of those processes, especially of novices. “Very few individuals have even thought about how we might practice or teach skills related to current event profiles” (French & McPherson, 2004). One suggestion offered for future research is to examine types of practice activities and view what types of response selection and execution improvement occurs. A second suggestion for future research is to describe developmental performance changes in cognition and motor processes in various sports, particularly in young people. The Tactical Games Model (TGM) is one teaching model that assumes to facilitate students’ response-selection and execution processes. Because of the models’ underlying assumptions and its organizational arrangement, perhaps examination of the practice activities situated in this model are worthy of examination.

### **Final Conclusions**

As a result of this view of the literature there are several conclusions to specifically highlight. First, the methodology used to examine a model, such as TGM, highly influences the extent to which research can contribute to the knowledge about the model. Second, because of the complexity of games, teachers’ tactical knowledge in net/wall, invasion, field/run/score, and target games categories is highly influential in the extent to which sport-related game units can be facilitated. Next, the complexity of games and the pedagogical content knowledge associated with constructivist approaches that TGM requires take time for both teachers and students to become familiar with and

engage in effectively. Fourth, expertise-grounded research methods can be useful tools for understanding how young novices learn about sport-related games and can provide evidence of the impact of TGM on students' cognition while participating in TGM units. Fifth, understanding TGM –itself not a form of play – can help students play better and more quickly, thus appreciating games more and being more motivated to learn and play them.

First, much of the research that used information processing frames was comparative studies that did not validate or identify how particular models of instruction were used. Comparative studies have not been successful in claiming that TGM is better than skill mastery approaches because weaknesses in that particular research design. What has been learned from comparative studies is that what is learned by students is directly related to what is taught; a particular model can be used to reach specific learning objectives. TGM is associated with learning and solving tactical problems, the development of tactical awareness. In previous comparative studies, this objective cannot be verified or distinguished from other approaches because descriptions of the units of instruction are not provided and pedagogical fidelity to the models is not validated. Thus, clear understanding of how these studies contribute to the research on TGM is very difficult to substantiate. Comparative studies among models of instruction should not be used because models have different goals and objectives. Additionally, providing rich descriptions of the unit of instruction and a validation of the model will make this study more substantial, more credible, and more generalizable to like situations.

Second, Rink (2002) noted that teachers leave out Game Stages Two and Three (refining and extending), both key factors in situating motor skills with the cognitive

game concepts.. Additionally, the skill mastery approach has dominated the instruction of sport-related games. Because of the complexity of games and the evidence of teachers mostly teaching in Stages One and Four (skill development and game play), teacher content knowledge of games is highly important and somewhat lacking in Games Stages Two and Three. In order to refine and extend games and develop units that provide tactical engagement and seek to promote tactical understanding, teachers must understand tactical problems associated with all Game Stages as well as particular game categories and/or specific games.

Third, teachers and students who are new to TGM will require time to learn and engage in the model effectively. If teachers and students have primarily engaged in teacher-centered instruction, then the student-centered instruction associated with TGM will require students and teachers both to adjust and even change beliefs about how instruction can occur. It will be important to convey objectives and purpose of the model to teachers new to the model, as well as to ascertain teacher knowledge of games and constructivism, and then to develop specific game-related knowledge and pedagogical content knowledge associated with TGM.

Fourth, the research in expertise and the methodology used in that research can be used to develop studies that would widen that knowledge base to include young novices' development of game understanding. We know it takes a period of ten or more years of committed practice to develop expertise (Ericsson, 1996). We also understand that specific cognitive process thoughts associated with expertise. Tapping into this information and associating these processes with instruction may assist young learners in developing game understanding. Additionally, understanding what young novices think

about during TGM can contribute to what we know about the novice learner, what we know about the novice learner in a TGM unit, as well what we know about TGM.

## **CHAPTER 3**

### **METHODOLOGY**

A case study research design (Creswell, 1998; Straus & Corbin, 1998) was used in this investigation. Case study design is a descriptive technique used to illicit considerable amounts of information that offer deep meaning about a single circumstance or occurrence. In depth information found within a case study may be used to attain a better understanding of similar cases (Creswell, 1998). This particular case was used instrumentally (Stake, 1995) to examine fifth-grade students' cognition during a physical education unit as a result of implementing a tactical games model of instruction.

#### **Setting**

The setting was a suburban elementary school in the northeastern United States. Students at Shade Tree Elementary (STE) participated in year-long physical education, 50 minutes per class, 2 days per week. The curriculum was focused on the development of students' movement skills through station skill practice, games, dance, and fitness activities. The primary curriculum venue in past years has been skill themes and movement concepts (Graham, Holt/Hale, & Parker, 2010). Skills such as throwing and catching, striking, and dribbling are taught at developmentally appropriate levels through a variety of means (individual skill practice, stations, games, etc.) using direct instruction, peer teaching, and discovery learning. Other venues include Building Dances (McGreevy-Nichols, Scheff, & Sprague, 2005) using a constructivist perspective, as well as activities and events such as school field day, Jump Rope for Heart (American Heart Association; AMA; 2009), and fire safety presentations from the local fire department.

TGM had never been implemented during the current physical educator's 21-year tenure; however, the teacher wanted to begin to implement the model with her fifth grade classes.

## **Participants**

### **Teacher Participant**

Abby (pseudonym), is the physical educator and head teacher at STE. Active in her state's professional organization (e.g., held high elected leadership position), she has previously been recognized as the state physical educator of the year and the National Association for Physical Education teacher of the year.

### **Student Participants**

Student participants in this study were 16 purposefully selected fifth graders. Specifically, two classes (N=50) out of five fifth grade classes were selected to participate in this study. Classes were purposefully selected based on the convenience of class schedule. Due to constraints placed on data collection procedures (i.e. camera placement and viewing ability), eight students, of various skill levels, were selected from each class (M=8, F=8; n=16) as primary student participants.

Participant selection included considerations such as the following: consent, student's ability to communicate in an interview, the teachers' belief that students would be in attendance, and teacher's ranking of skill level. Consent was obtained from the school's administration, the teacher, the students, and the parents. Permission from the university's Institutional Review Board (IRB) was also obtained. Pseudonyms are used to protect the identity of participants and the school. Complete data were obtained for 11 target students (n=11). Absenteeism and being pulled from physical education for band sectional practice attributed to the loss of data for five participants.

## Teacher Training

A constructivist perspective was used to train Abby in TGM. Abby engaged in a series of readings and exploratory teaching practices with her own students. Intermittent reflections and discussions with the investigator occurred throughout the training process. Research memos and field notes were used to record the training.

### Reading

After an initial teacher interview was conducted, teacher training began with a selection of readings determined by the investigator (see Table 3.1). Abby kept a journal of notes and questions. These were discussed at regularly scheduled meetings.

Table 3.1. – Selected Readings for Teacher Training

Authors	Book	Chapters/ Assignment
Griffin, L.L., & Butler, J.	(2005). <i>Teaching Games for Understanding: Theory, Research, and Practice. Human Kinetics: Champaign, IL.</i>	1,2,3,4,7,8,11,12,13
Mitchell, S.A., Oslin, J.L., & Griffin, L.L.	(2006). <i>Teaching Sport Concepts and Skills: A Tactical Games Approach. Human Kinetics: Champaign, IL.</i>	1,2,3,15,16,17,18; Study Tables 2.1, 2.2, page 17, and tip boxes.
Mitchell, S.A., Oslin, J.L., & Griffin, L.L.	(2003). <i>Sport Foundations for Elementary Physical Education: A Tactical Games Approach. Human Kinetics: Champaign, IL.</i>	4, 5

The meetings were used to determine the sport content that would be most appropriate for this investigation based on Abby's ability and comfort level, student ability, gymnasium space, and ease of data collection. A net/wall sampling unit was decided upon as the mode for student participation for this investigation. We planned a

net/wall unit for Abby to practice with the classes (1, 2, and 3) that were not part of this study. For those students that were part of the study (classes 4 and 5), we planned an invasion games unit for them during the teacher training. The rationale for this decision was to provide the investigation group experience in participating and learning within the model and to aid in data collection procedures. This invasion games unit was also another opportunity for Abby to practice facilitating within the model (see Table 3.2).

Table 3.2. TGM Training for Teacher and Student (6 days of teaching)

Training with non-investigation groups (Classes 1, 2, & 3)	Training with investigation groups (Classes 4 & 5)
Teacher trains by teaching TGM <i>net/wall games</i> to students that will not be participating in the study.	Teacher trains by teaching TGM <i>invasion games</i> to students who will be in the study; students experience the model, practice verbal recall, and experience having cameras in the gym.

### **Training Unit**

The teacher-training unit was a 6-day unit of net/wall games with three classes not part of the investigation (3 weeks) along with a 6-day unit of invasion games (3 weeks) with the classes that were part of the investigation. Prior to each lesson, Abby and I discussed the tactical problem and the focus for the day. Abby was very comfortable with me being in the gym, included my name on the wall as an STE teacher as to involve me in the classroom community, and often asked if I had anything to add or any questions to ask the students. Occasionally, I modeled questions based on my observations of students. After each lesson, we reflected on students' learning.

During the training segment, we made minor lesson revisions to adjust for the investigative unit. We combined the first two lessons, adjusted game and practice time in some lessons, and changed some equipment (e.g. deck ring to flat playground ball).

### **TGM Investigation Unit**

A 20-day net/wall sampling unit was observed and analyzed. The unit was constructed closely to the net/wall sampling unit developed by Mitchell, Oslin, and Griffin (2003). Abby taught the unit to two classes of approximately 25 students. Eight target student participants in each class intermingled and participated with and against each other on a select set of courts that could be viewed through the video cameras. The unit schedule according to the text used is displayed in Appendix A. The entire class time was devoted to TGM. The first 2-5 minutes of class was structured to provide students with the tactical problem, game rules, expectations, etc. The unit then commenced according to the sequence as outlined in the book or deemed appropriate by the teacher.

### **Data Collection**

Multiple data sources were used to explore students' tactical understanding, decision-making processes, transfer of learning, and to verify the implementation of TGM. Data sources were: (a) pre-post unit game play assessment (pickle ball, badminton, volleyball), (b) situational knowledge quiz (pre-post-unit), (c) formal, semi-structured teacher interview (pre-post-unit), (d) descriptive field notes, (e) video-taped student performances, (f) audio-taped lessons, (g) student think-aloud reports during the second game of each lesson (McPherson & Thomas, 1989), and (h) post-unit student focus group interviews.

### **Game Play Assessment**

Prior to the unit, students engaged in 15 minutes of game play for the following net/wall games: pickle ball, badminton, and volleyball. The goal for each game was for students to outscore their opponents. Games were modified (e.g., court boundaries; see Appendix B) and videotaped, serving as baseline and post-unit measures for performance, involvement, skill execution, decision-making and support.

### **Student Situational Knowledge Quizzes**

The student situational knowledge quiz was given to all students in both classes (N=50) before and after the unit. The quiz was designed to understand what students knew and understood about net/wall games (i.e. solving defensive and offensive tactical problems). The quiz had twenty-one items in which the students chose from a list, explained, or drew what to do in a particular net/wall scenario and explained why they would take that action (see Appendix C).

### **Formal, Semi-Structured Teacher Interviews**

The *pre-unit teacher interview* was designed to learn and understand the teacher's current philosophy and physical education practices, as well as to elicit teacher's understanding of the model, knowledge of using the model, and knowledge of net/wall games and other game classification categories (see Appendix D).

The *post-unit teacher interview* was used to elicit teacher's perception of student participation, learning, and facilitation of the model. The teacher was also *interviewed intermittently* after several lessons to examine perceptions of and weaknesses using the model, of specific lessons, or of specific students. Intermittent interviews were informed

by researcher's observations and analysis of lessons, as well as teachers' volitions to initiate reflection or ask questions.

### **Descriptive Field Notes**

Descriptive field notes were taken each day, and memos were taken during viewing of videotapes. Teacher's interaction and use of the model, students' engagement, and pertinent student interactions were noted. Metzler's (2000) teacher benchmarks (see Appendix E), as well as a researcher-developed checklist were used in developing notes to validate the model (see Appendix F).

### **Video Taped and Audio Taped Lessons**

The daily lessons were video taped and audio taped. Videos were analyzed to verify the use of the model, and to examine teacher facilitation, student participation, and how the lesson staged knowledge structures.

### **Verbal Reports**

Verbal reports were used to examine students' tactical understanding and decision-making (i.e. problem representations). These reports were students' thought processes during problem solving situations in the second game of each lesson. Tape recorders were placed at the sideline of the playing area. To initiate verbal recall, the researcher stopped game play after a point was scored or after a dead ball and asked players to verbally respond to a written prompt beside their tape recorder. This process was repeated until all eight students in each class responded at least once during each lesson. Example prompts included: What were you thinking when your team had the ball?, How did your team try to solve the tactical problem?, and What were you thinking

as you played? See Appendix G to examine the prompt sheet that will be provided to students during verbal recall.

### **Student Focus Group Interviews**

Student focus group interviews were conducted post-unit. Focus groups consisted of four groups of two students per class. Groups were arranged purposefully as pairs that played against each other multiple times. The focus group interviews were designed to gain information regarding previous experiences, perception of the unit, what they thought they learned, how they understood playing with and/or against each other, transfer of knowledge from one game to another, game understanding and tactical decision-making, and to extend the researcher's understanding of her observations and student's pre-post-unit quizzes (see Appendix H).

### **Data Analysis**

Analysis was be on-going throughout data collection. Video taped play was analyzed using the Game Performance Assessment Instrument (GPAI; Griffin, Mitchell, & Oslin, 1997). The quizzes, verbal recall data, and focus group interviews were analyzed using a protocol analysis developed by McPherson and Thomas (1989). The teacher interviews and student focus group interviews were open coded and analyzed for descriptive use. Additionally, the teacher interview was compared to the TGM validation instruments. Field notes were typed and all interviews, audio-taped lessons, and student think-aloud reports were transcribed verbatim.

### **Game Play Assessment**

The videotaped pre-post-unit game play was analyzed using the Game Performance Assessment Instrument (GPAI; Griffin, Mitchell & Oslin, 1997). The GPAI was used to

assess students' tactical knowledge and game performance across the unit. Specific performances included students' appropriate/ inappropriate or efficient/inefficient decision-making, skill execution, and support. Additionally, involvement and game performance scores were calculated. Performances are reported using descriptive statistics. Specific coding criteria are provided in Appendix E. Indices were calculated for decision-making, skill execution, support, involvement, and game performance. Calculation procedures are in Table 3.3.

Table 3.3. Game Performance Assessment Instrument Calculation

<i>Index</i>	<i>Calculation</i>
<i>Support Index (SUPI)</i>	<u>appropriate support</u> (appropriate support + inappropriate support)
<i>Decision-Making Index (DMI)</i>	<u>appropriate decisions</u> (appropriate decisions + inappropriate decisions)
<i>Skill Execution Index (SEI)</i>	<u>efficient skill executions</u> (efficient skill execution + inefficient skill execution)
<i>Game Performance Index (GPI)</i>	$\frac{[\text{decision-making Index} + \text{skill execution index} + \text{support index}]}{3}$
<i>Involvement Score (IS)</i>	appropriate decisions + inappropriate decisions + efficient skill executions + inefficient skill executions + appropriate supporting movements

Rater reliability was established prior to coding and analysis of GPAI data. Coder training was conducted before reliability measures were conducted. For training, 10% of the data were provided to a second trained coder and he coded game play for each of the indices. The coding was compared to the researcher's scores for a reliability of 90 % or

greater for initial reliability. When 90 % reliability was achieved during training, coding resumed.

Thirty-percent of the GPAI data was randomly selected and coded for rater reliability. All inter- and intra ratings for number of observations and appropriate/inappropriate or efficient/inefficient coding was greater than 80 %, demonstrating rater reliability and consistency (van der Mars, 1989, p. 57; see Tables 3.4 through 3.6).

Table 3. 4. GPAI Rater Reliability: Pickleball

<i>Analysis Category</i>	<i>Inter-Rater Reliability</i>	<i>Intra-Rater Reliability</i>
Total Observations (Appropriate + Inappropriate Ratios)	% Agreement	% Agreement
<i>Decision-Making</i>	92	100
<i>Support</i>	97	99
<i>Skill Execution</i>	85	100
Segregated Observations (Appropriate / Inappropriate / No Decision Observations) Or (Efficient / Inefficient Observations)	% Agreement	% Agreement
<i>Decision-Making</i>	84 / 92 / 99	100 / 99 / 99
<i>Support</i>	97 / 97	98 / 99
<i>Skill Execution</i>	85 / 85	99 / 99

Table 3. 5. GPAI Rater Reliability: Badminton

<i>Analysis Category</i>	<i>Inter-Rater Reliability</i>	<i>Intra-Rater Reliability</i>
Total Observations (Appropriate + Inappropriate Ratios)	% Agreement	% Agreement
<i>Decision-Making</i>	99	97
<i>Support</i>	94	100
<i>Skill Execution</i>	99	100
Segregated Observations (Appropriate / Inappropriate / No Decision Observations) Or (Efficient / Inefficient Observations)	% Agreement	% Agreement
<i>Decision-Making</i>	94 / 98 / 84	99 / 93 / 91
<i>Support</i>	93 / 96	100 / 99
<i>Skill Execution</i>	100 / 97	99 / 99

Table 3. 6. GPAI Rater Reliability: Volleyball

<i>Analysis Category</i>	<i>Inter-Rater Reliability</i>	<i>Intra-Rater Reliability</i>
Total Observations (Appropriate + Inappropriate Ratios)	% Agreement	% Agreement
<i>Decision-Making</i>	93	98
<i>Support</i>	99	96
<i>Skill Execution</i>	92	100
Segregated Observations (Appropriate / Inappropriate Observations) Or (Efficient/ Inefficient Observations) Or (Perfect Pass/ Good / Not Playable]	% Agreement	% Agreement
<i>Decision-Making</i>	91 / 95	100 / 96
<i>Support</i>	96 / 97	93 / 100
<i>Skill Execution</i>	86 / 95 / 92	100 / 100 / 100

## **Knowledge Quizzes and Verbal Recall**

The justification for the responses on the quizzes and the verbal recall transcripts were content analyzed and coded according to a protocol analysis developed by McPherson and Thomas (1989). Specifically, participants' verbal problem representations were coded into major concept categories (i.e. conditions, actions, goals; see McPherson, 1993, p. 167). Units of information were coded according to: 1) circumstances in which actions occurred, 2) motor or perceptual responses, and 3) purpose of action selected (see McPherson, 1993, p.167-169). These concepts are reported using descriptive statistics, as well.

### **Rater Reliability**

Rater reliability was established prior to coding and analysis of verbal recall data. Prior to rater-reliability coding, coder training was conducted. Ten percent of the data was provided to a second trained coder, and she arranged the statements according to the concept categories of condition, action, and goal. The arrangement was compared to the researcher's arrangement and scored for a reliability of .90 or greater for initial reliability. When 90 percent reliability was achieved, coding resumed by the researcher. Finally, the second coder coded 30 % of the analyzed data for final reliability of .80 or greater (van der Mars, 1989, p. 57; see Table 3.7).

Table 3.7. Verbal Recall Rater Reliability

<i>Analysis Category</i>	<i>Inter-Rater Reliability</i>	<i>Intra-Rater Reliability</i>
Total Observations	% Agreement	% Agreement
<i>Action Concepts</i>	92	100
<i>Condition Concepts</i>	97	99
<i>Goal Concepts</i>	85	100

After all statements were coded into concepts, frequency of items in each concept was tallied. Concepts were then broken down by characteristics into sub-categories. Next, more detailed micro-analysis occurred through a qualitative, hierarchal examination of each condition, action, and goal concept. Coding rules established by McPherson (1993, p. 169) were used for micro-analysis and are provided in Table 3.8. Finally, concept categories and frequencies were tallied regarding these levels for each concept category.

Table 3.8. Coding Rules

Quality Level				
Code Type	0	1	2	3
<i>Condition Quality</i>	Inappropriate /weak	General condition, no characteristics	Appropriate, once characteristic	Appropriate, two or more characteristics
<i>Action Quality</i>	General/weak	Appropriate, no forceful quality, only action	Appropriate, one forceful quality	Appropriate, two or more forceful qualities
<i>Goal Quality</i>	Skill and self	Self and teammates	Win/ Winning the game/the point	-----

### **Teacher Interview**

The teacher interviews was transcribed and content analyzed to determine teacher understanding of TGM, net/wall content, and to understand teacher's perceptions of students' performances. Specifically, the interview transcripts were coded in relationship to the specific themes listed above. This information was used in triangulation of other data sources.

### **Focus Group Interviews**

Focus group interviews were transcribed. Next, students' statements were content analyzed. Content analysis was used to determine what students learned during the unit.

### **Descriptive Field Notes and Model Fidelity**

All videotaped field note observations were content analyzed to determine teacher understanding and implementation of TGM, net/wall content (e.g., lesson set-up, questions, conditioned games) and model progress. Twelve random lessons (30% of the 40 lessons) were viewed to validate the use of TGM. Metzler's (2000) teacher and student benchmarks were used to verify the fidelity of the model. The following headings are aligned to represent Metzler's (2000) teacher and student benchmarks (see Appendix D).

#### **Content**

The tactical problems presented in each lesson were consistent with lessons used from the Mitchell, Oslin and Griffin (2003) textbook (see Appendix A). These problems were consistently established and used as the organizing center for each learning task. Each day began with a question-answer review of the previous day's tactical problem and student solutions. Student examples were often used in the review. Each lesson, the teacher asked students to view the court set-up and boundaries and explain what this told them about the game. This strategy honed students in on court space and boundaries and was used as means of aiding students to think about how the constraints of the game might impact their strategy and etiquette from court to court. Abby always introduced the tactical problem, the game and scoring rules, and asked students to think about how they might achieve the goal of the game. Often times, the word "goal" was substituted for the

words “tactical problem.” The teacher quickly matched target students together and against each other for game play each day.

### Sequence

The TGM sequence was followed in every lesson (i.e. game > practice > game, with intermittent question-answer segments). The average segment length is presented in Table 3.9.

Table 3.9. Segment Length and Teacher-Student Interactions in TGM Sequence

<i>TGM Sequence Segment or Interaction</i>	<i>Average Time (Minutes) or Average Number of Interactions</i>
Review and introduction to the tactical problem and game rules	5 minutes
Game 1	10 minutes
Situated practice	10 minutes
Game 2	8 minutes
Whole group question-answer	3 minutes
Lesson conclusion and checking for understanding	3 minutes
Management	6 minutes
Average number of teacher-student interactions (team or individual “freeze” segments) per lesson	20 interactions

### Modifications

For the game segments, modified games were always used and were set-up as suggested in the textbook’s lessons. These lessons consistently situated the tactical problem to be solved. For the situated practices, game forms were always used as

suggested in the textbook's lessons. The court boundaries were consistently modified to provide space for all students to participate and to set the tactical problem (e.g. long, narrow courts for badminton). The nets were set at 5 feet in deck tennis, badminton, and volleyball to aid in student success. Equipment was altered to be developmentally appropriate; for example, beach balls were used in volleyball, short-handled rackets and elementary sized shuttles were used in badminton, elementary paddles and tennis balls were used in pickleball, and flat playground balls were used as a deck ring.

### **Questioning**

The teacher consistently provided feedback through repeated questioning to guide students to a particular answer regarding the tactical problem. Questions included how, what, when, where, why, if-this-then what, and timing. The average number of questioning interactions requesting student response was 25 per lesson. The teacher's wait time ranged from 5-15 seconds for responses, and average wait time was 10 seconds before calling on a single student or asking another leading question. The teacher would spend up to 2 minutes with the whole group on a particular question related to the tactical problem. The teacher, on average, called on 10 different students each day in whole group question-answer segments. Throughout the entire class, the teacher interacted directly with each student at least once. In whole group questioning, students provided a conglomeration of correct and incorrect answers and often added to each other's responses. The teacher constantly initiated questions with students, used examples, and backtracked until appropriate answers were provided.

### **Lesson Conclusion**

The teacher engaged students in whole group question-answer segments at the end of every lesson, using questions related to the tactical problem and to previous problems. She allowed students who had not participated in discussion earlier to respond. She asked questions such as, “Do you have anything to add?”, “What did you find easy or hard about today’s lesson?”, or “How did you achieve today’s goal?”.

### **Assessment**

A summative assessment such as the Game Performance Assessment Instrument (GPAI) was not conducted by the teacher. Implementation of the GPAI was not part of the teacher’s initial training since there were multiple data sources being collected. Observational assessments were continually made by the teacher and used for the purpose of initiating question-answer segments, providing feedback to students, and for making game modifications for individual students.

### **Video Taped and Audio Taped Teacher and Student Performances**

Transcripts of video and audio taped teacher and student performances were content analyzed to provide model verification, to determine teachers’ understanding, and to examine student/teacher performances. This was used in triangulation of other data sources.

### **Final Analysis**

All intermediate data were constantly compared, axially and selectively coded, and triangulated to develop categories. Data were related to teacher facilitation/class structure to determine the best means for representing the phenomena.

## **Triangulation**

Trustworthiness was established through triangulation of all data, critical friend review, and keeping an inventory of procedures, reflections, and analyses memos (Creswell, 1998; Merriam, 1998; Rossman & Rallis, 2003). A critical friend helped with debriefing the findings and keeping the study in-line with the purpose, and provoked questions in light of analysis and researcher bias. Research memos provided an inventory of procedures, reflections, ideas, difficulties, and interactions throughout the study.

## CHAPTER 4

### MANUSCRIPT I (GPAI RESULTS/IMPLEMENTATION)

#### Introduction

The Tactical Games Model (TGM; Griffin, Mitchell & Oslin, 1997), a version of Teaching Games for Understanding (TGfU) (Bunker & Thorpe, 1982), was developed in the United States and tailored to provide teachers with a clear-cut plan for understanding concepts and implementing the model (Mitchell, 2005). TGM involves a game, practice, game lesson sequence with intermittent questioning and answering segments (Mitchell, Oslin & Griffin, 2006). Like the original model, the lesson sequence comprises segments that offer elements of game-form, including modification and exaggeration, and opportunities to make decisions and develop skill (Collier, Oslin, Rodriguez & Gutierrez, 2010). These elements help students to learn tactical awareness needed for decision-making and skill execution. Students also learn how to perform motor skills efficiently (Mitchell et al., 2006). Game sampling can be used to highlight specific tactical problems that are shared across like games to aid in transfer of knowledge (Mitchell, Oslin & Griffin, 2003). Game sampling is a technique where games in the same category are played in consecutive lessons so students experience different games must the same tactical problems (throw tennis, pickleball, handball, deck tennis, badminton, volleyball, etc.)

Proponents of the model contend that TGM possesses elements that make it a worthwhile, holistic games approach that promotes skill development, tactical awareness, problem-solving, and fosters a motivation to continue to learn and play games (Oslin & Mitchell, 2006). These elements include (a) an invitation to play the game first, which

taps into student's inherent desire to play, (b) the use of tactical problems which are shared among like-games (learning decision-making in one game has the potential to transfer to another), (c) infusion of problem-solving which aids in the development of decision-making for games, and (d) engagement in problem-solving processes which aids in the development of life-long decision-makers (Oslin & Mitchell, 2006).

### **TGM Research**

Early studies on TGM compared the model to a mastery learning approach. Multiple studies sought to determine which approach more readily impacted students' skill and knowledge (Allison & Thorpe, 1997; French, Werner, Rink, Taylor, & Hussey, 1996a; French, Werner, Taylor, Hussey, & Jones, 1996b; Gabriele & Maxwell, 1995; Griffin, Oslin, & Mitchell, 1995; 1997; Lawton, 1989; Light, 2002; Mitchell, Griffin & Oslin, 1997; Mitchell, Oslin & Griffin, 1995; Rink, French & Tjeerdsma, 1996; Turner, 1996; Turner & Martinek, 1992; 1999). These studies took place in settings in which the teachers were physical education specialists trained in TGM. The participants varied in school level from college to high school and middle school, but the majority were middle school students in short units. Combined, these studies encompassed analysis in two game classifications (a) invasion games (basketball, field hockey, soccer), and (b) net/wall games (badminton, volleyball, and squash).

Mixed conclusions regarding the validity and merits of TGM have resulted from these comparative studies and have not supported one approach over the other. For example, Rink, French and Tjeerdsma (1996) found that students in a tactical approach related better to tests on tactical knowledge compared to students in a technique approach. Other studies have examined differences in knowledge acquisition. Griffin et

al., (1995) found differences between groups in declarative knowledge for volleyball and Turner (1996) also found that declarative knowledge was greater for the tactical group in field hockey. Light (2002) examined the effectiveness of the model on student engagement and cognition. He suggested that the questioning and discussion of ‘what to do’, the embedded processes within the model, facilitated higher order thinking.

From an affective perspective, TGM has been found to be more enjoyable and to enhance student motivation to be involved in class. (Griffin, Oslin & Mitchell, 1999; McKeen, Webb & Pearson, 2005). Researchers (Light, 2003; Pope, 2004) suggest that the affective experiences offered by positive game involvement are highly important to learning to play games and sport.

Conversely, less support for TGM has been offered by other comparative studies. For example, Turner and Martinek (1999) found that tactically taught students in a field hockey study did not demonstrate significant improvements in tackling, dribbling and shooting, but were able to demonstrate better passing and control. Turner (1996) found no differences for skill development between the two approaches.

More recently, experts have offered that comparing TGM to a mastery learning approach is irrelevant to understanding how students learn in TGM (Hopper, 2002; Rink, 2001). Each approach has different objectives and intended outcomes. Metzler (2006) concluded that what you teach for is what you get. Rink (2010) suggested that a “versus language is not helpful (p. 36)” and that future research should focus on the teaching and learning process of TGM supported by a learning theory (Rink, 2001; Rink, 2010).

Further, these comparative studies are limited in their ability to validate assumptions of TGM. First, comparing two different approaches may result in

inappropriate conclusions because the content variability, instructional roles and methods, as well as teachers and instructional environment, posed such diversity. Second, these studies lacked description regarding the use of the model, making generalizability of these studies and the validation of the model unlikely. Third, the short length of the units may not have provided enough time for significant learning. Though these investigations were methodologically weak, these studies showed positive reports regarding the model's contributions to improved skill, cognition, and game performance.

Few studies have attempted to examine game performance and tactical knowledge development in TGM alone, using an information-processing lens (Bohler, 2009; Griffin, Dodds, Placek & Tremino, 2001; Mahut et al., 2003; Nevett, Rovegno, Babiarz & McCaughtry, 2001; Nevett, Rovegno & Babiarz, 2001). Griffin and Patton (2006) suggested that an information-processing lens be used to examine student learning in TGM. Information-processing is a powerful lens to view student learning of games because the theoretical frame can help extract what information students gather, store, and retrieve while participating in lessons, and this lens can help researchers understand how that information is used. Collectively, these studies sole TGM studies suggest that novices vary in their game performance and tactical knowledge when they enter a unit and as they progress through a unit (Bohler, 2009; Griffin et al., 2001; Mahut et al., 2003; Rovegno et al., 2001). A novice continuum of development seems to exist for game understanding, as expressed in "knowledge taxonomies" (Griffin et al., 2001) and in characteristics for "expectation horizon" (Mahut et al., 2003). "Knowledge taxonomies" were hierarchal levels used to assess student's strategic knowledge in Griffin et al.'s study (2001). "Expectation horizon" was student's level of projected game configurations

after viewing a video of their play in Mahut et al.'s study. Though knowledge structures do develop and expand, knowledge structures tend to be basic, typically lack sophistication, and approach student problem-solving broadly (Bohler, 2009; Griffin et al., 2001; Rovegno et al., 2001; Mahut et al., 2003). Knowledge structures remain unstable and fragile (Bohler, 2009; Mahut et al., 2003; Rovegno et al., 2001). Novices tend to report more action statements, which are motor or perceptual responses (Bohler, 2009; Rovegno et al., 2001).

Researchers from these studies have also offered some insight regarding implementation of TGM. Mahut et al. (2003) suggested that verbalization of game events and using debate of ideas helps students recognize environmental conditions, which in turn supports understanding of sequence of events and aids in action planning. Rovegno et al. (2001) and Bohler (2009) suggested teachers needed to be able to effectively implement the model for novice learning, considering environmental interactions, as opposed to just implementing the model sequence. Bohler (2009) also proposed that teachers be able to effectively represent the tactical problems to facilitate novice understanding. Moreover, model implementation should be discussed and validated by the researcher to add confidence to the findings. Longer units may also have a greater influence on student development (Bohler, 2009). Griffin et al. (2001) and Mahut et al. (2003) referred to various levels of understanding and levels of play. Considering various levels or taxonomies of development and knowing where students start and how students move through these levels may provide more concrete insight into how students learn games.

Though limited research exists regarding transfer in TGM (Contreras Jordan et al., 2003; Jones & Farrow, 1999; Mitchell & Oslin, 1998), these studies suggest that the potential exists for transfer of tactics among like-games (i.e., games in the same Game Category). Studies regarding transfer from generic invasion games to hockey (Contreras Jordan et al., 2003), volleyball to badminton (Jones & Farrow, 1999), and badminton to pickleball (Mitchell & Oslin, 1999) have offered support for the use of Games Classification system within TGM to elicit transfer. Mitchell and Oslin (1999) provided that knowledge gained from these studies can aid in how we order games in the curriculum to set up tactical transfer. Understanding specific tactical concepts that transfer among novices, as well as examining progression of overall game play, may give further insight into novices' learning of tactics and provide further support for TGM.

### **Cognition in Game Play**

Studies on novices' decision-making and skill executions provide some further insight into student cognition in sport-related games. Novices have been examined in comparison to experts using an information-processing lens. These studies have offered some insight into how novices differ in their knowledge base and game performance in relationship to experts. Expertise studies have shown that experts and novices vary greatly in their knowledge base. Abernethy, Burgess-Limerick and Parks (1994) found distinctions between experts' and novices' motor execution and response selection processes. Their results revealed that adult sport experts exhibit superior tactical decision-making and motor skill execution. Several studies have detailed that child experts' performances rarely attain the highly developed response selection and motor skill execution planes achieved by adult experts (French & McPherson, 1999; Nielson &

McPherson, 2001; McPherson, 1999). In tennis studies (McPherson, 1999, 2000; McPherson, French & Kernodle, 2002; McPherson & Thomas, 1989; Nielsen & McPherson, 2001) and baseball studies (Nevett & French, 1997; Nevett, 1996), knowledge and content retrieved were examined. Extreme differences arose in conditions (circumstances in which actions occur) and actions (motor or perceptual responses) that were accessed by novices and experts.

Overall, these cognition studies in sport have shown that in motor skill performance and in response selection processes (a) sport experts are automatic, consistent, adaptable, perceptive, self-monitoring, fast and accurate, knowledgeable, and they anticipate and plan in advance, while (b) novices are self focused, attend to irrelevant conditions, and have limited retrieval strategies. Also novices retrieve a limited number of actions, (mostly primary), and access single movements without planning. Novices typically do not reflect on their action and rarely reflect on the opponent. They lack consistency and are passive in assessing the game (see French & McPherson, 1994).

Henninger, Pagnano, Patton, Griffin and Dodds (2006) offered a descriptive examination of four college-age novices' knowledge of volleyball. The researchers concluded that novices do bring domain-specific knowledge into the classroom, but often have difficulty accessing the knowledge to plan for future movements during play. Game scenarios offered students more time to process what they would do, and they were able to provide more condition and action responses that were more refined than the verbal reports. Novices in this study demonstrated characteristics described in previous studies (McPherson, 1993; 1999; McPherson & Thomas, 1989; Nevett & French, 1997).

Understanding characteristics of play at diverse levels can provide physical educators with insight to set reasonable performance expectations that can support students' desire to play. French and McPherson (2004) and Henninger et al. (2006) discussed that more research is needed to better understand response-selection processes and to better understand how to develop a knowledge base and to facilitate the learning of those processes, especially of novices.

Since games are a primary part of physical education curriculum, understanding how students can best learn and understand game play is highly relevant to the development of appropriate lessons and practices for novices. Research which explores the ways in which novice students think about games and learn tactics can be useful in the understanding of curriculum events that influence tactical and strategic knowledge development, help students make connections to previous knowledge, support appropriate motor skill selection and execution, and promote students' ability to make decisions in game contexts (Griffin, Dodds, Placek & Tremino, 2001). "Very few individuals have even thought about how we might practice or teach skills related to current event profiles" (French & McPherson, 2004). Current event profiles are synopses of student's "ability to accurately monitor current task demands, use strategic and tactical planning, predict probable outcomes with increasing sophistication, and anticipate opponents' intentions" (p. 96, Ward & Williams, 2003). One suggestion offered for future research is to examine types of practice activities and view what types of response selection and execution improvement occurs. A second suggestion for future research is to describe developmental performance changes in cognition and motor processes in various sports, particularly in young people (McPherson & French, 2004). TGM is one

teaching model that proponents have said facilitates students' response-selection and execution processes. Because of the model's underlying assumptions and organizational arrangement, the activities situated in this model are worthy of examination.

Assumptions of TGM have primarily lacked theoretical under-pinning and are not supported by any substantial descriptive studies. Additionally, limited information exists regarding how novices develop response selections skills for sport-related games or the extent to which students engage in decision-making in TGM. This paper presents data from a study conducted to examine fifth-grade students' cognition in a 20-day Tactical Games Model (TGM) net/wall sampling unit. More specifically, the purpose of this study was to provide a rich description of TGM implementation and students' engagement in decision-making and game performance during a lengthy TGM sampling unit. An information-processing lens was used to frame this study. Information processing is a theory for understanding how individuals select, use, store, and interpret information (Starkes & Allard, 1993). From a teaching perspective, this theory has been used to explain the types of information provided to the learner and how it is conveyed (Rink, 1999). This paper is intended to (a) understand novices' decision-making in game play and across like-games in TGM, (b) add support regarding the assumptions of TGM, and (c) add strength to the research process for examining student engagement within TGM.

### **Methodology**

This study was part of a larger study. A case study research design (Creswell, 1998; Straus & Corbin, 1998) was used in this investigation. Case study design is a descriptive technique used to illicit considerable amounts of information that offer deep meaning about a single circumstance or occurrence. In depth information found within a

case study may be used to attain a better understanding of similar cases (Creswell, 1998). This particular case was used instrumentally (Stake, 1995) to examine fifth-grade students' cognition during a physical education unit as a result of implementing a tactical games model of instruction.

### **Setting**

The setting was a suburban elementary school in the northeastern United States. Students at Shade Tree Elementary (STE) participated in year-long physical education, 50 minutes per class, 2 days per week. The curriculum was focused on the development of students' movement skills through station skill practice, games, dance, and fitness activities. The primary curriculum venue in past years has been skill themes and movement concepts (Graham, Holt/Hale, & Parker, 2010). Skills such as throwing and catching, striking, and dribbling are taught at developmentally appropriate levels through a variety of means (individual skill practice, stations, games, etc.) using direct instruction, peer teaching, and discovery learning. Other venues include Building Dances (McGreevy-Nichols, Scheff, & Sprague, 2005) using a constructivist perspective, as well as activities and events such as school field day, and Jump Rope for Heart (American Heart Association; AMA; 2009). TGM had never been implemented during the current physical educator's 21-year tenure; however, the teacher wanted to begin to implement the model with her fifth grade classes.

### **Participants**

#### **Teacher Participant**

Abby (pseudonym), is the physical educator and head teacher at STE. Active in her state's professional organization (e.g., held high elected leadership position), she has

previously been recognized as the state physical educator of the year and the National Association for Physical Education teacher of the year.

### **Student Participants**

Student participants in this study were 16 purposefully selected fifth graders. Specifically, two classes (N=50) out of five fifth grade classes were selected to participate in this study. Classes were purposefully selected based on the convenience of class schedule. Due to constraints placed on data collection procedures (i.e. camera placement and viewing ability), eight students, of various skill levels, were selected from each class (M=8, F=8; n=16) as primary student participants.

Participant selection included considerations such as the following: consent, student's ability to communicate in an interview, the teachers' belief that students would be in attendance, and teacher's ranking of skill level. Consent was obtained from the school's administration, the teacher, the students, and the parents. Permission from the university's Institutional Review Board (IRB) was also obtained. Pseudonyms are used to protect the identity of participants and the school. Complete data were obtained for 11 target students (n=11). Absenteeism and being pulled from physical education for band sectional practice contributed to the loss of data for five participants. These five participants missed between 1-3 lessons and did not have video- or audio-taped game performances or verbal recall data for the few days they were out.

### **Teacher Training**

A constructivist perspective was used to train Abby in TGM. Abby engaged in a series of readings and exploratory teaching practices with her own students. Intermittent

reflections and discussions with the investigator occurred throughout the training process. Research memos and field notes were used to record the training.

### **Reading**

After an initial teacher interview was conducted, teacher training began with a selection of readings determined by the investigator (see Table 4.1). Abby kept a journal of notes and questions. These were discussed at regularly scheduled meetings.

Table 4.1. – Selected Readings for Teacher Training

<b>Authors</b>	<b>Book</b>	<b>Chapters/ Assignment</b>
Griffin, L.L., & Butler, J.	(2005). <i>Teaching Games for Understanding: Theory, Research, and Practice. Human Kinetics: Champaign, IL.</i>	1,2,3,4,7,8,11,12,13
Mitchell, S.A., Oslin, J.L., & Griffin, L.L.	(2006). <i>Teaching Sport Concepts and Skills: A Tactical Games Approach. Human Kinetics: Champaign, IL.</i>	1,2,3,15,16,17,18; Study Tables 2.1, 2.2, page 17, and tip boxes.
Mitchell, S.A., Oslin, J.L., & Griffin, L.L.	(2003). <i>Sport Foundations for Elementary Physical Education: A Tactical Games Approach. Human Kinetics: Champaign, IL.</i>	4, 5

The meetings were used to determine the sport content that would be most appropriate for this investigation based on Abby’s ability and comfort level, student ability, gymnasium space, and ease of data collection. A net/wall sampling unit was decided upon as the mode for student participation for this investigation. We planned a net/wall unit for Abby to practice with the classes (1, 2, and 3) that were not part of this study. For those students that were part of the study (classes 4 and 5), we planned an invasion games unit for them during the teacher training. The rationale for this decision

was to provide the investigation group experience in participating and learning within the model and to aid in data collection procedures. This invasion games unit was also another opportunity for Abby to practice facilitating within the model (see Table 4.2).

Table 4.2. TGM Training for Teacher and Student (6 days of teaching)

Training with non-investigation groups (Classes 1, 2, & 3)	Training with investigation groups (Classes 4 & 5)
Teacher trains by teaching TGM <i>net/wall games</i> to students that will not be participating in the study.	Teacher trains by teaching TGM <i>invasion games</i> to students who will be in the study; students experience the model, practice verbal recall, and experience having cameras in the gym.

### **Training Unit**

The teacher-training unit was a 6-day unit of net/wall games with three classes not part of the investigation (3 weeks) along with a 6-day unit of invasion games (3 weeks) with the classes that were part of the investigation. Prior to each lesson, Abby and I discussed the tactical problem and the focus for the day. Abby was very comfortable with me being in the gym, included my name on the wall as an Shade Tree Elementary teacher as to involve me in the classroom community, and often asked if I had anything to add or any questions to ask the students. Occasionally, I modeled questions based on my observations of students. After each lesson, we reflected on students' learning.

During the training segment, we made minor lesson revisions to adjust for the investigative unit. We combined the first two lessons, adjusted game and practice time in some lessons, and changed some equipment (e.g. deck ring to flat playground ball).

## **TGM Investigation Unit**

A 20-day net/wall sampling unit was observed and analyzed. The unit was constructed closely to the net/wall sampling unit developed by Mitchell, Oslin, and Griffin (2003). Abby taught the unit to two classes of approximately 25 students. Eight target student participants in each class intermingled and participated with and against each other on a select set of courts that could be viewed through the video cameras. The unit schedule according to the text used is displayed in Appendix A. The entire class time was devoted to TGM. The first 2-5 minutes of class was structured to provide students with the tactical problem, game rules, expectations, etc. The unit then commenced according to the sequence as outlined in the book or deemed appropriate by the teacher.

### **Data Collection**

Multiple data sources were used to explore students' tactical understanding, decision-making, transfer of learning, and to verify the implementation of TGM. These included pre-post unit game play assessment (pickleball, badminton, and volleyball), descriptive field notes, video-taped student performances, and audio-taped lessons.

### **Game Play Assessment**

Prior to the unit, students engaged in 15 minutes of game play for the following net/wall games: pickle ball, badminton, and volleyball. The goal for each game was for students to outscore their opponents. Games were modified (e.g., court boundaries; see Appendix B) and videotaped, serving as baseline and post-unit measures for performance, involvement, skill execution, decision-making and support.

### **Descriptive Field Notes**

Descriptive field notes were taken each day, and memos were taken during viewing of videotapes. Teacher's interaction and use of the model, students' engagement, and pertinent student interactions were noted. Metzler's (2000) teacher benchmarks (see Appendix C), as well as a researcher- developed checklist were used in developing notes to validate the model (see Appendix D).

### **Video Taped and Audio Taped Lessons**

The daily lessons were videotaped and audio taped. Video- and audio- tapes were analyzed to verify the use of the model, and to examine teacher facilitation, student participation, and how the lesson staged knowledge structures.

### **Verbal reports**

Verbal reports were used to examine students' tactical understanding and decision-making (i.e. problem representations). These reports were students' thought processes during problem-solving situations in the second game of each lesson. Tape recorders were placed at the sidelines. To initiate verbal recall, the researcher stopped game play after a point was scored or after a dead ball and asked players to verbally respond to a written prompt beside their tape recorder. This process was repeated until all eight students in each class responded at least once during each lesson. Prompts included questions about what students were thinking as they played. See Appendix F to examine the prompt sheet that was provided to students.

### **Data Analysis**

Analysis was on-going throughout data collection. Videotaped play was analyzed using the Game Performance Assessment Instrument (GPAI; Griffin, Mitchell, & Oslin,

1997). Field note observations were typed, and audio taped lessons were transcribed verbatim. Observations were compared to Metzler’s (2000) TGM teacher and student benchmarks and to the researcher-developed checklist to examine model fidelity.

**Game Play Assessment**

The videotaped pre-post-unit game play was analyzed using the Game Performance Assessment Instrument (GPAI; Griffin, Mitchell & Oslin, 1997). The GPAI was used to assess students’ tactical knowledge and game performance across the unit. Specific performances included students’ appropriate/ inappropriate or efficient/inefficient decision-making, skill execution, and support. Additionally, involvement and game performance scores were calculated. Performances are reported using descriptive statistics. Specific coding criteria are provided in Appendix E. Indices were calculated for decision-making, skill execution, support, involvement, and game performance. Calculation procedures are in Table 4.3.

Table 4.3. Game Performance Assessment Instrument Calculation

<i>Index</i>	<i>Calculation</i>
<i>Support Index (SUPI)</i>	$\frac{\text{appropriate support}}{\text{(appropriate support + inappropriate support)}}$
<i>Decision-Making Index (DMI)</i>	$\frac{\text{appropriate decisions}}{\text{(appropriate decisions + inappropriate decisions)}}$
<i>Skill Execution Index (SEI)</i>	$\frac{\text{efficient skill executions}}{\text{(efficient skill execution + inefficient skill execution)}}$
<i>Game Performance Index (GPI)</i>	$\frac{[\text{decision-making Index} + \text{skill execution index} + \text{support index}]}{3}$
<i>Involvement Score (IS)</i>	$\text{appropriate decisions} + \text{inappropriate decisions} + \text{efficient skill executions} + \text{inefficient skill executions} + \text{appropriate supporting movements}$

Rater reliability was established prior to coding and analysis of GPAI data. Coder training was conducted before reliability measures were conducted. For training, 10% of the data were provided to a second trained coder and he coded game play for each of the indices. The coding was compared to the researcher's scores for a reliability of 90 % or greater for initial reliability. When 90 % reliability was achieved during training, coding resumed.

Thirty-percent of the GPAI data were randomly selected and coded for rater reliability. All inter- and intra- ratings for number of observations and appropriate/inappropriate or efficient/inefficient coding were greater than 80 %, demonstrating rater reliability and consistency (van der Mars, 1989, p. 57; see Tables 4.4 through 4.6).

Table 4. 4. GPAI Rater Reliability: Pickleball

<i>Analysis Category</i>	<i>Inter-Rater Reliability</i>	<i>Intra-Rater Reliability</i>
Total Observations (Appropriate + Inappropriate Ratios)	% Agreement	% Agreement
<i>Decision-Making</i>	92	100
<i>Support</i>	97	99
<i>Skill Execution</i>	85	100
Segregated Observations (Appropriate / Inappropriate / No Decision Observations) Or (Efficient / Inefficient Observations)	% Agreement	% Agreement
<i>Decision-Making</i>	84 / 92 / 99	100 / 99 / 99
<i>Support</i>	97 / 97	98 / 99
<i>Skill Execution</i>	85 / 85	99 / 99

Table 4. 5. GPAI Rater Reliability: Badminton

<i>Analysis Category</i>	<i>Inter-Rater Reliability</i>	<i>Intra-Rater Reliability</i>
Total Observations (Appropriate + Inappropriate Ratios)	% Agreement	% Agreement
<i>Decision-Making</i>	99	97
<i>Support</i>	94	100
<i>Skill Execution</i>	99	100
Segregated Observations (Appropriate / Inappropriate / No Decision Observations) Or (Efficient / Inefficient Observations)	% Agreement	% Agreement
<i>Decision-Making</i>	94 / 98 / 84	99 / 93 / 91
<i>Support</i>	93 / 96	100 / 99
<i>Skill Execution</i>	100 / 97	99 / 99

Table 4. 6. GPAI Rater Reliability: Volleyball

<i>Analysis Category</i>	<i>Inter-Rater Reliability</i>	<i>Intra-Rater Reliability</i>
Total Observations (Appropriate + Inappropriate Ratios)	% Agreement	% Agreement
<i>Decision-Making</i>	93	98
<i>Support</i>	99	96
<i>Skill Execution</i>	92	100
Segregated Observations (Appropriate / Inappropriate Observations) Or (Efficient/ Inefficient Observations) Or (Perfect Pass/ Good / Not Playable]	% Agreement	% Agreement
<i>Decision-Making</i>	91 / 95	100 / 96
<i>Support</i>	96 / 97	93 / 100
<i>Skill Execution</i>	86 / 95 / 92	100 / 100 / 100

## **Descriptive Field Notes and Model Fidelity**

All videotaped field note observations were content analyzed to determine teacher understanding and implementation of TGM, net/wall content (e.g., lesson set-up, questions, conditioned games) and model progress. Twelve random lessons (30% of the 40 lessons) were viewed to validate the use of TGM. Metzler's (2000) teacher and student benchmarks were used to verify the fidelity of the model. The following headings are aligned to represent Metzler's (2000) teacher and student benchmarks (see Appendix C).

### **Content**

The tactical problems presented in each lesson were consistent with lessons used from the Mitchell, Oslin and Griffin (2003) textbook (see Appendix A). These problems were consistently established and used as the organizing center for each learning task. Each day began with a question-answer review of the previous day's tactical problem and student solutions. Student examples were often used in the review. Each lesson, the teacher asked students to view the court set-up and boundaries and explain what this told them about the game. This strategy honed students in on court space and boundaries, and was used as means of aiding students to think about how the constraints of the game might impact their strategy and etiquette from court to court. Abby always introduced the tactical problem, the game and scoring rules, and asked students to think about how they might achieve the goal of the game. Often times, the word "goal" was substituted for the words "tactical problem." The teacher quickly matched target students together and against each other for game play each day.

## Sequence

The TGM sequence was followed in every lesson (i.e. game  $\Rightarrow$  practice  $\Rightarrow$  game, with intermittent question-answer segments). The average segment length is presented in Table 4.7.

Table 4.7. Segment Length and Teacher-Student Interactions in TGM Sequence

<i>TGM Sequence Segment or Interaction</i>	<i>Average Time (Minutes) or Average Number of Interactions</i>
Review and introduction to the tactical problem and game rules	5 minutes
Game 1	10 minutes
Situated practice	10 minutes
Game 2	8 minutes
Whole group question-answer	3 minutes
Lesson conclusion and checking for understanding	3 minutes
Management	6 minutes
Average number of teacher-student interactions (team or individual “freeze” segments) per lesson	20 interactions

## Modifications

For the game segments, modified games were always used and were set-up as suggested in the textbook’s lessons. These lessons consistently situated the tactical problem to be solved. For the situated practices, game forms were always used as suggested in the textbook’s lessons. The court boundaries were consistently modified to

provide space for all students to participate and to set the tactical problem (e.g. long, narrow courts for badminton). The nets were set at 5 feet in deck tennis, badminton, and volleyball to aid in student success. Equipment was altered to be developmentally appropriate; for example, beach balls were used in volleyball, short-handled rackets and elementary sized shuttles were used in badminton, elementary paddles and tennis balls were used in pickleball, and flat playground balls were used as a deck ring.

### **Questioning**

The teacher consistently provided feedback through repeated questioning to guide students to a particular answer regarding the tactical problem. Questions included how, what, when, where, why, if-this-then what, and timing. The average number of questioning interactions requesting student response was 25 per lesson. The teacher's wait time ranged from 5-15 seconds for responses, and average wait time was 10 seconds before calling on a single student or asking another leading question. The teacher would spend up to 2 minutes with the whole group on a particular question related to the tactical problem. The teacher, on average, called on 10 different students each day in whole group question-answer segments. Throughout the entire class, the teacher interacted directly with each student at least once. In whole group questioning, students provided a conglomeration of correct and incorrect answers and often added to each other's responses. The teacher constantly initiated questions with students, used examples, and backtracked until appropriate answers were provided.

### **Lesson Conclusion**

The teacher engaged students in whole group question-answer segments at the end of every lesson, using questions related to the tactical problem and to previous problems.

She allowed students who had not participated in discussion earlier to respond. She asked questions such as, “Do you have anything to add?”, “What did you find easy or hard about today’s lesson?”, or “How did you achieve today’s goal?”.

### **Assessment**

Summative assessment such as GPAI was not conducted by the teacher. Implementation of the GPAI was not part of the teacher’s initial training since there were multiple data sources being collected. Observational assessments were continually made by the teacher and used for the purpose of initiating question-answer segments, providing feedback to students, and for making game modifications for individual students.

### **Video Taped and Audio Taped Teacher and Student Performances**

Transcripts of video and audio taped teacher and student performances were content analyzed to provide model verification, to determine teachers’ understanding, and to examine student/teacher performances. This was used in triangulation of other data sources.

### **Verbal Reports**

For this study, verbal reports were content analyzed to understand student thought processes. These data were used in triangulation of other data sources.

### **Final Analysis**

All intermediate data were constantly compared, axially and selectively coded, and triangulated to develop categories. Data were related to teacher facilitation/class structure to determine the best means for representing the phenomena.

## **Triangulation**

Trustworthiness was established through triangulation of all data, critical friend review, and keeping an inventory of procedures, reflections, and analyses memos (Creswell, 1998; Merriam, 1998; Rossman & Rallis, 2003). A critical friend helped with debriefing the findings and keeping the study in-line with the purpose, and provoked questions in light of analysis and researcher bias. Research memos provided an inventory of procedures, reflections, ideas, difficulties, and interactions throughout the study.

## **Results**

Results for this study are demonstrated below according to the Game Performance Assessment indices used in this study (support, decision-making, skill execution, game performance, and involvement), and observations of participants. Results demonstrated improvement across the majority of these indices. Student responses were mediated by positive student interactions with the tactical problem, the lesson sequence, and teacher.

### **Game Performance Assessment**

Mean pre- and post- unit index scores for pickleball, badminton, and volleyball are reported in Table 4.8 for support (SUPI), decision-making (DMI), skill execution (SEI), and game performance (GPI). These scores are ratios, falling between zero (0) and one (1), where one (1) is optimal. Mean involvement scores (IS) are shown in Table 4.9.

## **Support Indices**

Scores were low in pre-unit assessment of support for all three game samples (see Table 4.8). All pre-unit means were below an index of 0.3 (out of 1.0), with all three samples being near equivalent to each other (pickleball 0.3; badminton 0.2; volleyball 0.2). In the post-unit assessment, scores from all three game samples showed

improvement and ranged from 0.6 to 0.8 (out of 1.0). These scores are considered high since they are above 0.5, meaning that on average, students returned to a supporting position after an execution more times than they did not. The largest improvement from pre- to post-unit was in volleyball, while pickleball had the smallest improvement. The highest post-unit mean was in volleyball, while pickleball had the lowest mean.

### **Decision-Making Indices**

In examining decision-making across pre- to post-unit assessment (see Table 4.10), initial indices across all game samples were low, falling below 0.3 (out of 1.0). Initial pickleball and badminton scores were equivalent, while initial volleyball scores were the lowest of the three samples (pickleball 0.3; badminton 0.3; volleyball 0.2). Post-unit scores increased for all three games samples and ranged from 0.5 to 0.7. Means in post-unit volleyball and badminton were considered high because more appropriate decisions were made than inappropriate decisions. The ratios of appropriate to inappropriate decisions for post-unit pickleball were almost equal, though inappropriate decisions outweighed appropriate decisions by 0.03. The largest improvement in decision-making was in volleyball, while pickleball scores demonstrated the smallest improvement of the three game samples. The highest post-unit mean for decision-making was in volleyball, and pickleball had the lowest mean (see Table 4.10).

Table 4.8. Mean Pre- and Post- Unit GPAI Index Scores for Target Students

<i>Index</i>	<i>Activity</i>							
	Pickleball		Badminton		Volleyball		Combined Samples	
	Pre-Unit	Post-Unit	Pre-Unit	Post-Unit	Pre-Unit	Post-Unit	Pre-Unit	Post-Unit
Support	.3	.6	.2	.7	.2	.8	.3	.7
Decision-Making	.3	.5	.3	.6	.2	.7	.2	.6
Skill Execution	.4	.5	.6	.7	.5	.8	.5	.6
Game Performance	.3	.5	.4	.6	.3	.6	.3	.6

Table 4.9. Mean Pre- and Post- Unit Game Involvement Scores for Target Students

<i>Index</i>	<i>Activity</i>							
	Pickleball		Badminton		Volleyball		Combined Samples	
	Pre-Unit	Post-Unit	Pre-Unit	Post-Unit	Pre-Unit	Post-Unit	Pre-Unit	Post-Unit
Game Involvement	102.4	88.7	219	252.1	38.8	61.4	120.1	134.1

Table 4.10. Mean Pre- and Post Unit Decision-Making Scores by Type of Responses for Target Students

	<i>Mean Score for Appropriate or Inappropriate Decision or No Decision</i>						
	Pre-Unit			Post-Unit			
	Approp.	Inapprop.	No Decision	Approp.	Inapprop.	No Decision	
Pickleball	.3	.3	.4	.5	.2	.3	
Badminton	.3	.4	.3	.6	.2	.2	
Volleyball	.2	.9	.0	.7	.4	.0	

Table 4.11. Target Students' Mean Pre- and Post- Unit Skill Execution Index Scores by Type of Responses

Activity	Mean Score for Efficient and Inefficient Skill Execution					
	Pre-Unit			Post-Unit		
	Efficient Hit	Inefficient Hit		Efficient Hit	Inefficient Hit	
Pickleball	.4	.6		.5	.5	
Badminton	.6	.4		.7	.3	
	Efficient Pass To Target	Playable Pass	Inefficient Pass (Not Playable)	Efficient Pass To Target	Playable Pass	Inefficient Pass (Not Playable)
Volleyball	.1	.4	.5	.4	.4	.2

### **Skill Execution Indices**

For skill execution (see Table 4.11), pre-unit means ranged from 0.4 to 0.6. The initial SEI mean for pickleball was low at 0.4. Initial badminton and volleyball SEI means were moderate at 0.6 and 0.5 respectively, as efficient and inefficient SEI were relatively equal for each game sample. Post-unit SEI means revealed improvement trends for each game sample. The average improvement across the unit was an index of 0.1. The largest SEI improvement was in volleyball, and the smallest improvement trend was in pickle ball. Post-SEI means for badminton and volleyball were considered high, as more efficient executions were made than inefficient executions in each game sample at 0.7 and 0.8 respectively. Post-SEI for pickle ball was near the moderate level with a mean of 0.5. The highest post-SEI mean was in volleyball, and the lowest was in pickle ball.

### **Game Performance Indices**

For overall game performance (see Table 4.8), initial scores for each game sample were low (pickleball 0.3; badminton 0.4; volleyball 0.3). All game samples improved in overall game performance from pre- to post-unit. Also, GPI post-unit means in

badminton and volleyball were considered high because these means reached above 0.5, signifying greater amounts of appropriate and efficient play over inappropriate and inefficient play. For pickleball, game performance improved, but did not surpass a moderate level of play; appropriate and inefficient scores were equivalent to inappropriate and inefficient scores. The greatest improvement in game performance was demonstrated in volleyball, with pickleball having the least improvement of the three game samples. The highest GPI score was in badminton, and the lowest in pickleball.

### **Involvement Scores**

Pre- to post-unit mean involvement scores (IS = appropriate SUPI + appropriate DMI + inappropriate DMI + efficient SEI + inefficient SEI; i.e. responses) varied across game samples (see Table 4.9). Mean involvement in pickleball was initially 102.4 responses, but dropped to 88.7 responses in post-unit assessment, for a decline in 13.6 responses. In badminton, mean involvement improved by 33.1 responses from pre- to post-unit. Pre- to post-unit involvement scores were 219 responses and 252.1 responses, respectively. Mean volleyball involvement scores increased by 22.5 responses from pre- to post-unit assessment. Mean volleyball involvement scores were 38.8 responses and 61.4 responses, respectively. The greatest improvement in involvement was in badminton, which also showed the highest involvement scores overall.

### **Interactions**

Student responses and skill executions were mediated by interactions with the tactical problem, the lesson sequence, and teacher. Observation as well as student statements supporting these interactions have led to three specific results. First, students' support movements were a contributing factor in their skill efficiency and their decision-

making abilities during play. Second, a continuum for decision-making regarding object placement was delineated from observations and compiled data. Third, transfer of decision-making and support existed for students learning in TGM.

### **Contributions of Learning Support**

GPAI results, as well as researcher observations and student statements during game play demonstrated that students learned on- and off- the ball supporting actions. Support was taught six times throughout the unit, and was linked to preparation for setting up to attack, as well as defending space. Throughout the unit, the teacher reiterated supportive movements, even when support was not the primary focus, through Question/Answer (Q/A) Segments, Freeze Segments, and individual feedback.

In Lesson 3 (competitive pickleball), field notes during the first game revealed that, “Students are not returning to base, but waiting.” Abby reiterates and addresses the tactical problem of defending space with students during the Q/A Segment after Game 1. This field note segment below demonstrates Abby’s interaction with students in a Q/A format and shows students’ initial limited understanding of when and why to return to baseline.

Abby: Who remembers the tactical problem?

Ginny: Defending space.

Abby: What is the focus?

Meg: Moving to baseline.

Abby: When do you find yourself moving to baseline?

Chris: When he throws it far.

Brandon: It depends on the speed of the throw.

Abby: If the score is close, what does that tell you?

Jon: You are both good at defending space.

Abby: If the score is 21-2, what does that tell you about how you are defending space? Think about what you need to do if you are the person with the low score.

After students finished participation in Lesson 3, Abby ends the class with a Q/A Segment. This observation from video- audio- taped lesson showed how the Q/A interaction and learning about the tactical problem through game play helped students to move from waiting on the return to see where to position themselves, to advance positioning to prepare for the next attack, early in the unit. Abby effectively provided prompts related to the tactical problem and guided students to a more specific answer. This segment also showed how one student, Chris, understood a defensive tactical problem in relation to his offensive tactical thinking.

Abby: What was the tactical problem?

Julie: Defending space.

Abby: What did you do?

Chris: Return to the back line.

Abby: You're right! What caused you to decide to return to baseline?

Chris: I aimed back because she didn't move.

Abby: You're right, but that's offense.

Chris: Okay. After she threw it, I moved to base.

Abby: *WHEN* do you decide to return to baseline? [Brandon?]

Brandon: *After* I throw.

GPAI results demonstrated that over time students had a greater ability to make more efficient skill executions and make better decisions about where to place the object.

Observations of student game play, as well as student statements revealed that as students made supporting movements, they were better able to track the object, thus their skill efficiency was enhanced, as was their decision-making about where to place the object.

In pickleball and badminton, students were more efficient in skill execution and more accurate in their decision-making when they returned to base line. Returning to base line provided them with more opportunities at appropriate skill execution, enhancing performance over time. For example, written field notes stated that in pre-unit assessment of badminton, “Alec stood and waited on the object. As the object came into the court, he had to backpedal and was not in position to make an efficient or effective hit.” Also, Alec was “not even focused on placement”, but was merely “just trying to make contact with the shuttle and just get to it.” This occurred often in students’ early game play.

In post-unit assessment of badminton, students’ return to base was much different and had a different implication to their play. Brandon explained in his focus group interview about the importance of his supportive defensive movements:

Returning to baseline...you would want to, after you hit, you would return back to baseline, and then you could try and find it. It [the shuttlecock] would be easier to find... And if it went behind you, you wouldn’t need to backpedal because you’re right on the baseline, so it would go out of bounds.

Backpedaling is harder than going forward.

Owen discussed his experience with trying to figure out how to defend his space and get ready for the next hit:

I thought when we first started, like in any sport really, to move to the middle so then you would be able to do like all the directions on the court, but then um...I was playing badminton, and I tried to see if going forwards a little would help because the shuttle doesn't go that far...so I was running back to hit it and it was really high so I jumped up to hit it and I jumped up and I fell. So, that's a sign that I know that didn't work. So, then I tried going back in the middle. And then again, somebody hit it far back and I was running back and keeping my eye on the shuttle. I was running back, and I saw the shuttle hit the wall and I stopped. So, I knew that didn't work either. So, then I tried returning back to baseline, and um...then I started scoring higher.

Moreover, as students understood the concept of containing the ball to set up for the attack and attempted to contain the ball on the first hit in volleyball, teammates began to anticipate the pass and would turn to support their classmates on the first hit. Initial GPAI scores for decision-making in volleyball were predominantly inappropriate. Researcher memos created during GPAI coding stated that, "Overall, students elected to return the ball back over as opposed to setting up to attack." If students had a tendency to return the volleyball on the first hit, then it is also logical to assume that there was no anticipation to receive or get ready for a pass. Researcher memos noted that students were "standing still if the ball did not come directly to them." Examination of initial support revealed that the scores for volleyball were low and mirrored the observations.

Students learned the concept of support as they learned the tactical problem of setting up to attack. In order to set up to attack they were constrained to attempt the pass. Nicole explained setting up to attack in the final focus group interview:

If you pass it to this person [at net] and the person to the right is running up to spike, then the person passed to [at net] passes to that person [running to spike]. They can spike it over without the defense knowing, and [the defense] wouldn't have that much time.

Jon added, "If you are in the back, just hit it up at the center, really high, so your partner can have time to get to the ball."

The motivation of games and keeping track of points was an incentive to be engaged in the game, and being in a supportive position aided in students' execution success. Meg explained this in the final focus group interview:

You're trying not to let the other people um...hit the ball back or the birdie back over the net because then it just keeps going. AND you want to get points in the game. You usually do when they DON'T hit it back over the net...And the skills would probably be trying to make sure you can get it over the net.

She further explained, "Defending your space means not to let the other team, well, to uh like maintain your space. Make sure you can hit the ball and make sure the ball is where you can hit it."

When students readied themselves to make an offensive or defensive support, they were in a better position to anticipate the return or pass and then execute the skill more efficiently, as well as have a better idea of where to place the object. Alec explained in a focus group conversation how he struggled when he didn't return to base:

Alec: ...running backwards while playing badminton and trying to hit it over using an overhand hit. I usually fall flat on my back when I try to do that.

Me: I saw you falling down a lot. Is there anything you learned to keep from having to run backwards a lot?

Alec: Yeah. Um, I'd look where my opponent was hitting the birdie, and I'd move there before I tried to hit. And I also tried to get as far back on the court as I could, before the opponent hit the birdie back.

Me: Why would you do that?

Alec: In case he was going to try and hit it really hard, I wouldn't have to run backwards while trying to hit it back to him.

In pickleball, the lack of skill during pre- and post- unit assessment may be due to students struggling to track the ball off the floor, move to the ball, and then efficiently execute the skill. Because of their lack of efficient skill execution, few rallies were recorded; students usually only had the opportunity to execute a return after the serve. This result may be due to developmental processing speed and should be expected. Using diverse equipment to match processing speed of the learner may be helpful.

In badminton, field notes and GPAI coding sheets described that students initially used underhand hits that tended to be inefficient. The underhand hits were used in reaction type manner as students had trouble deciding how to position their racket to attack the shuttle. In the post-unit assessment, more overhand hits were used than other types of hits, and they were used efficiently. Students gained understanding of how to attack and use the court. As students attempted to move their opponents back and forward, they learned that the overhand clear and overhand smash were very effective, so they used an overhand shot more often. Students grew in their skill efficiency.

In volleyball, initial hits were single-handed overhand hits or “swats” with a distinct aim across the net. As students made decisions to contain the ball, they used mostly “overhead set-type hits” on the first and second hits. These were more controlled, intentional passes and resulted in more playable executions. Over time, students were able to make fewer non-playable passes and execute more efficient, playable passes and sometimes very efficient, purposeful passes to a target. TGM provided them with a more intentional purpose for their executions through tactical problems and specific goals.

### **Continuum for Decision-Making**

GPAI results showed that gains for the number of appropriate decisions made were strong (see Table 4.10). Students were able to engage in the decision-making process and make more accurate decisions over time. These decisions regarded moving the opponent or scoring by hitting to open space in pickleball and badminton, and containing the ball to set up for the attack in volleyball. A continuum for decision-making was delineated from field note observations, video- and audio-taped lessons, pre- and post-unit verbal recall, researcher memos during coding of GPAI (see Figure 4.1).

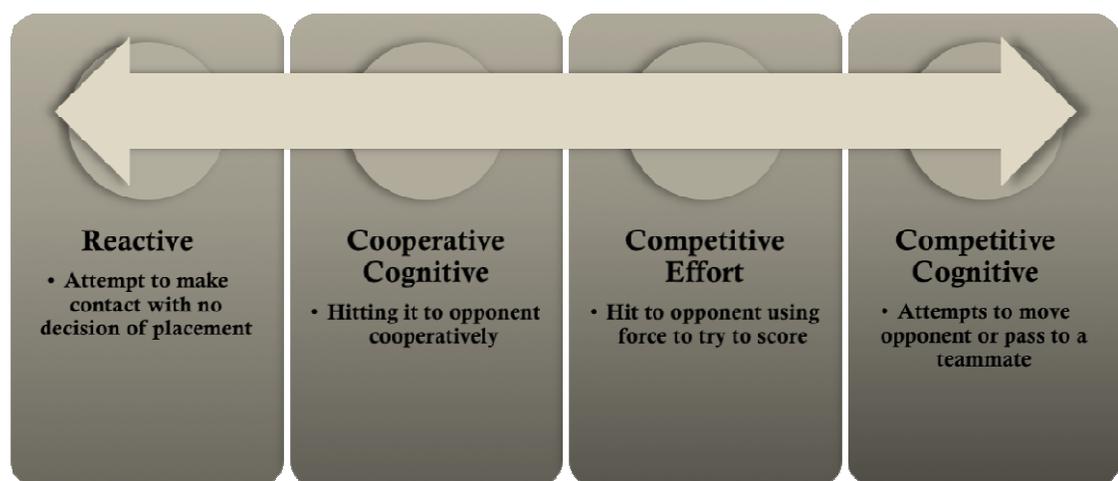


Figure 4.1. Continuum of Novice Decision-Making in Net/Wall for Object Placement.

At the most novice end of decision-making, researcher memos during GPAI coding noted that students reacted to the ball by just striking with no intentions in both cooperative and competitive situations. Most reactive decisions were coded in pre-unit GPAI assessment and early unit lessons. Sammy explained in her pre-unit pickleball verbal recall the need to be quick, but she was not focused on much else in pre-unit pickleball: “I’m thinking as I played, like you have to get to the ball as quick as you can, like moving on your toes, like we have to do in soccer.” James’ pre-unit pickleball verbal recall comment reflects another example of the most novice end of the continuum: “I was thinking I was good. I was quick. Um, I missed the ball 75% of the time, and I dropped it.”

At the second point on the continuum, students made inappropriate decisions to hit to their opponent in competitive games, but these were considered appropriate during cooperative games. For example, in a pre-unit verbal recall assessment of competitive badminton, Autumn stated, “Today, I was thinking of getting it over the net and hitting it to my other opponent.” Few students opted to hit to their opponent in order to keep a good game going. Theo’s verbal recall explained of his pre-unit competitive badminton game, “I was thinking to hit it to my opponent because she’s not really good.”

Third, as students grew to understand the nature of competitive games and became more confident in skill, they began to use force to prevent their opponent from returning the object. This ultimately impacted their skill efficiency and placement accuracy negatively. Written field notes from Lesson 8 read, “Avery is using a lot of force in his hits against James and vice versa...balls are flying out!” Alec explained in his verbal recall statement in Lesson 6:

I was thinking that I better start throwing it as hard as I can, but not so hard that it bounces out of bounds. Because I know that my competitor is not very good when I throw the tennis ball very fast.

At the more advanced end of the novice continuum of decision-making students attempted to move their opponent and hit to open spaces. In his verbal recall statement, Chris explained in Lesson 14:

I was thinking when I was playing, we played a couple of good people, and I was playing against this tall kid. So I hit it forward, and he couldn't really get to it. And he started all the way to the left side, and I hit it all the way to the right side and he couldn't get there.

Students were able to practice the decision-making of moving their opponent, like Chris demonstrated above. Researcher memos taken during GPAI coding noted that "skill efficiency is stronger and placements attempts are becoming more varied and specific". For example, Steve explained in his verbal recall during post-unit pickleball:

I was facing Jon. The score was 20-18. How I solved the game was hitting it right to him in the back court, kind of trying to hit the non-dominant hand, trying to get him to do a backhand, which kinda messes him up because he just hits it to the left side and to the other court.

Students in this study started at different points along this continuum, and all students eventually discussed attempting to place the object where their opponent was not. Students who started on the most novice end of the continuum struggled longer and moved through other points on the continuum before attempting to do this.

## **Transfer**

Transfer can be inferred by the increasingly enhanced game performance across all games in all indices. Students' scores in post-unit assessment increased in all games respectively (see Table 4.8), and are represented in the order in which they were taught [pickleball, badminton, volleyball] for support (.6 to .7 to .8), decision-making (.5 to .6 to .7), and skill execution (.5 to .7 to .8). Students highlighted the tactical problems of returning to base and hitting to the open space in their verbal recall data. Steady increases in skill efficiency may be due to the transfer of the tactical problems of returning to base and hitting to open space in relation to the goal of the games.

Halley echoed Brandon's previous statement regarding the importance of support, but she suggests using this tactic in all net/wall games, illustrating transfer of knowledge. When asked in her focus group interview what were some of the tactical problems she learned, she said, "Return to baseline so you could see the whole court and where your opponent would hit the ball or whatever you were playing with." The "whatever you were playing with" part of this statement reveals the transfer of the tactical problem of defending space by returning to base position in all net/wall games.

Transfer was also evident in the tactical problem of setting up to attack across the games. Jon stated in a focus group interview, "In volleyball, [badminton] helped me to learn how to hit it and pass the same way...how to set up and hit it hard and back and forward."

Ways of scoring were also reiterated across games to suggest transfer. In her focus group interview, Autumn explained the goal of the games, "[for pickleball] It has to bounce twice...[for badminton] like pickleball, try and get a point, but you don't want it

to touch the ground...[for volleyball] try to get a point, kind of like badminton, but you're using your hands."

In a focus group interview, when asked, "Is there anything that you learned in tennis or badminton, or volleyball that helped you in one of the other games?" Madison gave this reply:

Yeah, cause when you play with a beach ball in volleyball, and you're playing badminton with a birdie, they are both kind of light. So they don't go far when you're hitting them really hard. So, they have the same kind of capacity, so you know how hard to hit in both sports.

This statement, while related to skill, may be connected to the way students track the object, which is impacted by their ability to ready themselves to prepare for similar types of trajectories related to the goal of the games of badminton and volleyball. This is different from the trajectory of the ball related to the goal of the game in pickleball.

### **Discussion**

In this study, an information-processing lens was used in a case study research design to examine the extent to which students were engaged in decision-making during TGM. This study was also designed to provide insight into novice game development and add strength to the research process related to TGM. Results showed that students who participated in a 20-day TGM net/wall sampling unit improved in all game performance indices assessed (support, decision-making, skill execution), with the strongest performances seen in support and decision-making. Skill execution did not improve to the extent of the other indices. Several student interactions with the lesson, teacher, and

peers facilitated students' development along a decision-making continuum and supported transfer throughout the unit.

Evidence from this study supports the underlying assumptions of TGM for facilitating students' tactical understanding of games (i.e., response selections and execution processes) through game-practice-game and Q/A interactions with peers and the teacher. Other studies comparing TGM to a mastery learning approach have also provided that TGM improves decision-making and skill execution in games (Alison & Thorpe, 1997; French & Thomas, 1987; Gabriele & Maxwell, 1995; Griffin, Oslin & Mitchell, 1995; Lawton, 1989; McPherson & French, 1991; Mitchell, Griffin & Oslin, 1995, 1997; Mitchell, Oslin & Griffin, 1995; Turner & Martinek, 1992, 1999). Though comparative studies have offered support for assumed impacts of TGM, the methodologies of these studies have been admittedly weak and further support has been needed regarding how the processes within the model impact student learning of tactics (Metzler, 2000; Rink, 1996). The current study is unique in that it offers a sole investigation of student cognition within a lengthy TGM unit and provides a rich description of model implementation. This study also offers a descriptive view of student interactions and development of decision-making within the model and cognitive processing during game play.

### **Support Discussed**

GPAI results suggest that TGM is effective for encouraging and enhancing off-the-ball supportive actions. Mitchell et al. (2006) noted that off-the-ball movements in offense and defensive situations are important parts of game play because off-the-ball movements consist of 90 % of game play and contribute to whole game play. Physical

education teachers often fail to teach off-the-ball movements (Mitchell, Oslin & Griffin, 2006). In this study, TGM participation in the modified games with particular tactical problems and foci gave students a reason to support and provided significant repetitions and variability to develop a clearer understanding of what it means to support.

Additionally, supportive movements and decisions impacted students' skill efficiency and decision-making. The ability to support offered novices in this time to ready themselves for an execution and gave them time to see where to place the object.

### **Decision-Making Discussed**

Student on-the ball decision-making (ball placement and being ready) was highly influenced by TGM in the current study. Results suggest that in net/wall games, as novices engage with the tactical problems of maintaining a rally, setting up to attack, and creating space, they are able to interact with and become familiar with the court spaces in competitive and cooperative play, as well as work on in-game skill executions. The most growth regarding decision-making was achieved in volleyball. The significant distinctness in the decision to contain the ball versus hitting it over, which was stimulated by the rules for scoring (i.e., point for attempting to pass to a teammate), may be the reason for such drastic improvements in volleyball. For the novice player, perhaps deciding to pass to a person on your team is much easier and requires less attention than gauging the location of your opponent and his/her tendencies and then returning the ball to an open location on the opposite side of the net in pickleball or badminton. This study did not examine decision for ball placement in volleyball because the dominant decision in the unit for volleyball was containment. This is a limitation to this study.

Part of what may have contributed to students' increase in decision-making was that the games were modified to limit the number of decisions that students had to make, thereby increasing the quality of decisions. The ways that games are structured in TGM (i.e., game form, modified games, etc.) help students to focus on one or two concepts. Paying attention to the full adult version of games requires too many attentional demands for the novice. Having a single tactical problem with a specific focus helps students to be successful during modified game-play. Decision-making is called to their attention and highlighted for intentional learning of how to make appropriate decisions. Solutions are made explicit during Q/A, and students are able to explore the results of decisions.

Varying levels of decision-making and the fragility of knowledge structures were represented in the decision-making continuum of this study. Results of Griffin et al. (2006) and Mahut et al. (2003) also found varying levels of student understanding. A continuum for student learning of decision-making seems evident on the novice end of the expert-novice spectrum. Students come into the games learning environment with different and interesting levels of competition, and ultimately students decide when they are ready to compete. At the lower end of the novice continuum of decision-making, winning the point is not as important as the success of keeping the object going. As students feel more confident and competent about themselves and their opponent, they move outside cooperative play, regardless of teacher-imposed rules, suggesting a self-imposed progressive challenge. The progressive competitive challenge starts with deciding to hit with more force and seems to occur before hitting to open space or moving their opponent for many students. Appreciation for skill is quickly developed, as force at this particular stage is not effective or efficient in relationship to skill. This

continuum seems to be an elaboration, and an addition regarding individual play, of the lower end of Pagnano-Richardson and Henninger's (2008) Tactical Decision-Making Competency (TDC) framework for team play. The TDC is an assessment tool designed from the current research on the development of expertise and research on novice decision-making. The framework highlights the focus of students' attention during game play at four levels: (a) self and skill execution, (b) self and teammates (c) self, teammates and opponents, and (d) self, teammates, opponents and situation. Further research is needed to fill in the gaps of these novice continua to aid in understanding how novices develop decisive solutions for game play in different games and through TGM.

### **Skill Discussed**

Skill was developed and supported within the model, but skill did not improve as quickly as support or decision-making. Results suggest that TGM does not impede the development of skill and may in fact enhance skill execution performance for novices. Students came into the unit with low skill in pickleball and moderate skill in badminton and volleyball. Low scores in pickleball throughout the entire unit may be attributed to students' developmental level and an inability to effectively track the ball off of the floor prior to returning it. The moderate scores in badminton and volleyball may be attributed to students' ability to more easily track and make contact with an in-flight object. Additionally, the equipment (i.e., elementary shuttlecocks and beach balls) used in badminton and volleyball was slower than the tennis balls used in pickleball. Students' experiences in Skill Themes and Movement Concepts in prior years may also be associated with the moderate pre-unit scores. Moreover, students' supportive movements may have negatively impacted their ability to track the object and move to hit the object

in pre-unit play, but positively impacted their ability to track the object and move to hit in post-unit play as support improved.

Students spent only one-quarter of their time in the unit in situated skill practice across a variety of games (sampling) and still showed trends of skill improvement. Students did not get extensive practice in the same skills for 20 lessons. The increase in skill as compared to the increase in decision-making and support was not as high, possibly because of sampling, though gains in skill were not limited because of sampling. As other researchers have suggested, teachers should consider that skill execution might not move along as quickly as the development of decision-making (McPherson, 1994).

Research on expertise provides that it takes a period of 10 or more years of persistent, focused practice with feedback to develop high-level skill (Ericcson et al., 1993). Teachers can expect that student cognitive development will move along faster than skill development. As teachers can engage students in cognitive development, perhaps students will feel more immediate success, as well as gain an appreciation for the skills necessary for higher-level play, and desire to participate in the future. Teachers do not have to sacrifice students' skill for cognitive development in this model.

### **Interactions Discussed**

The descriptive results of this study suggest that novices' interactions with consistent tactical problems within a sampling unit, as well as interactions with Q/A segments and extensive modified-game play, aid in (a) the development of novices' understanding of tactical problems and (b) encourage and foster cognitive processing and investigation of solutions that facilitate the development of off-the-ball supportive movements and on-ball decision-making. Additionally, TGM (c) offers a space to

practice and develop variable game play skills that are linked to decision-making and problem solving across like games.

Cognitive interaction with the teacher and other students during Q/A Segments helps students to move along a continuum of decision-making. Game play and the probes conducted by the teacher stimulate students at different levels of understanding to investigate solutions. Because novices are attempting different response selections and executions, game performance wavers and shows fragility (Rovegno et al., 2001).

Novice students are able to arrive at solutions that work for them in their game at a particular moment. As students get a variety of experiences within different games and tactical problems, and interact with different students and receive multiple probes by the teacher, decisions become more effective. The TGM process helps students to understand their execution decisions because they learn from mistakes and successes, and they learn strategies for different opponents. Moreover, students learn the if-then process for making decisions and develop a meta-cognition for problem solving.

The concept of transfer was evident in this study. The nature of cognitive transfer was that (a) students improved within games and across games, (b) students expressed tactical understanding of object placement and returning to baseline across games, (c) students explained commonalities of the goals of these games, and (d) transfer was evident from badminton and volleyball in students' perceptual tracking and movement to the object. These findings support the assumptions of Thorpe et al. (1986) regarding the potential of transfer of tactics in this model. The current research also mirrors findings from other studies that have supported positive tactical transfer across like games (Contreras Jordan et al., 2003; Jones & Farrow, 1999; Mitchell & Oslin, 1998).

The transfer results in this study suggest that tactical similarities within game classifications (Almond, 1986; Ellis, 1983) allow for efficient integration of content and sequencing of tactical problems (i.e., sampling of different games with same tactical problems; Mitchell & Oslin, 2005). Also, students experience important interactions with game sequencing, predominant tactical problems within lessons and across games, and teacher's Q/A segments that facilitate the development of offensive and defensive principles of play associated with like games (e.g., placement of object into open space and returning to baseline to defend space). Higher-order thinking that students are prompted to engage in within the model enhances how individuals can understand and apply the same tactics in another game (Oslin & Mitchell, 2006; Piggot, 1982).

Handford et al. (1997) noted that similar goals of games provide another source for positive transfer, even when constraints or rules are changed. This may be one reason why students were able to draw links among the goals of the games in this study. The relationship between students' perceptual responses in badminton and volleyball may also be attributed to the similarity of the goals of the game (i.e., object hits or bounces a single time in opponent's area to score), being slightly different from the goal of pickleball (i.e., object bounces twice in opponent's area to score). It is more likely, however, that the shuttle or ball was easier to track in the air than a ball bouncing off the floor. Additionally, the transfer of the support tactic may have contributed to student readiness to perceive and track the objects across the unit.

The current study provides support for transfer of offensive and defensive tactics for fifth graders in a TGM net/wall sampling unit. Game sampling allows teachers to provide diverse experiences while learning consistent concepts (e.g., particular tactical

problems such as setting up to attack and defending space). The notion of transfer is important in that it allows teachers to provide connected experiences for students and build off previously learned information, rather than offering isolated experiences. Learning is enhanced and is richer when students can relate new information to prior experiences (Werner, Thorpe and Bunker, 1996, p. 30). Moreover, variable practice within a net/wall sampling unit with same tactical problems helps students to develop a net/wall schema for supportive movements, deciding where to place the object, and how to perceive the object coming into play (Piggot, 1982).

### **Conclusion**

TGM provides a venue for novices to process tactical problems and experiment with different response selections and executions. Processing and experimenting within appropriate, modified-game play, along with diverse interactions in different games with different opponents, facilitates understanding of games and game performance. The teacher plays an important and crucial role in probing, stimulating, and redirecting thought processes of novice players, guiding them to appropriate responses.

Novices enter into the TGM environment with limited experiences to relate to, thus lengthy time spent within a sampling unit that includes the same tactical problems is beneficial in building game understanding, developing schema for game play solutions, and developing skill. The teacher must also develop ways to help students move through the decision-making continuum. In initial stages when the student is very reactive, the game should provide for appropriate context to develop tactics without having to focus highly on skill. Reducing the complexities of the environment, such as using slower flight/ bounce objects, smaller court space, and lower nets, is beneficial.

Hopper (2009) suggested adaptation games to even the playing field among or between students and assist in decision-making development. In *Adaptation Games*, rule structures are intermittently placed on the environment by a student as his/her opponent scores or gains an advantage. For example, in a net/wall game, a student who loses the point can choose to make his opponents' space bigger. The ability to adapt the rules helps them learn about the game while keeping it interesting for both players. Grehaigne (2009) suggested stopping game play and asking questions to help students see the options or game configurations at a particular instant.

In order to build tactics, we must include some type of opposition in order to facilitate decision-making. Students will adapt to opposition (Grehaigne & Godbout, 1995, p. 491). Teachers need to ensure that game configurations match the developmental level of the learner and support how students will adapt. Knowing decision-making continuums can facilitate teachers' understanding of how students will adapt and can aid teachers in setting up the appropriate sequence to help them adapt.

These tactical schemata can also transfer to other like games. Teachers should consider the concept of transfer as they develop lessons, units, programs, and Q/A probes. "Pupils can learn and understand seemingly difficult and loosely related topics if provided the appropriate learning conditions" (Piggot, 1982, p. 20).

In TGM, tactical awareness and decision-making are taught along with skill, though cognitive aspects of the model are primary objectives. Other researchers have suggested that students learn what you teach them (Metzler, 2000). This model has the capacity to develop both tactical decision-making and skill in the context of game-play.

Novices can develop decision-making skills, appropriate tactics, and efficient skill by playing the game first in TGM.

## CHAPTER 5

### MANUSCRIPT II (VERBAL RECALL)

#### Introduction

Investigating experts' and novices' knowledge base for sport offers a lens to view the barriers and benefits in games participation and aids in the development of optimal instruction methods for games in physical education (French & McPherson, 2004). Much of what is known about individuals' knowledge base for sport has developed from studying expert processes. Information is limited about the sport knowledge base of the novice games player and the developmental processes of building that base. Most of the research on the novice games player is found in comparative studies and describes how experts and novices differ in their knowledge bases and processes (French & McPherson, 2004).

Abernethy, Burgess-Limerick and Parks (1994) distinguished experts' and novices' motor execution and response selection processes. Results showed that adult experts displayed superior tactical decision-making and execution of motor skills. Other studies have revealed that child experts do not reach the superior responses and executions of adult experts (French & McPherson, 1999; Nielson & McPherson, 2001; McPherson, 1999). Examination of knowledge and content retrieved in tennis (McPherson, 1999, 2000; McPherson, French & Kernodle, 2002; McPherson & Thomas, 1989; Nielsen & McPherson, 2001) and in baseball (Nevett & French, 1997; Nevett, 1996) revealed that conditions and actions accessed by experts and novices varied greatly. What is known conclusively, from an information processing perspective, is that experts plan ahead and are automatic, consistent, adaptable, perceptive, self-monitoring,

fast, accurate, and knowledgeable. Novices are self-focused, pay attention to extraneous game conditions, and have few means of strategizing. Novices use limited action selections (typically single and unplanned) and passively assess game situations without reflection on their previous responses or their opponent's, resulting in inconsistent play (see French & McPherson, 2004).

Though there is a lack of substantial documented research on the cognitions of the novice games player, perhaps a more influential inquiry would be to understand how the novice develops and grows in the knowledge base for game play. Future research should examine instructional approaches that facilitate the development of intelligible and efficient game play and that foster the impetus for future play. French and McPherson (2004) proposed that research is needed to determine methods for promoting student learning of response selection processes, and to understand what types of activities aid in the development of game knowledge.

The Tactical Games Model (TGM) claims to promote student understanding and tactical awareness (Mitchell, Oslin & Griffin, 2006). Initially developed as Teaching Games for Understanding (Bunker & Thorpe, 1982), TGM is a problem-based approach that taps into children's inherent motivation to play games by first playing the game. Developmentally appropriate games emphasize tactical circumstances to be problem-solved. The game and the students are central, while the teacher facilitates by asking students questions about their game play (see Bunker & Thorpe, 1982; Mitchell, Oslin & Griffin, 2006; Oslin & Mitchell, 2006).

Cognitive research on this model has done little to support the claims of game understanding and tactical awareness development of students because of weaknesses in

methodology. Much of the cognitive research on TGM has compared the model to a skill mastery approach, and game understanding and tactical awareness cannot be verified or distinguished from other approaches because descriptions of instruction units were not provided and pedagogical fidelity of the model was not validated. Thus, clear understanding of how these studies contribute to the research on TGM is difficult to substantiate. Also, these comparative studies were not successful in claiming that TGM is better than skill mastery approaches because of limitations in the research designs. Each approach in the comparative studies had different goals and objectives and used different teacher instructional methods, making weak comparisons.

Comparative studies do show that what is learned by students is directly related to what is taught; specific models can be used to reach specific learning objectives. Further research is needed to validate and support how TGM aids in the development of student game understanding and tactical awareness. Using TGM to guide student response selection and execution processes would also be a useful tool to examine how novice students develop in their game play. Griffin and Patton (2005) suggested that TGM be examined through multiple lenses, such as information processing, a theory for understanding how individuals select, use, store, and interpret information (Starkes & Allard, 1993). This theory has been used to explain the types of information provided to the learner and how it is conveyed (Rink, 1999).

The purpose of this study was to examine fifth-grade physical education students' tactical understanding and decision-making in a TGM net/wall sampling unit. Specifically, an information-processing lens was used in a case study research design to examine the extent to which students were engaged in decision-making during TGM and

to provide insight into novice game development and add strength to the research process related to TGM by using methods and paradigms that were substantial and credible and that can be generalized to like situations.

### **Methodology**

This investigation was part of a larger study. A case study research design (Creswell, 1998; Straus & Corbin, 1998) was used. Case study design is a descriptive technique used to illicit considerable amounts of information that offer deep meaning about a single circumstance or occurrence. Information found in a case study may be used to attain a better understanding of similar cases (Creswell, 1998). This particular case was used instrumentally (Stake, 1995) to examine fifth-grade students' cognition during a physical education unit as a result of TGM instruction.

### **Setting**

The setting was a suburban elementary school in the northeastern United States. Students at Shade Tree Elementary (STE) participated in year-long physical education, 50 minutes per class, 2 days per week. The curriculum was focused on the development of students' movement skills through station skill practice, games, dance, and fitness activities. The primary curriculum venue in past years has been skill themes and movement concepts (Graham, Holt/Hale, & Parker, 2010). Skills such as throwing and catching, striking, and dribbling are taught at developmentally appropriate levels through a variety of means (individual skill practice, stations, games, etc.) using direct instruction, peer teaching, and discovery learning. Other venues include Building Dances (McGreevy-Nichols, Scheff, & Sprague, 2005) using a constructivist perspective, as well as activities and events such as school field day, Jump Rope for Heart (American Heart

Association; AMA; 2009), and fire safety presentations from the local fire department. TGM had never been implemented during the current physical educator's 21-year tenure; however, the teacher wanted to begin to implement the model with her fifth grade classes.

## **Participants**

### **Teacher Participant**

Abby (pseudonym), is the physical educator and head teacher at STE. Active in her state's professional organization (e.g., held high elected leadership position), she has previously been recognized as the state physical educator of the year and the National Association for Physical Education teacher of the year.

### **Student Participants**

Student participants in this study were 16 purposefully selected fifth graders. Specifically, two classes (N=50) out of five fifth grade classes were selected to participate in this study. Classes were purposefully selected based on the convenience of class schedule. Due to constraints placed on data collection procedures (i.e. camera placement and viewing ability), eight students, of various skill levels, were selected from each class (M=8, F=8; n=16) as primary student participants.

Participant selection included considerations such as the following: consent, student's ability to communicate in an interview, the teachers' belief that students would be in attendance, and teacher's ranking of skill level. Consent was obtained from the school's administration, the teacher, the students, and the parents. Permission from the university's Institutional Review Board (IRB) was also obtained. Pseudonyms are used to protect the identity of participants and the school. Complete data were obtained for 11

target students (n=11). Absenteeism and being pulled from physical education for band sectional practice attributed to the loss of data for five participants.

### **Teacher Training**

A constructivist perspective was used to train Abby in TGM. She engaged in a series of readings and exploratory teaching practices with her own students. Intermittent reflections and discussions with the investigator occurred throughout the training process. Research memos and field notes were used to record the training.

### **Reading**

After an initial teacher interview was conducted, teacher training began with a selection of readings determined by the investigator (see Table 5.1). Abby kept a journal of notes and questions. These were discussed at regularly scheduled meetings.

Table 5.1. – Selected Readings for Teacher Training

<b>Authors</b>	<b>Book</b>	<b>Chapters/ Assignment</b>
Griffin, L.L., & Butler, J.	(2005). <i>Teaching Games for Understanding: Theory, Research, and Practice. Human Kinetics: Champaign, IL.</i>	1,2,3,4,7,8,11,12,13
Mitchell, S.A., Oslin, J.L., & Griffin, L.L.	(2006). <i>Teaching Sport Concepts and Skills: A Tactical Games Approach. Human Kinetics: Champaign, IL.</i>	1,2,3,15,16,17,18; Study Tables 2.1, 2.2, page 17, and tip boxes.
Mitchell, S.A., Oslin, J.L., & Griffin, L.L.	(2003). <i>Sport Foundations for Elementary Physical Education: A Tactical Games Approach. Human Kinetics: Champaign, IL.</i>	4, 5

The meetings were used to determine the sport content that would be most appropriate based on Abby’s ability and comfort level, student ability, gymnasium space,

and ease of data collection. A net/wall sampling unit was decided upon as the mode for student participation. We planned a net/wall unit for Abby to practice with the classes (1, 2, and 3) that were not part of this study. For those students that were part of the study (classes 4 and 5), we planned an invasion games unit for them during the teacher training. This provided the investigation group experience in participating and learning within the model and aided in data collection. This invasion games unit was also another opportunity for Abby to practice facilitating within the model (see Table 5.2).

Table 5.2. TGM Training for Teacher and Student (6 days of teaching)

<b>Training with non-investigation groups (Classes 1, 2, &amp; 3)</b>	<b>Training with investigation groups (Classes 4 &amp; 5)</b>
Teacher trains by teaching TGM <i>net/wall games</i> to students that will not be participating in the study.	Teacher trains by teaching TGM <i>invasion games</i> to students who will be in the study; students experience the model, practice verbal recall, and experience having cameras in the gym.

### **Training Unit**

The teacher-training unit was a 6-day unit of net/wall games with three classes not part of the investigation (3 weeks) along with a 6-day unit of invasion games (3 weeks) with the classes that were part of the investigation. Prior to each lesson, Abby and I discussed the tactical problem and the focus for the day. Abby was very comfortable with me being in the gym, included my name on the wall as an STE teacher as to involve me in the classroom community, and often asked if I had anything to add or any questions to

ask the students. Occasionally, I modeled questions based on my observations of students. After each lesson, we reflected on students' learning.

During the training segment, we made minor lesson revisions to adjust for the investigative unit. We combined the first two lessons, adjusted game and practice time in some lessons, and changed some equipment (e.g. deck ring to flat playground ball).

### **TGM Investigation Unit**

A 20-day net/wall sampling unit was observed and analyzed. The unit was constructed closely to the net/wall sampling unit developed by Mitchell, Oslin, and Griffin (2003). Abby taught the unit to two classes of approximately 25 students. Eight target student participants in each class intermingled and participated with and against each other on a select set of courts that could be viewed through the video cameras. The unit schedule according to the text used is displayed in Appendix A. The entire class time was devoted to TGM. The first 2-5 minutes of class was structured to provide students with the tactical problem, game rules, expectations, etc. The unit then commenced according to the sequence as outlined in the book or deemed appropriate by the teacher.

### **Data Collection**

Multiple data sources were used to explore students' tactical understanding, decision-making processes, transfer of learning, and to verify the implementation of TGM. Data sources included the following: (a) student think-aloud reports during the second game of each lesson (McPherson & Thomas, 1989), (b) a situational knowledge quiz (pre-post-unit), (c) post-unit student focus group interviews, (d) descriptive field notes, (e) video-taped student performances, and (f) audio-taped lessons.

### **Verbal Reports**

Verbal reports were used to examine students' tactical understanding and decision-making (i.e. problem representations). These reports were students' thought processes during problem-solving situations in the second game of each lesson. Tape recorders were placed at the sidelines. To initiate verbal recall, the researcher stopped game play after a point was scored or after a dead ball and asked players to verbally respond to a written prompt beside their tape recorder. This process was repeated until all eight students in each class responded at least once during each lesson. Prompts included questions about what students were thinking as they played. See Appendix F to examine the prompt sheet that was provided to students.

### **Student Situational Knowledge Quizzes**

The student situational knowledge quiz was given to all students in both classes (N=50) pre- and post- unit. Designed to measure what students know about net/wall games (i.e. solving defensive and offensive tactical problems), the quiz entailed 21 items in which the students were asked to choose from a list, describe, or draw what to do in a scenario and explain why (see Appendix B).

### **Student Focus Group Interviews**

Student focus group interviews were conducted post-unit. Focus groups consisted of four groups of two students per class. Groups were arranged purposefully as pairs that played against each other multiple times. The focus group interviews were designed to gain information regarding previous experiences, perception of the unit, what they thought they learned, how they understood playing with and/or against each other, transfer of knowledge from one game to another, game understanding and tactical

decision-making, and to extend the researcher's understanding of her observations and student's pre-post-unit quizzes (see Appendix C).

### **Descriptive Field Notes**

Descriptive field notes were taken each day, and memos were taken during viewing of video-tapes. Teacher's interaction and use of the model and students' engagement and pertinent interactions were noted. Metzler's (2000) teacher benchmarks (see Appendix D), as well as a researcher- developed teaching checklist designed around TGM characteristics, were used in developing notes (see Appendix E).

### **Video Taped and Audio Taped Lessons**

Students' pre- and post- unit game performances and lessons were video and audio taped. Videos were analyzed to verify model use, and to examine teacher facilitation and staging of knowledge structures.

### **Data Analysis**

Analysis was on-going throughout data collection. Videotaped play was analyzed intermittently to re-examine game situations that students discussed and to examine teacher-student interactions related to specific field notes. The verbal recall data, quizzes, and focus group interviews were analyzed using a protocol analysis developed by McPherson and Thomas (1989). Verbal recall and student focus group interviews were open coded and analyzed for descriptive use. Field notes were typed, and interviews, audio-taped lessons, and student think-aloud reports were transcribed verbatim.

### **Knowledge Quizzes and Verbal Recalls**

The justification for the responses on the quizzes and the verbal recall transcripts were content analyzed and coded according to a protocol analysis developed by

McPherson and Thomas (1989). Specifically, participants' verbal problem representations were coded into major concept categories (i.e. conditions, actions, goals; see McPherson, 1993, p. 167). Units of information were coded according to: 1) circumstances in which actions occurred, 2) motor or perceptual responses, and 3) purpose of action selected (see McPherson, 1993, p.167-169). These concepts are reported using descriptive statistics, as well.

### **Rater Reliability**

Rater reliability was established prior to coding and analysis of verbal recall data. Prior to rater-reliability coding, coder training was conducted. Ten percent of the data was provided to a second trained coder, and she arranged the statements according to the concept categories of condition, action, and goal. The arrangement was compared to the researcher's arrangement and scored for a reliability of .90 or greater for initial reliability. When 90 percent reliability was achieved, coding resumed by the researcher. Finally, the second coder coded 30 % of the analyzed data for final reliability of .80 or greater (van der Mars, 1989, p. 57; see Table 5.3).

Table 5.3. Verbal Recall Rater Reliability

<i>Analysis Category</i>	<i>Inter-Rater Reliability</i>	<i>Intra-Rater Reliability</i>
Total Observations	% Agreement	% Agreement
<i>Action Concepts</i>	92	100
<i>Condition Concepts</i>	97	99
<i>Goal Concepts</i>	85	100

After all statements were coded into concepts, frequency of items in each concept was tallied. Concepts were then broken down by characteristics into sub-categories. Next, more detailed micro-analysis occurred through a qualitative, hierarchal examination of

each condition, action, and goal concept. Coding rules established by McPherson (1993, p. 169) were used for micro-analysis and are provided in Table 5.4. Finally, concept categories and frequencies were tallied regarding these levels for each concept category.

Table 5.4. Coding Rules

Quality Level				
Code Type	0	1	2	3
<i>Condition Quality</i>	Inappropriate /weak	General condition, no characteristics	Appropriate, one characteristic	Appropriate, two or more characteristics
<i>Action Quality</i>	General/weak	Appropriate, no forceful quality, only action	Appropriate, one forceful quality	Appropriate, two or more forceful qualities
<i>Goal Quality</i>	Skill and self	Self and teammates	Win/ Winning the game/the point	-----

### **Focus Group Interviews**

Focus group interviews were transcribed. Next, students' statements were content analyzed. Content analysis was used to determine what students learned during the unit.

### **Video Taped and Audio Taped Teacher and Student Performances**

Video taped and audio taped transcripts of teacher and student performances were content analyzed to provide verification of the model, to determine teacher's understanding of TGM and net/wall content, and to examine student performances and teacher performances. This information was also used in triangulation of other data sources.

## **Descriptive Field Notes and Model Fidelity**

All videotaped field note observations were content analyzed to determine teacher understanding and implementation of TGM, net/wall content (e.g., lesson set-up, questions, conditioned games) and model progress. Twelve random lessons (30% of the 40 lessons) were viewed to validate the use of TGM. Metzler's (2000) teacher and student benchmarks were used to verify the fidelity of the model. The following headings are aligned to represent Metzler's (2000) teacher and student benchmarks (see Appendix D).

### **Content**

The tactical problems presented in each lesson were consistent with lessons used from the Mitchell, Oslin and Griffin (2003) textbook (see Appendix A). These problems were consistently established and used as the organizing center for each learning task. Each day began with a question-answer review of the previous day's tactical problem and student solutions. Student examples were often used in the review. Each lesson, the teacher asked students to view the court set-up and boundaries and explain what this told them about the game. This strategy honed students in on court space and boundaries and was used as means of aiding students to think about how the constraints of the game might impact their strategy and etiquette from court to court. Abby always introduced the tactical problem, the game and scoring rules, and asked students to think about how they might achieve the goal of the game. Often times, the word "goal" was substituted for the words "tactical problem." The teacher quickly matched target students together and against each other for game play each day.

## Sequence

The TGM sequence was followed in every lesson (i.e. game > practice > game, with intermittent question-answer segments). The average segment length is presented in Table 5.5.

Table 5.5. Segment Length and Teacher-Student Interactions in TGM Sequence

<i>TGM Sequence Segment or Interaction</i>	<i>Average Time (Minutes) or Average Number of Interactions</i>
Review and introduction to the tactical problem and game rules	5 minutes
Game 1	10 minutes
Situated practice	10 minutes
Game 2	8 minutes
Whole group question-answer	3 minutes
Lesson conclusion and checking for understanding	3 minutes
Management	6 minutes
Average number of teacher-student interactions (team or individual “freeze” segments) per lesson	20 interactions

## Modifications

For the game segments, modified games were always used and were set-up as suggested in the textbook’s lessons. These lessons consistently situated the tactical problem to be solved. For the situated practices, game forms were always used as suggested in the textbook’s lessons. The court boundaries were consistently modified to provide space for all students to participate and to set the tactical problem (e.g. long,

narrow courts for badminton). The nets were set at 5 feet in deck tennis, badminton, and volleyball to aid in student success. Equipment was altered to be developmentally appropriate; for example, beach balls were used in volleyball, short-handled rackets and elementary sized shuttles were used in badminton, elementary paddles and tennis balls were used in pickleball, and flat playground balls were used as a deck ring.

### **Questioning**

The teacher consistently provided feedback through repeated questioning to guide students to a particular answer regarding the tactical problem. Questions included how, what, when, where, why, if-this-then what, and timing. The average number of questioning interactions requesting student response was 25 per lesson. The teacher's wait time ranged from 5-15 seconds for responses, and average wait time was 10 seconds before calling on a single student or asking another leading question. The teacher would spend up to 2 minutes with the whole group on a particular question related to the tactical problem. The teacher, on average, called on 10 different students each day in whole group question-answer segments. Throughout the entire class, the teacher interacted directly with each student at least once. In whole group questioning, students provided a conglomeration of correct and incorrect answers and often added to each other's responses. The teacher constantly initiated questions with students, used examples, and backtracked until appropriate answers were provided.

### **Lesson Conclusion**

The teacher engaged students in whole group question-answer segments at the end of every lesson, using questions related to the tactical problem and to previous problems. She allowed students who had not participated in discussion earlier to respond. She asked

questions such as, “Do you have anything to add?”, “What did you find easy or hard about today’s lesson?”, or “How did you achieve today’s goal?”.

### **Assessment**

A summative assessment such as the Game Performance Assessment Instrument (GPAI) was not conducted by the teacher. Implementation of the GPAI was not part of the teacher’s initial training since there were multiple data sources being collected. Observational assessments were continually made by the teacher and used for the purpose of initiating question-answer segments, providing feedback to students, and for making game modifications for individual students.

### **Final Analysis**

All intermediate data were constantly compared, axial and selectively coded, and triangulated to develop categories. Data were related to teacher facilitation/class structure to determine the best means for representing the phenomena.

### **Triangulation**

Trustworthiness was established through triangulation of all data, critical friend review, and keeping an inventory of procedures, reflections, and analyses memos (Creswell, 1998; Merriam, 1998; Rossman & Rallis, 2003). A critical friend helped with debriefing the findings and keeping the study in-line with the purpose, and provoked questions in light of analysis and researcher bias. Research memos provided an inventory of procedures, reflections, ideas, difficulties, and interactions throughout the study.

### **Results**

Results indicated that participants had a range of types of action, condition, and goal statements, as well as a range in the quality of those statements. Participants

predominantly discussed *in-game knowledge* concepts and to a lesser extent discussed *about-game knowledge*. In-game knowledge concepts tended to match the tactical problems in the unit. All participants experienced waves of sound and unsound in-game knowledge structures, much like Piaget (1972) described accommodation and assimilation. Sound knowledge structures were process related, included if-then type statements, were planned, and consisted of action, condition, and goal statements. Unsound knowledge structures were more reactive in nature, lacked if-then type processing, or were inaccurate or contained misconceptions. Sound and unsound in-game knowledge for the tactical problems of setting up to attack and defending space were evident for all students across pickleball, badminton, and volleyball, demonstrating transfer of knowledge. Collectively, participants remained novice in their explanations, but had waves and highlights throughout the unit where thoughtful game play was instigated. Participant's *about-game* knowledge was declarative and represented understanding of the game, such as how to score, rules, equipment, and specific skills used in the game. About-game knowledge was not highly evident in this study.

Descriptive results for specific action, condition, and goal concepts are reported first. Next, categories developed through in-depth qualitative analysis are reported in the form of *in-game knowledge* and *about-game knowledge*. Two participants, Brandon and Meg, were purposively selected to highlight processing levels of novice participants that had a more sound and a less sound tactical understanding.

### **Action, Condition, and Goal Concepts**

Overall results from coding of verbal recall responses indicated that participants mostly accessed knowledge structures related to actions (i.e. motor or perceptual

responses; 459/941 = 49%). Participants accessed limited knowledge structures related to game conditions (i.e. circumstances in which actions occurred; 232/941 = 25%) and goals (i.e. purpose of action selected; 250/941= 27%; See Tables 5.6-5.10). More in-depth descriptions of these concepts are discussed below.

### **Action Concepts: Identifying Responses for Goal Related Play**

Action concepts were the selected behaviors students discussed that were related to goal related changes in their play (McPherson, 1993; McPherson & Kernodle, 2005). A total of 459 concept statements represented the category in which students described a particular action they were thinking about. Participants' action statements were most frequently related to the on-ball skill of *hitting the object* (348 = 76%) and off-ball movements related to offensive and defensive *positioning* (111 = 24%). These action statements were seen across all tactical problems that were presented in the unit (maintain a rally, set up to attack, defend space, win the point; see Table 5.6).

#### **“Hit it...”**

A majority of the action statements related to hitting the object were considered tactically sound (i.e. having one or more forceful qualities). Tactically sound statements included specific placement of the object in relationship to the opponent, such as “I would hit the ball to where Jake wasn't” (Aydan; medium skilled; pre-unit pickleball; Level 2 Statement). Even more tactically complex statements combined a forceful quality, such a speed or level, with the placement of the object in relationship to the opponent. For example, “How I solved the game was hitting it right to him in the back court, kind of trying to hit it to the non-dominant hand” (Steve; high skilled; post-unit pickleball; Level 3 Statement). Statements at these two levels were in-line with the

tactical problems and specific lesson foci in the unit such as setting up to attack, creating space, and winning the point (Lessons 2, 4, 6, 8, 9, 13, 17, 19, 20).

Less tactically complex statements regarding hitting the object had accurate actions, but lacked forceful qualities or specifications. For example, Allie (low skilled, post-unit badminton, Level 1 Statement) stated, “I was thinking of hitting it over.” Other less tactically complex statements were inaccurate or related to playing cooperatively in competitive situations. Chen provided an inaccurate action statement in a competitive game, “I hit it to my opponent”(medium skilled; pre-unit badminton; Level 0 Statement). These less effective statements were more egocentric actions or reactions inferring complete concentration on just hitting the object and getting it over to keep play going. Inaccurate statements demonstrated a focus on a prior tactical problem of maintaining a rally, the desire to keep the game going in participant’s limit capacity to think about or skillfully place the object, and/or a true lack of thoughtful play by just reacting.

Participant’s action statements in relationship to specific skills were limited in their *in-game* lingo. They typically started their actions statements in pickleball and badminton with “hit it...” In volleyball, they also used the language of both “hit it...” and “pass it...” Though students did not express their specific skill-related knowledge in terms of what they were thinking about during verbal recall, students did refer to and distinguished among hits such as forehand, backhand, overhand, underhand, and the spike in other data sources. Participants did not use these terms continuously in their *in-game* process lingo, nor did they attempt to describe specific how-to’s for executing these skill as they played. Most of their knowledge for skills and skill execution was expressed in outside-of-game quizzes and interviews, where students were probed further. For

example, in a focus group interview, Cody (high skilled) explained the need for the “right footing...in order to hit” in pickleball. As he was probed further, he made this statement:

Well, you have to have it, you learn...forehand...you would have to have your weak foot in front and your strong foot in back, and you have to hit it before it comes to your waist, or before it comes to you...or when it comes to you.

Brandon (high skilled) explained how two specific hits related to setting up to attack, ...there’s the set, there’s the spike...when you have a teammate from the back hit it up to someone in the front, and they try to hit it right up against the net, and then that person will hit it over...and they would try and hit it directly down instead of having it float a little. They would want to have it directly down because it would be harder for the opponent to get it.

In a focus group interview, Gracie (medium skilled) discussed the kind of hits she used. She expressed accurate, but limited knowledge among games, struggled to retrieve the words for the types of hits, and confused some terminology. Referring to the pickleball serve used in the unit, she made this statement:

Well you have to bounce the ball, drop the ball and then hit it once the ball bounces...it’s when you turn and hit it like [demonstrated forehand]...I forgot what that’s called, which serve that is, well there’s the backhand serve.

For volleyball she said, “Well, if you’re playing with other people you should pass it, so the front person can spike it, and you should use both your hands [referring to pass].”

### **Positioning**

Participants who discussed offensive positioning had a limited ability to express specific offensive position in relation to their on-ball actions. Offensive position

statements were all Level 0 Statements (general and weak), and were related to being ready. For instance Cody stated, “Be ready to attack.” This statement does imply the relationship of defensive readiness to setting up a good offense. In effect, offensive positioning was not an intentional focus in any lesson throughout the unit; it was inferred as a direct result of good defense. Defense was a very specific focus in the unit in Lessons 3, 5, 8, 10, 14, and 18. Predominant results regarding positioning were defensive in nature and paralleled the unit’s lessons for defending space by recovering to base position, returning to baseline, court coverage, and judging lines.

Defensive statements ranged in complexity; most statements related to positioning of one’s self in a specific defensive location (Level 2 Statements), while others added the relationship to the opponent (Level 3 Statements). Respective examples included Brandon’s (high skilled; Lesson 18) statement highlighting the concept of returning to base, “return to baseline and be snap in the middle.” Post- unit quizzes demonstrated that a majority of students selected to return to baseline or to the center of the court to ready for offense in Scenario 5. Gracie (medium skilled) wrote, “I would move there because that is where the baseline is, and I would go there quickly so I could get a good vision where the ball is going.” Oden (medium skilled) spoke about court coverage: “If I stayed, my opponent would hit it over”.

In post- unit quizzes, all students were able to recognize in Scenario 13 that the ball was going out of bounds and made appropriate decisions for what to do. Meg (low skilled) wrote, “I should just let it go, and I will win a point because it went out of bounds.” Prior to the unit, three students did not answer Scenario 13 appropriately, such as Aydan (medium skilled) statement: “I’d hit the ball if it was coming to go out of

bounds. I'd spike it, so I could hit it back. I'd suggest it, so I wouldn't get out and them a point." Aydan recognized the boundaries, but had a weak understanding of what they meant for scoring. He also demonstrates his inherent love for just hitting the object without thinking about the game, (typical for Aydan throughout the unit).

### **Condition Concepts: Identifying Game Circumstances**

Condition concepts were the circumstances participants identified that related to their specified actions for achieving a particular goal ((McPherson, 1993; McPherson & Kernodle, 2005). A total of 232 statements across the unit represented the category in which participants described a particular condition they were thinking about. In over half of these statements, participants honed in on conditions related to their opponent, and in just under half, participants were concerned with conditions related to themselves or teammates (see Table 5.7-5.8).

### **Conditions Related to Opponent**

Three foci represent conditions related to participant's opponent. Participants predominantly noticed conditions related to their *opponent's hit*. To a lesser extent, participants noticed conditions related to *opponent's positioning*. An additional minimal focus was *specific characteristics of their opponent*.

Participants' condition statements were predominantly associated with their *opponent's hit*. These types of statements evenly ranged in complexity from accurate, but weak, circumstances that were recognized (Level 1 Statements) to increasingly descriptive, more complex observations of game play situations that occurred (Level 2 and 3 Statements). J.W.'s (medium skilled; pre-unit volleyball) statement demonstrates a less complex, but important observation of his opponent's toss serve: "That's where they

throw it everyday.” A more acute awareness of the location of an opponent’s hit and the development of an action plan was shown in Mattie’s statement: “When she hits it close [to the net, i.e. front court] (medium skilled; Lesson 13; Level 2 Statement)”. An even more complex observation of an opponent’s hit that describes acknowledgement of game process was stated by Steve (high-skilled; post-unit badminton; Level 3 Statement): “When he hit it up really high toward the back [court], [on the next rally] he tried to hit it toward the ground.”

Additionally, the more detail or forceful qualities the participant included in the observation of the situation, the more likely the condition related to a prior or sequential response selection. Steve (high skilled) discussed how his action created a specific condition for the game he/she was playing: “...which kind of messes him up; he just hits to the left side and to the other court (post-unit pickleball; Level 3 Statement).” Jerry (high skilled) had a statement of similar type: “ I was thinking if it looks like she’s gonna hit it hard...(post-unit badminton; Level 3 Statement)”.

Participants also discussed their *opponent’s position*. The majority of condition statements that related to the opponent’s position were considered tactically sound, with at least one forceful quality (Level 2 Statement). Statements of the like were specific about where the opponent was located and often were related to their own immediate actions for an attack, such as Nichole (medium skilled; Lesson 14): “She wouldn’t be able to run that far.” These types of statements were also presented as process statements related to future response selections. For example, Allie (low skilled; Lesson 17) “If she was far...” There were only a few statements that represented the extreme ends of tactical understanding spectrum regarding opponent’s position. A Level 3 Statement from Mattie

(post-unit badminton) demonstrated similar planning as Allie's statement above:

"...because you can't picture her just standing in one of the corners. She would want to be in the middle of the court somewhere." Steve stated in a focus group interview: "I look at the space where they are not, and I also look at my opponent after I hit because then I know when they hit it and what angle it's going, so then I can go where he hit it..." The weakest of statements lacked specific information to aid in any type of action plan, but demonstrated basic processing and learning the conditions of the game. This was Gracie's (medium skilled; pre-unit volleyball) statement, "thinking where the other players are." In post-unit Scenario 8, a majority of participants recognized where the opponent was moving right and selected to place the ball in the left corner for the return to make it difficult for the opponent or to score. Alec (medium skilled) explained, "So he will have to turn around and possibly miss it."

Fewer statements were made regarding *specific characteristics of the opponent*. These statements were fairly evenly spread across the ranges of tactical complexity. Cody's (high skilled; Lesson 17; Level 0 Statement) statement represents the weakest level. He competitively asserted that it takes an accurate judgment of personal power to move ahead, "They thought they put up a good effort." Alec (medium skilled; Lesson 14; Level 1 Statement) made an observation of opponent's skill in relation to his own, but made no reference to the possible outcome or an action he might have taken: "My opponent is way better than me." Oden (medium skilled; Lesson 18; Level 2 Statement) made a similar statement but adds an additional conclusion about how the game will go: "Well, with my opponent as good as he is, there's no way I'm gonna win." Cody (high skilled; Lesson 15; Level 3 Statement) said, "I did learn that both of my opponents are

good at jumping up in the air and hitting over their head.” All of these statements seem to progress respectively in quality level, based on the number of forceful additions; however, Cody’s Level 3 Statement, and similar statements, demonstrate a tactical complexity that is relevant to future game play. The other statements represent students’ regulation of their own personal abilities against another’s, without specific observations that would lead to a processing for specific actions.

### **Conditions Related to Self or Teammates**

Conditions related to the participants themselves or their teammates were represented by four separate contextual observations. Participants predominantly noticed conditions related to their *own hit*. To a lesser extent, participants noticed conditions related to the *game outcome*, as well as conditions regarding their *own positioning*. A minimal focus was *specific characteristics of themselves or their teammates*.

Participants’ statements regarding themselves or teammates were predominantly associated with their *own hit*. A majority of these condition statements were regulatory statements related to the success of the hit. Nichole (medium skill; pre-unit volleyball; Level 1 Statement) said, “...it wouldn’t go over too well”. Other more complex statements, though limited in this specific category, were followed by a decision or response related to a condition (if-then). For example, Cody (high skill; Lesson 13; Level 2 Statement) stated, “When I was serving...”; Steve (high skilled; Lesson 14; Level 2 Statement) said, “Right after I hit...”; and Brandon (high skilled; post-unit pickleball; Level 3 Statement) commented, “If it didn’t go to the baseline...”

Statements regarding the *condition of the game* were displayed in relationship to the score. These statements were fairly evenly distributed among the tactical

complexities. Weak statements were reports of students “thinking about the score (Steve; high skilled; pre-unit pickleball)” without giving any specific information. Other reports demonstrated an uncertain score and reflected a one-sided aspect of the game condition, such as “I thought I was winning (Alec; ;medium skilled; pre-unit badminton)”, “thinking how many points I had (Nikki; medium skilled; Lesson 14)”, “I won the game (Jake; medium skilled; Lesson 16)”, and “So far he’s winning (Nichole; medium skilled; Lesson 17)”. More complex statements demonstrated that students could report their own personal score and if they were winning or not. For example, Gracie (medium skilled; Lesson 19) said, “I was thinking we were gonna win, but we’re behind by four points”. The most complex statements related to the game condition were participants who reported each team’s score and acknowledged who was ahead: “The score was 34-37; he beat me by 3 (J.W.; medium skilled; Lesson 18)”.

Conditions stated that were related to participant’s *own positioning* were less of a focus than personal hits or game conditions. Statements around self-positioning were mostly defense related in the games of pickleball and badminton. As students talked about their play in volleyball, offensive statements were also included. Statements at the weakest level did not specify specific positioning and were related to keeping moving or waiting for some luck. Haley (medium skilled; pre-unit badminton; Level 0 Statement) stated, “As long as I moved around more”, and Alec (medium skilled; post-unit volleyball; Level 0 Statement) inferred waiting for something to occur by chance, “If I stand here long enough”. Though still weak, more complex statements specified offensive or defensive positioning and indicated an action plan, “while defending (Meg; low skilled; Lesson 18; Level 1 Statement)”. More complex statements included specific

locations with some form of reasoning or action plan, "...I wouldn't want to be standing right on the net (Brandon; high skilled; Lesson 11; Level 2 Statement)". Gracie (medium skilled; post-unit volleyball; Level 2 Statement) stated, "If the person in back got the ball". Only one highly complex statement was expressed in relationship to personal/team positioning. Nichole (medium skilled; Lesson 20; Level 3 Statement) described how the positioning of her teammate when receiving the volleyball was not helpful in setting up to attack, "...if he tried to let us get it, he would stand right in front of it so we couldn't get to it".

Statements regarding *personal or teammate's characteristics* had the least amount of focus. All but one of these statements were weak and lacked sound tactical explanation. Many statements of this focus were personal regulatory statements that gave no insight into the game situation or action plan. For example, Jake (medium skilled; Lesson 19; Level 0 Statement) said, "We were doing really good." Alec (medium skilled; Lesson 11; Level 0 Statement) commented, "We could hold a rally for ten years the way we are playing. Me and my partner (opponent) were playing really good". In this category, only one statement was made that was considered tactically sound and was linked to decision-making, "Since I run fast (Sid; Lesson 18; Level 2 Statement).

### **Goal Concepts: Identifying the Purpose of Action**

Goal concepts were statements that exhibited the process in which the game was won, such as scoring points or the purpose of a selected action (McPherson, 1993; McPherson & Kernodle, 2005). A total of 250 statements across the unit represented the category in which students described a particular goal they were thinking about. Participant's statements were grouped into six separate goal types: (1) *scoring/winning*

*the point, (2) making it difficult for the opponent to hit or return the object, (3) facilitate game play, (4) defending space/recovering, (5) personal positioning, and (6) accomplishing the tactical problem (see Table 5.9-5.10).*

### **Scoring/Winning the Point**

Thirty-three percent of participants' goal statements were about scoring or winning the point. Tactically sound statements here were process statements or if-then statements where stated actions lead to the goal of scoring or were a result of specific actions. For example, "...to get a point (Haley; medium skilled; Lesson 19; Level 2 Statement)" or "...and I got lots of points for that (Cody; high skilled; Lesson 13; Level 2 Statement). Other tactically sound statements demonstrated an action plan against their opponent and stated how the point was won, such as Matthew's (medium skilled; Lesson 14; Level 2 Statement) statement, "...then she'd be forced and it would at least bounce twice." Oden's (medium skilled; Lesson 19; Level 2 Statement) statement was about preventing the other team from taking actions to score or win, "...so the other team couldn't get a good return to win a point."

Weaker score-related goal statements lacked an if-then process or actions related to the goal, such as Alec's (medium skilled; post-unit volleyball; Level 1 Statement) comment, "I was thinking we could get all the points back and beat them". Similarly, Haley (medium skilled; Lesson 13; Level 1 Statement) responded, "I was thinking about the score." Other weak thought processes related to scoring were filled with general statement about learning to be a team player, beginning to think about cooperation, and having a competitive spirit. For example, Matthew (medium skilled; post-unit volleyball; Level 0 Statement) said, "What I was thinking also was just try to win and be a good

teammate and just try to score and win, but it's okay either way", and Aydan (medium skilled; post-unit volleyball; Level 0 Statement) stated, "Teamwork is the way of winning." Moreover, these types of statements represent beginnings of understanding the complexities of learning to play with a group of teammates, moving beyond personal goals to team goals and responsibilities, in the game of volleyball.

### **Making it Difficult for My Opponent**

Twenty-six percent of goal statements were related to *making it difficult for the opponent to hit or return the object*. Statements were evenly distributed into Level 2 and Level 1 quality statements. This split demonstrated tactically sound statements at a forceful level and a less forceful level, respectively. Both statement types included processes that involved action-related goals or if-then statements; Level 2 Statements were more descriptive in nature. Mattie (medium skilled; lesson 15; Level 2 Statement) explained, "...so my opponent wouldn't be able to receive the pass", and "...that way she wouldn't have time to get there in time to hit the ball" (lesson 16; Level 2 Statement). Other examples included, "...so my opponent would rush (Brandon; high skilled; lesson 14; Level 2 Statement)", and "...then they would have to shuffle their feet to hit the ball (Jerry, high skilled, lesson 13; Level 1 Statement)." Alec (medium skilled) is even more descriptive in his statement and highlights the process trying to set-up for the attack, "I would try to get them to move forward a little bit, then I would try to get them to move backwards (lesson 17; Level 2 Statement)."

Other statements were process related, but less descriptive and mostly related to hoping the opponent would miss the object. Brie's (low skilled) comment is uncertain and lacks a more detailed description of the opponent reaction she intended to create:

“...and maybe he’ll miss it (lesson 18; Level 1 Statement).” Gracie (medium skilled) said, “...and try not to let the other team get it” (lesson 20; Level 1 Statement)

### **Facilitate Game Play**

Participant’s statements for *facilitating game play* were desired game conditions or desired personal or opponent actions. These statements varied in types of actions or conditions desired, and in quality or tactical soundness. Goal statements were mostly action results derived from other offensive actions used to simplify the environment, create advantages, or establish control. Often, these types of statements were related to the lesson focus or tactical problem of the lesson.

*Ball placement* was a major action that facilitated game play. Participants realized that their ball placement could set-up for future personal actions and court conditions or could be used to obtain a specific action response from opponents. An example of one appropriate action-linked goal that was related to the tactical problem of maintaining a rally was Jon’s (medium skilled; Lesson 11; Level 1) statement: “...so he could hit it back in a cooperative way without me dropping it.” Haley (medium skilled; Lesson 12; Level 1 Statement) had a similar statement for helping her partner gain control of the ball in a cooperative game: “so it wouldn’t go really far back.” Cody’s (high skilled; Lesson 11; Level 1 Statement) statement was a goal he had for his partner’s means of throwing: “...so I could catch it”. Meg (low skilled, Lesson 13; Level 1 Statement) wanted to make sure “it [the ball] stayed inbounds.

A more complex statement was made in Lesson 13 by Alec (medium skilled; Level 2 Statement). He explained the result of setting-up to attack in a competitive game, “...so it’s easier to go anywhere on the court.” While playing volleyball, Mattie (medium

skilled; post-unit volleyball; Level 2 Statement) provided a tactically sound regulatory response and described how she wanted her teammates to be able to receive the pass more easily: “I didn’t want the ball to be right next to me. They couldn’t get it if it was right next to me.” Other participants had the goal of creating space and setting-up for the attack: “...so I would have the full space (Haley; medium skilled; Lesson 14; Level 2 Statement)”, and “so my team could spike it (Jerry; medium skilled; post-unit volleyball; Level 2 Statement).”

Participants discussed game facilitation in relation to *defending space* or *recovering*. These statements were also process type statements in the form of action-related goals. For example, “...so I could run back to my space (Jon; medium skilled; Lesson 14; Level 2 Statement), and “...so I would be able to run up and down (Haley; medium skilled; Lesson 14; Level 1 Statement).” Other statements demonstrated students learning and attempting to discover defensive solutions: “Find a way to make sure the shuttle doesn’t hit the ground (Nichole; medium skilled; Lesson 18; Level 1 Statement).”

Some statements evidenced students’ understanding that *positioning* impacted game play. In a cooperative game, Oden (medium skilled; Lesson 11; Level 2 Statement) discussed how being in the right location helped his partner get him the ball: “Make sure there was a section where my partner would be able to drop it and it wouldn’t be too hard for him to just get a serve over. Other statements were less complex and connected to body movement: “You have to get to the ball as quick as you can, like moving on your toes (Sammie; low skilled; pre-unit pickleball; Level 1 Statement).” Nichole (medium skilled; Lesson 12; Level 0 Statement) made a regulatory statement related to prior

conditions: "...should have rotated positions more often because half the time two girls were up front and one guy was in the back."

Action-related goals (process type statements) that specifically related to the tactical problem were not detailed statements, but did highlight what students were learning in particular lessons. These statements also represented language development around the tactical problems and were linked to actions related to the tactical problem. Students were often accurate in their language use, action responses, and could accurately identify the tactical problem of a lesson. For example, "...in order to maintain a rally (Steve; high skilled; Lesson 12; Level 2 Statement)", "...so we could set-up to attack (Oden; medium skilled; post-unit volleyball; Level 2 Statement)", and "...so I could get back to defend my space (Brandon; high skilled; Lesson 14; Level 2 Statement)."

Less sound statements lacked if-then processing, such as Meg's (low skilled; Lesson 17; Level 0 Statement) statement, "I had to defend space and make sure that I could. I had to trick people and had to remember to defend my space." Brandon's (high skilled; post-unit badminton; Level 0 Statement) comment in a post-badminton interview were like many in the post-unit talk aloud comments; he knew there were multiple tactical problems presented and multiple tactical problems to solve, but did not express them in detail: "Thinking to make sure I do all the tactical problems we have done before and make sure I accomplish them."

### **Knowledge Structures**

*About-game knowledge* and *in-game knowledge* were delineated from the data. Participant's *about-game* knowledge was declarative knowledge that represented understanding of the game, such as how to score, rules, equipment, and specific game

skills. *In-game* knowledge was tactical knowledge that represented participant's decision-making, goal-related processes, tactics, and use of about-game knowledge during the game. Action, condition, and goal statements were considered process pieces of in-game knowledge. The type of knowledge base most evident throughout the unit was in-game knowledge. Limited about-game knowledge was accessed.

### **About-Game Knowledge**

Participants demonstrated very general aspects about the games they played regarding rules, procedures for scoring, equipment used, play space, and inherent skills. Participants discussed about-game knowledge as they described similarities of badminton and volleyball and what one sport has taught them about another regarding pickleball, badminton, and volleyball.

Participants' primary responses during pre-unit quizzes were that both badminton and volleyball "...both have nets (J.W; medium skilled)". Another frequently made statement regarded the similarities in objectives "...you can't let the object hit the ground (Oden; medium skilled)." Rarely did participants link the object hitting the ground with scoring points prior to the unit. Three students claimed, "I don't know what badminton is (Jake; medium skilled)." Many of these responses were accurate, but lacked details that truly define and distinguish these games.

Post-unit quiz responses were more complex and predominantly related to similarities in scoring. For example, "They are also similar because if it touches the ground it's the other person's point (Jake; medium skilled)." Jake was one individual who initially did not know what badminton was. Participants also continued to discuss, to a lesser extent than before, the fact that both games have nets.

In the post- unit quiz, when asked to discuss similarities of pickleball, badminton, and volleyball to soccer, there were mixed responses that were generally accurate, but did not reach complex levels to include tactical thought. The discussion remained superficial, such as inclusion of types of equipment (nets and balls), use of feet versus hands, involvement of people, and existence of boundaries, etc. Participants were not able to tactically relate or distinguish among the net/wall games presented and soccer.

Throughout the unit, in verbal recall, students could distinguish how to score. They predominantly discussed the forehand hit in pickleball and inability to use the backhand hit. In badminton, students called the shuttle predominantly “birdie,” less frequently “shuttle,” and occasionally “the badminton.” The spike was the predominant skill discussed in volleyball. Participants rarely use the terms forearm pass or set.

### **In-Game Knowledge**

Participant’s knowledge structures tended to match the concepts that were taught in the unit. Mattie (medium skilled) expressed a match in Lesson 11 (maintaining a rally), “The tactical problem was to maintain a rally. What we did to solve the problem was make sure that we hit it to each other so we could have a compatible game.” Cody (high skilled), a predominantly sound tactical thinker, provided an example of a mismatch in tactical focus: “I was trying to maintain a rally by hitting it where he wasn’t, so he couldn’t hit it back easily.” Cody, like a few of the more advanced novice tactical thinkers, played more competitively in games that were intended to be cooperative.

Though knowledge structures seemed to match concepts that were taught, participants demonstrated sound and less sound tactical knowledge. Participants who demonstrated less sound tactical knowledge responded with more reactive type

statements of what to do, and those participants with more sound tactical knowledge were better able to create a plan of what to do and used if-then type statements. Participants at both levels had instability in their knowledge structures throughout the unit.

### **Sound and Unsound Tactical Knowledge Samples**

Two students, Meg and Brandon, were purposively selected to highlight processing levels of novice participants that had sound and unsound tactical understanding. Meg was a female student who had no prior experience with net wall games, having only participated in soccer, dance, and cheerleading outside of physical education. Abby ranked her skill as low. Meg began the unit with several misconceptions of net/wall games and had a low level of tactical understanding. At the end of the unit, she was able to demonstrate several tactically sound concepts, but overall knowledge base remained fragile.

Brandon was a male student who had prior experience in several different games: lacrosse, basketball, soccer, hockey, baseball, and badminton. In a post unit focus group interview, he stated that he played badminton differently at home than how it was played in class: “like different boundaries...kind of like a tennis court...that there would be doubles.” When asked if he thought he had an understanding of net/wall games coming into this unit, he expressed limited understanding, “No, cause badminton was really the only one I’d ever played.” Abby ranked his skill as high. Brandon began the unit with fairly accurate in-game and about-game knowledge, though he lacked the detail that he was able to express at the end of the unit.

**Meg.** In her pre-unit verbal recall regarding volleyball, Meg demonstrated unsound tactical understanding for setting up to attack in a *hit it* action statement: “When

I was playing volleyball, I was thinking, ‘Make sure you hit the ball over and make it hard to intercept...you can get points, you just hit it to an open space.’” This statement demonstrated an understanding of the competitive nature of volleyball and that hitting it to open space is a possible way to win the point, which was that game’s objective. On the other hand, this statement is not specific in sound processes for attacking and lacks specific details of how the point is won. Her response could also be considered reactive.

In her post- unit quiz, Meg had a wavering ability to express tactically sound understanding of setting-up to attack or creating space. Upon receiving the serve, in the diagram, her version of setting up to attack was to “...hit the ball over the net” because “there is an open space in front of me”. She selected to return the ball immediately as opposed to pass and set up for an attack. In a separate scenario, was able to select a tactically sound option for what the front person should do on the second hit in volleyball: “Pass forward to you or player ‘3’,” but she was not able to coherently rectify her selection: “Then I can hit to them, and they can hit to an open spot.”

Meg misstated the tactical problem of defending space in Lesson14 (pickleball) and said in a reactive manner regarding positioning, “...maintaining space...I mean setting up to attack. I moved around and made sure there’s spaces I could get to that the person would hit.” This statement lacks certainty as well as description and reflects that she followed her opponent’s hits reactively. In Lesson 18 (badminton) she accurately, but unsoundly, discussed positioning: “We did different things while we were defending space. My team moved around and went back to the baseline because it’s easier to run forward than backward.” Her statement demonstrates an incomplete understanding of her positioning for defending space. She knew that it was important to go to baseline for

forward momentum, but was not explicit about why that action might be important in relationship to specific game conditions or the goal of the game.

**Brandon**. In his pre-unit quiz, regarding setting up to attack or creating space, Brandon demonstrated accurate decision making and had waves of sound tactical understanding. After receiving the serve in volleyball, he selected that he would “Pass to teammate 2” at the net, “so he can get a better shot.” In this scenario, Brandon’s decision to pass to teammate 2 at the net was accurate; however, the conception that the setter was in a position to spike or have a better shot demonstrates a gap in his procedural knowledge for setting up to attack. In another scenario where Brandon discussed what the setter should do on the second hit, he answered soundly, “Pass forward to you or player ‘3’, as they run toward the net,” but he was not able to defend his answer with clarity: “Because there is no one where teammate 3 will run. Then he can hit it.”

In a post-unit quiz volleyball scenario, Brandon gave a *hit it* response with sound tactical reasoning by providing that he would “...pass to teammate two [setter at the net]”, “because if I hit to teammate two, he could set up to spike or catch player A out of position.” Here Brandon acknowledges how to set up to attack using three hits, but he also allows room for other decisions based on the game conditions.

Brandon struggled to discuss the action of defensive positioning in Lesson 13 (pickleball). His statement highlighted his cognitive processing of learning what to do rather than an automatic choice based on a specific condition: “What I was thinking of when I was playing was a position where I could be where it would be safe for me to be when my opponent returns.”

In Lesson 18, Brandon's action statement had more sound tactical understanding and planning as he linked in to the tactical problem. Even though his statement offered more sound tactics, there was still an essence of uncertainty:

The tactical problem was to defend your space, and what I did to solve the problem was I usually stayed in the middle of my court. I still went to baseline, except most of the time I didn't go onto a side. I stayed in the middle. I was thinking as I played, where should I position myself? I want to make sure that when I return to baseline he won't be able to hit it anywhere because I'll be right snap in the middle.

He was beginning to formulate plans based on what he should do related to the tactical problem of the lesson, though he did not suggest his plan was based on specific conditions of the environment. He did have the idea of attempting some means of positioning that would make his opponent's attack difficult.

### **Discussion**

Findings from this study highlight what 5<sup>th</sup>-grade students were thinking during a 20-day TGM net/wall unit. Participants had a range of types of action, condition, and goal statements, as well as a range in the quality of those statements. The range of statements represents diverse levels of student knowledge structures, as well as the fragility of student knowledge structures. Fragility of knowledge has been documented in several studies regarding novice game play (Mahut et al., 2003; Rovegno et al., 2001). Collectively, participants in this study remained novice in their explanations, but had waves and highlights throughout the unit where thoughtful game play was instigated.

These consistencies and distinctions are described below in relationship to novice game play literature (French & McPherson, 2004).

Action concepts were stated more frequently than other concepts in this study. In another study, Bohler (2009) also found that action concepts were more profound than condition or goal concepts in novices' game play statements. Studies conducted by McPherson (1994, 1999) have provided that novices tended to focus on actions. French et al. (1996) and McPherson (1999) also noted that novices did not use specific labels for actions and used non-labeled actions such as "hit." Findings from this study were similar in participants' verbal recall statements. Conversely, the current study showed that in focus group interviews participants could generate specific action labels for certain types of hits and knew when to generally use them. Students also generated defensive actions, a result that has been limited to experts in other studies. (McPherson, 1994, 1999).

McPherson (1999) found that as novice players discussed conditions, they were primarily weak or inappropriate conditions, and they were conditions related to themselves and not their opponent. French et al. (1996) found that novices provided very few conditions in their study, and when conditions were provided they were very literal. Participants in this study discussed half as many game conditions as they did game actions, providing for fewer conditions stated. This result aligns with the above studies (French et al., 1996; McPherson, 1999). However, participants in the current study, unlike those in the above studies, were able to generate several types of conditions related to their opponent and themselves. These conditions were often related to actions for goal-related outcomes. Others have found that conditions stated by novices are limited in their actions links (French et al., 1996).

Goal statements in the current study were not generated as frequently as action concepts. Goal statements were predominantly related to winning or scoring the point and making it hard for the opponent to return the object, while other goals regarded ease of game play and defense. French et al. (1996) and McPherson (1999) noted that novices had limited higher-level goal statements with tactical relevance for competition. McPherson described that the goals stated in her study were the participants' plans. Findings in the current study differ in that participants' goals were action-related outcomes they desired, and many of the goal statements were higher-level in quality.

Participant's *about-game* knowledge was declarative knowledge that represented understanding of the game, such as how to score, rules, equipment, and specific skills used in the game. About-game knowledge was not highly evident in this study and was very general. Though limited in number, about-game knowledge structures did improve for many by the end of the unit. This finding of limited about-game structures may be due to the fact that *in-game* knowledge was the predominant focus in this unit while about-game information was included only as modified or situated parameters of the TGM games. Students did not have much opportunity to develop about-game knowledge, except for in an indirect manner. In many instances, about-game information was only used to "set the scene" for students to play the game and was not established as "need to know information" as many traditional lessons do. McPherson (1994) provided that novice players retrieve less declarative knowledge. For this study, this may not be the case. Findings in this study related to about-game knowledge may be more related to what was taught. Metzler (2003) offered that students learn what you teach them.

Engagement in TGM lessons may not require significant about-game knowledge as games are modified and situated to facilitate a single tactical problem. Perhaps about-game knowledge was not only limited in the fact that it was not significant to this unit, but possibly because of the novice level of the students. The case may be that specific and detailed about-game knowledge is not necessary at this level of play, and about-game knowledge may develop as more support is needed for in-game knowledge. This statement is made not to devalue about-game knowledge, but to offer that about-game knowledge in TGM may be situational and progress on a “need to know basis.”

Rink (1996) provided that about-game knowledge and in-game knowledge are interdependent. Teachers can seek to understand students’ about-game knowledge and misconceptions about the game as they emerge as enhancers or as challenges during a lesson. Acknowledging appropriate and inappropriate about-game knowledge concepts may influence students’ in-game knowledge. Additionally, about-game concepts that transfer and that are related to the tactical problem are particular about-game concepts that could be highlighted (e.g., how to score). There is little evidence to suggest how much and what kind of about-game knowledge facilitates in-game knowledge development in TGM. Future studies should investigate the relationship between in-game and about-game concepts in TGM. The limited about-game knowledge and the misconceptions apparent in the unit highlight the need for more dense information and experiences to bridge connections among in-game and about-game knowledge.

All participants in the current study experienced waves of sound and unsound in-game knowledge structures. Sound knowledge structures were planned, process related, included if-then type statements, and consisted of action, condition, and goal statements.

These knowledge structures moved away from the typical characteristics of novice play outlined by French and McPherson (2004). Unsound knowledge structures were more reactive in nature, lacked if-then type processing, or were inaccurate and were similar to those novice characteristics outlined by French and McPherson (2004). Sound and unsound in-game knowledge for the tactical problems of setting up to attack and defending space were evident for all students across pickleball, badminton, and volleyball, demonstrating transfer of knowledge (Mitchell & Oslin, 1999).

In-game knowledge concepts tended to match the tactical problems in the unit. Abernethy (1988) as well as others (French et al., 1996; Nevett & French, 1997) suggested that task-specific practice leads to more accurate and sophisticated responses or problem representations. Practice tasks, in the form of modified games, situated practices, and Q/A segments that are appropriately facilitated by the teacher aid in the development of appropriate and more sophisticated action plans, awareness of diverse game conditions that inform game play, and support action related goal structures.

Proponents of TGM have claimed that the model supports tactical knowledge development and decision-making (i.e. what to do) (Oslin & Mitchell, 2006). To date, there is limited research that examines what students think about during TGM and limited research offers insight into novices' knowledge structure development in the model. The current study supports the assumptions of TGM for the development of tactical awareness and decision-making for game play. A lengthy unit, having multiple experiences with similar tactical problems, in different means of play (i.e., sampling) can help to establish procedural knowledge related to different and various tactical problems. Additionally,

incorporation of defensive tactical problems facilitates offensive tactical problems and response selections for the novice player.

For the novice games player, sound tactical knowledge structures can be developed in this model, but these structures need to be continually supported. Novices need time and multiple, varied experiences to grow in their knowledge base. Young novices bring in limited experiences. Teachers must help students build a knowledge base to relate to for deeper knowledge structures to form.

### **Conclusion**

A 20-day TGM net/wall sampling unit aided in participants' development of tactical understanding; however, knowledge structures were frail and intermittent, even in a lengthy unit. These results highlight the importance of teaching for understanding and the need for teachers to actively work to help novice students develop tactical awareness in games. To better aid students in developing stronger, deeper understanding, perhaps novices should experience fewer tactical problems in a 20-lesson sampling unit. The few tactical problems they experience should stay connected or relational (MacPhail, Kirk & Griffin, 2008), such as offense to defense transitional play in net/wall games, where perceptual and decision-making dimensions come together. Additionally, it is important for teachers to instructionally relate to the experiences of their students. Understanding students' misconceptions, as well as in-game and about-game knowledge, and focusing on those weak areas for particular students, would enhance knowledge base.

Grehaigne (2010) proposed enhancing student configuration of play by stopping and looking at possibilities in the game. When students are allowed to observe and are actively asked to discuss the game situation, they can take a deeper look at the game and

process what is happening. Additionally, this process allows teachers to determine deeper misconceptions and fragile knowledge structures on the spot and individually.

Hopper (2010) suggested that peer observation is one important means of learning the intricacies of games and how young people gather tricks of the trade from their peers. The observation environment and trial and practice opportunities for these tactics should be encouraged and purposely built into TGM lessons.

Strongly tending to a few tactical problems while offering opportunities for students to observe their peers' tactics and to explain configurations they see in-depth (aside from short question and answer segments) would help students develop deeper knowledge structures and support wavering knowledge structure. Additionally, experiencing fewer, but related tactical problems may allow teachers to tune in better to misconceptions students may have and tend to those early and consistently. In conclusion, TGM offers a positive structure and instructional paradigm that facilitates the development of and enhances sound tactical knowledge structures for novices. The additional pedagogical techniques that have been suggested will only further support the model's ability to enhance learning of tactical awareness.

Table 5.6. Quantifications and Qualifications of Action Statements

Tactical Problem & Lesson Number	Game	Quality Levels for Specific Categories							
		Hit Category				Position Category			
		0	1	2	3	0	1	2	3
<b>Win the Game</b>									
Pre-Unit Game	Pickleball	7	3	13	4	3	1	2	1
Pre-Unit Game	Badminton	12	4	9	4	3	3	3	0
Pre-Unit Game	Volleyball	5	9	5	2	3	2	1	0
<b>Maintain a Rally</b>									
Lesson 11	Pickleball	2	1	9	2	3	1	3	0
Lesson 12	Pickleball	2	4	15	8	1	1	0	0
Lesson 15	Badminton	0	3	6	3	1	0	2	2
Lesson 16	Badminton	0	1	5	0	0	0	0	0
<b>Set-Up to Attack</b>									
Lesson 13	Pickleball	1	4	12	14	1	2	2	0
Lesson 17	Badminton	0	1	8	3	1	4	1	0
Lesson 19	Volleyball	0	1	11	2	0	0	0	0
Lesson 20	Volleyball	2	0	3	9	0	0	0	0
<b>Defend Space</b>									
Lesson 14	Pickleball	0	4	19	9	0	2	9	3
Lesson 18	Badminton	1	3	21	8	2	3	9	7
<b>Win the Game</b>									
Post-Unit Game	Pickleball	3	0	10	2	0	0	4	2
Post-Unit Game	Badminton	1	3	8	7	0	3	3	4
Post-Unit Game	Volleyball	1	10	23	6	1	2	8	2
<b>Quality Action Statements Total</b>		<b>37</b>	<b>51</b>	<b>177</b>	<b>83</b>	<b>19</b>	<b>24</b>	<b>47</b>	<b>21</b>
<b>Action Category Statements Total</b>		<b>348</b>				<b>111</b>			

Table 5.7. Quantifications and Qualifications of Condition Statements Related to Opponent

Tactical Problem & Lesson Number	Game	Quality Levels for Specific Categories											
		Opponent's Hit				Opponent's Position				Opponent's Characteristics			
		0	1	2	3	0	1	2	3	0	1	2	3
<b>Win the Game</b>													
Pre-Unit Game	Pickleball	0	2	2	0	0	0	4	0	2	0	0	0
Pre-Unit Game	Badminton	0	1	4	0	0	0	0	1	0	0	0	0
Pre-Unit Game	Volleyball	0	3	0	0	2	1	1	0	2	0	0	0
<b>Maintain a Rally</b>													
Lesson 11	Pickleball	0	2	0	1	0	0	4	0	0	0	0	0
Lesson 12	Pickleball	0	0	0	0	0	0	2	0	0	0	0	0
Lesson 15	Badminton	1	2	1	2	0	0	3	1	0	0	0	1
Lesson 16	Badminton	0	0	1	0	0	0	1	0	0	0	1	1
<b>Set-Up to Attack</b>													
Lesson 13	Pickleball	0	0	2	2	0	1	4	1	0	0	0	0
Lesson 17	Badminton	0	1	1	1	0	1	2	1	0	0	0	0
Lesson 19	Volleyball	0	1	0	0	0	0	0	0	0	0	0	0
Lesson 20	Volleyball	0	0	0	0	0	0	0	0	1	0	0	0
<b>Defend Space</b>													
Lesson 14	Pickleball	0	2	5	3	0	0	1	1	0	2	1	0
Lesson 18	Badminton	0	3	11	5	0	0	4	0	0	1	1	0
<b>Win the Game</b>													
Post-Unit Game	Pickleball	0	1	1	4	0	1	1	0	0	1	0	0
Post-Unit Game	Badminton	0	4	5	3	0	0	4	1	0	0	0	0
Post-Unit Game	Volleyball	0	0	0	0	0	0	0	1	0	0	0	0
<b>Quality Action Statements Total</b>		<b>1</b>	<b>22</b>	<b>33</b>	<b>21</b>	<b>2</b>	<b>4</b>	<b>31</b>	<b>7</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>
<b>Total Action Category Statements</b>		<b>77</b>				<b>44</b>				<b>14</b>			

Table 5.8. Quantifications and Qualifications of Condition Statements Related to Self and Score

Tactical Problem & Lesson Number	Game	Quality Levels for Specific Categories															
		Self Hit				Self Position				Self/ Team Characteristics				Game Score			
		0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3
<b>Win the Game</b>																	
Pre-Unit Game	Pickleball	0	1	0	0	0	2	0	0	0	0	0	0	2	0	0	2
Pre-Unit Game	Badminton	0	3	0	0	0	1	0	0	0	0	0	0	2	2	0	1
Pre-Unit Game	Volleyball	0	1	1	0	3	1	0	0	2	0	0	0	0	2	0	0
<b>Maintain a Rally</b>																	
Lesson 11	Pickleball	0	0	0	0	0	0	3	0	1	0	0	0	0	0	0	0
Lesson 12	Pickleball	0	4	0	0	0	0	1	0	0	0	0	0	1	0	0	0
Lesson 15	Badminton	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Lesson 16	Badminton	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	4
<b>Set-Up to Attack</b>																	
Lesson 13	Pickleball	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lesson 17	Badminton	0	1	1	0	0	0	1	0	2	0	0	0	0	0	1	0
Lesson 19	Volleyball	0	6	0	1	0	0	0	1	0	0	0	0	0	0	0	1
Lesson 20	Volleyball	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Defend Space</b>																	
Lesson 14	Pickleball	0	0	2	0	0	0	0	0	2	0	0	0	0	0	0	0
Lesson 18	Badminton	0	7	0	1	0	3	0	0	2	0	1	0	0	3	0	0
<b>Win the Game</b>																	
Post-Unit Game	Pickleball	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Post-Unit Game	Badminton	0	0	0	0	0	1	1	0	1	0	0	0	0	1	1	0
Post-Unit Game	Volleyball	0	0	2	0	1	0	2	0	2	0	0	0	1	0	2	0
<b>Quality Statements Total</b>		<b>0</b>	<b>25</b>	<b>7</b>	<b>3</b>	<b>4</b>	<b>8</b>	<b>8</b>	<b>1</b>	<b>12</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>6</b>	<b>9</b>	<b>5</b>	<b>8</b>
<b>Category Statements Total</b>		<b>35</b>				<b>21</b>				<b>13</b>				<b>28</b>			

Table 5.9. Quantifications and Qualifications of Goal Statements

Tactical Problem & Lesson Number	Game	Quality Levels for Specific Categories								
		Score			Difficult for Opponent to Hit			Defend Space/Recover		
		0	1	2	0	1	2	0	1	2
<b>Win the Game</b>										
Pre-Unit Game	Pickleball	0	2	8	0	2	4	1	0	1
Pre-Unit Game	Badminton	1	6	11	1	0	1	0	0	1
Pre-Unit Game	Volleyball	0	1	3	0	0	1	1	1	1
<b>Maintain a Rally</b>										
Lesson 11	Pickleball	0	0	0	0	6	3	0	0	1
Lesson 12	Pickleball	0	2	0	0	10	2	0	0	0
Lesson 15	Badminton	0	0	1	0	0	1	0	0	0
Lesson 16	Badminton	0	0	2	0	1	1	0	0	0
<b>Set-Up to Attack</b>										
Lesson 13	Pickleball	1	0	5	0	4	2	0	0	0
Lesson 17	Badminton	1	0	2	1	0	3	0	3	1
Lesson 19	Volleyball	0	0	3	0	0	0	0	0	0
Lesson 20	Volleyball	0	0	3	0	3	0	0	2	0
<b>Defend Space</b>										
Lesson 14	Pickleball	1	1	3	0	0	7	1	2	4
Lesson 18	Badminton	2	0	2	0	3	4	0	5	3
<b>Win the Game</b>										
Post-Unit Game	Pickleball	0	0	4	0	1	2	0	0	0
Post-Unit Game	Badminton	1	0	2	0	1	0	0	0	2
Post-Unit Game	Volleyball	4	0	9	0	2	1	0	0	0
<b>Quality Statements Total</b>		<b>11</b>	<b>12</b>	<b>58</b>	<b>2</b>	<b>32</b>	<b>32</b>	<b>3</b>	<b>13</b>	<b>14</b>
<b>Category Statements Total</b>		<b>81</b>			<b>66</b>			<b>30</b>		

Table 5.10. Quantifications and Qualifications of Goal Statements Continued

Tactical Problem & Lesson Number	Game	Quality Levels for Specific Categories								
		Facilitate Another Action/Condition			Self Position			Tactical Problem		
		0	1	2	0	1	2	0	1	2
<b>Win the Game</b>										
Pre-Unit Game	Pickleball	4	1	4	0	1	2	0	0	0
Pre-Unit Game	Badminton	2	1	2	0	0	1	0	0	0
Pre-Unit Game	Volleyball	6	3	6	0	0	1	0	0	0
<b>Maintain a Rally</b>										
Lesson 11	Pickleball	0	0	0	0	0	0	0	0	3
Lesson 12	Pickleball	0	0	0	0	0	0	0	0	6
Lesson 15	Badminton	0	0	0	0	0	0	0	0	0
Lesson 16	Badminton	0	0	0	0	0	0	0	0	0
<b>Set-Up to Attack</b>										
Lesson 13	Pickleball	0	1	3	0	0	0	1	0	0
Lesson 17	Badminton	0	2	0	0	0	0	0	0	0
Lesson 19	Volleyball	0	0	0	0	4	1	1	0	0
Lesson 20	Volleyball	0	0	0	1	0	0	0	0	0
<b>Defend Space</b>										
Lesson 14	Pickleball	0	1	1	0	0	0	0	0	0
Lesson 18	Badminton	0	0	0	0	0	0	0	0	0
<b>Win the Game</b>										
Post-Unit Game	Pickleball	2	0	0	0	0	0	0	0	0
Post-Unit Game	Badminton	0	0	0	0	0	0	0	1	0
Post-Unit Game	Volleyball	0	1	0	1	4	5	0	0	0
<b>Quality Statements Total</b>		<b>14</b>	<b>10</b>	<b>16</b>	<b>2</b>	<b>9</b>	<b>10</b>	<b>2</b>	<b>1</b>	<b>9</b>
<b>Category Statements Total</b>		<b>40</b>			<b>21</b>			<b>12</b>		

## APPENDIX A

### UNIT SCHEDULE

Day	Set-Up	Tactical Problem	Lesson Focus	Play Type
1	1v1 throw tennis Level I	Maintain a rally	Court space	Cooperative; long narrow court, tennis ball
2	1v1 throw tennis Level I	Set up to attack	Rules and court space	Competitive; long narrow court, tennis ball
3	1v1 throw tennis Level I	Defending space	Recover to base position	Competitive; long narrow court, tennis ball
4	1v1 one-wall handball Level I	Set up to attack	Court space	Cooperative and competitive; long narrow with gym wall, tennis ball and soft bounce ball
5	1v1 one-wall handball Level I	Defending space	Recover to base position	Competitive; long narrow with gym wall, tennis ball and soft bounce ball
6	2v2 throw tennis Level I	Creating space	Court space	Competitive; combine the 1v1 court space, tennis ball
7	3v3 deck tennis Level II	Maintain rally	Keeping projectile in court	Cooperative; combine 3 1v1 courts/half a regular volleyball court; deflated playground ball/deck ring
8	3v3 deck tennis Level II	Creating and defending space	Throw quickly to space, judge lines, cover court	Cooperative and competitive; combine 3 1v1 courts/half a regular volleyball court; deflated playground ball/deck ring
9	3v3 deck tennis Level II	Maintain rally and creating space	Backhand and forehand throwing technique	Competitive; combine 3 1v1 courts/half a regular volleyball court; deflated playground ball/deck ring
10	3v3 deck tennis Level II	Defending space	Court coverage and sliding movements	Competitive; combine 3 1v1 courts/half a regular volleyball court; deflated playground ball/deck ring
11	1v1 pickle ball Level III	Maintain rally	Court space	Cooperative; long narrow court; tennis ball; plastic paddle
12	1v1 pickle ball Level III	Maintain rally	Court space Backhand and forehand	Cooperative; long narrow court; tennis ball; plastic paddle
13	1v1 pickle ball Level III	Set up to attack	Court space and rules	Competitive; long narrow court; tennis ball; plastic paddle
14	1v1 pickle ball Level III	Defending space	Recover to baseline	Competitive; long narrow court; tennis ball; plastic paddle
15	1v1 badminton Level III	Maintain rally	Court space	Cooperative; long narrow court; badminton racquet; shuttle; raised net

16	1v1 badminton Level III	Maintain rally	Court space	Cooperative; long narrow court; badminton racquet; shuttle; raised net
17	1v1 badminton Level III	Set up to attack	Court space	Competitive; long narrow court; badminton racquet; shuttle; raised net
18	1v1 badminton Level III	Defending space	Recover to base	Competitive; long narrow court; badminton racquet; shuttle; raised net
19	3v3 volleyball Level III	Set up to attack	Court space, base position, rotation, Overhead pass	Competitive; combine 3 1v1 courts/half a regular volleyball court; beach ball; net same as in badminton
20	3v3 volleyball Level III	Set up to attack Winning the point	Overhead pass spike	Competitive; combine 3 1v1 courts/half a regular volleyball court; beach ball; net same as in badminton

## APPENDIX B

### PRE-POST UNIT GAME PLAY AND COURT DESIGN DIAGRAM

**Pickle Ball**

- 1 v1, 15 minute game
- Low net (set up in middle of basketball court, length-wise, from goal to goal)
- Long narrow court (5 courts per half a basketball court; ten courts total)
- Plastic, novice-level, pickle ball paddle
- Tennis ball (for slower tracking)
- Toss serve to initiate game play, service goes to the scorer

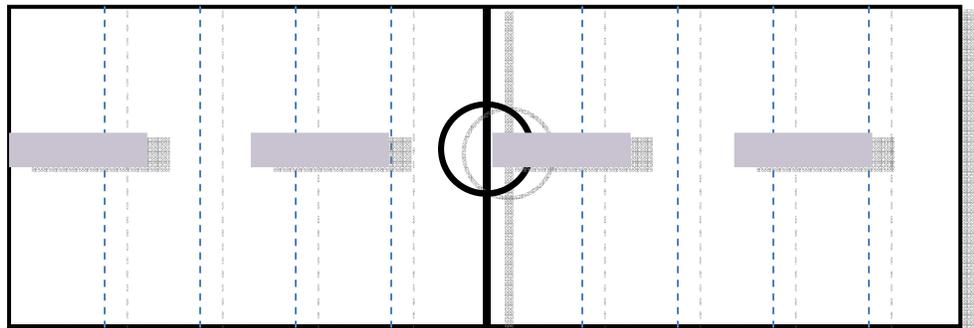
**Badminton**

- 1v1, 15 minute game
- 5 ft. net (set up in middle of basketball court, length-wise, from goal to goal)
- Long narrow court (5 courts per half a basketball court; ten courts total)
- Elementary badminton rackets
- Regular size elementary shuttle cocks
- Toss serve to initiate game play, service goes to the scorer

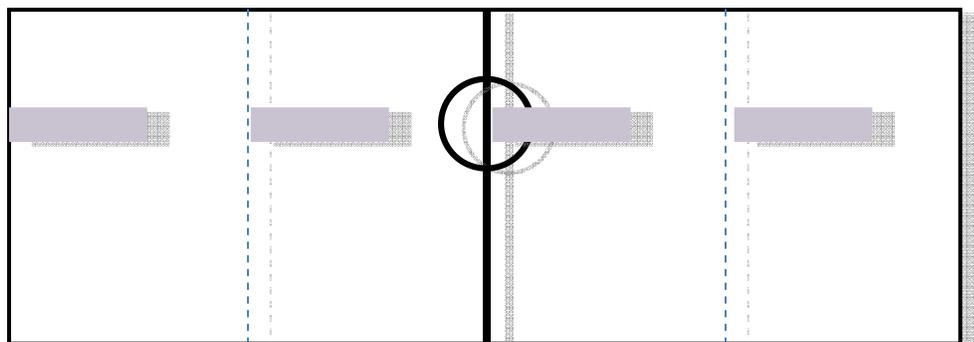
**Volleyball**

- 3v3, 15 minute game
- 5 ft. net (set up in middle of basketball court, length-wise, from goal to goal)
- Long narrow court (2 courts per half a basketball court)
- 12" beach ball; Rainbow toss serve to initiate game play, service goes to the scorer

*Court Design for Pickleball and Badminton*



*Court Design for Volleyball*

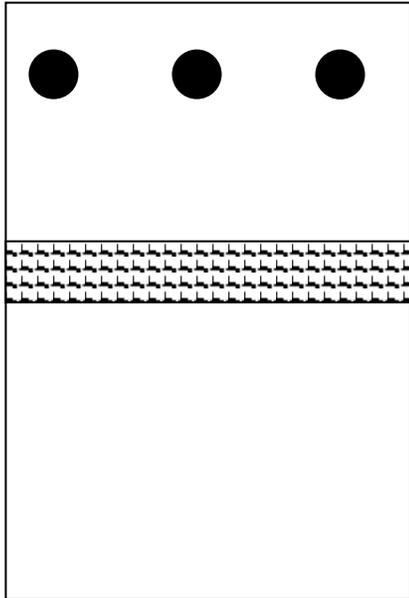


APPENDIX C

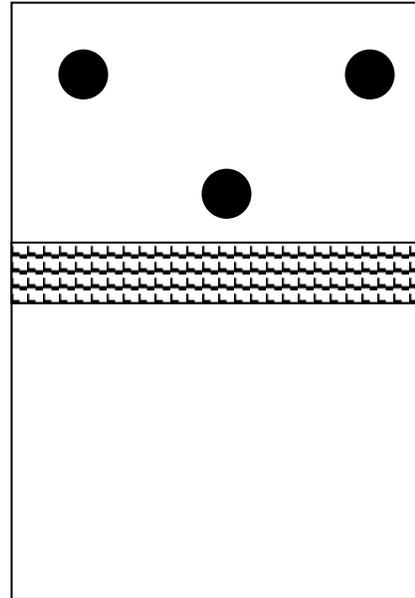
STUDENT SITUATIONAL KNOWLEDGE QUIZ

1. What is the best position for your team to defend your own court space? (circle A,B,C,D)

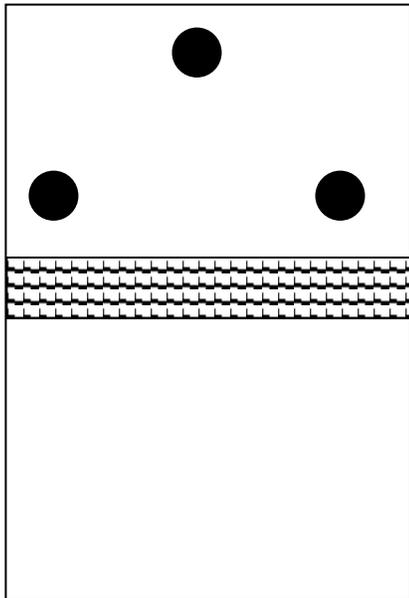
**A**



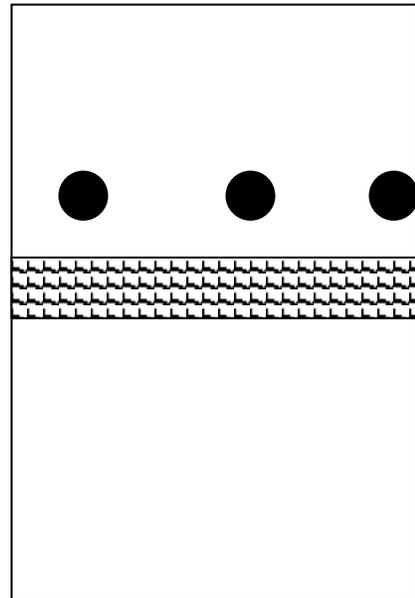
**B**



**C**



**D**



2. Why is this the best positioning for your team to defend its' court?

3. Draw lines from the object to the word to match the object to the net/wall game.



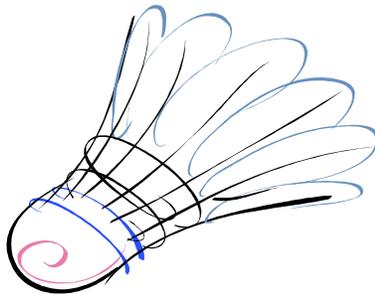
Racquet Ball



Badminton



Tennis



Volleyball



Pickleball

**4. How do you win a point in each of these games? Explain in each box.**

How do you win a point in Volleyball?

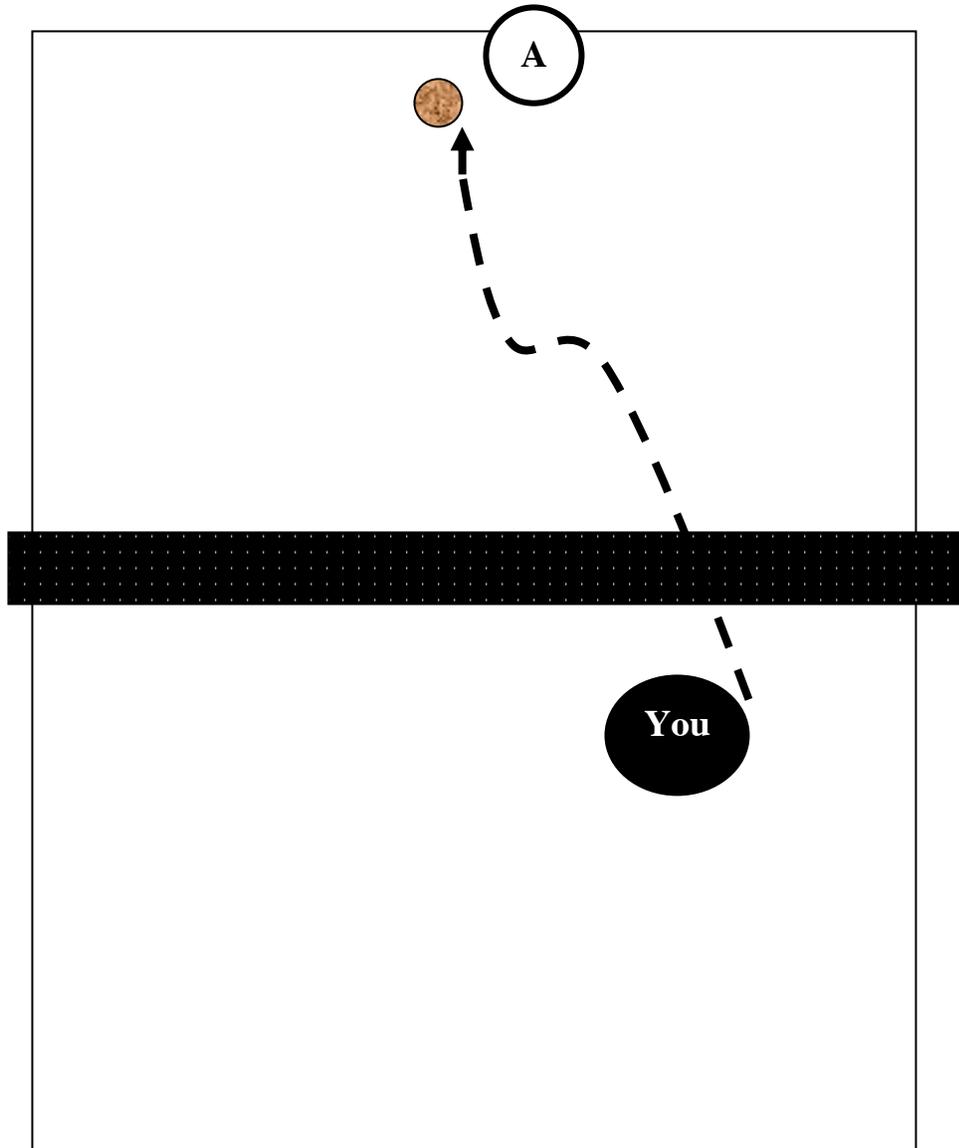
How do you win a point in Badminton?

How do you win a point in Tennis?

5. If you return the ball to player “A”, where will you go to defend your court space?

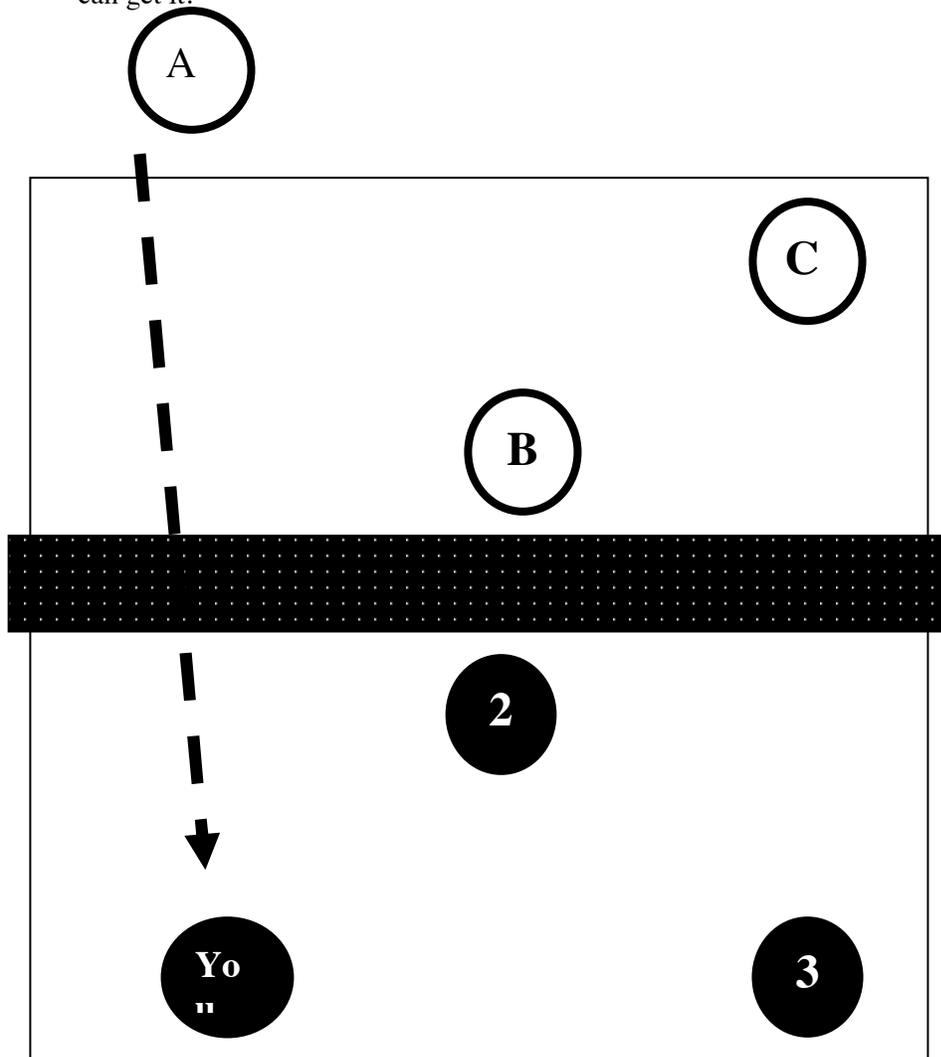
A. Draw a line that describes how and where you will move.

B. Why would you move there? (explain)



6. If you receive the serve, where will you hit the ball to set up for the attack?

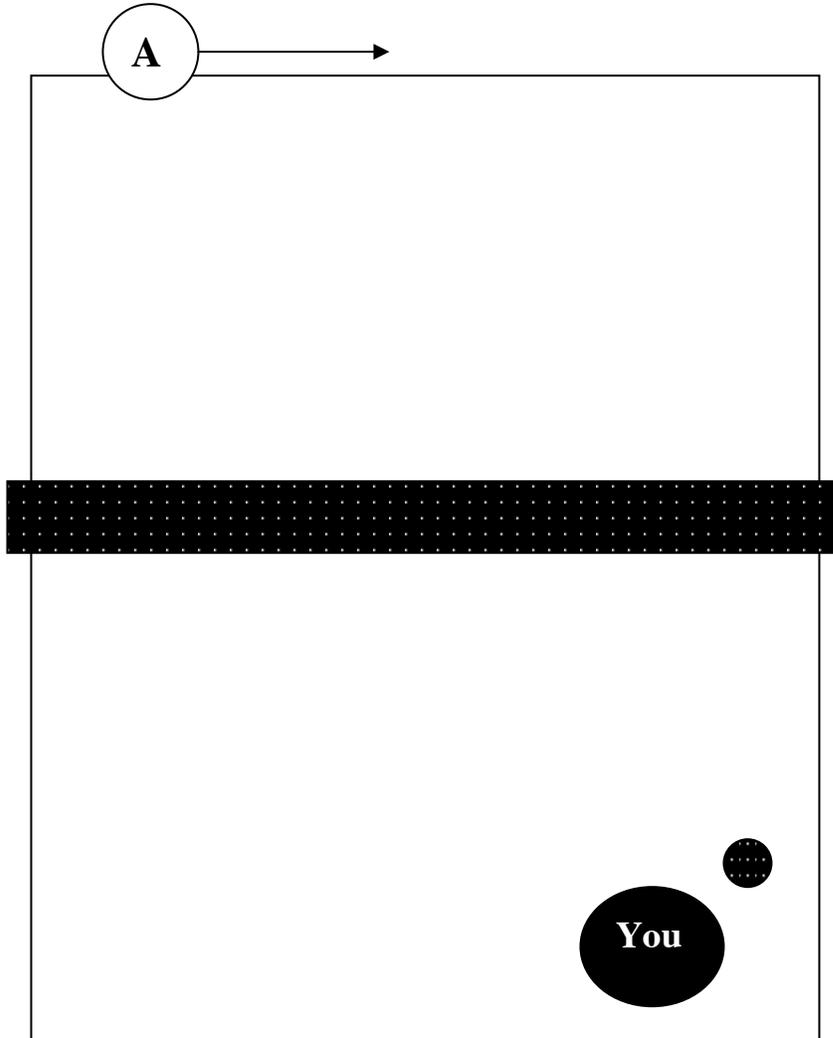
- A. I will hit the ball over the net.
- B. I will pass to teammate 2.
- C. I will pass to teammate 3.
- D. I will hit the ball high and to the center of my court so someone on my team can get it.



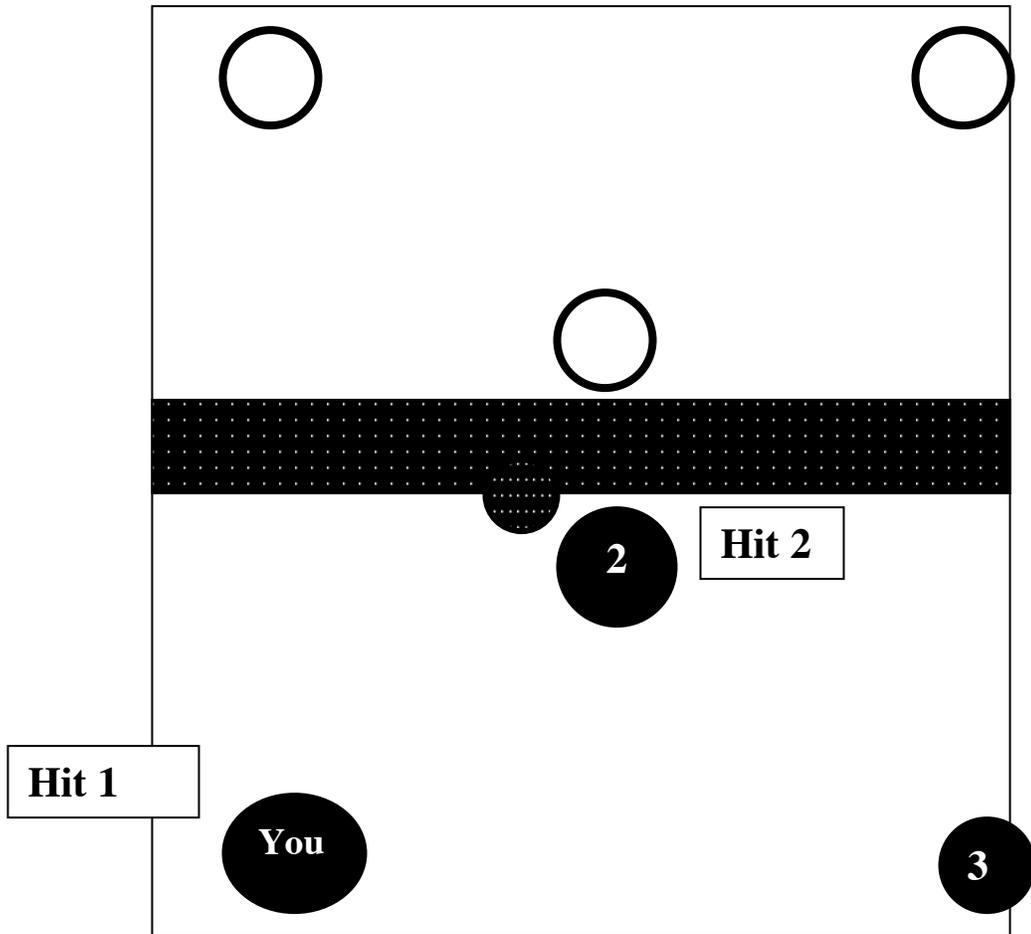
7. Why will you hit the ball where you suggested?

8. Opponent "A" just returned the ball to you. "A" is now moving to base position. If you are attacking, where will you hit the ball to try to win the point?

- A. Draw a line to demonstrate how and where you will hit the ball.
- B. Why will you hit the ball where you suggest?



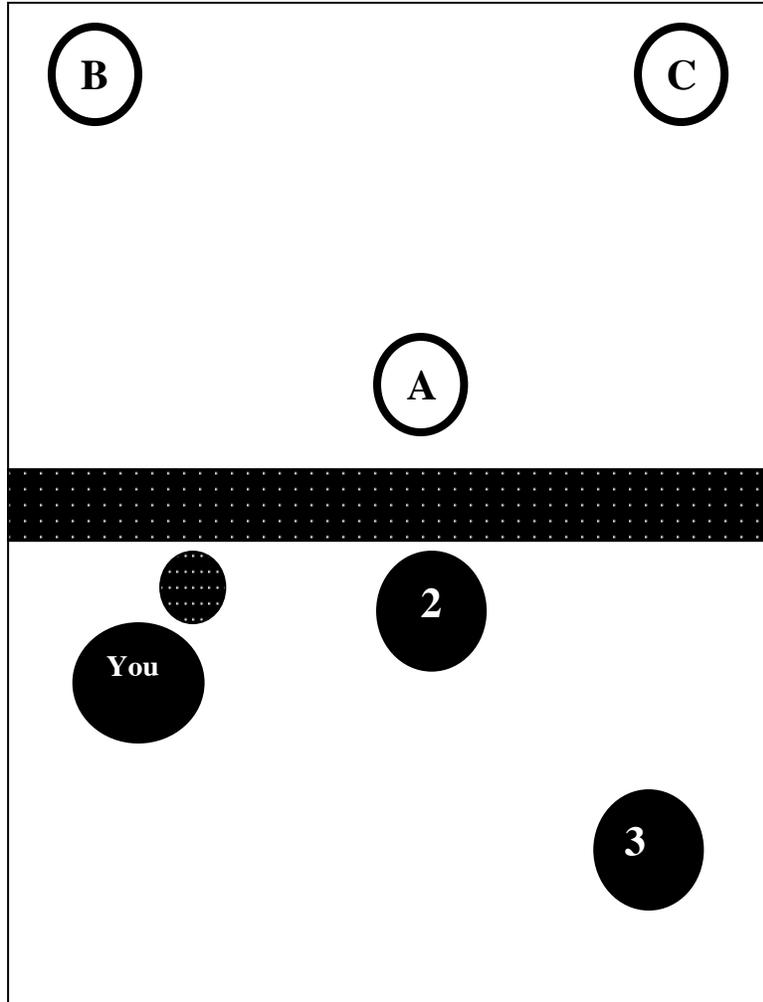
9. You passed to your teammate “2”. What should “2” do so that your team can best attack with a spike?
- A. Pass backwards to you.
  - B. Pass backwards to player “3”.
  - C. Pass forward to you or player “3”, as they run toward the net.
  - D. Spike it over.



10. Why will you hit the ball as you suggested?

11. If you are making the third hit, where is the best place to hit the ball?

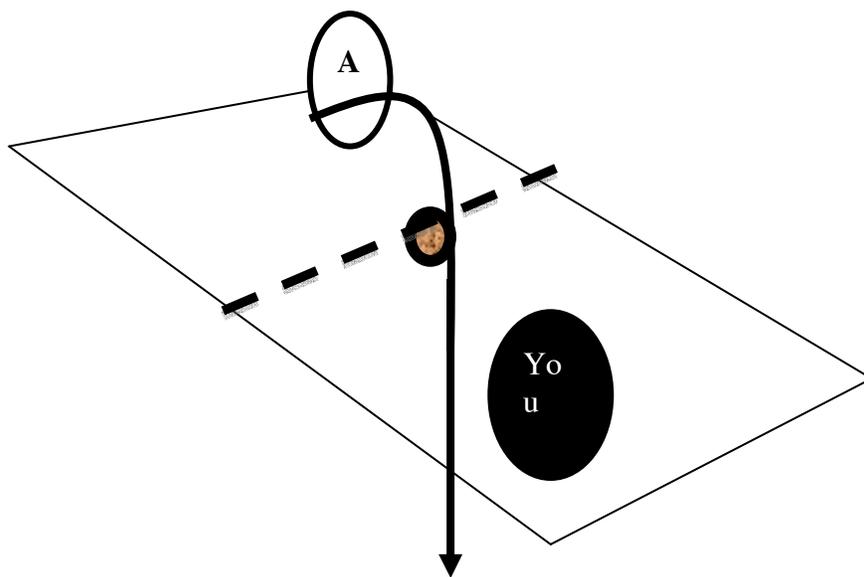
- A. Use a line to show the path of the ball.
- B. Mark an X where you will place the ball.



12. Why would you hit the ball where you suggested?

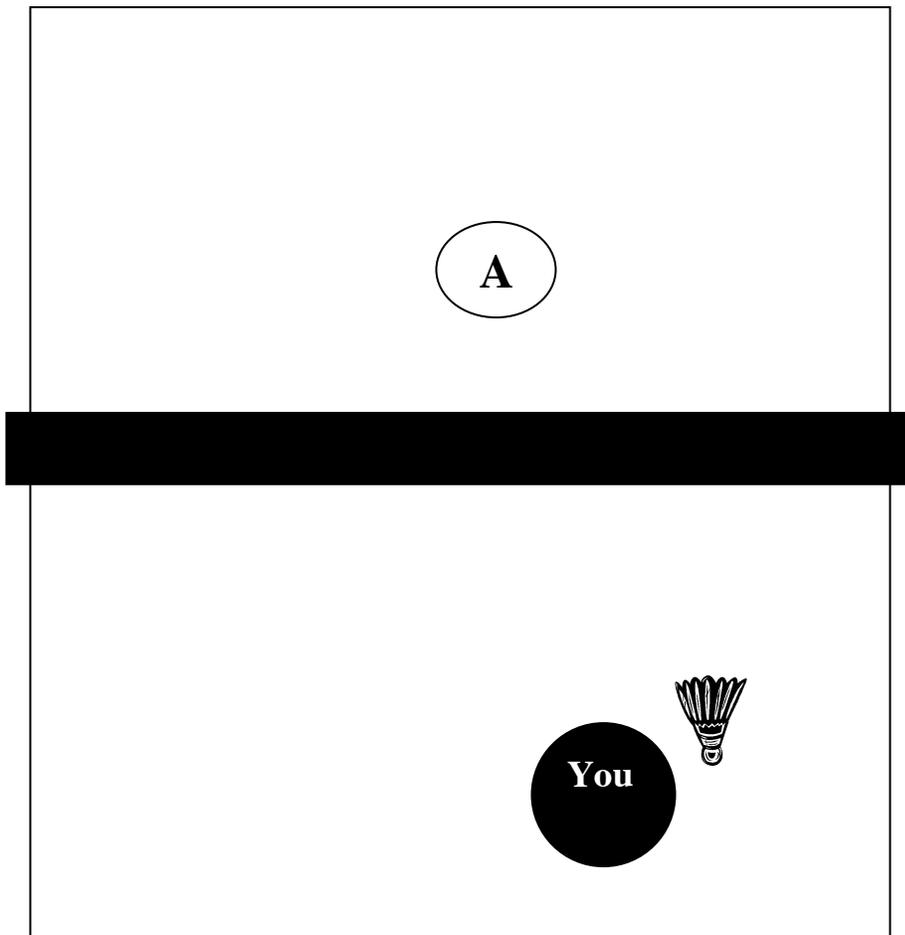
13. What should you do if the ball is coming over the net, but is going out of bounds?

- A. Explain your answer below.
- B. Why do you suggest this?



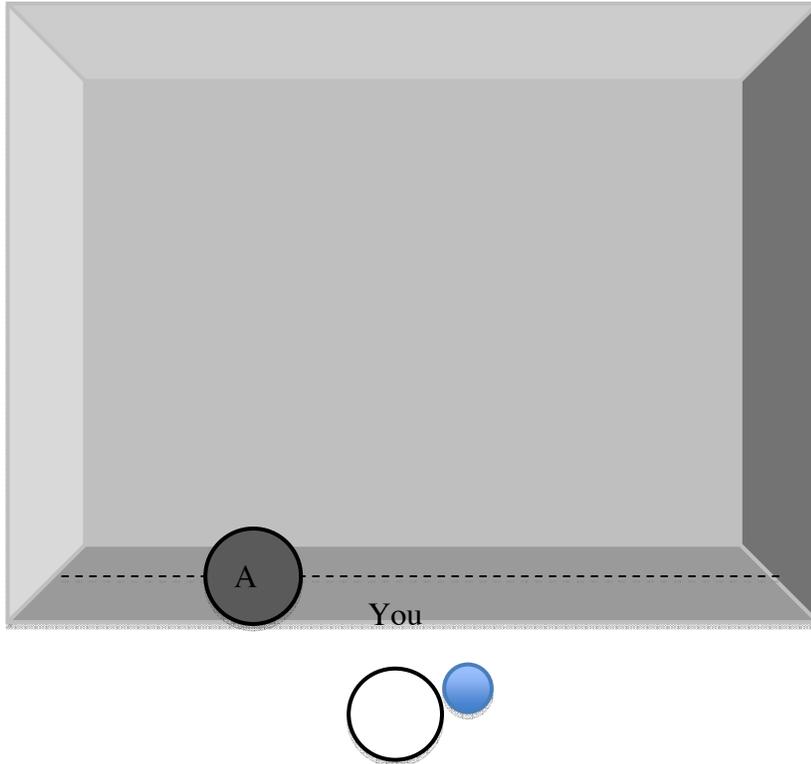
14. Where should you hit the shuttle to move your opponent?

- A. Draw a line to show the path of the shuttle.
- B. Place an X where you want to place the shuttle.
- C. Why do you suggest you move your opponent to this place?
- D. Where will you move to defend your space after you hit the shuttle?  
**Draw a line to where you will move.**
- E. Why will you move there?



15. Where will you hit the ball to make it difficult for your opponent to return it?

- A. Draw a path where you will place the ball .
- B. Put an X where the ball will land.



16. Why will you hit the ball as you suggested?

17. How are badminton and volleyball similar?
18. Is there anything that you have learned about badminton that helps you understand volleyball? If so, explain what.
19. Is there anything that you have learned about pickle ball that helps you understand volleyball or badminton? If so, explain what.
20. Is volleyball, badminton, or pickle ball similar to soccer? If your answer is yes, please explain how these are similar. If your answer is no, please explain how these are different.

## APPENDIX D

### TEACHER INTERVIEW QUESTIONS: PRE- AND POST- UNIT

#### Teacher Interview Questions: Pre- Unit

1. What do you deem as your expertise as a physical education teacher? As a teacher in general?
2. Describe your current teaching practices. (e.g., What are your goals for students? How do you set out to accomplish those goals? What do students do? How are students organized? What methods, strategies or models do you use? What is your role in your physical education classes? Etc.)
3. What is your basic philosophy? What particular literature or thoughts of practice do you use to back up your philosophy in the gymnasium?
4. Do you consider yourself to follow direct instruction practices? Why/why not? If so, how do you implement DI? Constructivist practices? Why/why not? If so, how do you implement Constructivism? Other?
5. What do you understand about constructivism?
6. What do you understand about Teaching Games for Understanding?
7. Why have you not implemented TGfU in the past?
8. Is there anything you are uncomfortable with regarding constructivism? TGfU? Participating in research?
9. Is there anything you would like to add that you feel you have not had the opportunity to point out?
10. What do you believe to be the tactical problem solving aspects of sports like basketball and soccer? Tennis and badminton? Softball and baseball?

11. In TGfU, games are classified as invasion games, net/wall games, striking/fielding games, and target games. How would you explain these classifications?
12. In TGfU, students play the game first, then work on skills needed. How would you explain the reasoning behind this sequence?  
  
[Game 1...Q&A...Game-like practice...Game 2]

Teacher Interview Questions: Post-unit

1. What do you understand about constructivism?
2. What do you understand about Teaching Games for Understanding?
3. Describe your participation in the unit? Students' participation?
4. How did you feel about this participation? Students' learning? Your ability to implement the model?
5. Is there anything you are uncomfortable with regarding constructivism? TGfU? Participating in research?
6. Is there anything you would like to add that you feel you have not had the opportunity to point out?
7. What do you believe to be the tactical problem solving aspects of sports like basketball and soccer? Tennis and badminton? Softball and baseball?
8. In TGfU, games are classified as invasion games, net/wall games, striking/fielding games, and target games. How would you explain these classifications?

9. In TGfU, students play the game first, then work on skills needed. How would you explain the reasoning behind this sequence? [Game 1....Q&A...Game-like practice...Game 2]
10. What are your curriculum plans for the future?
11. Do you have any ideas to add to TGfU approach/research? What would you tell/say to other physical educators? What would you say to TGfU developers? Researchers?

APPENDIX E

METZLER'S BENCHMARKS (2000, P 360)

<i>Teacher Benchmarks</i>	<i>How to Verify</i>	<i>Student Benchmarks</i>	<i>How to Verify</i>
<ol style="list-style-type: none"> <li>1. Teacher uses tactical problems as the organizing center for each learning task.</li> <li>2. Teacher begins each unit segment with a game form to assess student knowledge.</li> <li>3. Teacher uses deductive questions to get students to solve the tactical problem.</li> <li>4. Teacher uses clear communications for situated learning tasks.</li> <li>5. Teacher uses high rates of guides and feedback during situated learning tasks.</li> <li>6. Teacher provides a review that includes the tactical problems of the lesson.</li> <li>7. Assessment</li> </ol>	<ol style="list-style-type: none"> <li>1. Check content listing, with tactical problems written out.</li> <li>2. Check unit plan</li> <li>3. Teacher can make a list of tactical areas in each unit segment and makes a written assessment of students' knowledge in each area after observing each game form</li> <li>4. Check teacher's lesson play, and make a list of all questions asked and students' responses.</li> <li>5. Observe students as they organize each task. Students should quickly set up and be engaged in the task according to the teacher's directions.</li> <li>6. Record the content and frequency of the teacher's instructional interactions</li> <li>7. Check the teacher's lesson plan, record the number of times the teacher checks for understanding at the end of each lesson, check the teacher's unit and lesson plans, review the teacher's checklists for tactical decision making and skill execution (e.g., use the GPAI).</li> </ol>	<ol style="list-style-type: none"> <li>1. Students are given time to think about deductive questions about the tactical problem.</li> <li>2. Students understand how to set up situated learning tasks.</li> <li>3. Students are making situated tactical decisions.</li> <li>4. Game modifications are developmentally appropriate.</li> <li>5. Students are able to progress on tactical knowledge as they move along in the task progression.</li> <li>6. Students have learned tactical awareness, decision-making, and situated skills.</li> </ol>	<ol style="list-style-type: none"> <li>1. Observe the teacher's use of wait time, and make a record of how many times each student is called to answer.</li> <li>2. Observe students as they organize each task. Students should quickly set up and be engaged in the task according to the teacher's directions.</li> <li>3. Record correct and incorrect answers given by students to teacher's questions during learning tasks, and observe student's tactical decision-making and skills during learning tasks.</li> <li>4. Observe students as they are engaged. Does the modification make the game too simple or too complex for them?</li> <li>5. Monitor game forms, modified games, and full games with the GPAI. Note which game performance components are not demonstrated as the complexity of learning tasks increases. Some drop-off will occur each time the complexity increases, but the drop should be only temporary.</li> <li>6. Monitor students with the GPAI or another authentic assessment.</li> </ol>

## APPENDIX F

### RESEARCHER DEVELOPED CHECKLIST FOR TGM FIDELITY

<i>Lesson Phase</i>	<i>Criteria</i>	<i>Y/N</i>	<i>Needs</i>	<i>(+/-) Critical Comments</i>
<b>1. Situational Set-Up</b>	<ul style="list-style-type: none"> <li>a. Modified playing area is created?</li> <li>b. Modified equipment is used (i.e. number of balls, size of equipment, etc.)</li> <li>c. Playing boundaries are verbally stated?</li> </ul>			
<i>Transcript Comments:</i>				
<b>2. Game One</b>	<ul style="list-style-type: none"> <li>a. Clearly states concepts/problem of game?</li> <li>b. The game demonstrates problem to be solved?</li> <li>c. Uses FREEZE technique to adjust?</li> <li>d. Modifications of game are made?</li> <li>e. Maximizes participation/involvement?</li> </ul>			
<i>Transcript Comments:</i>				
<b>3. Q&amp;A</b>	<ul style="list-style-type: none"> <li>a. Questions align with problem presented?</li> <li>b. Questions are based on observation of student's Game 1 performance?</li> <li>c. Students' answers are used in Q/A session?</li> <li>d. Uses "how" questions to lead/guide to the tactical problem to be solved?</li> <li>e. Does not over-question?</li> <li>f. Maximizes student involvement?</li> </ul>			
<i>Transcript Comments:</i>				
<b>4. Situated Practice</b>	<ul style="list-style-type: none"> <li>a. Teacher uses modeling &amp; demonstration to set-up the situated practice?</li> <li>b. Teacher uses at least 3 clear, crisp teaching cues?</li> <li>c. Practice is developmentally appropriate?</li> <li>d. Practice is aligned to goals/expectations defined by problem?</li> <li>e. Practice is game like?</li> <li>f. The master lesson is demonstrated in context?</li> <li>g. Sufficient repetitions or prompts are provided within diverse conditions?</li> </ul>			
<i>Transcript Comments:</i>				
<b>5. Game Two</b>	<ul style="list-style-type: none"> <li>a. Reinforces the preceding practice?</li> <li>b. Verbalizes rule modifications according to performance of Game One?</li> <li>c. Meets developmental needs?</li> </ul>			
<i>Transcript Comments:</i>				
<b>6. Closure</b>	<ul style="list-style-type: none"> <li>a. Game problem is revisited?</li> <li>b. Tactics developed are discussed and tied to the problem?</li> <li>c. Present lesson is tied to problems or developments in future lesson?</li> </ul>			
<i>Transcript Comments:</i>				
<b>7. Social Concepts</b>	<ul style="list-style-type: none"> <li>a. Manages social demeanor of the game, throughout the lesson?</li> </ul>			
<i>Transcript Comments:</i>				
<b>8. Overall</b>	<ul style="list-style-type: none"> <li>a. Game/Q&amp;A/Practice/Game Sequence?</li> </ul>			
<i>Transcript Comments:</i>				

APPENDIX G

VERBAL RECALL PROMPT SHEET

**\*Say Your Full Name**

- 1. What were you thinking when your team had the ball?**
- 2. What was the Tactical Problem?**
- 3. What did your team do to solve the tactical problem?**
- 4. What were you thinking as you played?**

## APPENDIX H

### FOCUS GROUP INTERVIEW QUESTIONS

1. What sports have you been involved with outside of school up until this year?
2. What did you think about the net/wall unit?
3. What is the goal of pickle ball? Tennis? Badminton? Volleyball?
4. What are the actions in pickle ball? Tennis? Badminton? Volleyball?
5. What are the game conditions in pickle ball? Tennis? Badminton? Volleyball? (If this, then this)
6. What are the tactical problems in pickle ball? Tennis? Badminton? Why are they all the same?
7. Explain the tactical problems in these games. How do you solve them? Can you give me an example?
8. What are things you looked at while you played?
9. What are things you thought about while you played?
10. What are things you thought about yourself?
11. What are things you thought about your opponent/s?
12. Tell me about what you learned while participating in this unit.
13. How did you play against your opponent in pickle ball? Badminton? Tennis? What are some things that you thought about?
14. What did you learn from game that helped you in another?

APPENDIX I

GPAI CODING CRITERIA

Game Performance Assessment Instrument Coding Criteria for Badminton		
Game	Index	Criteria for Coding
<i>Badminton</i>	Support	Student is ready for the return hit by having knees bent, body and eyes focused on shuttle, and arms and racket positioned for a hit. Returning to base position is also considered supportive. Lack of support is evidenced by student standing erect, arms at side or on hips, racket down or being played with, looking away from shuttle or not facing the shuttle, or not paying attention to the game on his/her court (attending to something else). Watching the shuttle as it comes over the net and being out of position may also be considered lack of support.
	Decision-Making	Appropriate decision was coded when student attempted to hit to an open space or make opponent move. Inappropriate was defined when a student hit to their opponent cooperatively so the ball could be returned, or the student attempted hit to a location that was not an open space or did not make opponent move. No decision was coded for behaviors that were reactive in nature and had no decision, appropriate or inappropriate, attached to them.
	Skill Execution	Efficient skill execution was coded when the shuttle made it into opponent's court. Inefficient skill execution was coded when the birdie was hit outside the court or did not make it into the court. The type of hit was recorded.

Game Performance Assessment Instrument Coding Criteria for Pickleball		
Game	Index	Criteria for Coding
Pickleball	Support	Student is ready for the return hit by having knees bent, body and eyes focused on ball, and arms and racket positioned for a hit. Returning to base position is also considered supportive. Lack of support is evidenced by student standing erect, arms at side or on hips, racket down or being played with, looking away from ball or not facing the ball, or not paying attention to the game on his/her court (attending to something else). Watching the ball as it comes over the net and being out of position may also be considered lack of support.
	Decision-Making	Appropriate decision was coded when student attempted to hit to an open space or make opponent move. Inappropriate was defined when a student hit to their opponent cooperatively so the ball could be returned, or the student attempted hit to a location that was not an open space or did not make opponent move. No decision was coded for behaviors that were reactive in nature and had no decision, appropriate or inappropriate, attached to them.
	Skill Execution	Efficient skill execution was coded when the ball made it into opponent's court for the first bounce. Inefficient skill execution was coded when the ball was hit outside the court or did not make it into the court. The type of hit was recorded.

Game Performance Assessment Instrument Coding Criteria for Volleyball		
Game	Index	Criteria for Coding
Volleyball	Support	Student is ready for the next hit by having knees bent, body and eyes focused on ball, and arms positioned for a pass. Returning to base position is also considered supportive. Lack of support is evidenced by student standing erect, arms at side or on hips, looking away from ball or not facing the ball, or not paying attention to the game on his/her court (attending to something else). Watching the ball and being out of position may also be considered lack of support.
	Decision-Making	Appropriate decision is coded when student attempts to contain the ball on own team's side on the first hit. Inappropriate decision was coded when student attempts to return the ball on the first hit. No decision was coded for behaviors that were reactive in nature and had no decision, appropriate or inappropriate, attached to them.
	Skill Execution	On the first hit off the return, student executes an efficient, legal hit. Legal hit is defined as an appropriate forearm pass, spike, dig, overhead pass, or other attempt that is not double touched, held, or thrown. Efficiency in this was coded in the following three ways: (1) <i>perfect pass</i> if the ball was hit high and apexes and falls within the center court area, (2) <i>good pass</i> if the execution was not a perfect pass, but was playable by teammates by being within the court boundaries and had an apex that allowed the hit to be high enough to retrieve. Depending on the situation and force of the ball, the typical apex for a <i>good execution</i> resulted in a hit that reached an apex of the receiver's head height or higher, or (3) <i>not playable</i> if the execution was not feasible to allow another hit by reaching an apex that is too low, by being extensively out of bounds, by "whiffing" or missing the ball, or by hitting an object such as the ceiling, wall, or net stand.

## REFERENCES

- Abernethy, B. (1988). The effects of age and expertise upon perceptual skill and development in a racquet sport. *Research Quarterly for Exercise and Sport*, 59, 210-221.
- Abernethy, B., Burgess-Limerick, R., & Parks, S. (1994). Contrasting approaches to the study of motor expertise. *Quest*, 46, 186-198.
- Abernethy, B., Thomas, K., & Thomas J. (1993). Strategies for improving understanding of motor expertise (or mistakes we have made and things we have learned!). In J. Starkes & F. Allard (Eds.), *Cognitive issues in motor expertise* (pp. 317-356). Amsterdam: Elsevier Science.
- Ackerman, D. (1999). *Deep play*. New York: Vintage.
- Alexander, K. (1983). Behavior analysis of tasks and accountability in physical education (Doctoral dissertation, The Ohio State University, 1982). *Dissertation Abstracts International*, 43, 3257A.
- Alexander, K., & Luckman, J. (2001). Australian teachers' perceptions and uses of the sport education curriculum model. *European Physical Education Review*, 7(3): 243-267.
- Alexander, K., Taggart, A., & Luckman, J. (1998). Pilgrims progress: The sport education crusade down under. *Journal of Physical Education, Recreation, and Dance*, 69(4), 21-23.
- Alexander, K., Taggart, A., & Medland, A. (1993). Sport education in physical education: Try before you buy. *ACHPER*, 40(4), 16-23.
- Alexander, K., Taggart, A., & Thorpe, S. (1996). A spring in their steps? Possibilities for professional renewal through sport education in Australian schools. *Sport, education and society*, 1, 23-46.
- Alexander, P., & Judy, J. (1988). The interaction of domain-specific and strategic knowledge in academic performance. *Review of Educational Research*, 58, 375-404.
- Allen, J. D. (1986). Classroom management: Students' perspective, goals and strategies. *American Educational Research Journal*, 23, 437-459.
- Allison, S., & Thorpe, R. (1997). A comparison of the effectiveness of two approaches to teaching games within physical education: A skills approach versus a games for understanding approach. *The British Journal of Physical Education*, 28(3), 9-13.

- Almond, L. (1986). Reflecting on theme4s: A games classification. In D. Bunker, R. Thorpe, & L. Almond (Eds.), *Rethinking games teaching* (pp. 71-72). England: University of Technology, Loughborough, Department of Physical Education and Sport Science.
- Almond, L., & Thorpe, R. (1988). Asking teachers to research. *Journal of Teaching in Physical Education*, 7(3), 221-227.
- American Heart Association (2009). *Jump rope for heart*. Retrieved April 3, 2009, from [http://www.heart.org/HEARTORG/Giving/ForIndividuals/JoinanEvent/jump-rope-sub-home\\_UCM\\_315609\\_SubHomePage.jsp](http://www.heart.org/HEARTORG/Giving/ForIndividuals/JoinanEvent/jump-rope-sub-home_UCM_315609_SubHomePage.jsp)
- Siegel, D. (2008). *Play, games, sport, and athletics: Introduction*. Retrieved July 21, 2008, from [http://www.science.smith.edu/exer\\_sci/ESS200/Play/PlayH01.htm](http://www.science.smith.edu/exer_sci/ESS200/Play/PlayH01.htm)
- Anderson, J. R. (1976). *Language, memory, and thought*. Hillsdale, NJ: Erlbaum.
- Anderson, J. R. (1982). Acquisition of cognitive skills. *Psychological Review*, 89, 369-406.
- Anderson, J., Reder, L., & Simon, H. (1996). Situated learning and education. *Educational Researcher*, 25, 5-11.
- Azzarito, L., & Solmon, M. A. (2005). A reconceptualization of physical education: The intersection of race, gender, and social class. *Sport Education and Sport Society*, 10, 25-47.
- Azzarito, L., Solmon, M. A., & Harrison, L. (2006). "If I had a choice I would...": A feminist poststructuralist perspective o girls in physical education. *Research Quarterly for Exercise and Sport*, 77, 222-239.
- Bandura, A. (1969). *Principles of behavior modification*. New York, NY: Holt, Rinehart, and Winston.
- Bell, C. (1998). Sport education in the elementary school. *Journal of Physical Education, Recreation and Dance*, 69(5): 36-48.
- Bennett, G. (2000). Sport education as an alternative for the basic instruction program. *Chronicle of Physical Education in Higher Education*, 11(3): 3, 9-11.
- Bennett, G., & Hastie, P. (1997). A sport education curriculum model for a collegiate physical activity course. *Journal of Physical Education, Recreation and Dance*, 68(1), 39-44.
- Benson, N. J. (1970). Training and transfer-of-learning effects in disabled and normal readers: Evidence of specific deficits. *Journal of Experimental Child Psychology*, 64, 343-366.

- Berman, R. (1994). Learners' transfer of writing skills between languages. *Test Canada Journal*, 12, 29-46.
- Bohler, H. R. (2004). *Sport education: examining an alternative physical education instructional approach*. Unpublished master's thesis, Texas Tech University, Lubbock, Texas.
- Bohler, H.R. (2009). Chapter 7: Sixth-grade students' tactical understanding and decision-making in a TGM volleyball unit. In T. Hopper, J. Butler, & B. Story (Eds.), *TGFU...Simply good pedagogy: Understanding a complex challenge*. (pp. 87-99). PHE Canada.
- Boyle, R. (1963). *Sport: Mirror of American life*. Boston, MA: Little, Brown.
- Brackenridge, c. (1979). *Games: Classification and analysis*. Conference presented to the Kirkless Teachers.
- Brooker, R., Kirk, d., Braikua, S., & Bransgroe, A. (2001). Implementing a game sense approach to teaching junior high school basketball in a naturalistic setting. *European Physical Education Review*, 6(1), 7-26.
- Brunton, J. (2003). Changing hierarchies of power in physical education using sport education. *European Physical Education Review*, 9(3), 267-284.
- Brustad, R. J. (1993). Youth in sport: Psychological considerations. In R. N. Singer, M. M. Murphy, & L. K. Tennant (Eds.), *Handbook of sport psychology* (pp. 695-717). New York, NY: Macmillan.
- Bunker, D. & Thorpe, R. (1982). A model for the teaching of games in secondary schools. *The Bulletin of Physical Education*, 18(1), 5-8.
- Bunker, D., & Thorpe, R. (1986). The curriculum model'. In R. Thorpe, D. Bunker, & L. Almond (Eds.), *Rethinking games teaching* (pp. 7-10). England: Nene Litho, Irthlingborough, Northants.
- Burrows, L., & Abbey, W. (1986). A teacher's reactions. In R. Thorpe, D. Bunker, & L. Almond (Eds.), *Rethinking games teaching* (pp. 45-52). England: Nene Litho, Irthlingborough, Northants.
- Butler, J. I. (1993). Teacher change in sport education. *Dissertation Abstracts International*, 54, 02A (UMI No. 9318198).
- Caillois, R., (1969). The structure and classification of games. In J. W. Loy, & G. S. Kenyon (Eds.), *Sport, culture, and society: A reader on the sociology of sport*. London: The Macmillan Company.

- Carey, S. (1985). Are children fundamentally different kinds of thinkers and learners than adults? In S. Chipman, J. Segal, & R. Glaser (Eds.), *Thinking and learning skills* (vol. 2, pp. 485-517). Hillsdale, NJ: Erlbaum.
- Carlson, T. B. (1995). We hate gym: Student alienation from physical education. *Journal of Teaching in Physical Education, 14*, 467-477.
- Carlson, T. B. (1995b). "Now I think I can." The reaction of eight low-skilled students to sport education. *ACHPER Healthy Lifestyles Journal, 42*(4): 6-8.
- Carlson, T. B., & Hastie, P. (1997). The student social system within sport education. *Journal of Teaching in Physical Education, 16*, 176-195.
- Charness, N. (1987). Component processes in bridge bidding and novel problem solving tasks. *Canadian Journal of Psychology, 41*, 223-243.
- Chen, A. (1996). Student interest in activities in a secondary physical education curriculum: An analysis of student subjectivity. *Research Quarterly for Exercise and Sport, 67*, 424-432.
- Chi, M. T. H. (1978). Knowledge structure and memory development. In R. S. Siegler (Ed.), *Children's thinking: What develops?* (pp. 73-105). Hillsdale, NJ: Erlbaum.
- Chi, M. T. H. (1981). Knowledge development and memory performance. In M. P. Friedman, J. P. Das, & N. O'Conner (Eds.), *Intelligence and learning* (pp. 221-229). New York: Plenum Press.
- Chi, M., Feltovich, P., & Glaser, R. (1981). Categorization and representation of physical problems by experts and novices. *Cognitive Science, 5*, 121-152.
- Chi, M. T., Glaser, R., & Farr, M. J. (1988). *Knowledge-constrained inferences about new domain-related concepts: Contrasting expert and novice children*. (ERIC Document Reproduction Service No. ED 297 882)
- Chi, M., Glaser, R., & Rees, E. (1982). Expertise in problem solving. In R. Sternberg (Ed.), *Advances in the psychology of human intelligence* (pp. 7-75). Hillsdale, NJ: Erlbaum.
- Chiesi, H. L., Spilich, G. J., & Voss, J. F. (1979). Acquisition of domain related information in relation to high and low domain knowledge. *Journal of Verbal Learning and Verbal Behavior, 18*, 257-273.
- Chinn, C. A., & Brewer, W. F. (1993). The role of anomalous data in knowledge acquisition: A theoretical framework and implications for science instruction. *Review of Educational Research, 61*(1), 1-49.
- Clarke, G. & Quill, M. (2003). Researching sport education in action: a case study. *European Physical Education Review, 9*(3), 253-266.

- Cohen, E. G. (1994). *Designing groupwork: Strategies for the heterogeneous classroom*. New York: Teachers College, Columbia University.
- Collier, C. S. (1998). Sport education and preservice education. *Journal of Physical Education, Recreation and Dance*, 69(5): 44-45.
- Collier, C. S. (2005). Integrating tactical games and sport education models. In L.L. Griffin, & Butler, J. I. (Eds.), *Teaching Games for Understanding: Theory, research, and practice*. Champaign, IL: Human Kinetics.
- Collier, C.S., Oslin, J., Rodriguez, D., & Gutierrez, D. (2010). Sport and game education: Models of practice. In Butler, J.I. & L.L. Griffin (Eds.), *More Teaching Games for Understanding: Moving globally*. Champaign, IL: Human Kinetics.
- Condon, R., & Collier, C. S. (2002). Student choice makes a difference in physical education. *Journal of Physical Education, Recreation and Dance*, 73, 26-30.
- Contreras Jordan, O.R., Garcia Lopez, L.M., & Ruiz Perez, L.M. (2003). Transfer of procedural knowledge from invasion games to hockey [Abstract]. Paper presented at the 2<sup>nd</sup> International Conference: Teaching Sport and Physical Education for Understanding, The University of Melbourne, Australia.
- Cook, H., & Stingle, S. (1974). Cooperative behavior in children. *Psychological Bulletin*, 81, 918-933.
- Cooper, J. O., Heron, T. E., & Heward, W. L. (1987). *Applied behavior analysis*. Columbus, OH: Merrill Publishing Company.
- Coordinated Approach to Child Health. (n.d.). *Coordinated Approach to Child Health*. Retrieved August 7, 2008, from <http://www.catchinfo.org/>
- Cothran, D., Kulinna, P. H., & Garrahy, D. A. (2003). "This is kind of giving a secret away...": Students' perspectives on effective class management. *Teaching and Teacher Education*, 19, 435-444.
- Creswell, J.W. (1998). *Qualitative inquiry and research design: Choosing among five traditions*. Thousand Oaks: Sage.
- Csikszentmihalyi, M. (1977). *Beyond boredom and anxiety*. San Francisco: Jossey-Bass.
- Csikszentmihalyi, M., & LaFevre, J. (1989). Optimal experience in work and leisure. *Journal of Personality & Social Psychology*, 56(5), 815-822.
- Curtnow, J., & Macdonald, D. (1995). Can sport education be gender inclusive? A case study in upper primary school. *The ACHPER Healthy Lifestyles Journal*, 42(4): 9-11.

- Darnell, J. (1994). Sport education in the elementary curriculum. In D. Siedentop (Ed.), *Sport Education* (pp.61-71). Champaign, IL: Human Kinetics.
- Department for Education and Skills/Qualifications and Curriculum Authority. (2000). *Curriculum Guidance for the Foundation Stage*. London: HMSO.
- Doolittle, S. (1983). Reflecting on an innovation. *Bulletin of Physical Education*, 19(1), 36-38.
- Doolittle, S. (2007). Is the extinction of high school physical education inevitable? *Journal of Physical Education, Recreation, and Dance*, 78(4), 7-9.
- Doyle, W. (1977). Paradigms for research on teacher effectiveness. In L. S. Shulman (Ed.), *Review of research in education*. Itasca, IL: F. E. Peacock.
- Doyle, W. (1980). *Classroom management*. West Lafayette, IN: Kappa Delta Pi.
- Doyle, W. (1983). Academic work. *Review of Educational Research*, 53, 159-199.
- Doyle, W. (1984). How order is achieved in classrooms: An interim report. *Journal of Curriculum Studies*, 16, 259-277.
- Doyle, W. (1986). Classroom organization and management. In M. C. Wittrock (Ed.), *Handbook of research on teaching (3<sup>rd</sup> ed.)*. New York, NY: Macmillan.
- Doyle, W., & Carter, K. (1984). Academic tasks in classrooms. *Curriculum Inquiry*, 14, 129-149.
- Drummond, M. J. N. (2003). The meaning of boys' bodies in physical education. *Journal of Men's Studies*, 11, 131-143.
- Dyson, G. P. (1995). Students' voices in two alternative elementary physical education programs. *Journal of Teaching in Physical Education*, 14, 394-407.
- Ebbeck, V., & Stewart, M. E. (1993). Who determines what's important? Perceptions of competence and importance as predictors of self-esteem in youth football players. *Pediatric Exercise Science*, 5, 253-262.
- Ellis, M. (1973). *Why people play*. Englewood Cliffs, NJ: Prentice Hall.
- Ellis, M. (1983). *Similarities and differences in games: A system for classification*. Paper presented at the Association Internationale des Ecoles Superieures d'Education Physique Conference, Rome, Italy.
- Emmers, A. P. (1981). *After the lesson plan: Realities of high school teaching*. New York: Teachers College Press.

- Ennis, C. D. (1995). Teachers' responses to non-compliant students: The realities and consequences of a negotiated curriculum. *Teaching and Teacher Education, 11*, 445-460.
- Ennis, C. D., Solmon, M., Satina, M., Loftus, S. J., Mensch, J., & McCauley, T. (1999). Creating a sense of community in urban schools using the 'Sport for Peace' curriculum. *Research Quarterly for Exercise and Sport, 70*: 273-285.
- Episto, J. (1979). Play and possibility. In E. Gerber, & W. Morgan (Eds.), *Sport and the body*. Philadelphia: Lea & Febiger.
- Ericsson, K. A. (1996). *The road to excellence: The acquisition of expert performance in the arts and sciences, sports, and games*. Mahwah, NJ: Erlbaum.
- Ericsson, K., Krampe, R., & Tesch-Romer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review, 100*, 363-406.
- Ericsson, K. A., & Simon, H. A. (1993). *Protocol analysis: Verbal reports as data*. Cambridge, MA: The MIT Press.
- Ericsson, K., & Smith, J. (1991). Prospects and limits of the empirical study of expertise: An introduction. In K. Ericsson & J. Smith (Eds.), *Toward a general theory of expertise: Prospects and limits* (pp. 1-38). New York: Cambridge University Press.
- Evans, J., & Roberts, G. C. (1987). Physical competence and the development of children's peer relations. *Quest, 39*, 23-35.
- Feiman-Nemser, S. (2001). From preparation to practice: Designing a continuum to strengthen and sustain teaching. *Teachers College Record, 103*(6), 1013-1055.
- Fink, E. (1960). The ontology of play. *Philosophy Today, 4*, 95-110.
- Fink, J., & Siedentop, D. (1989). The development of rules, routines and expectations at the start of the school year. *Journal of Teaching in Physical Education, 8*, 198-212.
- French, K.E., & McPherson, S.L. (1999). Adaptations in response selection processes used during sport competition with increasing age and expertise. *International Journal of Sport Psychology, 30*, 173-193.
- French, K. E., & McPherson, S. L. (2004). Development of expertise in sport. In M. R. Weiss (Ed.), *Developmental sport and exercise psychology: A lifespan perspective* (pp. 403-423). Morgantown, WV: Fitness Information Technology, Inc.
- French, K. E., & Thomas, J. R. (1987). The relation of knowledge development to children's basketball performance. *Journal of Sport Psychology, 9*, 15-32.

- French, K. E., Werner, P. H., Rink, J. E., Taylor, K., & Hussey, K. (1996a). The effects of a 3-week unit of tactical, skill, or combined tactical and skill instruction on badminton performance of ninth-grade students. *Journal of Teaching in Physical Education, 15*(4), 418-438.
- French, K. E., Werner, P. H., Taylor, K., Hussey, K., & Jones, J. (1996b). The effects of a 6-week unit of tactical, skill, or combined tactical and skill instruction on badminton performance of ninth-grade students. *Journal of Teaching in Physical Education, 15*(4), 439-463.
- Furlong, W. (1976). The fun in fun. *Psychology Today*. June, 35-36, 38, 80.
- Gabriele, T. E., & Maxwell, T. (1995). Direct versus indirect methods of squash instruction. *Research Quarterly for Exercise and Sport, 66*(Suppl.), A-63.
- Garrahy, D., Cothran, D., & Hodges-Kulinna, P. (2005). Voices fro the trenches: An exploration of teachers' management knowledge. *The Journal of Educational Research, 99*, 56-63.
- Gilly, Y. (1992). Signifiant, referent, reel et texte littéraire. In Annales Littéraires de L'Université de Besancon (Eds.), *Signifiant, referent, réel*. Paris: Les Belles Lettres.
- Glaser, R., & Chi, M. T. H. (1988). Overview. In M. T. H. Chi, R. Glaser, & M. J. Farr (Eds.), *The nature of expertise* (pp. xv-xxviii). Hillsdale, NJ: Erlbaum.
- Graham, K. C. (1987). A description of academic work and student performance during a middle school volleyball unit. *Journal of Teaching in Physical Education, 7*, 22- 37.
- Graham, G., Holt-Hale, S. A., & Parker, M. (2001). *Children moving: A reflective approach to teaching physical education (5th ed.)*. Mountain View, CA: Mayfield Publishing Company.
- Grant, B. C. (1992). Integrating sport into the physical education curriculum in New Zealand secondary schools. *Quest, 44*, 304-316.
- Graves, M. A., & Townsend, J. S. (2000). Applying the sport education curriculum model to dance. *Journal of Physical Education, Recreation and Dance, 71*(8), 50-54.
- Gréhaigne, J. & Zerai, Z. (2010) About configurations of play at school: A few models. Paper presented at the 2010 AEISEP Conference, TGFU Special Interest Group, A Coruna, Spain.
- Gréhaigne, J., & Godbout, P. (1995). Tactical knowledge in team sports from a constructivist and cognitivist perspective. *Quest, 47*, 490-505.

- Gréhaigne, J., & Godbout, P. (1998). Observation, critical thinking and transformation: Three key elements for a constructivist perspective and the learning process in team sport. In R. Feingold, C. Roger Rees, G. T. Barette, L. Fiorentino, S. Virgilio, & E. Kowalski (Eds.), *Education for life, Proceedings of the AIESEP World Sport Science Congress*. New York, NY: Adelphi University Press.
- Gréhaigne, J.F., Richard, J.F., & Griffin, L.L. (2005). *Teaching and learning team sports and games*. New York, New York: RoutledgeFalmer.
- Gréhaigne, J.F., & Roche, J. (1990). Quelques questions à propos du football [A few questions concerning soccer]. In AEEPS (Ed.), *Education physique et didactique des APS* (pp. 63-72). Paris: AEEPS.
- Griffin, L. L. (1991). Analysis of the instructional task system in an interscholastic volleyball setting (Doctoral dissertation, The Ohio State University, 1991). *Dissertation Abstracts International*, 52, 2580A.
- Griffin, L. L., Dodds, P., Placek, J. H., & Tremino, F. (2001). Middle school students' conceptions of soccer: Their solutions to tactical problems. *Journal of Teaching in Physical Education*, 20(4), 324-340.
- Griffin, L. L., Mitchell, S., & Oslin, J. (1997). *Teaching sport concepts and skills: A tactical games approach*. Champaign, IL: Human Kinetics.
- Griffin, L. L., Oslin, J. L., & Mitchell, S. A. (1995). An analysis of two instructional approaches to teaching net games. *Research Quarterly for Exercise and Sport*, 66(Suppl.), A-64.
- Griffin, L. L., & Patton, K. (2005). Two decades of Teaching Games for Understanding: Looking at the past, present, and future. In L. L. Griffin & J. I. Butler (Eds.), *Teaching Games for Understanding: Theory, research, and practice*. Champaign, IL: Human Kinetics.
- Griffin, L. L., & Placek, J. H. (2001). The understanding and development of learners' domain-specific knowledge: Introduction. *Journal of Teaching in Physical Education*, 20(4), 299-300.
- Griffin, P. (1984). Co-ed physical education: Problems and promise. *Journal of Physical Education, Recreation, and Dance*, 55, 36-37.
- Gubacs, K., Carney, M. P., Griffin, L. L., & Supapron, S. (1998). "Orderly chaos": Future teacher educators' learning experiences implementing a tactical approach to games teaching. *Research Quarterly for Exercise and Sport*, 69(Suppl.), A-92.
- Gubacs, K. (1999). Action research on a tactical approach to teaching a preservice tennis class. *Research Quarterly for Exercise and Sport*, 70(1), Supplement, 82.

- Guttman, A. (1978). *From ritual to record*. New York, NY: Columbia University Press, 1-14.
- Handford, C., Davids, K., Bennet, S., & Button, C. (1997). Skill acquisition in sport: Some applications of an evolving practice ecology. *Journal of Sport Science, 15*, 621-640.
- Harris, J. (1980). Play: A definition and implied interrelationships with culture and sport. *Journal of Sport Psychology, 2*, 46-61.
- Harter, S. (1978). Effectance motivation reconsidered: Toward a developmental model. *Human Development, 21*, 34-64.
- Harvey, L., & Anderson, J. (1996). Transfer of declarative knowledge in complex information-processing domains. *Human-Computer Interaction, 11*, 69-96.
- Hastie, P. (1994a). Selected teacher behaviors and student ALT-PE in secondary school physical education classes. *Journal of Teaching in Physical Education, 13*, 342-359.
- Hastie, P. (1994b). Improving monitoring skills in physical education: A case study in student teaching. *Journal of Classroom Interaction, 13*(2), 11-20.
- Hastie, P. (1996). Student role involvement during a unit of sport education. *Journal of Teaching in Physical Education, 16*, 88-103.
- Hastie, P. (1997). Factors affecting the creation of a new ecology in a boys-only physical education class at a military school. *Research Quarterly for Exercise and Sport, 68*, 62-73.
- Hastie, P. (1998a). Skill and tactical development during a sport education season. *Research Quarterly for Exercise and Sport, 69*, 368-379.
- Hastie, P. (1998b). The participation and perception of girls within a unit of sport education. *Journal of Teaching in Physical Education, 17*, 157-171.
- Hastie, P. (1998c). Applied benefits of the sport education model. *Journal of Physical Education, Recreation and Dance, 69*(4): 24-26.
- Hastie, P. (2000). An ecological analysis of a sport education season. *Journal of Teaching in Physical Education, 19*, 355-357.
- Hastie, P. (2003). Designing quality sporting experiences. In P. Hastie (Ed.), *Teaching for lifetime: Physical activity through quality high school physical education* (pp. 159-192). New York, NY: Benjamin Cummings.
- Hastie, P., & Buchanan, A. M. (2000). Teaching responsibility through sport education: Prospects for a coalition. *Research Quarterly for Exercise and Sport, 71*: 25-35.

- Hastie, P., & Pickwell, A. (1996). A description of a student social system in a secondary school dance class. *Journal of Teaching in Physical Education, 15*, 171-187.
- Hastie, P., & Saunders, J. E. (1990). A study of monitoring in secondary school physical education. *Journal of Classroom Interaction, 25*(1-2), 47-54.
- Hastie, P., & Saunders, J. E. (1991). Accountability in secondary school physical education. *Teaching and Teacher Education, 7*, 373-382.
- Hastie, P., & Saunders, J. E. (1992). A study of tasks and accountability in elite junior sports settings. *Journal of Teaching in Physical Education, 11*, 376-388.
- Hastie, P., & Siedentop, D. (1999). An ecological perspective on physical education. *European Physical Education Review, 5*(1), 9-30.
- Hastie, P. A., & Siedentop, D. (2006). The classroom ecology paradigm. In D. Kirk, D. Macdonald, & M. O'Sullivan (Eds.), *The handbook of physical education* (pp. 214-225). Thousand Oaks, CA: Sage.
- Hellison, D. (1995). *Teaching responsibility through physical activity*. Champaign, IL: Human Kinetics.
- Henninger, M. L., Pagnano, K., Patton, K., Griffin, L. L., & Dodds, P. (2006). Novice volleyball players' knowledge of games, strategies, tactics, and decision-making in the context of game play. *The Journal of Physical Education New Zealand, 39*, 36-48.
- Herrigal, E. (1953). *Zen and the art of archery*. New York: Vintage Books.
- Hook, J. L., & Tannehill, D. (1995, Early Winter). Task systems in elementary physical education classes instructed by a student teacher. *Physical Educator, 52*, 187-196.
- Hopper, T. F. (2002). Teaching games for understanding: The importance of student emphasis over content emphasis. *Journal of Physical Education Recreation and Dance, 72*(7), 44-48.
- Hopper, T.F., & Sanford, K. (2010). Can video games be a good model for learning games in PE: A complex "system" perspective on game instruction. Paper presented at the 2010 AEISEP Conference, TGfU Special Interest Group, A Coruna, Spain.
- Hopple, C., & Graham, G. (1995). What children think, feel, and know about physical fitness testing. *Journal of Teaching in Physical Education, 14*, 408-417.
- Howarth, K., & Walkuski, J. (2003). Teaching tactical concepts with preservice teachers. In J. I. Butler, L. L. Griffin, B. Lombardo, & R. Nastasi (Eds.), *Teaching games for understanding in physical education and sport: An international perspective* (pp. 127-138). Oxon Hill, MD: AAHPERD Publications.

- Huizinga, J. (1950). *Homo ludens: A study of the play element in culture*. Boston, MA: Beacon.
- Jackson, S. A., & Csikszentmihalyi, M. (1999). *Flow in sports*. Champaign, IL: Human Kinetics.
- Jones, D. L. (1992). Analysis of task systems in elementary physical education classes. *Journal of Teaching in Physical Education, 11*, 411-425.
- Jones, C., & Farrow, D. (1999). The transfer of strategic knowledge: A test of the games classification curriculum model. *The Bulletin of Physical Education, 25*(2), 103–124.
- Jones, E. E., & Gerard, H. B. (1967). *Foundations of social psychology*.: Hoboken, NJ: John Wiley & Sons.
- Joyce, B., & Weil, M. (1972). *Models of teaching*. Englewood Cliffs, NJ: Prentice-Hall.
- Keating, J. (1964). Sportsmanship as a moral category. *Ethics, LXXV*(1), 25-35.
- Kinchin, G. D. (1997). High school students' perceptions of and responses to curriculum change in physical education. Unpublished doctoral dissertation, The Ohio State University, Columbus, OH.
- Kinchin, G. D. (2001a). A high skilled pupil's experience with sport education. *The ACHPER Healthy Lifestyles Journal, 48*(3), 5-9.
- Kinchin, G. D. (2001b). Using team portfolios during a sport education season. *Journal of Physical Education, Recreation and Dance, 72*(2): 41-44.
- Kinchin, G. D. (2003). Sport education and the student teacher. *PE and Sport Today, 13*, 40-42.
- Kinchin, G. D., & Hastie, P. (2004, September). Sport education and its perceived impact upon practice: The case of one head of department in and out of the gym! Paper presented at the Annual meeting of the British Educational Research Association conference, Manchester, England.
- Kinchin, G. D., & Kinchin, V. K. (2005). Laying the foundation for sport education. In D. Penney, G. Clarke, M. Quill, and G. D. Kinchin (Eds.), *Sport Education in Physical Education: Research-based Practice*. London: Routledge.
- Kinchin, G. D., & O'Sullivan, M. (1999). Making high school physical education meaningful for students. *Journal of Physical Education, Recreation and Dance, 70*(5): 40-44, 54.
- Kinchin, G. D., & O'Sullivan, M. (2003). Incidences of student support for and resistance to a curricular innovation in high school physical education. *Journal of Teaching in Physical Education, 22*(3), 245-260.

- Kinchin, G. D., Penney, D. & Clarke, G. (2002a). Roles and responsibilities in physical education. *British Journal of Teaching Physical Education*, 33(4), 23-26.
- Kinchin, G. D., Wardle, C., Roderick, S., & Sprosen, A. (2004). A survey of year 9 perceptions of sport education in one English secondary school. *Bulletin of Physical Education*, 40(1), 27-40.
- Kinchin, G. D., Penney, D., & Clarke, G. (2005). Sport education in teacher education. In D. Penney, G. Clarke, M. Quill, & G. D. Kinchin (Eds.), *Sport Education in Physical Education Education: Research-based Practice*. London: Routledge.
- Kirk, D. (1983). Theoretical guidelines for 'teaching for understanding'. *Bulletin of Physical Education*, 19, 41-45.
- Kirk, D., & Almond, L. (1999). Sport education as situated learning in physical education: Making links to citizenship and critical consumerism. Paper presented to the AIESEP International Conference, Besancon, France, April 1999.
- Kirk, D., & Kinchin, G. D. (2003). Situated learning as a theoretical framework for sport education. *European Physical Education Review*, 9(3), 221-235.
- Kirk, D., & MacDonald, D. (1998). Situated learning in physical education. *Journal of Teaching in Physical Education*, 17, 376-387.
- Kounin, J. (1970). *Discipline and group management in classrooms*. New York: Holt, Rinehart, & Winston.
- Kretchmar, R. S. (2005a). *Practical philosophy of sport and physical activity*. Champaign, IL: Human Kinetics.
- Kretchmar, R. S. (2005b). Why do we care so much about mere games? (And is this ethically defensible?). *Quest*, 57, 181-191.
- Kretchmar, R. S. (2006). Life on easy street: The persistent need for embodied hopes and down-to-earth games. *Quest*, 58, 345-354.
- Kulinna, P. H., Cothran, D. J., & Regualos, R. (2006). Teachers' reports of student misbehavior in physical education. *Research Quarterly for Exercise and Sport*, 77, 32-40.
- Lawton, J. (1989). Comparison of two teaching methods in games. *Bulletin of Physical Education*, 25(1), 35-38.
- Lewis, J. (2001). Is it possible that Siedentop's sport education model can be used with a key stage 1 physical education class to aid pupil development? Unpublished undergraduate dissertation, De Montford University: Bedford.

- Light, R. (2002). Engaging the body in learning: Promoting cognition in games through TGfU. *ACHPER Healthy Lifestyles Journal*, 49(2), 23-26.
- Light, R. (2003). Preservice teachers' responses to TGfU in an Australian university: "No room for heroes". In J. I. Butler, L. L. Griffin, B. Lombardo, & R. Nastasi (Eds.), *Teaching games for understanding in physical education and sport: An international perspective* (pp. 67-78). Oxon Hill, MD: AAHPERD Publications.
- Light, R. (2004). Coaches' experiences of game sense: Opportunities and challenges. *Physical Education and Sport Pedagogy*, 9(2), 115-131.
- Lister, A. (2001) 'SEPEP cricket and school-community links': Taking sport education beyond bell-time: Paper presented at the AARE International Conference, Freemantle.
- Loy, J. W. (1968). The nature of sport: A definitional effort. *Quest*, 10(1), 1-15.
- Loy, J. W. (1969). The nature of sport. In J. W. Loy, & G. S. Kenyon (Eds.), *Sport, culture, and society: A reader on the sociology of sport*. London: The Macmillan Company.
- Lloyd, R. J., & Smith, S. J. (2006). Interactive flow and exercise pedagogy. *Quest*, 58, 222-241.
- Luke, M. (1989). Research on class management and organization: Review with implications for current practice. *Quest*, 44, 55-67.
- Lund, J. (1992). Assessment and accountability in secondary physical education. *Quest*, 44, 352-360.
- MacPhail, A., & Kinchin, G. d. (2004). The use of drawings as an evaluative tool: students' experiences of sport education. *Physical Education and Sport Pedagogy*, 9(1): 87-108.
- MacPhail, A., Kinchin, G. D., & Kirk, D. (2003). Students' conceptions of sport and sport education. *European Physical Education Review*, 9(3): 285-300.
- MacPhail, A., Kirk, D., & Griffin, L.L. (2008). Throwing and catching as relational skills in game play: Situated learning in a modified game unit. *Journal of Teaching in Physical Education*, 27, 100-115.
- MacPhail, A., Kirk, D., & Kinchin, G. D. (2004). Sport education: Promoting team affiliation through sport education. *Journal of Teaching in Physical Education*, 23, 106-122.
- Magill, R. (1998). Knowledge is more than we can talk about: Implicit learning in motor skill acquisition. *Research Quarterly for Exercise and Sport*, 69, 104-110.

- Mahut, N., Chevalier, G., Mahut, B., & Grehaigne, J. F. (2003). The construction of student tactical knowledge in badminton. In J. I. Butler, L. L. Griffin, B. Lombardo, & R. Nastasi (Eds.), *Teaching games for understanding in physical education and sport: An international perspective* (pp. 139-154). Oxon Hill, MD: AAHPERD Publications.
- Marano, H. (1999). The power of play. *Psychology Today*, 32, 36-40, 68.
- Marks, M. C. (1988). Development of a system for the observation of task structures in physical education (Doctoral dissertation, The Ohio State University, 1990). *Dissertation Abstracts International*, 51, 3358A.
- Massimini, F., & Carli, M. (1988). The systematic assessment of flow in daily experience. In M. Csikszentmihalyi, & J. S. Csikszentmihalyi (Eds.), *Optimal experience*. Cambridge, MA: Cambridge University Press.
- Mauldon, E., & Redfern, H. B. (1969). *Game teaching: A new approach for the primary school*. London: MacDonald and Evans Ltd.
- McCaughy, N. (2004). Learning to read gender relations in schooling: Implications of personal history and teaching context on identifying disempowerment for girls. *Research Quarterly for Exercise and Sport*, 75, 400-412.
- McCaughy, N. (2006). Working politically amongst professional knowledge landscapes to implement gender-sensitive physical education reform. *Physical Education and Sport Pedagogy*, 11, 159-179.
- McCaughy, N., & Rovegno, I. (2003). Development of pedagogical content knowledge: Moving from blaming students to predicting skillfulness, recognizing motor development, and understanding emotion. *Journal of Teaching in Physical Education*, 22, 355-368.
- McCaughy, N., Sofu, S., Rovegno, I., & Curtner-Smith, M. (2004). Learning to teach sport education: misunderstandings, pedagogical difficulties, and resistance. *European Physical Education Review*, 10(2): 135-155.
- McCaughy, N., Tischeler, A., & Flory, S. B. (2008). The ecology of the gym: Reconceptualized and extended. *Quest*, 60, 268-289.
- McGreevy-Nichols, S., Scheff, H., & Sprague, M. (2005). *Building dances: A guide to putting movements together (2<sup>nd</sup> Edition)*. Champaign, IL: Human Kinetics.
- McKeen, K., Webb, P., & Pearson, P. (2005). Promoting physical activity through teaching games for understanding in undergraduate teacher education. *AISEP, 2005 World Congress Proceedings. Active Lifestyles. The Impact of Education and Sport, Lisbon*, 251-258.

- McNeill, M. C., Fry, J. M., Wright, S. C., Tan, W. K. C., & Schempp, P. G. (2004). 'In the local context': Singaporean challenges to teaching games on practicum. *Sport, Education, and Society*, 9(1), 3-32.
- McPherson, S. L. (1993a). Instructional influences on player's planning strategies in tennis. *Research Quarterly for Exercise and Sport*, 64(Suppl.), A-78.
- McPherson, S. L. (1993b). Knowledge representation and decision-making in sport. In J. L. Starkes, & F. Allard (Eds.), *Cognitive issues in motor expertise*. Atlanta, GA: Elsevier Science Publishers B. V.
- McPherson, S. L. (1993c). The influence of player experience on problem solving during batting preparation in baseball. *Journal of Sport & Exercise Psychology*, 15, 304-325.
- McPherson, S. L. (1994). The development of sport expertise: Mapping the tactical domain. *Quest*, 46(2), 223-240.
- McPherson, S. L. (1999). Expert-novice differences in performance skills and problem representations of youth and adults during tennis competition. *Research Quarterly for Exercise and Sport*, 70, 233-251.
- McPherson, S. L. (2000). Expert-novice differences in planning strategies during collegiate singles tennis competition. *Journal of Sport & Exercise Psychology*, 22, 39-62.
- McPherson, S. L., & French, K. E. (1991). Changes in cognitive state and motor skill in tennis. *Journal of Sport and Exercise Psychology*, 1, 26-41.
- McPherson, S. L., French, K. E., & Kernodle, M. W. (2002, April). *Problem representation of male entry-level professionals and novices during singles tennis competition*. Paper presented at the annual conference of the American Alliance for Health, Physical Education, Recreation, and Dance, San Diego, CA.
- McPherson, S. L., & Thomas, (1989). Relation of knowledge and performance in boys' tennis: Age and expertise. *Journal of Experimental Child Psychology*, 48, 190-211.
- Mechikoff, R. A., & Estes, S. G. (2002). *A history and philosophy of sport and physical education: From ancient civilization to the modern world (3<sup>rd</sup> ed.)*. Boston, MA: McGraw-Hill.
- Merriam-Webster's On-line Dictionary (2008). Retrieved May 14, 2008, from <http://www.merriam-webster.com/>
- Merritt, M. (1982). Distributing and directing attention in primary classrooms. In L. C. Wilkinson (Ed.), *Communicating in the classroom*. New York, NY: Academic Press.

- Metzler, M. (2000). *Instructional models for physical education*. Boston, MA: Allyn & Bacon.
- Michener, J. (1976). *Sports in America*. Greenwich, CN: Fawcett Crest.
- Mitchell, S. A., Griffin, L. L., & Oslin, J. L. (1997). An analysis of two instructional approaches to teaching invasion games. *Research Quarterly for Exercise and Sport*, 66(Suppl.), A-65.
- Mitchell, S.A., & Oslin, J.L. (2005). Teaching Games for Understanding. In J. Lund & D. Tannehill (Eds). *Standards-based Physical Education Curriculum Development*. Boston, MA: Jones and Bartlett.
- Mitchell, S.A., & Oslin, J.L. (1999). An investigation of tactical transfer in net games. *European Journal of Physical Education*, 4(2), 162-173.
- Mitchell, S. A., Oslin, J. L., & Griffin, L. L. (1995). The effects of two instructional approaches on game performance. *Pedagogy in Practice: Teaching and Coaching in Physical Education and Sports*, 1, 36-48.
- Mitchell, S.A., Oslin, J.L., & Griffin L.L. (2003). Sport foundations for elementary physical education: A tactical games approach. Champaign, IL: Human Kinetics.
- Mitchell, S., Oslin, J., & Griffin, L. L. (2006). *Teaching sport concepts and skills: A tactical games approach*. Champaign, IL: Human Kinetics.
- Morine-Dersheimer, G. (1985). *Talking, listening, and learning in the elementary classroom*. New York: Longman.
- Mosston, M. (1966). *Teaching physical education: From command to discovery*. Columbus, OH: Charles E. Merrill Books.
- Mosston, M., & Ashworth, S. (1994). *Teaching physical education (4<sup>th</sup> ed.)*. New York, NY: Macmillan College Publishing Company.
- National Football League (2008). Retrieved August 15, 2008, from <http://www.nfl.com/players/elimanning/profile?id=MAN473170>
- Nielsen, T. M. & McPherson, S. L. (2001). Response selection and execution skills of professionals and novices during singles tennis competition. *Perceptual and Motor Skills*, 93, 541-555.
- Nevett, M. (1996). *Knowledge content, sport-specific strategies, and other self-talk accessed by shortstops of different ages during defensive game play*. Unpublished doctoral dissertation, University of South Carolina, Columbia.

- Nevett, M., & French, K. E. (1997). The development of sport-specific planning, rehearsal and updating of plans during defensive youth baseball game performance. *Research Quarterly for Exercise and Sport*, 69, 203-214.
- Nevett, M., Rovegno, I., & Babiarz, M. (2001a). Fourth-grade children's knowledge of cutting, passing, and tactics in invasion games after a 12-lesson unit of instruction. *Journal of Teaching in Physical Education*, 20(4), 389-401.
- Nevett, M., Rovegno, I., Babiarz, M., & McCaughtry (2001b). Changes in basic tactics and motor skills in an invasion-type game after a 12-lesson unit of instruction. *Journal of Teaching in Physical Education*, 20(4), 352-369.
- Newell, K. (1986). Constraints on the development of coordination. In H. Wade & H. Whiting (Eds.), *Motor Development Aspects of Coordination and Control*. Dordrecht, The Netherlands: Martinus Nijhoff Publishers.
- Oberteuffer, D., & Ulrich, C. (1962). *Physical education: A textbook of principles for professional students (3<sup>rd</sup> ed.)*. New York, NY: Harper & Row.
- O'Donovan, T. M. (2003). A changing culture? Interrogating the dynamics of peer affiliations over the course of a season. *European Physical Education Review*, 9(3): 237-252.
- Olafson, L. (2002). "I hate phys. ed.": Adolescent girls talk about physical education. *Physical Educator*, 59, 67-74.
- Ormond, T. C., DeMarco, G. M., Smith, R. M., & Fischer, K. A. (1995). Comparison of the sport education and traditional approaches to teaching secondary school basketball. Paper presented to the Annual meeting of the American Alliance for Health, Physical Education, Recreation and Dance, Portland, OR.
- Oslin, J. L. (1996). Tactical approaches to teaching games. *Journal of Physical Education, Recreation, and Dance*, 67(1), 27.
- Oslin, J. L., & Mitchell, S. (2006). Game-centered approaches to teaching physical education. In D. Kirk, D. Macdonald, & M. O'Sullivan (Eds.), *The handbook of physical education* (pp. 627-651). Thousand Oaks, CA: SAGE Publications Ltd.
- O'Sullivan, M., & Dyson, B. (1994). Rules, routines, and expectations of 11 high school physical education teachers. *Journal of Teaching in Physical Education*, 13, 361-374.
- O'Sullivan, M., & Henninger, M. (2000). *Assessing student responsibility and teamwork*. Reston, VA: National Association for Sport and Physical Education.

- O'Sullivan, M., & Kinchin, G. D., Dunaway, D., Kellum, S., & Dixon, S. (1996). Thinking differently about high school physical education. Paper presented to the Annual meeting of the American Alliance for Health, Physical Education, Recreation and Dance, Atlanta, GA.
- Pagnano, K. B. (2004). *A case study of the dual roles of an exemplary physical education teacher/coach: An ecological comparison*. Unpublished doctoral dissertation, University of Massachusetts-Amherst.
- Pagnano-Richardson, K., & Henninger, M.L. (2008). A model for developing and assessing tactical decision-making competency in game play. *Journal of Physical Education Recreation and Dance*, 79(3), 24-29.
- Panicucci, J., Hunt, L. F., Kohut, A., Rheingold, A., & Stratton, N. (2002). *Adventure curriculum for physical education: Middle school*. Beverly, MA: Project Adventure, Inc.
- Penney, D. (2003). Sport education and situated learning: Problematizing the potential. *European Physical Educational Review*, 9(3): 301-308.
- Penney, D., Clarke, G., & Kinchin, G. (2002). Developing physical education as a “connective specialism”: Is sport education the answer? *Sport, Education and Society*, 7: 55-64.
- Penney, D., Clarke, G., Quill, M., & Kinchin, G. (2002). Activity selection in sport education. *Journal of Sport Pedagogy*, 8(2): 53-66.
- Penney, D., & Wilkie, B. (2005). Sport education and outdoor and adventurous activities. In D. Penney, G. Clarke, M. Quill, and G. D. Kinchin (Eds.), *Sport education in physical education: Research-based practice*. London: Routledge.
- Piaget, J. (1972). Development and learning. In C.S. Lavattelly & F. Stendler, *Reading in child behavior and development*. New York: Hartcourt Brace Janovich.
- Piggot, B. (1982). A psychological basis for new trends in games teaching. *Bulletin of Physical Education*, 18(1), 17-22.
- Placek, J. H. (1983). Conceptions of success in teaching: Busy, happy and good? In T. Templin & J. K. Olson, *Teaching in physical education*. Champaign, IL: Human Kinetics.
- Placek, J. H., Griffin, L. L., Dodds, P., Raymond, C., Tremino, F., & James, A. (2001). Middle school students' conceptions of fitness: The long road to a healthy lifestyle. *Journal of Teaching in Physical Education*, 20(4), 314-323.
- Pope, C. C. (2004). Building the TGFU model with Tchoukball. Paper presented at the Physical Education New Zealand National Conference, Wellington, September 19-22.

- Pope, C., & O'Sullivan, M. (1998). Culture, pedagogy and teacher change in an urban high school: How would you like your eggs done? *Sport, Education and Society*, 3(2): 201-226.
- Portman, P. (1995). Coping behaviors of low-skilled students in physical education: Avoid, announce, act out, and accept. *The Physical Educator*, 52, 29-39.
- Professional Bull Riding (2008). Retrieved August 15, 2008, from <http://www.pbrnow.com/>
- Qualifications and Curriculum Authority. (2002). PE in schools today. *British Journal of Teaching Physical Education*, 33(4), 6-8.
- Richard, J. F., & Wallian, N. (2005) Emphasizing student engagement in the construction of game performance. In L. L. Griffin & J. I. Butler, *Teaching Games for Understanding: Theory, research, and practice* (pp.19-32). Champaign, IL: Human Kinetics.
- Rink, J. (1996). Effective instruction in physical education. In S. Silverman and C. Ennis (Eds.). *Student Learning in Physical Education*, (pp. 171-198). Champaign, IL: Human Kinetics.
- Rink, J. (1999). Instruction from a learning perspective. In C.A. Harely & M. Mawer (Eds.). *Learning and teaching in physical education*, (pp. 149-168). London: Falmer.
- Rink, J. (2001). Investigating the assumptions of pedagogy. *Journal of Teaching in Physical Education*, 20, 112-128.
- Rink, J. (2002). *Teaching physical education for learning (4<sup>th</sup> ed.)*. New York, NY: McGraw-Hill.
- Rink, J. (2010). TGfU: Celebrations and cautions. In Butler, J.I. & L.L. Griffin (Eds.), *More Teaching Games for Understanding: Moving globally*. Champaign, IL: Human Kinetics.
- Rink, J.E., French, K.E., & Tjeerdsma, B.L. (1996). Foundations for the learning and instruction of sport and games. *Journal of Teaching in Physical Education*, 15(4), 399-417.
- Roberts, P. (1995). Goofing off. *Psychology Today*, 28, 34-38.
- Romar, J. E. (1995). *Case studies of Finnish physical education teachers: Espoused and enacted theories of action*. Abo: Abo Academi University Press.
- Ross, S. (1995). Psychomotor learning theories, pedagogy and persons: A philosophical anthropological analysis. *International Journal of Physical Education*, 31(1), 13- 18.
- Rossman, G.B., & Rallis, S.F. (Eds.) (2003). *Learning in the field: An introduction to qualitative research (2<sup>nd</sup> ed.)*. Thousand Oaks, CA: Sage Publications, Inc.

- Rovegno, I. (1994). Teaching within a curricular zone of safety: School culture and the situated nature of student teachers' pedagogical content knowledge. *Research Quarterly for Exercise and Sport*, 65, 269-280.
- Rovegno, I. (1995). Theoretical perspectives on knowledge and learning and a student teacher's pedagogical content knowledge of dividing and sequencing subject matter. *Journal of Teaching in Physical Education*, 14, 284-304.
- Rovegno, I. (1998). The development of in-service teachers' knowledge of a constructivist approach to physical education: Teaching beyond activities. *Research Quarterly for Exercise and Sport*, 69, 147-162.
- Rovegno, I., Nevett, M., Brock, S., & Babiarz, M. (2001a). Teaching and learning basic invasion-game tactics in 4<sup>th</sup> grade: A descriptive study from situated and constraints theoretical perspectives. *Journal of Teaching in Physical Education*, 20(4), 370-388.
- Rovegno, I., Nevett, M., & Babiarz, M. (2001b). Learning and teaching invasion-game tactics in 4<sup>th</sup> grade: Introduction and theoretical perspective. *Journal of Teaching in Physical Education*, 20(4), 341-351.
- Sallis, J. F., & McKenzie, T. L. (1991). Physical education's role in public health. *Research Quarterly for Exercise and Sport*, 64, 25-31.
- Salomon, G., & Perkins, D. (1998). Individual and social aspects of learning. In P. Pearson & A. Iran-nejad (Eds.), *Review of research in education* (pp. 1-24). Washington, D. C.: American Educational Research Association.
- Salthouse, T. (1996). The processing-speed theory of adult age differences in cognition. *Psychological Review*, 103, 403-428.
- Scanlan, T. K., & Simons, J. P. (1992). The construct of sport enjoyment. In G. C. Roberts (Ed.), *Motivation in sport and exercise* (pp. 199-215). Champaign, IL: Human Kinetics.
- Schmitz, K. (1972). Sport and play: Suspension of the ordinary. In E. Gerber (Ed.), *Sport and the body: A philosophical symposium*, 25-32.
- Schneider, L. (1964). Institution. In J. Gould, & W. L. Kolb, *A dictionary of the social sciences*. New York, NY: Free Press.
- Schön, D. A. (1990). *Educating the reflective practitioner: Toward a new design for teaching and learning in the professions*. San Francisco: Jossey-Bass.
- Scivener, E., & Penney, D. (2005). Sport education in key stage 4 swimming. In D. Penney, G. Clarke, M. Quill, and G. D. Kinchin (Eds.), *Sport education in physical education: Research-based practice*. London: Routledge.

- Sève, C., Durand, M., Saury, J., & Avanzini, G. (2000). L'analyse de l'activité de pongiste de haut niveau en compétition: Perspective pour l'entraînement. *Science et motricité*, 38, 26-31.
- Shen, B., McCaughtry, N., Martin, J. J., & Dillon, S. (2006). Does “sneaky fox” facilitate learning? Examining the effects of seductive details in physical education. *Research Quarterly for Exercise and Sport*, 77, 498-506.
- Shuell, T. (1986). Cognitive conceptions of learning. *Review of Educational Research*, 56, 411-436.
- Shulman, L. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15, 4-14.
- Siedentop, D. (1972). *Physical education: Introductory analysis*. Dubuque, Iowa: WM. C. Brown Company Publishers.
- Siedentop, D. (1987). High school physical education: Still an endangered species. *Journal of Physical Education, Recreation, and Dance*, 58(2), 24-25.
- Siedentop, D. (1988). An ecological model for understanding teaching/learning in physical education. In *New Horizons of Human Movement: Proceedings of the 1988 Olympic Scientific Congress*. Seoul: SOSCO.
- Siedentop, D. (1992). Thinking differently about secondary physical education. *Journal of Physical Education, Recreation, and Dance*, 63(7), 69-77.
- Siedentop, D. (1994). *Quality PE through positive sport experiences: Sport education*. Champaign, Illinois: Human Kinetics.
- Siedentop, D. (1994b). *Sport education*. Champaign, IL: Human Kinetics.
- Siedentop, D. (2002). Sport education: A retrospective. *Journal of Teaching in Physical Education*, 21: 409-418.
- Siedentop, D., Doutsis, P., Tsangaridou, N., Ward, P., & Rauschenback, J. (1994). Don't sweat gym! An analysis of curriculum and instruction. *Journal of Teaching in Physical Education*, 13, 375-394.
- Siedentop, D., Hastie, P., & van der Mars, H. (2004). *Complete guide to sport education*. Champaign, IL: Human Kinetics.
- Siedentop, D., & Tannehill, D. (2000). *Developing teaching skills in physical education (4<sup>th</sup>)*. Mountain View, CA: Mayfield.

- Siegel, D. (2008). *Play, games, sport, and athletics: Introduction*. Retrieved July 21, 2008, from [http://www.science.smith.edu/exer\\_sci/ESS200/Play/PlayH01.htm](http://www.science.smith.edu/exer_sci/ESS200/Play/PlayH01.htm)
- Silverman, S. (2005). Thinking long term: Physical education's role in movement and mobility. *Quest*, 57, 138-147.
- Silverman, S., & Subramaniam, P. R. (1999). Student attitude toward physical education and physical activity: A review of measurement issues and outcomes. *Journal of Teaching in Physical Education*, 19, 97-125.
- Sinelnikov, O. A., Hastie, P. A., Chance, A., & Schneulle, D. (2005). Bicycle safety: Sport education style. *Journal of Physical Education, Recreation and Dance*, 76(2), 24-29.
- Singer, R. N., & Lidor, R. (1993). Learning sports skills: The "just do it" approach. *International Journal of Physical Education*, 30(1), 10-14.
- Skinner, B. F. (2008). *A brief survey of operant behavior*. Retrieved June 15, 2008, from [http://www.bfskinner.org/brief\\_survey.html](http://www.bfskinner.org/brief_survey.html)
- Sport, Play, and Active Recreation for Kids. (n.d.). *Sport, Play, and Active Recreation for Kids*. Retrieved August 7, 2008, from <http://www.sparkpe.org/>
- Stake, R. (1995). *The art of case research*. Thousand Oaks, CA: Sage Publications.
- Starkes, J. L., & Allard, F. (1993). *Cognitive issues in motor expertise*. Amsterdam: Elsevier.
- Sternberg, R. J. (1984). A theory of knowledge acquisition in the development of verbal concepts. *Developmental Review*, 4, 113-138.
- Sternberg, R. J., & Horvath, J. A. (1995). A prototype of expert teaching. *Educational Researcher*, 24(6), 9-17.
- Stinson, S. (1993). Meaning and value: Reflections on what students say about school. *Journal of Curriculum and Supervision*, 8, 216-238.
- Stone, G. (1972). *Games, sport and power*. New Jersey: TransAction Books.
- Strauss, A., & Corbin, J. (1998). *Basics of qualitative research: Techniques and procedures for developing grounded theory*. Thousand Oaks, CA: Sage Publications, Inc.
- Styles, L. (1974). *Theories for teaching*. New York, NY: Dodd, Mead, & Co.
- Suits, B. (1972). What is a game? In E. Gerber (Ed.), *Sport and the body: A philosophical symposium*, 16-22.

- Sullivan, E., & Swabey, K. (2003). Comparing assessment of preservice teaching practices using traditional and TGfU instructional models: Data from Australia and the United States. In J. I. Butler, L. L. Griffin, B. Lombardo, & R. Nastasi (Eds.), *Teaching games for understanding in physical education and sport: An international perspective* (pp. 99-112). Oxon Hill, MD: AAHPERD Publications.
- Supaporn, S. (2000, Fall). High school students' perspectives about misbehavior. *The Physical Educator*, 124-135.
- Swanson, R. A., & Spears, B. (1995). *History of sport and physical education in the United States (4<sup>th</sup> ed.)*. Boston, MA: McGraw-Hill.
- Sweeney, M., Everitt, A., & Carifio, J. (2003). Teaching games for understanding: A paradigm shift for undergraduate students. In J. I. Butler, L. L. Griffin, B. Lombardo, & R. Nastasi (Eds.), *Teaching games for understanding in physical education and sport: An international perspective* (pp. 99-112). Oxon Hill, MD: AAHPERD Publications.
- Tennenbaum, G. (1999). The development of expertise in sport: Nature and nurture. *International Journal of Sport Psychology*, 30(2).
- Terr, L. (1999). *Beyond love and work: Why adults need to play*. New York, NY: Scribner.
- Thomas, J. R., French, K. E., Thomas, K. T., & Gallagher, J. D. (1988). Children's knowledge development and sport performance: Directions for motor behavior research. *Journal of Sport Psychology*, 8, 259-272.
- Thomas, K. (1994). The development of sport expertise: From Leeds to MVP legend. *Quest*, 46, 199-210.
- Thorndike, E. L. (2008). *Human intelligence: Biographical profile of Edward. L. Thorndike*. Retrieved June 15, 2008, from <http://www.indiana.edu/~intell/ethorndike.shtml>
- Thorpe, R. (1990). New directions in games teaching. In N. Armstrong (Ed.), *New directions in physical education* (pp.79-100). London: Human Kinetics.
- Thorpe, R. (1992). The psychological factors underpinning the 'teaching for understanding games' movement. In L. Almond, T. Williams, & A. Sparks (Eds.), *Sport and physical activity: Moving towards excellence* (pp. 209-218). London: E and FN Spon.
- Thorpe, R., & Bunker, D. (1989). A changing focus in games teaching. In L. Almond (Ed.), *The place of physical education in schools* (pp. 42-71). London: Kogan Page.
- Thorpe, R., Bunker, D., & Almond, L. (1984). *A change in focus for the teaching of games*. Paper presented at the Olympic Scientific Congress, Eugene, OR.

- Thorpe, R., Bunker, D., & Almond, L. (1986). Rethinking games teaching. Loughborough, England: Department of Physical Education and Sports Science University of Technology.
- Tinning, R., & Fitzclarence, L. (1992). Postmodern youth culture and the crisis in Australian secondary school physical education. *Quest*, 44, 287-303.
- Tinning, R. I., & Siedentop, D. (1985). The characteristics of tasks and accountability in student teaching. *Journal of Teaching in Physical Education*, 4, 286-299.
- Tjeerdsma, B. L., Rink, J. E., & Graham, K. C. (1996). Student perceptions, values, and beliefs prior to, during, and after badminton instruction. *Journal of Teaching in Physical Education*, 15(4), 464-476.
- Tousignant, M. (1982). Analysis of the task structures in secondary physical education classes (Doctoral dissertation, The Ohio State University, 1982). *Dissertation Abstracts International*, 43, 1470A.
- Tousignant, M., & Siedentop, D. (1983). A qualitative analysis of task structures in required secondary physical education classes. *Journal of Teaching in Physical Education*, 3, 47-57.
- Turner, A. P. (1996). Teachers' perceptions of technical and tactical models of instruction. *Research Quarterly for Exercise and Sport*, 67(Suppl.), A-90.
- Turner, A. P., & Martinek, T. J. (1992). A comparative analysis of two models for teaching games (technique approach and game centered [tactical focus] approach). *International Journal of Physical Education*, 29(4), 15-31.
- Turner, A. P., & Martinek, T. J. (1995). Teaching for understanding: A model for improving decision making during game play. *Quest*, 47, 44-63.
- Turner, A. P., & Martinek, T. J. (1999). An investigation into teaching game for understanding: Effects on skill, knowledge and game play. *Research Quarterly for Exercise and Sport*, 70, 286-296.
- van der Mars, H. (1989). Observer reliability: Issues and procedures. In P.W. Darst, D.B. Zakrajsek, and V.H. Mancini (Eds.), *Analyzing physical education and sport instruction* (pp. 53-80). Champaign, IL: Human Kinetics.
- Vanderzwaag, H. (1972). *Toward a philosophy of sport*. Reading, MA: Addison-Wesley Publishing Co.
- Vosniadou, S., & Brewer, W. (1987). Theories of knowledge restructuring in development. *Review of Educational Research*, 57, 51-67.

- Vygotsky, L. (1978). *Mind in society*. Cambridge, MA: Harvard University Press.
- Wade, A. (1967). *The F. A. Guide to training and coaching*. London: Heinemann.
- Wallhead, T. L., & Buckworth, J. (2004). The role of physical education in the promotion of youth physical activity. *Quest*, 56, 285-301.
- Wallhead, T., & Ntoumanis, N. (2004). Effects of a sport education intervention on students' motivational responses in physical education. *Journal of Teaching in Physical Education*, 23: 4-18.
- Ward, P., Barrett, T., Evans, S., Doutis, P., Nguyen, P. T., & Johnson, M. K. (1999). Curriculum effects in eighth grade lacrosse. *Journal of Teaching in Physical Education*, 18, 428-443.
- Ward, P., & Williams, A. M. (2003). Perceptual and cognitive skill development in soccer: The multidimensional nature of expert performance. *Journal of Sport and Exercise Psychology*, 25(1), 93-111.
- Wardle, C., & Kinchin, G. D. (2000). Sample sport education units: Year 7 tennis. *PE and Sport Today*, 16, 43-46.
- Weiss, M. R., & Chaumeton, N. (1993). Motivational orientations in sport. In T. S. Horn (Ed.), *Advances in sport psychology* (pp. 61-99). Champaign, IL: Human Kinetics.
- Wenz, P. (1985). Human equality in sports. In D. Vanderwerken, & S. Wertz (Eds.), *Sport inside out*. Fort Worth, TX: Texas Christian University, pp. 208-221.
- Werner, P., Thorpe, R., and Bunker, D. (1996) Teaching games for understanding: evolution of a model. *The Journal of Physical Education Recreation and Dance*, 67 (1), 28 – 33.
- Wideman, J. E. (2001). *Hoop roots*. New York, NY: Houghton Mifflin Co.
- Wilson, A., & Kinchin, G. D. (2000). High school students' present and predicted likes and dislikes regarding physical education. *Illinois Journal for Health, Physical Education, Recreation and Dance*, [Spring]: 4-8.
- Women's National Basketball Association (2008). Retrieved August 15, 2008, from <http://www.wnba.com/>