AN INVESTIGATION INTO TEACHING GAMES FOR UNDERSTANDING

by

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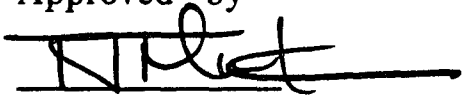

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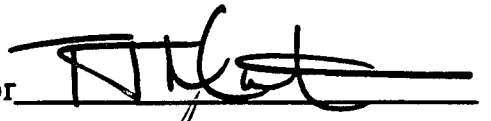
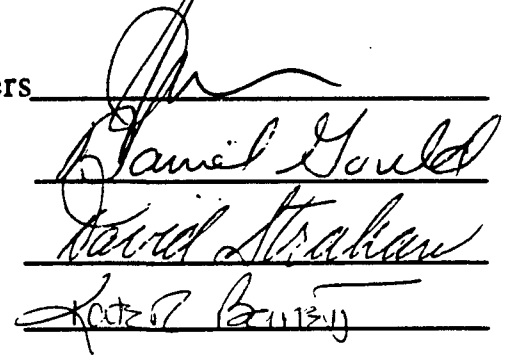
Dissertation Advisor 

Committee Members 

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The purpose of this study was to test the validity of the games for understanding (GFU) model by comparing it to a technique approach to instruction and to a control group. The technique method focused primarily on skill instruction where the skill taught initially was incorporated into a game at the end of each lesson. The GFU approach emphasized the development of tactical awareness and decision-making in small game situations. Two physical education specialists taught field hockey using these approaches. Both teachers used each approach with different groups. The control group did not receive hockey instruction.

Data were collected from 71 middle school children. Pretests and posttests were administered for hockey knowledge, skill and game performance. The treatments lasted for 15 (45 minute) lessons. The teachers recorded their thoughts about the lessons in journals after each class. Student perceptions were also recorded during interviews in the penultimate week of the study.

Separate 2 x 3 MANOVA were conducted to examine group differences across time for (1) skill (accuracy and time), (2) knowledge (declarative and procedural), and (3) game play (control, decision-making and execution). For hockey skill there were no significant differences among the treatment groups for time or accuracy. For declarative hockey knowledge both treatment groups

scored significantly higher than the control group on the posttest. The GFU group recorded significantly better scores for procedural knowledge than the other two groups on this test. During posttest game play the GFU group scored significantly higher on the control and decision-making variables than the other groups.

The student interview data and teacher journal data were coded into themes. Students in the GFU group were more positive about their learning experiences and consistently identified strategic decision-making as critical for playing field hockey. Students in the technique group viewed skill learning as essential. In their journals the teachers noted a transition from static drills to games in the technique approach. They viewed small games as the basis for teaching both strategy and skill during the GFU approach.

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CHAPTER I

INTRODUCTION AND REVIEW OF LITERATURE

Steve Simms has just finished teaching a soccer unit to his 7th grade class. The focus of his instruction was teaching the basic skills of the game (passing and control, dribbling, tackling, heading and shooting). The majority of his learning tasks were structured drills and the students had the opportunity to play games at the conclusion of some lessons and at the end of the unit of instruction. During the time assigned for games Steve observed that many pupils who performed well during the practice drills played poorly during the games. It appeared that a number of students were unable to execute many of the basic skills that they had previously practiced when they were actually playing a soccer game.

The above scenario illustrates a common problem for many physical education teachers. Students who appear to possess adequate game skills have great difficulty performing those skills in game situations. Like Steve Simms, teachers have often tried to present skills first and then put students in game situations hoping that the application of those skills will surface. Unfortunately, the majority of teachers and coaches find that only a few of their charges can effectively make the transition. Even with the persistent practice of these skills ineffective game play frequently ensues.

Games Teaching

Traditionally games lessons have been structured around the learning of specific skills and the development of techniques associated with these skills. The requirement that learners move in a lockstep manner from one simple skill to the next can be a debilitating design strategy (Vickers, 1990). "Such an approach has assumed the necessity for enabling skills to be developed before the game could be tackled resulting in an emphasis on physical ability rather than game understanding" (Bailey & Almond, 1983, p. 56).

Inadvertently, this approach may be undermining the cognitive skills that are essential for effective participation in games during physical education lessons. Beyer (1987) has shown that effective thinking requires dispositions that include being well informed, able to look at the whole picture and being open-minded. The adoption of a technique focus in games instruction has led Asquith (1989) to question whether teachers are helping children to achieve optimum potential in the playing and understanding of games.

The implications of this shortcoming are already evident. Hughes (1980) has shown that understanding what is necessary requires both knowledge and perception; thus the excellent technical performer may not be skillful, because he/she may not understand when and where to use his/her techniques. The individual's performance must be appropriate in terms of the game (Kirk, 1980) and therefore sensitive to the context (Lipman, 1988). For example, the soccer player who continually ignores teammates who are in

space, and passes to marked players instead has not understood what is required of him/her. Even if the student's technical ability in passing the ball is perfect, it is clear that, in the context of the game of soccer, such behavior is inappropriate.

A Need for Change in Games Education?

During the past decade a number of teachers, teacher educators, and researchers in Britain and the United States (Almond, 1986; Bunker & Thorpe, 1982; Rink, French & Werner, 1991; Turner and Martinek, 1992, in press) have become concerned with the way in which games have been taught in schools. Bunker and Thorpe (1982) have encouraged teachers to rethink the manner in which children are exposed to games and argued that the preoccupation with developing good technique has proved detrimental to the development of highly motivated, thinking players. Williamson (1982) expressed a concern that there had been no serious appraisal of the teaching of games in physical education and this view coincides with that of Mauldon and Redfern (1981) who postulated that fresh thinking in this field was long overdue.

The magnitude of the importance of games instruction was put into perspective when a survey (Thorpe, Bunker & Almond, 1984) revealed that 65% or more of the time allotted to physical education in Britain was occupied by the games curriculum. In addition, the teaching of games is out of line with the characteristics and philosophies of teaching in other areas of the curriculum (Mauldon & Redfern, 1981). Rather than foster a student's curiosity and interest

by encouraging them to solve problems in games the tendency has been to instruct a child on exactly what is to be done (Asquith, 1989; Werner, 1989; Doolittle and Girard, 1991).

Bunker and Thorpe (1986) have shown that observation of games teaching typically shows a series of highly structured lessons leaning heavily on the teaching of techniques. A similar emphasis is identified by Joyce and Weil (1986) in reference to "The Theory to Practice" model of teaching. This method mixes information about a skill with demonstrations, practice, feedback and coaching until the skill is mastered.

Bunker and Thorpe (1986) hypothesize that the reason why teachers are so technique-oriented is a result of the emphasis placed upon skill acquisition and measurement and evaluation courses during the teachers' training period. Rovegno (1993) suggests that this may be because research based information about motor skill development is available whereas similar information about game play/strategy development is currently unavailable.

The focus on simple skills that are rarely employed in a sport context (Thomas, French, Thomas & Gallagher, 1988), but which are so much easier to evaluate than other aspects of games, such as decision-making, may have pulled the physical educator toward the technical side of games. Bailey and Almond (1983) have shown that one of the consequences has been a clear division in our schools between those who "can do" and those who "cannot do" games. If this is true indifference towards game participation becomes an

acquired disposition of the "cannot do's". Teachers may have unwittingly been fostering incompetence in the majority of children.

Bunker and Thorpe (1986) contend that the insistence by training colleges and universities upon a lesson plan that ensures student teachers follow a clear and easily documented preparation procedure has led to a lesson format divided into an introductory activity, a skill phase and a game. Figure 1 provides a typical example of the model.

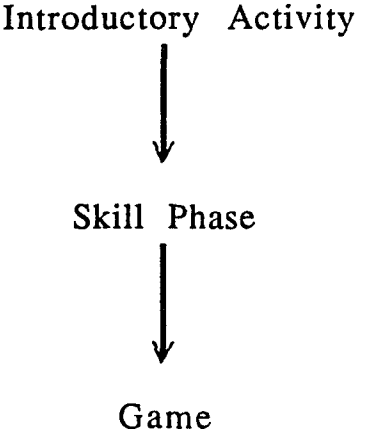

Figure 1. The technique model for teaching games.

At worst this structure has led to an introductory session unrelated to what is to follow, a technique section which is seen as essential by only the teacher, and a game which is inappropriate to the ability of many of the children. Research supporting the wide use of the technique approach was documented in a study by Cheffers and Mancini (1978). They analyzed patterns of teaching of 83 physical education teachers recorded in Anderson's (1978) Video

Data Bank. Cheffers and Mancini concluded that the P.E. teachers used lecture, demonstration, and direction giving as their predominant mode of teaching. More recently research by Asquith (1989) has also shown that this remains the predominant mode for games instruction.

Almond (1986) has suggested that there is a need to reappraise the form in which prospective teachers are initiated into games education. Most teachers appear to believe that a list of techniques to be taught offers the strongest framework for thinking about games teaching (Bunker & Thorpe, 1986). If teachers are socialized into a specific manner of thinking about games instruction then there are strong implications for teacher training (Almond). Rovegno's (1993) study adds credence to Almond's contention. She examined how 12 K-8 physical education teacher education (PETE) majors learned about a movement approach to games instruction that was discrepant from their experiences with physical education. She found that 9 of the 12 (PETE) students in her study did not recognize game play and inherent strategy as content to be taught. Instead these preservice teachers viewed games as interesting contexts for practising skills.

The major problem with the technique orientation which Bunker and Thorpe (1986) criticize is the rigid structure that leads to a "content" rather than "child" based teaching approach. Teachers who have little real idea about how to develop a game fear that they may not be seen as teaching anything important unless they are

concentrating on the skill phase. In the United States the use of any instructional method which does not focus on the teaching of specific skills may be misinterpreted as the "ball roller" approach to games teaching--where the students are simply allowed to play without any teacher intervention (Chandler & Mitchell, 1990).

While the skill instructional phase may be seen as the vital part of the lesson by the teacher, the students may not perceive it in the same way (Bunker & Thorpe, 1986). Consequently, low motivation ensues in many students. The question "when can we play a game?" is not uncommon in most lessons. This view coincides with Schmidt's (1988) concern that it is important for individuals to be motivated to attempt a skill in order for effective learning to occur. If the pupil perceives the task as meaningless or undesirable, then learning from it will probably be minimal.

Turner and Martinek (in press) support the view that there should be a move away from how to execute skills toward the use of skills in game play at the upper elementary, middle and high school age levels. They contend that over the years there has been a tendency to teach games using a technical approach focusing on skill instruction. Vickers (1990) identifies this methodology as a *bottom-up* teaching strategy where simpler skills are built one upon the other. The more complex material is supposedly reached as the result of a linear process. The bottom-up process may be easier for beginning teachers and coaches to comprehend because the simple-to-complex ordering of hierarchical information is intuitively

appealing. Unlike expert teachers, novices cannot easily attend to multiple ideas and events simultaneously (Rovegno, 1992; Sabers, Cushing, & Berliner, 1991). However, Vickers has shown that the learning of simpler skills may not always occur before complex ones are learned. By restricting instruction to this one approach the limitations placed on students are inappropriate (Vickers, 1990). There is speculation that the reason some performers have succeeded under this approach may have been primarily due to their innate talent and motivation rather than the positive attributes of this teaching method (Werner and Almond, 1990).

Research by Buck and Harrison (1990) indicates that students regress in skill level during game play. Their study has shown that this occurs either because the students have not learned the basic skills or because they are unable to apply the skills in a game setting. They postulate that "a common error in teaching sport skills is to practice the skill using drills and then incorporate the skill into a game situation" (p. 43). The two scenarios presented below by Pigott (1983) and Peterson (1992) were conceived almost a decade apart, and across the teaching of different sports, but serve to illustrate how in practice teachers and students are still faced with the same dilemma in games instruction.

> We see numerous instances of repetitive passing in pairs (the infamous chest pass!), unopposed shooting and set positions. Activities like these are prescribed with the best of intentions to help children in their preparation for effective, competent

> participation in games. However, for the majority, and especially those less able, the game is often typified by aimless participation following a breakdown of supposedly well-practised technique. The games teacher is left to reflect, with growing despondency, upon his pupils' maturing frustration and disinterest. What went wrong? (Pigott, 1983, p. 71)

> It is very common to see an elementary school class practice soccer dribbling around cones, practice dribbling and shooting at a goal, and then play a game. However, the skills that are practiced often fall apart in games, and students and teachers get discouraged because teaching these skills does not appear to affect performance. (Peterson, 1992, p. 37)

The template that appears to have emerged for games teaching is one in which teachers have structured the learning experience so that students are guided and prompted continually, culminating in the development of teacher dependent performers. Under a guided learning approach identified by Singer (1982), thinking (improvising, planning, adapting) behaviors are discouraged and learning is deemed efficient as specific acts are acquired in rapid time.

Earls (1987) and Peterson (1992) have noted in reference to game play that a child's readiness is frequently violated by the leap from simple practice drills to complex games. It appears that a weakness may exist in the practice conditions for teaching games during physical education lessons. A key prediction of the schema

theory of motor learning (Pew, 1974; Schmidt, 1975) is that schema, or rules, governing a category of movements becomes stronger with more variable practice of these movements. The variable practice will develop schemata which are retained longer and are more adaptable. It may be argued that current games teaching practices neglect this theory.

The variability prediction has prompted much research attention and has found general, though not always convincing support (e.g., Carson & Wiegand, 1979; Kelso & Norman, 1978; Moxley, 1979). Although these and other tests of the variability of practice notion have focused on closed skills, the predictions about variable practice would seem to be more significant for the acquisition of "open" skills as shown by Gabbard (1984), where greater demands are made upon response adaptation during games.

Buck and Harrison (1990) indicate that the effective transition from skill drills to game play requires students to practice in game-like conditions early in the learning sequence. Singer (1982) has shown that if the purpose of the learning situation is to lead to the development of the learning process, to encourage learners to think, resolve any situational dilemmas, and adapt to new but related game situations, then the encouragement of problem-solving approaches (guided tactfully by the teacher) in the initial learning situations should be advantageous.

Open skills are predominant in games. Open tasks involve adaptive processes, the ability to react suddenly to the unknown and

anticipate. The ability to anticipate and to make accurate predictions stems from the experience of playing games (Davies & Armstrong, 1989). Singer (1982) has shown that habit-like learned acts could be disastrous for performance in game situations. In field hockey, for example, a player in possession of the ball must be able to use the appropriate technique at the correct time. Rigid habits may cause the field hockey player to make mistakes. Gentile (1972) suggests that it is possible for an open-skill performer to have a consistent motor pattern that simply does not work to produce the desired environmental consequence. As Hoffman (1983) has indicated: "decision errors are eliminated only when the performers learn to pay closer attention to the temporal relationship between their movements and relevant signals in the environment" (p. 40). Open skills are difficult to execute because of the complexity of the environment and the need to select the most appropriate action for the occasion. Hence there is a need to move away from drill and repetition towards a situation where the students actively pursue solutions to their problems in games (Gabbard & McBride, 1990).

Bunker and Thorpe (1986) also contend that each game situation poses a problem and that this element of games lies within the cognitive area of learning. For example, Schwager and Labate (1993) have shown that in a basketball game a student may ask "how do I get the basketball down court while I am closely guarded?" The student must examine the situation on the court, decide on a possible course of action, establish which movements will

result in success, and then assess the the outcome of the choice that was selected. Voss, Green, Post, and Penner (1983) have alluded to the importance of domain-specific knowledge as a determinant of problem solving ability, and McBride (1991) suggests that to think critically in an effective fashion in any domain one must first have knowledge about that domain.

Knowledge and Game Performance

What types of knowledge are important in terms of understanding and performing intelligently in games? Thomas, French and Humphries (1986) postulate that the ability to select appropriate responses in game situations is a type of decision-making which requires several kinds of knowledge; including knowledge about the game and its goals, and knowledge of actions within the context of game situations. If teaching games is concerned with developing good decision-makers then the "knowledge concept" appears to be crucial.

Anderson (1976) proposed two distinct classifications of knowledge, declarative and procedural. Declarative knowledge is defined as the knowledge of factual information. It is conceptualized as a propositional network consisting of nodes and links (Chi & Glaser, 1980; Chi & Rees, 1983). Each node indicates a concept and the links represent associations between concepts.

Procedural knowledge is usually conceptualized in terms of production systems (Anderson, 1976, 1982; Chi & Rees, 1983). Productions could be used to model physical actions (Chi & Rees).

Procedures are (if-then) statements for completing sequences of action that are activated through associations with declarative concepts. If the condition side matches the contents of the short term memory, then the action is executed. McPherson and Thomas (1989) have indicated that procedural knowledge in games is organized around conditions (the circumstances under which the production can apply) and actions (what should be done when the production applies) which are influenced by the current goals and context (stimuli from the environment).

> Thomas, French and Humphries (1986) have shown that in baseball, knowledge of the players, the field, and different positions would be declarative knowledge, whereas knowledge of the appropriate actions during the course of the game would be procedural knowledge. (p. 261)

The importance of declarative and procedural knowledge has been demonstrated by research into game expertise. Anderson's (1982) knowledge based-paradigm has been used to study expertise in sport. It will also provide a theoretical basis for the investigation into games instruction in this study.

Knowledge and expertise in game play. Chi, Feltovich and Glaser (1981) note that physics experts have greater procedural knowledge and exhibit superior ability in problem-solving tasks than novices. In addition, Allard and Burnett (1985), Starkes and Deakin (1984), and Thomas, French and Humphries (1986), postulate that skilled athletes evolve similar forms of advanced declarative and

procedural knowledge as experts in other domains. In contrast to the belief that skilled athletes have superior nervous systems, Allard and Burnett infer that they possess the same form of task-specific semantic network suggested for experts in other areas requiring cognitive involvement. It is not surprising that many of the techniques for investigating the nature of chess skill (Chi, 1978) have been used to investigate open sport skills because most true open skills feature the same sort of tactical knowledge important for the game of chess (Allard & Starkes, 1991).

Several studies have examined the relationship between knowledge and expertise involved in sport performance. The implications of these studies may be important if teachers intend to produce more effective games performers. One technique (a four/five-second recall task) has proved particularly effective in the study of open sport skills. For instance, Allard, Graham, and Paarsalu (1980), examined the ability of basketball players and non-players to recall basketball slides after a 4-second viewing period. The scenes shown on the slides were from structured and unstructured game situations. The results indicated that basketball players were more accurate than non-players at remembering the slides, but only for the structured situations. Starkes and Deakin (1985) reported similar findings for a recall task presented to field hockey players of varying abilities. Varsity players were better than novices at recalling structured game situations.

The research by Allard, Graham and Paarsalu (1980) about basketball and Starkes and Deakin's (1985) study of field hockey confirmed the earlier findings with chess players that showed experts encode game structured information more deeply than novices (Chase & Simon, 1973a, 1973b). When unstructured chess situations were presented recall was similar for both experts and novices. Chase and Simon contend that the superior recall of experts in structured situations may be attributed to experience with the subject matter rather than a greater memory capacity. Starkes and Deakin (1985) postulate that since basketball and field hockey players recall a greater amount of information about player positions in game structured stimuli (reflecting a superiority of athletes in sport specific declarative knowledge), it could also be argued that the procedural knowledge obtained in setting up and running plays, probably enhances the acquisition and retention of declarative knowledge. Knowing how to perform a "motion offense" provides basketball players with more "hooks" on which to hang new declarative knowledge. Broadbent (1989) also suggests that once the procedural type of knowledge has been acquired, declarative knowledge may arise from it as well as vice versa.

French and Thomas (1987) examined the relationship of children's sport specific knowledge to the development of their basketball performance. In their first experiment child expert and novice basketball players (aged 8-10 and 11-12 years) were compared on components of game performance (control, decision-

making and execution) and on measures of basketball knowledge, dribbling skill and shooting skill. The expert children possessed more shooting skill and basketball knowledge in both age groups. A canonical correlation analysis revealed that sport specific declarative knowledge is related to the development of procedural knowledge (decision-making skills), and that shooting and dribbling skill are related to game components of control and execution. French and Thomas (1987) suggest that when children first enter into sports they have little sport specific declarative knowledge. This reduces the quality of decisions made within the context of the game. If students can be provided with a greater knowledge base via a specific instructional approach then this might lead to better decision-making in games.

Experiment 2 in French and Thomas' (1987) study indicated that the change in children's performance across the course of a season was due to an ability to make appropriate decisions during game play and also an increase in the ability to catch (control) the ball. Interestingly the basketball program in which these children participated emphasized cognitive strategy development. Practice time was devoted more to strategies and organization than to the development of basketball skills in isolation.

French and Thomas (1987) contend that many of the cognitive decision-making processes involved in sports situations could be modeled by productions (procedural knowledge). Furthermore, if as Anderson (1982) and Chi and Rees (1983) suggest, a foundation of

declarative knowledge is necessary for the development of procedural knowledge--such as what to do in a given game situation --then an adequate declarative knowledge base will assist in the development of good decision-making skills. French and Thomas indicate that this could include knowledge of the rules of the game, goals, and subgoals of the game.

The implications for teaching games are considerable, and this is precisely the contention made by Bunker and Thorpe (1986) in their criticism of the technique emphasis in games teaching.

> Our request to teachers is that they ask themselves--"Why do I teach games?" Is it to learn a flick in hockey, a punt in rugby, or a side foot pass in soccer? "If so--Why?" The answer can only be to play the game better, but are we sure the children know what the game is? To be sure we must be confident the children understand the rules of the game and recognize the major problem such as "how can we score a goal, point, run, basket, etc.?" (p. 28)

Knowledge of the aims and rules of a game may be very important in the development of effective games players. Brackenridge (1979) has commented in reference to games that the code of rules identifies the problem and ensures that both teams or individuals meet on an equal basis. The rules provide a structure for the game because they clearly state the nature of the problem and closely constrain the means available to the player(s) for solving the problem (how winning can be achieved). All competitive games are

characterized by having a set of rules which provide a structure that defines the problem. (e.g.. playing area, equipment, number of players, time allowed, and the goal or aim of the game).

Chiesi, Spilich, and Voss (1979) and Spilich, Vesonder, Chiesi, and Voss (1979) have identified a conceptual framework in which the structure of the knowledge base for a sport is organized in terms of the game's goal structure, game states, and actions, and the setting in which the game takes place. The goal structure is hierarchically organized with the highest goal being to win the game. Spilich et al. also suggest that most games can be described in terms of sequences of game states and game actions. The game state is the existing condition in a game at any given time. A game action is an action or actions occurring during the game which may produce a change in the game state. The importance of a specific game action is determined by the game's goal structure. Research by Chiesi et al. (1979) suggests that "high knowledge" individuals tend to process input information relevant to the goal structure of the game. "High knowledge" individuals are able to monitor changes in game states and actions and selectively process information related to the goal structure.

The implication of this research appears to be very important for the teaching of games. Thomas, French and Humphries (1986) infer that an individual who is more knowledgeable about the sport is better able to select the appropriate response for a situation within the context of a game's goal structure. That is, sport performance

differences may result from an individuals knowledge of "what to do" in the context of a sport situation.

One of the only experiments to address this issue was undertaken by McPherson and Thomas (1989). They classified 9-12 year-old tennis players as experts or novices. Novices had 3-6 months playing experience and had never played in tournaments. The experts had a minimum of 2 years experience and had played in junior tournaments. In this study after each point in a game the players were interviewed and asked what they had attempted to do on the previous point. This information was then compared to what they had done--which was established from a video-tape of the points played.

In general terms, the experts knew "what to do" nearly all of the time, whereas the novices did not know "what to do". The verbal protocols of the experts' action included both the selection of the action (then) and the method for carrying out this action (do) (McPherson & Thomas, 1989). The researchers note the following example from an expert player: "if my opponent has a weak backhand then I will stroke my forehand deep down the line to his backhand and I will do it by placing topspin on the ball and making sure I will follow through" (p. 208). In contrast, novices were still forming a declarative base of knowledge and how to solve the problems (making decisions during game play) which follows along with the characteristics of the development of procedural knowledge (e.g., general interpretive procedures). Novices exhibited a much

more general approach to solving the problem "I was just trying to hit it" (p. 208). The interviews indicated that the novices were unable to use procedural references during game play because they did not exist. As French and Thomas (1987) have indicated "many mistakes commonly observed in young children in various sports situations may stem from a lack of knowledge about what to do in the context of a given sport situation. . . . " (P. 17).

The studies of French and Thomas (1987) and McPherson and Thomas (1989) have shown that the development of sport declarative knowledge was related to the development of productions that allowed sport participants to make better decisions during game play.

Decision-making in Games

In many games an individual awaiting an opponent's action is facing a multiple problem-solving situation. He or she must make a decision in a very short space of time, decide on the type of response to make and execute that response also in a very short space of time (Anshel, 1990; Davies & Armstrong, 1989; Proteau, Levesque, Laurencelle, & Girouard, 1989). The example of a tennis player receiving a serve is described by Jones (1990): the player has to identify (perceive) the velocity and amount of spin on the ball as it approaches him/her; then, make a rapid decision about an appropriate shot to intercept and return the serve. Finally the decision has to be programmed into a response before this is transmitted to the appropriate muscles.

Speed and accuracy of decision-making. Garland and Barry (1987) have indicated that:

> The ability of students to encode and retrieve sport specific information in an efficient and accurate manner is extremely valuable in reliable and instantaneous decision-making. Chase and Ericsson (1981) have argued that a highly organized hierarchical system of encoding and retrieving information is necessary for reliable and fast retrieval. Intuitively, experts or high skilled individuals, should encode and retrieve highly complex and game structured information faster than nonexperts, resulting in faster decision-making. (p. 18)

Research by Chase and Ericsson (1981) has shown that with training the relationship between the encoding structure, retrieval structure, and relevant retrieval cues may be strengthened, thereby enabling the encoding and retrieval processes to become faster and more reliable. A study by Thiffault (1974) examined the trainability of sport specific decision-making. Young ice hockey players were presented with a series of slides depicting tactical situations in games. The players had to decide as quickly as possible the most appropriate move for the player with the puck. The possible responses were "shoot," "pass," or "skate". One experimental group then underwent 10 training sessions in which exposure time for the slides was gradually reduced. The results indicated that a significant effect was found for the training group, as trained players made faster tactical decisions upon viewing the slides. These studies were

undertaken in a laboratory setting but they do demonstrate that complex decisions (when a player has possession of a ball/puck) on slides may improve with practice.

In contrast, Starkes (1987) has shown that elite field hockey players do not make faster tactical decisions than lesser ability players, but they do make more accurate decisions about what constitutes the appropriate offensive move. These results are in opposition to those of an earlier study in volleyball (Allard & Starkes, 1980) that reported faster, not necessarily more accurate decisions. The differences between the findings of these studies may be due to the specific sports. In volleyball, for example, the extreme speed of the game dictates that the player must purposely ignore much of the game structure information presented, and must try to selectively attend and react quickly to basic information such as the position of the ball (Allard & Starkes, 1980).

Nevertheless, Starkes (1987) indicates that no evidence exists to show that decision training utilizing visual stimuli on slides transfers to actual game performance. In addition, Adam and Wilberg (1992) posit that most of the sport-specific perceptual studies generally employ long periods of display availability, such as 4-5 seconds of viewing time. It would seem, therefore, that effective training may need to incorporate the actual moving game activities. This appears to have implications for teaching strategies, attempting to improve decision-making during games. While it is one thing to pick up the relevant cues correctly and solve a problem, it is another

thing to use this information and carry out the motor response correctly. This raises the question of the relationship between understanding and acting (Ripoll, 1991).

The Understanding-acting Process in Games and Sport.

In open skills games performers have to process visual information in order to analyze and interpret the situation, and additionally perform the motor response with maximum accuracy (Ripoll, 1991). This is characteristic of a semantic/sensorimotor trade-off enabling the athlete to process in order to adapt his/her response to fit the situation. Semantic visual function identifies and interprets the situation. Ripoll suggests that in racket/paddle games visual cues are picked up from the opponent in order to predict the kind of stroke that the opponent will make. The role of sensorimotor visual function is to carry out the response, this may entail considering the time of contact required to release the strike and coordinate the visual and motor systems involved in the stroke.

In open situations, the relationship between the sensorimotor and semantic visual function is akin to the relationship between understanding and acting (Ripoll, 1991). In racket/paddle games perceptual uncertainty and time pressure mean that the player has to shorten his/her viewing and decision-making time to allow the movement to occur within the time available (Anshel, 1990; Williams & MacFarlane, 1975). The athlete has to arrange his/her criterion of decision on a speed-accuracy trade-off. Because uncertainty and time pressure are diametrically opposed the balance is difficult to

process (Ripoll, 1991). Consequently, the time needed to interpret the situation increases with the amount of uncertainty conveyed by the situation. When uncertainty is manipulated by an opponent, the time allocated is limited. The performer has to attend to either the semantic or the sensorimotor dimension of the task. Ripoll posits that the regulation of such a trade-off will determine the pertinency of the response by the athlete.

The athlete can either utilize the maximum allotted time to identify the situation, in order to select the appropriate response, therefore focusing on the semantic characteristics, or process the situation incompletely and select an inadequate response. Ripoll contends that semantic and sensorimotor processing seems to be serially organized. Ripoll's (1989) research with elite table-tennis players showed that increased level's of uncertainty changed motor and visual behavior. He compared drill situations with actual game situations and found that the greater the uncertainty, the more complex the visual strategy and the longer the motor response took. This appears to confirm that the performer cannot organize his/her sensorimotor mechanisms before understanding the specific characteristics of the situation. This clearly has very important implications for games teaching suggesting that performers should learn to execute skills in game related situations.

The semantic/sensorimotor trade-off forced the players to use the time necessary to process the semantic information thereby shortening the time needed to give the response. In order to reduce

the uncertainty in game situations players might ask the following three questions: "What kind of stroke (forehand or backhand will the opponent make? At what moment will it be released? Where will it be directed (longitudinal and latitudinal landing)?" (Ripoll, 1991, p. 230). Teaching students via a questioning approach could enhance understanding and ultimately improve game performance.

A further plausible strategy in reducing the time requirement for understanding might be by labelling relevant configurations of stimuli with a single salient feature that can be detected and associated with a sensorimotor unit (Paillard, 1991). However, Paillard indicates that experts seem to use a global mode for the perceptual identification of the relevant situation, which is more like the gestalt recognition mode described by neuropsychologists for the recognition of familiar faces.

In motor learning there are tasks that are highly context dependent and entirely framed by the goal to be reached in that context (Paillard, 1991). In that case it is the versatility and adaptability in the choice of the means that characterizes the performance of the skilled performer. As Allard and Starkes (1991) suggest the more ways in which basketball players can score, the better players they are. It is the appropriate linking of doing to the current state of knowing that is critical for open skill and it is flexibility in linking that is vital for successful game performance.

The decisions concerning appropriate actions in the course of a game are frequently as important as the motor skills used to carry

out those actions (French & Thomas, 1987). This principle is at the very center of a game's approach "teaching for understanding" which stresses the importance of the player making correct decisions in the light of tactical awareness (Bailey & Almond, 1983). It is posited that students should be encouraged to understand that effective games participation is contingent upon making appropriate decisions and that physical education teachers are in a position to facilitate this concept.

Teaching for Understanding Model

Bunker and Thorpe (1982) have shown that the sequential aspects of the "Games for Understanding" model are critical. Unlike traditional teaching methods this approach starts with a game and its rules which set the scene for the development of tactical awareness and decision-making, which, in their turn, always precede the response factors of skill execution and performance. Figure 2 indicates the proposed model for teaching games.

A summary of Bunker and Thorpe's (1982) interpretations for each of the six stages of the model is presented:

1. Game Form

An adult game may be the aim, but initially students should be introduced to a variety of mini (lead-up) game forms. A suitable playing surface, small numbers and adapted equipment may be used to present children with situations and problems involved in playing games. If an appropriate mini-game is constructed it may bear a close resemblance to the adult version of the game.

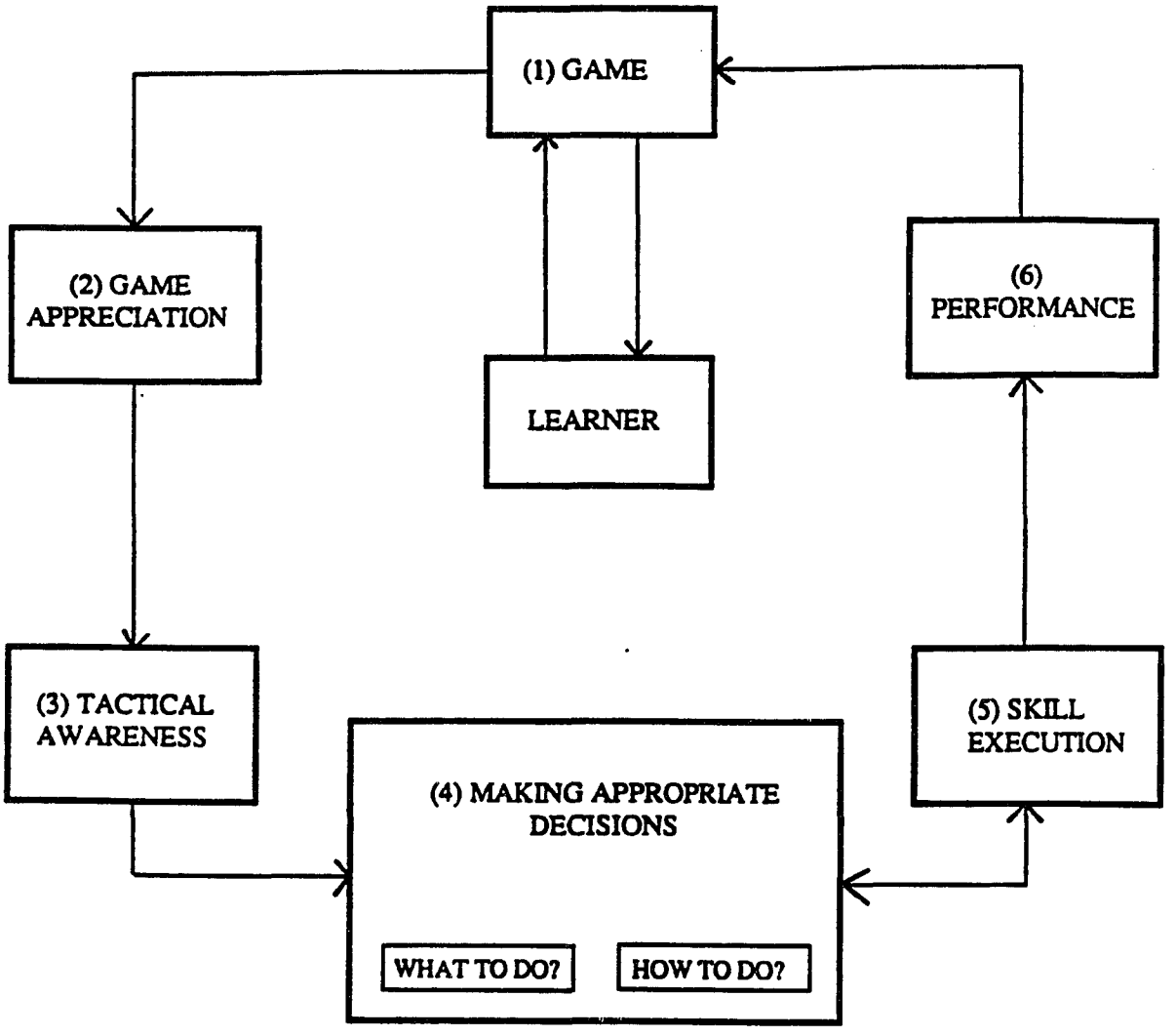

Figure 2. A model for the teaching of games. (Bunker & Thorpe, 1982)

2. Game Appreciation

The emphasis from the beginning is that children understand the rules of the game they are learning to play. The rules provide the game with its shape. The laws of the game will place constraints of time and space on the game. They will state how points (goals)

are scored, and will also determine the range of skills that are required. The rules serve as a prerequisite for developing tactical awareness.

3. Tactical Awareness

After some involvement and an understanding of the rules, it is necessary to consider the tactics to be used in the game. For example, ways of creating space when attacking, and denying space when defending may be utilized in order to overcome the opposition. Common principles of play form the basis for a tactical approach.

4. Decision-making

In this approach to games there is a difference between decisions based upon "what to do?" and "how to do it?" thus permitting both the learner and teacher to recognize and attribute shortcomings in decision-making.

"What to do?" While tactical awareness is necessary in order to make decisions, the nature of games means that circumstances are continually changing. In order to decide what to do each situation has to be assessed. The ability to recognize cues and predict potential outcomes is essential. Thomas, French and Humphries (1986) emphasize that if students are facilitated to realize the importance of monitoring changes in game states and actions, then they are more apt to develop strategies to monitor changes and plan responses in advance. A higher knowledge student has the ability to predict game related actions based upon a small set of environmental cues. They select relevant cues from the situation and attach

possibilities to game actions. "How to do it?" The decision that remains is what is the best way to do it and the selection of an appropriate response is critical.

In addition to the work of Ripoll (1991), and the interpretations in sport expertise research of Anderson's (1982) knowledge-based paradigm, theoretical support for Bunker and Thorpe's sequence distinction between "what to do" and "how to do it" is provided from an information processing perspective. Information processing models that specify the movement preparation process usually stipulate the determination of the action goal as a stage that occurs prior to the preparation of the movement parameters. Requin, Lecas, and Bonnet (1984) and Sanders (1980) have shown in their motor preparation models that specification of the goal directed action precedes the creation of a motor program to carry out the action. Pew (1984) and Schmidt (1982) also consider that after a goal-oriented representation has been accessed from memory (what to do) then the movement parameterization process takes place (how to do it).

5. Skill Execution

Bunker and Thorpe (1982) refer to this component as the actual production of the required movement as envisaged by the teacher and seen in the context of the learner; recognizing the learners limitations. Skill execution is always seen in the context of the learner and the game. Bunker and Thorpe indicate that it is separate from "performance" because it contains a qualitative

component judging the efficiency of the skill and its appropriateness in the game.

6. Performance

"The observed outcome of the previous processes measured against criteria that are independent of the learner" (Bunker & Thorpe, 1982, p. 3). This is the classification of students as good or bad players at school or international level based on the appropriateness of the response as well as the efficiency of the skill.

Support for Games for Understanding:

A Top-down Approach

The games for understanding model incorporates a top-down approach to games teaching. The top-down approach (Vickers, 1990) strives to create planned experiences that let students see the whole or achieve an overview of the subject. In cognitive psychology there is support for top-down processing (Gardner, 1985; Lindsay & Norman, 1977) which suggests that people are able to grasp the whole without requiring an in depth analysis of individual features. A top-down approach posits that learners are initially able to understand complex principles and concepts underlying full activities or games (Vickers, 1990).

Ausubel (1968) called the provision of such an experience as an advance organizer enabling students to see the whole before they understand its parts. Vickers (1990) contends that in physical education instruction this should capture the aim of the game but with a minimum number of players, facilities and equipment.

Students are introduced to the game as quickly as possible under conditions that are appropriate for them to handle. Vickers suggests that in basketball a two-on-two situation would be an advanced organizer allowing dribbling, shooting and passing, and the execution of basic offensive and defensive maneuvers within a game-like context. She contends that students are allowed to learn the rudiments of strategies (give and go, screen, post play, rebounding) frequently before they have mastered the intricacies of individual skills (dribble, pass, shoot). Vickers suggests that requiring students to move from one simple skill to the next (technique approach) may be a debilitating design strategy if used exclusively. At every step in a top-down strategy the learner is shown how a skill or concept fits into the larger context of game play. As Bunker and Thorpe (1982) contend children should then begin to see the necessity for techniques as they are required in the game situation.

Vickers (1990) has shown that one of the main elements in a top-down approach is the provision of small group learning experiences that are game-like. Top-down approaches are harder to conceptualize than bottom-up teaching strategies because they require a greater understanding of the game. As Vickers (1990) suggests:

> There is a tendency for master instructors to teach in a top-down fashion. This occurs because they possess a rich knowledge structure for their sport, in which they have come

to understand the relationships between multiple skills and between skills and strategic maneuvers. (p. 36)

It is the relationship between game strategy and skill which has recently attracted attention into the methodology for games instruction. Magill (1989) posits that skill development should precede strategy instruction. Magill's contention is that in games an adaptation of a movement that has been well learned in practice is necessary. Rink (1985) has also suggested that fundamental motor proficiency should be developed before game strategies are included in instruction. The technique method of instruction in the present study places an emphasis on learning a skill prior to entering into a game setting.

In contrast, Almond (1983) contends that the emphasis should be placed upon cognitive strategies initially in games teaching rather than refined motor skills. Riley and Roberton (1981) also hypothesize that the more game-like the practices are the more a person will be able to actually play the "game". This contention is crucial to the "games for understanding" approach advocated by Bunker and Thorpe (1982). They argue that if too great an emphasis is placed on skill development then this will lead to individuals who are technically correct but who fail to use appropriate game strategies. This debate about how games should be taught has now become the focus for research into games teaching.

Research into Games Instruction

Several studies have examined the effects of different approaches to games teaching on criterion that include student game playing ability (control, decision and execution), declarative and procedural knowledge, and skill development.

Game playing ability. Rink, French and Werner (1991) examined the effects of three different treatments (tactical awareness, skill development, and a combination of skill and strategy development) on game playing abilities of 9th grade beginning badminton players. The skill treatment and tactical treatment groups performed better than the combination treatment group on trunk rotation, body position, competitive decision, and execution. However, the results did not support the superiority of one treatment over another for game playing ability (control, decision, execution).

Turner and Martinek (1992) compared the games for understanding (game-centered) and technique models of instruction on the game playing abilities of 6th and 7th grade students engaged in a unit of field hockey. No significant differences were found between the two treatments for hockey game playing ability (control, decision, execution). Both teaching approaches led to improvement over time in control and execution during games but no time effect was evident for decision-making.

The failure to find significant increases in the quality of decisions over time in Turner and Martinek's (1992) research

contrasts the earlier findings reported by French and Thomas (1987) on child basketball players. Their study showed that both expert and novice players increased their percentage of successful decisions during game performance on the posttest. French and Thomas contend that young basketball players learned to make accurate cognitive decisions in the context of game situations faster than they learned the sport skills. In their research little improvement in motor skills was observed across the length of the season and time of testing proved non-significant for execution in games.

The inconsistency in these findings may exist for several reasons. First, French and Thomas (1987) indicated that practice time was only designated to game strategies and team organization for competition. Turner and Martinek's (1992) study, however, was based on skill and strategy instruction in differing combinations but it did not focus solely on the tactical element of game play as was the case in French and Thomas' research.

Second, there was a difference in the time periods of the two studies. French and Thomas' (1987) research was conducted across a basketball season, where as the treatment period for Turner and Martinek's (1992) study was only six lessons. The short treatment period may have impaired the effects of the two treatments on decision-making in the field hockey research. This notion is supported by Thomas, French, Thomas and Gallagher (1988) who contend that the ability to make correct decisions within the context of the game takes considerable time and many hours of practice.

Further research supporting this view was reported by Turner (in press) who found that with a longer treatment period for field hockey (15 lessons) students receiving instruction under the games for understanding model made better decisions during games than students in a control group or technique instruction group. The present study will also last for 15 treatment lessons in order to address this concern.

There were no significant differences between the games for understanding and technique groups in terms of game execution in Turner's (in press) study. These recent findings are interesting in the light of McPherson and Thomas' (1989) study with child expert and novice tennis players. Although the experts were quite capable of showing that they knew what action goal to establish in a specific situation (i.e., they made the correct decision), they were not always capable of accomplishing it in their game performance. While the appropriate goal may have been established there were problems in attaching the correct parameter values to the selected motor program in the game. As Magill (1989) speculates the "what to do" and "how to do it" distinction may be unique to complex motor skills unlike verbal skills where knowing "what to do" is enough.

McPherson and French (1991) posit that different emphases for practice may produce different results: "overemphasis on strategy instruction may produce learners who know what to do in game situations but do not possess the motor skills to execute the shots successfully" (p. 27). McPherson and French examined the impact of

the timing of skill and strategy instruction on game performance in tennis. In their research two experiments were conducted. The first experiment may be likened to the technique approach for teaching games.

In Experiment 1 the novice adult subjects were given instruction in fundamental tennis skills emphasizing consistent motor patterns and declarative tennis knowledge (rules, goals and subgoals of the game) followed by the introduction and integration of tennis strategies after midterm. In Experiment 2, which is more akin to the games for understanding model, subjects received declarative and procedural (decision-making) tennis knowledge and minimal fundamental skill instruction until midterm followed by an emphasis on refining knowledge and skill in the context of game situations. Thus attention was focused more on strategy than on skill initially.

In Experiment 1 the category of strong decision improved slightly across the semester. The percentage of forceful executions indicated that the students' ability to carry out strong decisions had increased. McPherson and French (1991) contend that this shows for the novice at least some development of elementary levels of accuracy in strategies may occur without direct instruction.

In Experiment 2 data showed that during game play strong decisions increased dramatically from pretest to posttest. The percentage of appropriate and forceful executions during game play also increased significantly after midterm and this is consistent with

the treatment phase that emphasized response execution during the second half of the experiment.

Declarative and procedural knowledge. Lawton's (1989) study of 12-13 year-old badminton players examined the effects on student knowledge of the games for understanding and technique based teaching approaches. The treatment period for Lawton's research was six weeks, a similar time interval to Turner and Martinek's (1992) study of field hockey. Both of these studies revealed that there were no significant differences for students' knowledge over time or between treatment groups.

The results for the knowledge component in French and Thomas' (1987) study contrast these findings. Their research found a significant main effect for time for both child expert and novice players while the scores of the non-player control group remained constant from pretest to posttest. One of the reasons why a difference in the findings may exist is noted by French and Thomas. They postulate that children who are novices often lack sufficient amounts of declarative and procedural knowledge. At the end of the short treatments in Lawton's (1989) and Turner and Martinek's (1992) studies all of the students may still have been novices in terms of their knowledge base.

The treatment period of six lessons in both of these studies may have placed limitations on the amount of knowledge that the students could realistically gain during such a short time. French and Thomas' (1987) study lasted for an entire season and this may

explain why they saw a greater increase in the knowledge base of their students. A longer treatment period in Lawton's (1989) and Turner and Martinek's (1992) research may have provided a more stringent examination of the games for understanding and technique methods of instruction and their effects on student knowledge.

In response to this factor Turner's (1993) study of beginners in a field hockey unit lasted for 15 lessons (45 minutes each). This study contrasted the games for understanding and technique methods of instruction with students in a control group. Turner found significant knowledge gains for the two treatment groups but not for the control group. Interestingly, a significant time by group interaction was found in favor of the games for understanding group for declarative knowledge. No significant differences existed between the treatment groups for procedural knowledge. This finding is particularly interesting in light of Anderson's (1982) view that a foundation of declarative knowledge is necessary for the development of procedural knowledge. Students in the games for understanding group in Turner's study may have developed a firm base of declarative knowledge where as the development of procedural knowledge may take a longer time (Thomas, French, Thomas & Gallagher, 1988).

The combination and timing of declarative and procedural knowledge was varied as part of the treatment phase in McPherson and French's (1991) research. In Experiment 1 of their study the novice adult subjects were given instruction in fundamental tennis

skills emphasizing consistent motor patterns and declarative tennis knowledge (rules, goals and subgoals of the game) followed by the introduction and integration of tennis strategies after midterm. The results indicated that knowledge increased significantly from pretest to mid-test only.

In Experiment 2, which is more akin to the games for understanding model, subjects received declarative and procedural (decision-making) tennis knowledge and minimal fundamental skill instruction until midterm followed by an emphasis on refining knowledge and skill in the context of game situations. Performance on the knowledge test increased significantly from pretest to posttest in line with the cognitive emphasis of the treatment in this experiment.

As part of both experiments in McPherson and French's (1991) research the students were assigned readings during their university activity classes to supplement their learning which probably assisted the knowledge increment. The age of the subjects may also be an important factor in the effectiveness of this experiment when compared to the other studies which all used children.

Rink, French and Werner (1991) examined the effects of three different treatments (tactical awareness, skill development, and the combination of strategy and skill development) on the knowledge base of 9th grade novice badminton players. No differences were observed between the treatment groups on the knowledge test. On the cognitive test, which was split into categories of knowledge of

rules, technique, and strategy, all treatment groups scored better than the control group that did not take badminton.

Skill development. The results of the studies by Turner and Martinek (1992) and Turner (1993) on field hockey did not indicate any significant differences in skill development, based on a hockey skills test for accuracy and speed, between the treatment groups. There was no significant difference between the pretest and the posttest on the accuracy component of the skills test. However, the time taken to negotiate the skills test was significantly less on the posttest for both groups in both studies.

The results of the skill tests suggest that the change in emphasis from a technique to a games for understanding approach does not adversely affect subjects' performances on specific field hockey skills. This finding parallels Lawton's (1989) study and Rink, French and Werner's (1991) research. Lawton found no differences between the skill based and teaching for understanding treatments on skill tests for the badminton serve and shuttle placement.

While the research by Rink, French and Werner (1991) did not indicate the superiority of one treatment over another for skill development in general, it did reflect contrasting results on certain skill tests that the authors were unable to explain. On the badminton clear the skill treatment and the combination treatment groups did better than the tactical treatment group. The skill treatment and tactical treatment students scored higher than the combination treatment pupils on the drop shot and serve. The tactical treatment

group, while not showing statistical significance performed better on the smash than the other groups.

Implications for future study. The variability in the findings of previous studies suggests that more research is warranted to determine the effectiveness of differing methods of games instruction on both cognitive and skill components of game performance. Empirical research is essential in order that teachers are provided with information to make informed choices about their mode of games instruction. Furthermore, while both cognitive and psychomotor areas have been the primary focal points of past studies future research needs to examine the affective domain.

The Affective Domain

Action research is needed to examine teacher and student responses to these different methods of games instruction. Burrows (1986) suggests that "teaching for understanding" may yield considerable benefit for students from an affective perspective. Lawton (1989) examined this notion in his study but failed to find conclusive evidence for this hypothesis. Turner (1993) devised an interview protocol to examine student responses to the technique and games for understanding approaches. An examination of student reactions suggests that differences in attitude may have resulted from the treatments. Further exploration and refinement of this notion will be undertaken in the present study.

Turner (in press) previously found that game activities provided the most enjoyment during sports instruction. The

predominance of this type of learning experience in the games for understanding approach appeared to yield greater student satisfaction than under the technique approach. In addition, students also identified that they performed well at different things under the two approaches. In response to the question "What kinds of things have you done well at?" Students receiving instruction under the technique approach indicated:

> Well, I'm pretty good at shooting and I've gotten a little better at passing but I still need help on it and that's about it
>
> Push passes I do good in individual lessons but when I get to do it in the action it seems that I don't get to do it well ... I like it though because when you're playing, when you're on the team, you're not going to get out on the field and say, OK, I want you to give him a push pass and then go out and do it 15 times and then turn around and do it over, you go out and play a game and you need the actions in a game more than you do in a lesson.

Students in the games for understanding group said:

> Oh like when my teammates, they're trying to shoot and sometimes when they do it they'll use a high stick and the ball will kind of roll behind them and I'm always behind them to push the ball back up forwards.
>
> I'm good at giving lead passes and controlling the ball, I mean I need a little more control because sometimes I just hit it when I can't find an open person.

In addition to the students perceptions, the teachers views could also provide some important insights into the effectiveness of

the games for understanding and technique methods of instruction. Previous action research (Almond, 1986; Almond & Thorpe, 1988) suggested that teachers were interested in teaching from a game-centered perspective. However, they lacked consistency in documenting their insights. The present study asked two teachers to record their insights in a journal. They were asked to comment on their students' responses to these two approaches to games instruction.

Most school physical education programs have games and sports as the mainstay of their curricula (Bain, 1990). There are, however, contrasting views about when cognitive strategies should be introduced during games teaching. Rink (1985) suggested that fundamental motor proficiency should be developed before game strategies are included in instruction. In contrast, Almond (1983) indicated that the emphasis should be placed upon cognitive strategies initially in games teaching rather than refined motor skills.

The focus on cognitive components at an early stage in Bunker and Thorpe's (1982) model made it possible to compare its effects on game performance with those of a technique oriented teaching method. The examination focused on game skill, knowledge (declarative and procedural) and decision-making components in game performance. An examination of student and teacher perceptions about these approaches was also undertaken. If it is the intention of physical education professionals to aid students in

becoming better game performers, then a study of this nature has the potential to produce important findings for games teaching.

Purpose of the Study

The purpose of the study was to test the validity of the model for games teaching proposed by Bunker and Thorpe (1982) by comparing it to the technique approach to games instruction and also to a control group that did not receive field hockey instruction. It was necessary to monitor the effects of the games for understanding, technique and control treatments on game playing ability (control, decision-making and execution), declarative and procedural knowledge and skill acquisition. Student and teacher perceptions of the games for understanding and technique models of instruction were also examined. The following questions guided the research:

1. Are there any significant differences among the games for understanding, technique and control groups regarding the development of game playing ability (control, decision-making, and execution) in middle school children?
2. Are there any significant differences among the games for understanding, technique and control groups regarding the development of declarative and procedural knowledge related to game play?
3. Are there any significant differences among the games for understanding, technique and control groups regarding the development of specific field hockey skills?

4. Are there significant relationships among game playing ability, (control, decision, and execution), hockey knowledge, (declarative and procedural), and skill (accuracy and time)?

5. What perceptions do students hold about the games for understanding and technique models of instruction?

6. What do the teachers perceive about their delivery of the games for understanding and technique models of instruction?

Definition of Terms

Decision-making. The process in which a person selects from two or more choices when there is more than one course of action to consider.

Declarative knowledge. The knowledge of factual information.

Procedural knowledge. Procedures or productions (if-then statements) for completing sequences of action, i.e. knowledge of appropriate actions during the course of a game. For example: if these conditions exist in the game then carry out this action (McPherson and French, 1991).

Technique approach to games teaching. The focus of this method is skill instruction where the skill taught initially is incorporated into a game to end the lesson.

Games for understanding approach to games teaching. This method focuses on the game. The lesson always starts with a game or game-like situation. The teaching emphasis is on the development of tactical awareness and decision-making. Students are taught how to match game conditions with the selection of appropriate responses

during the course of a game. Technique is taught only when the need for it is recognized in game situations. The lesson always concludes with a game.

Game playing ability. The elements of control, decision-making, and execution in player performance during games.

Skill development. An improvement in specific field hockey skills.

Scope

The subjects for this study were 71 sixth and seventh grade students from four classes at Our Lady of Grace School. The research contrasted the games for understanding, technique and control groups. The first method (games for understanding) focused on the development of cognitive decision-making and employed an approach to teaching games where a game form was introduced first and used as a point of reference for instruction during the latter parts of the lesson. The second (technique) approach specified that individual skills were taught first and then game experience was provided as the culminating part of the lesson. The 15 lesson plans for each of these treatments ensured that both groups covered similar skills in the hockey curriculum. Two instructors used both the technique and games for understanding teaching approaches. The control group did not receive any field hockey instruction.

An investigation of this nature required a careful integration of several research strategies. It encompassed sports knowledge (procedural and declarative), skill tests, treatment validation, and the

use of a behavioral coding instrument to analyze decision-making and skill execution during game performance.

A research format proposed by French (1985) indicated a number of criteria that needed to be addressed in this study. The following were developed prior to the study:

1. An appropriate knowledge test for field hockey that was valid and reliable across the age ranges of the study.
2. A reliable and valid field hockey test to tap into critical hockey skills.
3. A system for describing the characteristics of interest during game performance.
4. A method for verifying the validity of the two teaching approaches.

In addition, there was also a need to:

5. Develop an interview protocol to examine student responses to the games for understanding and technique treatments.
6. Examine the teachers perceptions of their delivery of the two approaches.

Limitations of the Study

Any attempt to understand or interpret this study must operate within the following limitations.

1. The study took place in the gymnasium at Our Lady of Grace School. It may not represent the findings that would have ensued in another school setting.

2. The children in this study only had physical education for 45 minutes twice a week. The study had to operate within the constraints of the school timetable.

3. The instructors were not blind to the purpose of the study. They were provided with inservice training and lesson plans for the two teaching approaches and asked to deliver the content of each lesson as objectively as possible in accordance with the lesson plan. However, it must be recognized that they had opinions and beliefs about the two teaching approaches. In response to this concern they were asked to record their comments about their instruction after each class in a journal.

4. The preparation for the games for understanding method was not widely available to physical education teachers in school settings in the United States.

5. The research in this study was specific to the game of field hockey. The findings may not necessarily be generalizable to games instructional units other than field hockey.

6. The game play observational instrument focused only on the player who was in possession of the ball. The decisions of players who were not in possession were not monitored and the effects of their decisions were unknown.

7. The students' responses to the interview questions may only reflect what the teachers said to them during the treatment lessons. They do not necessarily indicate a deeper level of understanding. However, if the interview data reinforce the quantitative findings for

game play, knowledge and skill this data may add credence to these results and assist with their interpretation.

Significance of the Study

Teaching methodologies for sports instruction have evolved from issues primarily concerning response execution (underlying motor processes). The traditional methodology for teaching games has typically focused on the instruction of techniques (McBride, 1988). Bunker and Thorpe (1986) have indicated that technique oriented games teaching has led to:

> (a) the majority of school leavers "knowing" very little about games.
>
> (b) the production of supposedly "skillful" players who in fact possess inflexible techniques and poor decision making capacity.
>
> (c) the development of teacher/coach dependent performers. (p. 7).

As a result, there exists a limitation concerning the role and use of tactical knowledge and the development of response-selection and response-execution components in games instruction (McPherson, 1994). French and Thomas (1987) have noted that the "best combination of motor and cognitive instruction and the best time to present strategy instruction can only be determined through further research" (p. 31). They indicated that future studies should address the process in which declarative knowledge is used to develop the

productions employed in the decision-making process during games and sport.

The component that distinguished expert players from novice players was the ability to make appropriate decisions within the context of the game (Thomas, French & Humphries, 1986). As the decision-making process is central to the games for understanding model identified by Bunker and Thorpe (1982) then the necessity for experimental research with it appeared explicit (Turner & Martinek, in press).

Almond and Werner (1990) indicated that methodological questions concerning technical versus tactical aspects of games need to be researched, published and disseminated. Housner and French (1994) have shown that attempts in pedagogy (Lawton, 1989; Turner & Martinek, 1992) to study short-term acquisition of cognitive and skill components in sport through a games for understanding approach have produced equivocal findings. However, these results are probably due to the curtailed treatment periods of only six lessons in these studies. The need for more extensive research examining the technique and games for understanding instructional methodologies appears explicit (Housner & French).

CHAPTER II

METHOD

Subjects

The subjects for this study were 71 sixth and seventh grade students (32 male and 39 female) from four classes at Our Lady of Grace School. The pupils were from two 6th grade classes (21 students in each group) and two 7th grade classes (19 students and 10 students respectively). They were from backgrounds that were predominantly middle to high in terms of socioeconomic status. The students participated in the study in accordance with the University of North Carolina at Greensboro Guidelines for Research with Human Subjects. Prior to the onset of the study permission forms were completed by the parents/guardians of the students in order that the children could participate in the research and be videotaped (see Appendix A).

Each of the 71 subjects were assigned to one of the three treatments. There were seven teaching groups in total (3 groups for games for understanding, 3 for technique, and a control group). Stratified random sampling was used to ensure that the groups were equated in terms of gender.

The Teachers

In order to control for potential "teacher" effects, two instructors both used the technique and the games for understanding teaching approaches.

The two physical education teachers (one male and one female) both had teaching experience. One teacher had been teaching at Our Lady of Grace school for four years. She was in her late twenties and had extensive experience in teaching and coaching a number of sports activities including basketball, volleyball, soccer and field hockey. The other teacher was trained as a physical education teacher in Great Britain. He was also in his late twenties and had six years playing and teaching experience in soccer, cricket and field hockey.

Both teachers had been exposed to the technique approach to games instruction as part of their undergraduate teacher education programs. They had both taught using this method. In addition, the teacher from Great Britain had also taught using the games for understanding approach. The teacher from Our Lady of Grace school had been introduced to teaching games for understanding as part of an inservice education program. She subsequently experimented with this teaching approach prior to this study.

Lesson Content

The selection of field hockey for this unit appeared to fulfill two essential criteria. First, field hockey was a sport in which none of the sample students had any previous experience of the game. It has been noted by Thomas, French, Thomas and Gallagher (1988) in reference to sport skills that "previous experience becomes the single most important characteristic of performance" (p. 180). In order to

ensure that this factor did not affect the "purity" of the treatments, field hockey appeared to be an appropriate selection.

Second, an intention of the study was to examine the treatment effect on instantaneous student decision-making. It was necessary, for that purpose, to use a flow sport rather than an episodic sport. Episodic sports are defined as those that have a pause between sequences of game actions (e.g. golf)--considerable time for planning the movement is available. Hockey is a flow sport where the performers have little time to prepare themselves for their responses.

The technique approach. This method placed the technical requirements of the game of field hockey as the central focus for learning the game. The lesson format for this approach was in three parts: an introductory activity, the teaching of a skill (technique practice) and a game to end the lesson.

In using the technique approach each skill was practiced in a drill situation. The lessons typically began with a demonstration of the skill and practice time was then allotted. Drills were usually static during the initial practice and became more dynamic over the course of each lesson. For example, during the second lesson of the unit, passing and receiving was the focus. After a demonstration the students passed the ball back and forth to a partner. The drill was then adapted so that after passing the ball to his/her partner the student then had to follow the pass. Subsequently during the

practice the students were timed to see how many passes each group of students could complete in one minute.

During each lesson technique feedback was provided to the students concerning their performances by the instructor. Feedback was given on both an individual and group basis. During the game play at the culmination of each lesson skill feedback was provided to the students. The instructor also acted as referee.

The focus of the lessons was primarily attacking skills with the exception of tackling. The skills that were covered in the 15 lesson treatment phase were basic dribbling, front tackling, evading an opponent, push passing and control (receiving), shooting (pushing only) and short and long corners. The lesson content for this treatment was dictated by the lesson plans which are included in Appendix B.

The games for understanding approach. In this approach the focus was on the tactical elements of game play as indicated in Bunker and Thorpe's (1982) model for games teaching. At the start of each lesson the teacher constructed a hockey game form. Examples of this included a 2 versus 1 keep away game and a 3 versus 3 mini hockey game. The teacher observed the game and then investigated tactical problems. This was done by stopping the game and questioning the students, thereby encouraging them to think about the aim of the game and exactly what they were trying to achieve.

If the game was "breaking down" it was appropriate to ask the students "why was this occurring?' The teacher attempted to elicit responses from the pupils. An example was where the play was compressed in a small space. From an attacking perspective this made the game difficult. Once the students were aware of the problem they needed to be helped to develop a strategy that could amend this predicament.

This was in the form of a game related practice decided upon by the teacher. If the reason for the game breakdown was technique related but the strategy was appropriate then the teacher intervened to promote (teach) the skill. However, as specified in Bunker and Thorpe's (1982) model, student decision-making based on tactical awareness always preceded the teaching of the skill. The theory attached to this approach was that students should see the need for, and relevance of, particular techniques as they were required in the game situation.

The students then returned to the game and the teacher stopped the game and taught game principles based on the students' performances.

The lesson structure for this method is indicated below:

1. The teacher set up the game form.
2. The teacher observed play/practice.
3. The teacher and students investigated tactical problems and potential solutions (game related practices).
4. The teacher observed play.

5. The teacher intervened to promote skill (if necessary).

6. The teacher observed the game and intervened to teach.

The main emphasis of this approach was attacking strategy. Students were taught how to match game conditions with the selection of appropriate responses during the course of a game. The teacher attempted to help students decide when to pass the ball and who to pass it to as the situation arose. The supporting players "off the ball" were encouraged to make space and to signal for the ball. The teacher helped the students to decide when to dribble (carry the ball) and when to take-on an opponent. Concepts such as making space to shoot and choosing the correct moment were addressed.

Once students were able to see that they needed new skills in these situations then the techniques of dribbling, push-passing and control, shooting (pushing only) and tackling were introduced. The lesson plans which the teachers used for this approach are included in Appendix B. The lesson plans assured equality in terms of the skills that were addressed in the two approaches. The rules were built into these plans progressively.

Game Rules for Both Treatments

The students were not allowed to: (1) use the back of the stick, (2) play the ball in a dangerous manner (stick no more than waist high), (3) lift the ball off the ground, (4) stop the ball with any part of the body (except goalkeepers, who were allowed to use their feet to stop the ball), (5) hit, hold or interfere with an opponent's stick, (6) turn the body as an obstruction to an opponent who was

attempting to play the ball, (7) engage in dangerous or rough play, (8) shoot from outside the shooting circle.

In situations where offenses occurred, defensive players had to retreat 3 yards from the place of the infringement; if these offenses, by the defending team occurred in the shooting circle a penalty corner resulted. A push-in took place if the ball went out at the side of the court. In this situation the team without the last contact on the ball gained possession. The equivalent of a 16 yard hit took place when the ball was hit over the defending teams goal-line by the attacking team. This occurred at the top of the shooting circle.

Instructor Training

In order to ensure that the two teachers had adequate knowledge of field hockey they were tested on their hockey knowledge. The test incorporated game rules, techniques and strategies. The same test was assigned to the students and is included at Appendix C. The teachers were required to answer all of the 30 items correctly prior to their teaching in the study.

When this preliminary requirement was successfully fulfilled the teachers were provided with an outline of the two teaching approaches and the scheduled times of their classes. In addition, lesson plans were provided for both approaches on a weekly basis (Appendix B). These plans were piloted in a previous study (Turner, 1993). The researcher reviewed the plans with the instructors during an hourly meeting prior to their teaching each week. This helped to assure the fidelity of the two approaches and provided an

opportunity to review progress and problems from the previous teaching episodes.

Teacher Journals

The teachers were required to keep a journal for each class that they taught. The purpose was to provide a record of the teachers' comments on their instruction. The instructors focused their entries around the following questions: (1) How did you feel about the content of your lesson under this games approach? (2) What kinds of things did you do to teach the content under this approach? (3) How effective were you in delivering the content? (4) How did the students appear to respond to your instruction? (5) Are their any other comments that you would like to make?

A copy of the form which the teachers used to make their entries is included in Appendix D.

Treatment Validation

In order to validate the use of the two treatments it was necessary to utilize a validation protocol (Turner & Martinek, 1992). A student teacher in physical education from UNC Greensboro was trained to use the instrument. She coded two lessons, one for each of the treatments, prior to the onset of the study. The results of this practice coding indicated that she was able to distinguish between the two treatments. Her coding of the lessons coincided precisely with that of the researcher; agreement was 100%.

The student teacher coded the lessons live at the school during the time of instruction. Twenty seven of the possible 90 treatment

lessons were coded. A copy of the protocol is included in Appendix E. The instrument was used to establish a dichotomy between the two teaching approaches. The validation protocol was expected to provide data indicating the response "yes" to items 2, 3, and 6 for the technique approach. The percentages obtained for these items during the treatment phase were 88%, 88%, and 100% respectively. For the games for understanding teaching method the responses were expected to be "yes" to items 1, 4, 5, and 7. The percentages obtained for these items during the treatment phase were 94%, 100%, 100% and 100% respectively.

Instrumentation

The Henry-Friedel field hockey test (H.F.F.H.T.) This test was used to measure the general field hockey skill of the students prior to the units of instruction and was used as a posttest measure upon conclusion of the treatments. The test was selected because it provided a measure of field hockey playing ability and incorporated the skills of ball control, dribbling, beating an opponent, shooting and tackling that were central to this study and which were also measured by the game play protocol.

The H.F.F.H.T. (Barrow, McGee and Tritschler, 1989) was developed on 31 junior high-school hockey players. The subjects ranged in expertise from novices to those who had several years of playing experience. The players were also given the Strait Field Hockey Test. Two judges assessed the players on footwork, stick-work and body control while they were performing 20 trials of the

modified test and 6 trials of Strait's test. The agreement between the judges was reported with a coefficient of .97.

The validity coefficient of .70 for speed and accuracy scores combined by T-scores was established using the results of the Strait Test. The ratings of the judges indicated a coefficient of .83 for the speed and accuracy scores combined by T-scores. Test-retest and ANOVA were utilized to calculate the test reliability. For 10 trials, the total test scores were .71 and .67, respectively.

The area needed for the test was 25 yards by 10 yards, with one 10 yard line marked off along the goal line, so that the goal was in the middle of that line. It was possible to prepare two testing areas in the gymnasium at the school. A copy of the floor markings is provided in Appendix F. The directions for the test and scoring procedures are also included in Appendix F.

Each subject completed 10 trials of the test, alternating trials with another pupil as indicated in the test procedure. Each trial provided a time score and a shooting accuracy score for each student. The mean score for the 10 trials was calculated for both of these components for each student.

In order to monitor the test effectively 4 assistants were at each of the two testing sites: a scorer, recorder, time-keeper and ball-roller. The inservice training for these assistants was previously administered in the research gymnasium at UNC Greensboro. The 8 assistants were provided with the directions for the test and the scoring instructions as indicated in Appendix F. A hockey player was

used to demonstrate the test in order that any questions about the scoring procedures could be noted. One question that emerged was whether the higher or lower accuracy score should be awarded when the ball crossed over the goal line directly through one of the divisions between the scoring zones. It was decided that the higher score should be awarded in all such instances.

The 8 assistants were split into 2 testing teams and they were assigned to one of four specific duties. The scorer was required to note the infringements resulting in time penalties, as indicated in Appendix F, and pass this information to the time-keeper who was required to amend the speed score accordingly. These data were then presented to the recorder who was also responsible for recording the accuracy score. The ball-roller had to roll the ball into the target square on each trial. The assistants occupied these positions on the actual test.

Two reliability checks were made between the two testing teams. On each of five time trials made prior to both the pretest and the posttest the two testing teams differed on average by less than two tenths of a second.

Hockey knowledge test. In order to test the declarative and procedural knowledge of the students it was necessary to develop a hockey knowledge test. The test questions were initially selected from Messick's (1987) Field Hockey Knowledge Test. In order for specific questions to be chosen they needed to be appropriate for the hockey curriculum to be covered under both of the teaching

approaches. Declarative and procedural knowledge items selected were concerned with dribbling, passing, shooting, tackling and attacking strategy.

A 30-item multiple choice test consisting of 15 procedural and 15 declarative items was constructed to assess hockey knowledge. Two physical education researchers were asked to rate the questions as to whether they were testing declarative or procedural knowledge. Agreement was a 100% on the thirty items.

The scale was then pilot-tested on 25 middle school students of a similar age to those students who were included in this study. The pilot test was used to determine if the students could understand the multiple choice items. It became clear from the students' questions about the 30 item scale that they were experiencing difficulty interpreting the general vocabulary (apart from the technical vocabulary). In retrospect this was probably not surprising as Messick's field hockey test was designed for college age students. It was decided that a number of the questions should be rephrased and the vocabulary simplified. A copy of the revised knowledge test is included in Appendix C.

The scale was then administered again (Appendix C) on 76 middle school students and an item analysis (Cronbach alpha) was performed. A standardized item alpha of 0.87 was determined for all 30 items. Individual analyses were also conducted for the 15 declarative and 15 procedural items. The standardized item alpha

was .74 for the declarative items and .82 for the procedural items. Table 1 provides a summary of the item analyses.

A test-retest reliability coefficient was also calculated to determine the scale's stability. Over a two-day period the knowledge test's stability was fairly low with a correlation coefficient of only .70.

Table 1

Summary of Item Analyses for the Hockey Knowledge Test taken by 76 6th & 7th Grade Students

Knowledge Items	n	Item Means	SD	Cronbach Alpha
Declarative	15	44.59	9.55	.74
Procedural	15	43.96	9.39	.82
Total	30	88.55	17.45	.87

Game Play Observational Instrument

An adaptation of an observational tool designed by French and Thomas (1987) for basketball was used to describe the types of decisions that the children made during field hockey games.

If both the quality of decisions and of motor execution determine successful performance in games, the contribution of motor skill execution to skilled performance could not be ignored. In order to separate the cognitive decision-making component of performance and the motor skill execution components of performance it was assumed that offensive hockey skill performance

typically occurs in the following sequence: a player controls the ball, decides which action is appropriate, and then executes the skill. The decision component involved selection of the skill (i.e.. shoot, dribble, pass, tackle), as well as which teammate to pass to, when to shoot, which direction to dribble, when to tackle, and so on.

It should be noted that although controlling the hockey ball was a motor action, it was considered a separate component due to the sequence in which offensive actions typically occur. Three categories of behavior were coded: Control, decision, and execution. Control was defined as successfully and legally (not using the back of the stick or the feet) stopping the ball. Control was coded as 1 for successful control, and 0 for unsuccessful control. Once a player had control of the ball he/she had to decide what to do with it. The quality of this decision was coded as 1 for an appropriate decision, and 0 for an inappropriate decision.

Execution of the skills was coded as 1 for a shot on target, and 0 for a shot off target. Pass execution was coded as 1 for a successful pass, and 0 for a pass too hard, out of bounds, or too far behind, or in front of a teammate. Dribbling execution was coded as 1 for successfully advancing the ball, and 0 for loss of control or loss of the ball due to a legal tackle. Tackling execution was coded as 1 for a legal tackle, and 0 for obstruction, hitting an opponent's stick, or dangerous play. The execution aspect of the coding form provided an opportunity to monitor "open" skills in the games. Table 2 provides a summary of the coding procedures for the categories of game play.

Table 2
Coding Procedures for Control, Decision-making, and Execution during Game Play

Control

coded as 1
1. Successful control.

coded as 0
1. Unsuccessful control.
2. Back of the stick.
3. Ball contacting feet.

Decision-making

Shooting
coded as 1
1. Any shot taken within the circle when the player was open, a defensive player did not have an advantage.

coded as 0
1. A shot taken outside of the circle.
2. A blocked shot.
3. Not attempting a shot when open inside the circle.

Passing
coded as 1
1. A pass to a teammate who is open.

coded as 0
1. A pass made to a player who is closely guarded, defensive player is positioned in the passing lane.
2. A pass made to an area of the court where no teammate is positioned.

Dribbling
Coded as 1
1. Advancing the ball up court not closely guarded by a defender.
2. An appropriate change of direction away from a defender (right or left) to an open space.

Coded as 0
1. Obstruction.
2. Dribbling into a defender.
3. Dribbling out-of-bounds.
4. Dribbling away from goal, without advancing the ball or attacking the defense.

Table 2 (continued)

Tackling

coded as 1

1. Deciding to tackle in 1 v 1.

coded as 0

1. Obstructing opponent in attempting to tackle.

Execution

Shooting

Coded as 1

1. Shot on goal.

Coded as 0

1. Shot off target.

Passing

Coded as 1

1. Successful pass to a teammate.

Coded as 0

1. Pass too hard.
2. Out of Bounds.
3. Too far behind or in front of a teammate.
4. Interception.

Dribbling

Coded as 1

1. Successfully advancing the ball.

Coded as 0

1. Loss of control.
2. Loss of ball due to legal tackle.

Tackling

Coded as 1

1. Legal Tackle.

Coded as 0

1. Obstruction.
2. Hitting opponent's stick.
3. Dangerous play (stick high).

Pilot work in order to establish whether coding the students with this protocol would be reliable was carried out in the gymnasium at Our Lady of Grace School. The pilot work indicated that in order to use this system, it was necessary to code from videotape recordings of individual game play. This allowed for a coder to review segments of student performance when clarification was needed. By using a wide angle lens on the video camera from a position at the half-way line on the gymnasium floor, it was possible to follow the ball and monitor the students making decisions and subsequently executing skills.

For coding purposes the most efficient strategy was to observe one player on each team at a time, and then repeat this process until all of the players were coded. Training videotapes for the coder to use were available from a previous study of field hockey (Turner, in press) that took place at a similar location.

An independent coder who had field hockey playing experience was trained to use the instrument. The investigator explained the protocol to the coder at an initial meeting and they examined a sample tape together. During the training of the coder adjustments were made to the protocol as a result of their discussion. The term "appropriate penetration" was removed from the protocol because it was not specific to field hockey. It was also discovered that when passes were intercepted by the opposing team no appropriate coding option was available. Consequently, the interception alternative was included in the protocol under passing execution and coded as 0. In

addition, the criteria for tackling were added because this is an integral aspect of field hockey and needed to be examined in the decision-making process.

Prior to coding any of the pretest data it was necessary to establish the reliability of the game play instrument. A reliability in the eighties would be considered satisfactory for this type of instrument (Gay, 1987). The reliability was established by having the coder and the investigator view one of the selected training tapes independently. An entire 30-minute game was observed from the tape. The percentage of agreement between the coder and the investigator was calculated on a player selected at random. The percentage of agreement between the investigator's ratings and the observer's ratings was 92% for the control variable, 90% for the decision-making variable and 84% for the execution component.

A similar reliability check was also undertaken prior to coding the game play data for the posttest. The percentage of agreement between the investigator's ratings and the observer's ratings was 95% for the control variable, 86% for the decision-making variable and 84% for the execution component.

Interview Protocol

In order to examine the students' perceptions of the two methods of instruction a question protocol devised by Turner (1993) was utilized during the penultimate week of the study. Three students were randomly selected from each of the games for understanding and technique groups (18 students in total).

The purpose of the interviews was to establish what aspects of their lessons the students liked/disliked under the two contrasting approaches. Furthermore, what rules, skills, decisions and strategies had they perceived as important from their instruction in field hockey? It was also important to inquire about the students' perceptions of their teacher and the students' level of motivation for the unit. A copy of the question protocol is included at Appendix G. Interview data were tape-recorded and transcribed by the researcher.

Procedure for Data Collection

There were 71 subjects in total. Stratified random sampling was used to ensure that the groups were equated in terms of gender. In each class the students were assigned to either the games for understanding or technique treatment groups. The control group consisted of 10 students. The subjects were assigned pinafores with identification numbers to be worn for the duration of the program. In order to ensure that the treatment effect was consistent student attendance was recorded at every lesson. If a student missed more than two lessons then his/her data were excluded from the analysis. One pupil missed five of the treatment lessons and so her pretest and posttest data were omitted

During the first week of the study each subject completed the Henry-Friedel Field Hockey Test (Appendix F) and the hockey knowledge test (Appendix C). Each question was read to the students for the knowledge test and they were required to answer by circling

the response that they considered to be most appropriate. The knowledge test was completed individually by each student.

The students were videotaped for the entire first lesson playing a hockey game (30 minutes in total--a running clock was used). The school physical education teacher selected teams that she considered were equal in terms of ability for each teaching group. The videotape was subsequently coded using the game play protocol indicated in Table 2. In this initial lesson no teaching took place. The teachers only refereed the hockey games.

The treatment period lasted for 15 lessons (45 minutes each). Both teachers used the two approaches and journal entries were made by the teachers after each class. Table 3 provides a summary of the group assignment and the treatment administration.

Table 3

A Summary of the Group Assignment and Treatment Administration

Teacher A:	Teacher B:
Technique-centered (Group 1, n = 10)	Games for understanding (Group 2, n = 11)
Games for understanding (Group 3, n = 10)	Technique-centered (Group 4, n = 11)
Technique-centered (Group 5, n = 9)	Games for understanding (Group 6, n = 10)
Control group (Group 7, n = 10)	

During the penultimate week of the treatments interview data were collected from the pupils. During the final week of the study the students were videotaped again during hockey games. The students were kept in the same teams as in the pre-treatment games. Post-treatment data on game performance were coded from the videotapes using the coding protocol indicated in Table 2. In the final week the hockey knowledge test and the skill test were administered again (posttests). A summary of the study's itinerary is provided in Table 4.

Table 4

An Itinerary of the Study

Week 1:	Skill and knowledge tests (pretests).
Week 2:	Game play coded.
Weeks 3-11:	Treatments.
Week 11:	Student interviews.
Week 12:	Game play coded.
Week 13:	Skill and knowledge tests (posttests).

Statistical Treatment of the Data

Question one asked: Are there any significant differences among the games for understanding, technique and control groups regarding the development of game playing ability (control, decision-making, and execution) in middle school children? In order to

answer this question, an examination of the control variable was made by administering a 2 x 3 (time by group) analysis of variance (ANOVA) for repeated measures. This analysis was conducted to examine group differences across time for the control variable. The alpha level for testing significance was set at .05. If interaction effects were indicated univariate analyses (F-tests) were conducted to determine the location of group differences across time. A Student-Newman-Keuls post hoc procedure was used to indicate which groups differed significantly.

An examination of decision-making was made by using a 2 x 3 (time by group) multivariate analysis of variance (MANOVA) for repeated measures. This analysis was conducted to examine group differences across time for dribbling, passing, shooting and tackling. Similarly, execution of these four variables was also examined by using a 2 x 3 (time by group) MANOVA for repeated measures. If significant multivariate Fs were found ($p<.05$), univariate F-tests were used to locate specific differences for each dependent variable. A Student-Newman-Keuls post hoc procedure was used to indicate which groups differed significantly.

Question two asked: Are there any significant differences among the games for understanding, technique and control groups regarding the development of declarative and procedural knowledge related to game play? Question 3 asked: Are there any significant differences among the games for understanding, technique and control groups regarding the development of specific field hockey

skills? For questions two and three, knowledge (declarative and procedural) and skill (accuracy and time) were examined by using separate 2 x 3 (time by group) MANOVA for repeated measures. If significant multivariate Fs were found ($p<.05$), univariate F-tests were used to locate specific differences for each dependent variable. A Student-Newman-Keuls post hoc procedure was used to indicate which groups differed significantly.

Question 4 asked: Are there significant relationships among game playing ability, (control, decision, and execution), hockey knowledge, (declarative and procedural), and skill (accuracy and time)? For this question, canonical correlations were performed to look at the multivariate relationships among the following sets of variables (variates): (1) control, decision-making, and execution, (2) knowledge (declarative and procedural) and (3) skill (accuracy and time). Separate analyses were performed on the pretest and posttest data. Follow-up analyses included inspection of the standardized coefficients to identify those variables that influenced the canonical correlation between the sets of variates.

Analysis of Student and Teacher Perceptions

Question five asked: What perceptions do students hold about the games for understanding and technique models of instruction? For this question student interview data were initially read by the researcher. The data from the 18 interviews were then grouped according to each of the teaching approaches. The researcher examined the responses to question 1 in the games for

understanding and technique groups separately. He highlighted concepts that seemed to be repeated throughout the 9 interviews in each approach. When a concept consistently emerged in 4 of the 9 interviews it was deemed to be a theme. The procedure was then repeated for the remaining 9 questions in each of the treatment groups. The themes that emerged in response to each question were recorded by the researcher.

To determine the reliability of these themes an outside observer (a Faculty Member in the Department of Exercise and Sport Science at UNC Greensboro) was asked to identify salient themes that emerged from the data using a similar approach. When the researcher and the observer examined these themes together they were virtually identical. Agreement was 100% on the themes and there was also consensus where these themes differed between the two teaching approaches.

Question 6 asked: What do the teachers perceive about their delivery of the games for understanding and technique models of instruction? For this question the teachers' perceptions were examined via their journals. The teachers responded to five questions after each lesson. Each teacher's journal responses were separated into those that referred to games for understanding classes and those that referred to technique classes. The researcher examined the responses to question 1 for the games for understanding and technique lessons of teacher "A" and highlighted concepts that seemed to be repeated throughout the teacher's journal

entries. When a concept consistently emerged in one third of the teacher's entries for a teaching approach it was deemed to be a theme for that approach. This process was then repeated for the responses from teacher "B" for question 1. A similar procedure was then repeated for the teachers' entries in response to the remaining four questions. The themes that emerged in response to each question were recorded by the researcher.

The journal data were collected over a three-month period. This amount of time was long enough for the researcher to learn and understand the context. It enabled the researcher to build trust with the teachers and helped to assure the trustworthiness of the journal data. The time spent in the company of each teacher during data collection was around 60 hours. This method of establishing credibility is identified as prolonged engagement (Lincoln & Guba, 1985).

CHAPTER III

RESULTS AND DISCUSSION

The purpose of the study was to test the validity of the games for understanding model by comparing it to the technique approach to games instruction and also to a control group that did not receive field hockey instruction. It was necessary to monitor the effects of the games for understanding, technique and control treatments on game playing abilities, declarative and procedural knowledge and skill acquisition. The six questions that were presented in chapter I guided the research.

In order to answer these questions the results are presented and discussed in six sections. The first three sections examine the differences among the treatments and these are followed by a discussion of the results.

The first section describes the effect of the treatments over time on the students game playing abilities. Three elements of game play are examined: control, decision-making, and execution. Section two describes the effect of the treatments over time on the students' declarative and procedural knowledge of field hockey. In the third section the effect of the treatments over time on specific field hockey skills is described. Time and accuracy were examined through this analysis.

The fourth section describes the relationships between game playing ability, knowledge and skill and is also followed by a discussion. Multivariate relationships are presented among the following variables: game playing ability (control, decision-making, execution), knowledge (declarative and procedural), and skill (accuracy and time).

The fifth section examines interview data collected from the students during the penultimate week of this study. The data are presented in three sub-sections: students' attitudes, components of game play, and student perceptions of instruction and their motivation.

The final section provides the teachers' perceptions of the effectiveness of their instruction. After each class the teachers responded to five questions that guided their journal entries. The data is presented in response to these five questions.

Game Playing Ability

Analysis of Control

Analysis of the control variable indicated that there was a significant main effect for teaching approach $F(2, 63) = 5.81$, $p<.05$. There was no significant main effect for time $F(1, 63) = 2.39$, $p>.10$. It was also found that a significant interaction effect existed between the teaching approach and time variables, $F(2, 63) = 5.69$, $p<.05$.

A follow-up univariate analysis on pretest scores for teaching approach indicated that there were no significant differences among

the games for understanding, technique and control groups $F(2, 63) = .52$, $p>.10$. On the posttest scores a univariate analysis indicated that there were significant differences among the three groups $F(2, 66) = 15.99$, $p<.05$. A Student-Newman-Keuls post hoc analysis indicated that the games for understanding group was significantly different from both the technique and control groups. No other differences were found. Table 5 provides a summary of the means and standard deviations for the control variable.

Table 5

Means and Standard Deviations for Control

Pretest	Mean	Standard Deviation
Games	.631	.165
Technique	.603	.138
Control	.574	.196
Total	.612	.157
Posttest		
Games	.753	.098
Technique	.602	.149
Control	.555	.129
Total	.662	.149

Analysis of Decision-making

The multivariate analysis of variance (MANOVA) of the decision variables: dribbling, passing, shooting, and tackling indicated that there were no significant main effects for teaching approach $F(8,$

120) = 1.40 $p > .10$. There was a significant effect for time $F(4, 60) = 6.94$, $p < .05$. A significant interaction effect was also found between the approach and time variables, $F(8, 120) = 2.56$, $p < .05$. The approach by time effect was found to be significant for passing $F(2, 63) = 6.51$, $p < .01$ and dribbling $F(2,63) = 3.58$, $p < .05$.

A follow-up univariate analysis on the pretest passing scores for teaching approach indicated that there were no significant differences among the games for understanding, technique and control groups $F(2, 63) = 1.33$, $p > .10$. On the posttest scores for passing a univariate analysis indicated that there were significant differences among the three groups $F(2, 66) = 15.55$, $p < .01$. A Student-Newman-Keuls post hoc analysis indicated that the games for understanding group was significantly different from both the technique and control groups. No other group differences were found.

A follow-up univariate analysis on the pretest dribbling scores for teaching approach indicated that there were no significant differences among the games for understanding, technique and control groups $F(2, 63) = 0.32$, $p > .10$. On the posttest scores for passing a univariate analysis indicated that there were significant differences among the three groups $F(2, 66) = 3.28$, $p < .05$. A Student-Newman-Keuls post hoc analysis indicated that the games for understanding group was significantly different from the technique group only. Tables 6, 7, 8, and 9 provide a summary of the means and standard deviations for each of the decision variables.

Table 6

Means and Standard Deviations for Dribbling Decisions

Pretest	Mean	Standard Deviation
Games	.222	.274
Technique	.274	.292
Control	.208	.250
Total	.242	.276
Posttest		
Games	.642	.395
Technique	.387	.375
Control	.444	.336
Total	.507	.393

Table 7

Means and Standard Deviations for Passing Decisions

Pretest	Mean	Standard Deviation
Games	.451	.185
Technique	.398	.206
Control	.527	.305
Total	.439	.214
Posttest		
Games	.673	.122
Technique	.503	.142
Control	.443	.230
Total	.569	.174

Table 8

Means and Standard Deviations for Shooting Decisions

Pretest	Mean	Standard Deviation
Games	.319	.363
Technique	.389	.441
Control	.378	.423
Total	.357	.401
Posttest		
Games	.598	.455
Technique	.437	.372
Control	.503	.486
Total	.517	.426

Table 9

Means and Standard Deviations for Tackling Decisions

Pretest	Mean	Standard Deviation
Games	.909	.262
Technique	.809	.385
Control	.971	.063
Total	.875	.309
Posttest		
Games	.961	.186
Technique	.993	.027
Control	.991	.026
Total	.979	.124

Analysis of Execution

The multivariate analysis of variance (MANOVA) of the execution variables: dribbling, passing, shooting, and tackling indicated that there was a significant main effect for teaching approach $F(8, 120) = 2.33$ $p < .05$. The main effect for approach was significant for passing $F(2, 63) = 5.97$, $p<.01$ and tackling $F(2, 63) = 3.97$, $p<.05$. A follow-up univariate analysis on the combined passing scores for pretest and posttest indicated that there were significant differences among the three groups $F(2, 65) = 5.36$, $p<.01$.

A Student-Newman-Keuls post hoc analysis indicated that the games for understanding group was significantly different from the technique group. No other group differences were found. A follow-up univariate analysis on the combined tackling scores for the pretest and posttest indicated that there were significant differences among the three groups $F(2, 65) = 3.62$, $p<.05$. A Student-Newman-Keuls post hoc analysis indicated that the games for understanding group was significantly different from the technique group. No other group differences were found.

There was no significant main effect for time $F(4, 60) = 2.01$, $p>.10$. No significant interaction effect was found between the approach and time variables, $F(8, 120) = 1.96$, $p>.05$. Tables 10, 11, 12, and 13 provide a summary of the means and standard deviations for each of the execution variables.

Table 10

Means and Standard Deviations for Dribbling Execution

Pretest	Mean	Standard Deviation
Games	.244	.294
Technique	.325	.320
Control	.224	.273
Total	.276	.301
Posttest		
Games	.465	.363
Technique	.331	.355
Control	.363	.341
Total	.394	.358

Table 11

Means and Standard Deviations for Passing Execution

Pretest	Mean	Standard Deviation
Games	.468	.171
Technique	.364	.185
Control	.558	.209
Total	.436	.192
Posttest		
Games	.581	.175
Technique	.453	.171
Control	.433	.264
Total	.507	.196

Table 12

Means and Standard Deviations for Shooting Execution

Pretest	Mean	Standard Deviation
Games	.245	.338
Technique	.399	.481
Control	.389	.486
Total	.330	.424
Posttest		
Games	.484	.441
Technique	.340	.365
Control	.362	.413
Total	.406	.406

Table 13

Means and Standard Deviations for Tackling Execution

Pretest	Mean	Standard Deviation
Games	.523	.277
Technique	.317	.294
Control	.456	.163
Total	.426	.286
Posttest		
Games	.608	.225
Technique	.568	.263
Control	.467	.087
Total	.572	.232

Hockey Knowledge

Analysis of Declarative and Procedural Knowledge

A MANOVA for declarative and procedural hockey knowledge indicated that there was no significant main effect for teaching approach $F(4, 126) = .54$, $p>.10$. There was a significant main effect for time $F(2, 63) = 38.8$, $p<.001$. A significant interaction effect was found between the approach and time variables, $F(4, 126) = 6.48$, $p<.001$. The approach by time effect was found to be significant for declarative knowledge $F(2, 64) = 7.34$, $p<.001$ and procedural knowledge $F(2, 64) = 9.16$, $p<.001$.

A follow-up univariate analysis on the pretest declarative knowledge scores for teaching approach indicated that there were no significant differences among the games for understanding, technique and control groups $F(2, 65) = .92$, $p>.10$. On the posttest declarative knowledge scores a univariate analysis indicated that there were significant differences among the three groups $F(2, 67) = 5.45$, $p<.01$. A Student-Newman-Keuls post hoc analysis indicated that the games for understanding group and the technique group were significantly different from the control group. No other group differences were found. Table 14 provides a summary of the means and standard deviations for the declarative knowledge scores.

Table 14

Means and Standard Deviations for Declarative Knowledge

Pretest	Mean	Standard Deviation
Games	4.63	2.61
Technique	4.96	2.33
Control	5.80	1.69
Total	4.94	2.38
Posttest		
Games	9.43	2.56
Technique	8.89	2.21
Control	6.60	2.27
Total	8.79	2.53

A follow-up univariate analysis on the pretest procedural knowledge scores for teaching approach indicated that there were no significant differences among the games for understanding, technique and control groups $F(2, 65) = 2.25$, $p>.10$. On the posttest procedural knowledge scores a univariate analysis indicated that there were significant differences among the three groups $F(2, 67) = 4.93$, $p<.01$. A Student-Newman-Keuls post hoc analysis indicated that the games for understanding group was significantly different from both the technique and control groups. No other group differences were found. Table 15 provides a summary of the means and standard deviations for the procedural knowledge scores.

Table 15

Means and Standard Deviations for Procedural Knowledge

Pretest	Mean	Standard Deviation
Games	6.03	2.30
Technique	7.07	1.80
Control	6.90	2.38
Total	6.58	2.15
Posttest		
Games	10.0	2.33
Technique	8.78	2.90
Control	7.30	2.21
Total	9.10	2.70

Field Hockey Skill

Analysis of Accuracy and Time

A MANOVA for shooting accuracy and time indicated that there was no significant main effect for teaching approach $F(4, 126) = .24$, $p>.10$. There was a significant main effect for time $F(2, 63) = 67.70$, $p<.001$. A significant interaction effect was found between the approach and time variables, $F(4, 126) = 3.43$, $p<.01$. The approach by time effect was found to be significant for the time variable $F(2, 64) = 5.68$, $p<.01$ but not for the accuracy component $F(2, 64) = 2.44$, $p>.05$. Table 16 and provides a summary of the means and standard deviations for the skill accuracy scores.

Table 16

Means and Standard Deviations for Accuracy

Pretest	Mean	Standard Deviation
Games	2.53	1.35
Technique	2.49	1.15
Control	3.21	0.96
Total	2.62	1.22
Posttest		
Games	3.50	1.11
Technique	3.41	1.29
Control	2.99	1.03
Total	3.39	1.17

A follow-up univariate analysis on the pretest skill time scores for teaching approach indicated that there were no significant differences among the games for understanding, technique and control groups $F(2, 65) = .24$, $p>.10$. On the posttest time scores a univariate analysis indicated that there were no significant differences among the three groups $F(2, 67) = 2.24$, $p>.10$. The failure to find a significant difference on the post hoc analysis appears to be attributed to disparate variability within each of the three groups. Table 17 provides a summary of the means and standard deviations for the skill time scores.

Table 17

Means and Standard Deviations for Time

Pretest	Mean	Standard Deviation
Games	22.37	3.83
Technique	22.76	3.71
Control	21.89	2.09
Total	22.46	3.54
Posttest		
Games	18.05	2.66
Technique	17.76	2.74
Control	19.82	1.78
Total	18.19	2.65

Canonical Relationships of Game Play, Knowledge and Skill Variables

Pretest Relationships

A canonical correlation was computed for the pretest scores for shooting accuracy and time (variate 1) with the pretest scores for control, decision-making and execution variables (variate 2). Two canonical functions were generated from the analysis, with the first being significant ($Rc_1 = .63$, $p<.001$). The amount of variance shared by the two variate sets for Rc_1 was 40%. Table 18 provides a summary of the canonical loadings for the first and second canonical correlations.

Table 18

Summary of the Canonical Correlations for Skill and Game Play

Variables	Function 1	Function 2
Predictor Variables		
time	1.01	0.38
shooting	0.04	1.08
Criterion Variables		
control	-0.58	-0.25
decision-making	-0.57	1.70
execution	-0.20	-1.66
canonical R	0.63	0.17
F value	6.01*	____
df	6.00	4.00
R^2	0.40	0.03

*p<.001

Within the predictor set of variables time was the best predictor. In the criterion set control and decision-making had the most weight. Therefore, time seems to be inversely related to control and decision-making during game play.

A canonical correlation was computed for the pretest scores for declarative and procedural knowledge (variate 1) with the pretest scores for control, decision-making and execution variables (variate 2). Two canonical functions were generated from the analysis, with the first being significant (Rc_1 = .41, p<.05). The amount of variance shared by the two variate sets for Rc_1 was 17%. This percentage of

variability was not very high. Table 19 provides a summary of the canonical loadings for the first and second canonical correlations.

Table 19

Summary of the Canonical Correlations for Knowledge and Game Play

Variables	Function 1	Function 2
Predictor Variables		
declarative knowledge	0.19	1.10
procedural knowledge	0.90	-0.67
Criterion Variables		
control	-0.01	0.95
decision-making	0.20	0.42
execution	0.83	-0.47
canonical R	0.41	0.22
F value	2.37*	____
df	6.00	4.00
R^2	0.17	0.04

*p<.05

Within the predictor set of variables procedural knowledge was the best predictor. In the criterion set execution had the most weight. Therefore, procedural knowledge and execution during game play seem to be related.

A canonical correlation was computed for the pretest scores for shooting accuracy and time (variate 1) with the pretest scores for

declarative and procedural knowledge (variate 2). Two canonical functions were generated from the analysis, with the first being significant ($Rc_1 = .53$, $p<.001$). The amount of variance shared by the two variate sets for Rc_1 was 28%. Table 20 provides a summary of the canonical loadings for the first and second canonical correlations.

Table 20

Summary of the Canonical Correlations for Skill and Knowledge

Variables	Function 1	Function 2
Predictor Variables		
time	0.98	0.48
shooting	-0.05	1.09
Criterion Variables		
declarative knowledge	-0.69	0.90
procedural knowledge	-0.47	-1.03
canonical R	0.53	0.07
F value	5.50*	____
df	4.00	2.00
R^2	0.28	0.01

*$p<.001$

Within the predictor set of variables time was the best predictor. In the criterion set declarative knowledge had the most weight. Therefore, time and declarative knowledge seem to be inversely related.

Posttest Relationships

A canonical correlation was computed for the posttest scores for shooting accuracy and time (variate 1) with the posttest scores for control, decision-making and execution variables (variate 2). Two canonical functions were generated from the analysis, with the first being significant ($Rc_1 = .60$, $p<.001$). The amount of variance shared by the two variate sets for Rc_1 was 36%. Table 21 provides a summary of the canonical loadings for the first and second canonical correlations.

Table 21

Summary of the Canonical Correlations for Skill and Game Play

Variables	Function 1	Function 2
Predictor Variables		
time	0.86	0.62
shooting	-0.30	1.01
Criterion Variables		
control	-0.23	0.88
decision-making	-0.89	0.57
execution	0.03	-1.47
canonical R	0.60	0.11
F value	5.46*	
df	6.00	4.00
R^2	0.36	0.01

*$p<.001$

Within the predictor set of variables time was the best predictor. In the criterion set decision-making had the most weight. Therefore, time and decision-making during game play seem to be inversely related.

A canonical correlation was computed for the posttest scores for declarative and procedural knowledge (variate 1) with the posttest scores for control, decision-making and execution variables (variate 2). Two canonical functions were generated from the analysis, with the first being significant ($Rc_1 = .49$, $p<.05$). The amount of variance shared by the two variate sets for Rc_1 was 24%. Table 22 provides a summary of the canonical loadings for the first and second canonical correlations.

Table 22

Summary of the Canonical Correlations for Knowledge and Game Play

Variables	Function 1	Function 2
Predictor Variables		
declarative knowledge	0.40	-1.03
procedural knowledge	0.77	0.79
Criterion Variables		
control	0.63	-0.95
decision-making	0.03	1.36
execution	0.47	-0.43

Table 22 (continued)

canonical R	0.49	0.17
F value	3.37*	———
df	6.00	4.00
R^2	0.24	0.03

*p<.01

Within the predictor set of variables procedural knowledge was the best predictor. In the criterion set control had the most weight. Therefore, procedural knowledge and control during game play seem to be related.

A canonical correlation was computed for the posttest scores for shooting accuracy and time (variate 1) with the posttest scores for declarative and procedural knowledge (variate 2). Two canonical functions were generated from the analysis, with the first being significant (Rc_1 = .47, p<.01). The amount of variance shared by the two variate sets for Rc_1 was 23%. Table 23 provides a summary of the canonical loadings for the first and second canonical correlations.

Within the predictor set of variables time was the best predictor. In the criterion set procedural knowledge had the most weight. Therefore, time and procedural knowledge seem to be inversely related.

Table 23

Summary of the Canonical Correlations for Skill and Knowledge

Variables	Function 1	Function 2
Predictor Variables		
time	0.98	0.38
shooting	-0.05	1.06
Criterion Variables		
declarative knowledge	-0.14	-1.09
procedural knowledge	-0.93	0.57
canonical R	0.47	0.05
F value	4.45*	____
df	4.00	2.00
R^2	0.23	0.00

*p<.01

Discussion of the Treatment Effects

Game Playing Ability

There was no time effect for ball control during hockey games across all the treatment groups. This finding is consistent with McPherson and French's (1991) study of novice tennis players; they also found that there was no significant pretest/posttest effect for the control variable during tennis game play. In the present study a significant difference did emerge, however, among the three

treatment groups on the posttest for the control variable. Students in the games for understanding group demonstrated successful control of the hockey ball in three out of every four (75%) instances. Pupils in this group were on average 15% more successful than those students in the technique group and 20% more successful than those in the control group.

The greater ability of students in the games for understanding group to control the hockey ball on the posttest seems to reflect the benefit of practising in games and game-like contexts during physical education instruction. This contention was substantiated in French and Thomas' (1987) study of child basketball players. They found that children who participated in a basketball program emphasizing cognitive strategy and organization for game play became more successful at controlling the basketball during game situations over the course of a season.

Decision-making

The analysis of the decision-making variable in this study showed that the percentage of successful decisions increased significantly from pretest to posttest; dribbling decisions increased from 24% to 50%, passing decisions from 43% to 56%, shooting decisions from 35% to 43%, and tackling decisions from 87% to 97%. A similar finding was reported by French and Thomas (1987) in their investigation of changes in the decision-making components of game performance for 8- to 10-year old basketball players. Over the course of a season they found that the accuracy of game decisions

improved for both expert and novice basketball players. The improvement in decision-making explained most of the improvement during game play (French & Thomas, 1987) and this is also apparent with the present study.

One concern in previous research has been the time duration of the treatments. The current research lasted for 15 treatment lessons and French and Thomas' (1987) study took place across a semester; in both studies there was an improvement in decision-making over time. In contrast Turner and Martinek (1992) failed to find a significant improvement in decision-making over a six lesson treatment period. Hence, there appears to be empirical support for the contention that the ability to make correct decisions within the context of the game takes considerable time and many hours of practice (Thomas, French, Thomas and Gallagher, 1988).

In addition to the over all improvement in decision-making, this study also showed that students receiving instruction under the games for understanding model made better decisions during posttest game play than students in the control or technique instructional groups. Turner's (1993) earlier study of field hockey showed a similar result favoring the games for understanding group. In the present study students in the games for understanding group were significantly better at making the appropriate decision regarding when to dribble. They were successful 64% of the time on the posttest where as students in the technique and control groups were less successful with 39% and 44%, respectively.

A significant difference also emerged regarding decisions concerning when to pass the ball. Students in the games for understanding group were successful 67% of the time on the posttest where as students in the technique and control groups were less successful with 50% and 44% of correct decisions. These results for passing replicate precisely those found in Turner's (1993) study. The posttest data in that study showed correct decision-making at 68% for the games for understanding group, 51% for the technique group and 43% for the control group on the posttest. The results concerning shooting decisions on the posttest in the present study are not significantly different among the treatment groups but the trend does indicate that the games for understanding group was more effective in deciding when to shoot than either the technique or control groups.

These results pertaining to the effectiveness of teaching games for understanding are interesting in the light of research undertaken by McPherson and French (1991) and Rink, French and Werner (1991) which examined the effects of the timing and integration of game tactics and skill instruction. Rink et al. examined the effects of three different treatments (tactical awareness, skill development, and a combination of skill and strategy development) on game playing abilities of 9th grade beginning badminton players. In their study the skill treatment and tactical treatment groups performed slightly better than the combination treatment group on competitive decisions during game play although the results did not support the

superiority of one treatment over another for decision-making over all. Interestingly, the combination group (skill and strategy) which seems to resemble the games for understanding group in this study demonstrated the least effective decision-making during game play.

In contrast, McPherson and French (1991) examined two different types of instructional approaches in two tennis classes. Their findings may be very helpful in explaining the results of the present study. A traditional motor skill approach (TMSA) was used with one class and a cognitive strategies approach (CSA) with the other. In the TMSA group motor skills were taught followed by the introduction of tactical knowledge. In the CSA declarative and tactical knowledge were provided initially with minimal skill instruction. Knowledge and skill were then refined in game situations. During subsequent game play students taught under the CSA generated more tactical response selections compared to students in the TMSA. As a result of the CSA players developed tactical condition action rules (procedural knowledge) which is characteristic of an accelerated learning phase (McPherson, 1994). Students receiving instruction under the CSA were attempting to develop more sophisticated knowledge during game play. The effectiveness of their game decisions increased dramatically from pretest to posttest (McPherson & French, 1991).

McPherson (1994) posits that the CSA provided students with more opportunities to actively solve tactical problems compared to the TMSA. This is also characteristic of the games for understanding

approach in this study. The CSA employed several teaching strategies to elicit the generation of tactical decisions by participants such as decision-making drills (McPherson, 1994).

In the present study the teacher's assistance to students (as specified in the lesson plans) took several forms that may be comparable to those used in the CSA (McPherson & French, 1991). In lesson 2, for example, simplifying the problem was one form of assistance. Using a three against one game situation in a defined area (20 X 10 yard grid) presented the opportunity to emphasize the essential points in possession play to the students. The use of questioning was an instructional method used to assist the students tactical understanding and decision-making concerning when to pass. "What is the appropriate time to make the pass to your teammate as a defender approaches?" "Too early and the defender has time to get across to the receiver." "Too late and the defender will rob the attacker of the ball." The empirical results concerning passing decisions in this study suggest that this may have been a very effective teaching strategy.

The use of imposed conditions was another instructional method used in lesson 14 of the games for understanding curriculum to help the children see the importance of specific game tactics (using a two-touch condition--one touch to control the ball and one touch to pass--to show that passing quickly will cause defenders a problem because they have little time to adjust their positions). Similarly, in lesson 9 the ball carrier was allowed 4 seconds (when he/she stood

still) before a tackle could be made by an opponent. This provided adequate time to make a decision about who to pass to; teammates were then asked: "So how can other players help in this instance?" "By moving to space to get open." The 4 second condition was later removed but looking for an open player to pass to was still emphasized. The children subsequently appeared to take their time to make a decision when they were not under pressure from an opponent. Teammates also moved quickly into supporting positions to help the player in possession of the ball.

Given the above findings the use of these instructional approaches may help to explain the ability of students in the games for understanding group to make more effective decisions during games. This is very important since the major component of performance that discriminates child expert and novice players is decision-making (French & Nevett, 1993). An instructional approach that facilitates the transition from novice to expert would be invaluable (Housner & French, 1994).

Accuracy and speed of decision-making are closely linked to procedural knowledge (Abernethy, Thomas, & Thomas, 1993; Starkes 1987) and the expert typically has greater procedural knowledge than the novice. Expert soccer players, for example, are faster in responding and more accurate than novices when deciding to shoot on goal, dribble around an opponent, or pass to an open teammate (Helsen & Bard, 1989). The expert player is able to link a specific

response to a potential event where as the novice has to create a response.

Response selection and decision-making must be learned in high strategy sports (Thomas, 1994) and the games for understanding approach appears to facilitate this learning process. Teachers can provide students with production systems (if-then statements) that define particular situations (if) and the actions (then) to be implemented in response to these situations (Housner & Griffey, 1994). Thomas suggests that the development of faster and more accurate decision-making should be one of the major goals for youth sports instruction. The present research findings suggest that teaching games for understanding could potentially help to bring this about.

Execution

There was no significant pretest/posttest difference for the execution variable during field hockey game play. This finding coincides with the results reported earlier by French and Thomas (1987) who found that young basketball players learned to make accurate cognitive decisions in the context of game situations faster than they learned the sport skills. In their research little improvement in motor skills was observed across the length of the season. Time of testing also proved non-significant for execution in the present study. Although a main effect was evident for teaching approach on game execution this remained constant across the

pretest and posttest since no interaction effect over time was evident.

The failure to find a significant difference over time may be due to the nature of sport which is a product of both cognitive knowledge about the current situation and a player's ability to execute the sport skill required (Thomas, French and Humphries, 1986). In sport an appropriate response selection (decision) does not necessarily correspond with a successful response execution (action) (McPherson & Thomas, 1989; Thomas & Thomas, in press). While the appropriate goal may be established there are often problems in attaching the correct parameter values to the selected motor program in the game (McPherson, 1994). As Magill (1989) speculates the "what to do" and "how to do it" distinction may be unique to complex motor skills unlike verbal skills where knowing "what to do" is enough. As a consequence, a student's advanced tactical knowledge and decision-making ability that was developed under the games for understanding approach in this study may have been confounded by an inability to execute a response selection in a sport situation.

The research examining sport expertise suggests that expert child performers may know the appropriate strategy or decision but may not be able to execute the skill (French & Thomas, 1987; McPherson & Thomas, 1989). This may be a stage that performers have to move through in their sport development and the contention

could be made that the games for understanding approach can help move students into this stage.

Although the results for the execution variable do not demonstrate statistical significance favoring teaching for understanding there was a trend towards greater improvement for the understanding group on several of the game play criteria. On average, dribbling execution and shooting execution doubled from pretest to posttest (dribbling from 24% to 47% and shooting from 25% to 48%). These fairly substantial changes were not evident for the technique or control groups. The combination of skill and strategy instruction in the games for understanding approach appears to have been beneficial on these execution variables.

Interestingly, McPherson and French (1991) suggested that one of the reasons volley skill execution in tennis improved during game play in the CSA approach in their study was because it was practiced in conjunction with strategy instruction (e.g., an approach and volley game situation). This combination of skill and strategy instruction was explicit in the games for understanding curriculum in this study of field hockey. In order for effective game execution to ensue children must practice strategy and skill combinations in actual game play (French & Nevett, 1993). The problem with the understanding group in this study was that they may have been capable of learning strategies before they were capable of executing the sports skills necessary to use these strategies during games.

Another reason why game execution did not improve significantly over the duration of the study may be because the game play protocol was designed to measure product outcomes of game execution. Game execution could have improved in process or qualitative terms but the observational tool would not detect these changes.

Declarative and Procedural Knowledge

For declarative knowledge the results showed a significant interaction on the posttest. The games for understanding group and the technique group scored significantly more than the control group. This was also the case for Rink, French and Werner's (1991) study that examined the effects of three different treatments (tactical awareness, skill development, and a combination of strategy and skill development) on the declarative knowledge base of 9th grade novice badminton players. No differences were observed between the treatment groups on the declarative knowledge test in their study but the treatment groups scored better than the control group that did not take badminton. In an earlier study, Turner (in press) also found that there were knowledge gains for the two treatment groups (games for understanding and technique) but not for the control group. The poor performance of the control group in the present research and previous studies (French & Thomas, 1987; Rink French and Werner, 1991) suggests that when children first enter sports, they generally have little sport specific declarative knowledge to enable them to solve a problem. This will develop with instruction.

This is very important since it is suggested that for younger athletes knowledge is potentially the major factor in determining game performance (Abernethy, Thomas, & Thomas, 1993). Research has shown that declarative knowledge assessed by knowledge tests is usually greater for child experts in sport than novices (French & Thomas, 1987; McPherson & Thomas, 1989). This study showed that for both technique and games for understanding groups declarative knowledge improved over the course of the study.

In contrast, Lawton's (1889) study of 12-13 year-old badminton players and Turner and Martinek's (1992) study of field hockey which also examined games for understanding versus technique models of instruction found no significant differences for students' knowledge over time. The treatment phase of only six lessons in both of these studies may have placed limitations on the amount of declarative knowledge that the students could realistically gain during such a short time. The present study appears to exemplify this; a treatment period of 15 lessons led to a significant difference in students knowledge over time.

The results pertaining to procedural knowledge are particularly interesting. A significant time by group interaction was evident. On the posttest the games for understanding group scored significantly higher for procedural knowledge than the technique group and the control group. This finding is very important in view of the research that suggests experts typically have greater procedural knowledge

and more connections among procedures than novices (McPherson, 1993; McPherson & Thomas, 1989).

In the present study, procedural knowledge items required subjects to match game conditions with the selection of appropriate responses in the context of a game scenario (if-then). The link between the situation and the action is called a procedure or an if-then statement (McPherson & Thomas, 1989). The games for understanding group was more effective on this criteria. If Anderson's (1982) theory of expertise is accurate and an individual's conceptual knowledge proceeds from a less sophisticated declarative form to a more sophisticated procedural form, it could be argued that students are developing greater expertise under a games for understanding approach. The students in the technique group developed the same declarative knowledge but their procedural knowledge lacked the refinement of those students in the games for understanding group.

Based on the results of the present study, the students in the games for understanding group appear to be operating at an advanced level in terms of procedural knowledge. Housner's (1981) study of expertise in badminton showed that experts generated more tactical game related concepts (forming "if-then" statements) than novices. The expert was able to plan more effectively the appropriate tactical response selection. Similarly, McPherson, Dovenmuehler, and Murray (1992) examined volleyball blocking knowledge. In their study experts were better than novices in

knowing when or under what conditions to apply the actions, and when selected these actions were more appropriate and tactical than the selections of novices.

By instructing via a games for understanding approach students were put into game-related environments and taught how to make effective decisions and select appropriate actions. This finding would seem to support the view that the emphasis placed on knowledge in stages 2 (game appreciation), 3 (tactical awareness) and 4 (decision-making) of the games for understanding model may have a definitive impact on the knowledge base of the learners. This may have led to the enhancement of their procedural knowledge. Allard and Starkes (1991) suggest that more skilled individuals may have the ability to forge new links between knowing and doing as required by the situation.

Skill

The results of this study did not indicate any significant differences in skill development between the treatment groups on the HFFHT. In addition, there was no significant difference between the pretest and the posttest on the accuracy component of the skills test. However, the time taken to negotiate the skills test was significantly lower on the posttest for the treatment groups. These findings parallel Turner and Martinek's (1992) earlier study of field hockey.

Two factors may explain why only time improved on the skills test: (1) it involved dribbling extensively and this skill showed the

most improvement in game play as well as on the skill test; (2) the increased speeds that the students were working at on the posttest may have caused hurried final shots at the end of the dribbling section. This may have prevented an increase in the accuracy scores.

The failure to find significant differences between the treatment groups is interesting. It might have been expected that the technique group would perform most effectively on the skill test because of the heavy emphasis on appropriate technique in the test. This emphasis matched the content of the technique group's treatment during the study. However, the games for understanding group may have equally benefited from the adaptability of working in game-related scenarios during their treatment period. As a consequence their time scores on the skill test improved significantly as was the case with the technique group.

The results of the skill tests suggest that the change in emphasis from a technique to a games for understanding approach does not adversely affect subjects' performances on specific field hockey skills. This finding parallels Lawton's (1989) and Rink, French and Werner's (1991) research. Lawton found no differences between the skill based and games for understanding treatments on skill tests for the badminton serve and shuttle placement.

Rink, French and Werner (1991), however, found contrasting results on certain skill tests that the authors were unable to explain. On the badminton clear the skill treatment and the combination treatment groups did better than the tactical treatment group. The

skill treatment and tactical treatment students did better than the combination treatment pupils on the drop shot and serve. The tactical treatment group, while not showing statistical significance performed better on the smash than the other groups. This may help to explain why improvement in the present study was seen on only one of the skill variables.

An interesting point emerges from the skill test results in the current study. Most instructional approaches as exemplified by the technique approach focus on changes in motor processes during skill acquisition (Fitts & Posner, 1967). When that emphasis is changed to a games for understanding approach focusing on the use of tactical knowledge and the development of response-selection and response-execution components then there appears to be little detriment to performance on these specific field hockey skill measures. As Bartlett suggested "the skilled performer must know more what to do rather than how to do it" (Knapp, 1963, p. 66).

In contrast, the games for understanding approach appears to lead to an improvement in tactical knowledge and decision-making during games. Game performance is improved. McPherson (1994) suggests that this may bring into question some of the theory that underlies initial learning and instruction in complex sports. For example, according to Schmidt (1991) tactical knowledge is not available to the performers until the autonomous stage of Fitts & Posner's (1967) model is attained. The results of this study would suggest that improved decisions about game strategy can be

formulated under a games for understanding approach prior to the final stage in Fitts and Posner's model of motor skill learning.

Discussion of Canonical Correlations

In order to examine the relationships between skill, knowledge and game playing abilities a series of canonical analyses were performed on these variables on the pretest and posttest scores. The results of the pretest suggest that skill and game play are significantly related. The time variable on the skill measure and the control and decision aspects of game play appeared to have the greatest influence on this relationship. Elevated time scores on the pretest may have resulted from a failure to control the ball appropriately. Similarly, a failure to control the ball effectively in game situations would coincide with a lack of skill. French and Thomas (1987) also found that skill had the largest standardized coefficient for control.

The strength of the relationship in this study between skill (time) and decision-making is also interesting in light of Johnson's (1991) research examining the decisions of soccer players aged 11-15. In one scenario Johnson found that few 11-year-olds made the correct decision concerning passing because they did not consider it a possibility. Skill tests for kicking revealed that the passing distance in the scenario was well beyond their capability. One reason for their poor response selection in this situation was because they did not have the passing skill to consider the action a possibility. Hence, poor decision-making was related to poor skill. Decision-making and

skill may be similarly related in the present study. Students may have made certain decisions in games because they did not have the required skills to make alternative decisions viable.

Analysis of the pretest scores show that knowledge and game play are significantly related. Procedural knowledge and game execution appear to have the greatest influence on this relationship. The link between procedural knowledge and game execution has also been posited by McPherson and Thomas (1989). The expert tennis players in their study were providing both the selection of the action (then) and the method for carrying out this action (do). It has also been shown that procedural knowledge and game execution interact in youth baseball players (Nevett, French, Spurgeon, Rink & Graham, 1993). For example, if a child doesn't possess the ability to throw to third base then a different option will be selected in a game. A less skilled player in terms of game execution in the present study may have inferior procedural knowledge and vice versa.

The results of the canonical correlation analysis on the pretest also suggest that knowledge and skill were related. Declarative knowledge and the time variable appeared to have the greatest influence on this relationship. Higher time scores on the pretest may have resulted from a lack of declarative knowledge. Students inability to make an appropriate dodge and failure to complete the circular tackle legally may have resulted in time penalties on the pretest caused by poor declarative knowledge. They also used the back of the stick which resulted in additional time penalties. Some

students also struck the ball from beyond the restraining line which also led to a penalty.

As was the case on the pretest, the results of the canonical correlation analysis on the posttest suggest that skill and game play are significantly related. The time variable on the skill measure and the decision aspect of game play appear to have the greatest influence on this relationship. Decision-making may be linked to skill as was suggested on the pretest because players with higher time scores (indicating a lower skill level) are unable to consider certain decision alternatives because they do not possess adequate skill to fulfil these decision possibilities (Johnson, 1991). In the present study, skill time depended on the students ability to dribble effectively. Poor dribbling led to higher time scores.

French and Thomas (1987) showed in the skill test they utilized for basketball that dribbling was moderately correlated with decision-making during games. Poor dribbling ability was related to inappropriate decision-making. However, in their study knowledge was a larger factor in this relationship. The present research also had dribbling as a component of the time score on the skill test so a similar relationship may exist between the time score and the decision component of game performance.

On the posttest, the canonical correlation analysis indicates that knowledge and game play were significantly related. Procedural knowledge along with control and execution during game play appeared to have the greatest influence on this relationship.

Surprisingly, decision-making has little influence on the relationship between knowledge and game play. This is in marked contrast to French and Thomas' (1987) research which showed that knowledge had the highest relationship to quality of decisions. The lack of a relationship between knowledge and decision-making may be due to an inability to effectively measure procedural knowledge. Some motor behaviorists question whether individuals have access to their procedures used in sport contexts (McPherson, 1994). Indeed, Vickers (1990) suggests that performers may exhibit little conscious awareness of what underlies performance.

The posttest analysis showed that knowledge and skill were related. Procedural knowledge and the time variable had the greatest influence on this relationship. Recall that on the pretest declarative knowledge had the main impact in the relationship with skill. On the posttest, however, its influence was negligible. The strength of the procedural knowledge component in the posttest relationship would suggest that declarative knowledge may have been a foundation for procedural knowledge (Anderson, 1982; Chi & Rees, 1983). As expertise has improved for all performers regardless of instructional approach procedural knowledge appears to have become more of a factor. For example, students had little difficulty in timing their approach runs in order to control the moving ball from the feeder (suggesting increased procedural knowledge) on the posttest for skill. Fewer time penalties were incurred on the skill posttest as a result. Similarly, subjects also timed their shots more

effectively from behind the restraining line and subsequently avoided any time penalties on the skill posttest.

Summary of Canonical Correlation Analyses

The canonical analyses provide some interesting findings. The results show that skill and game play are related and that as time increased on the skill test (indicating a decrease in skill) effective decision-making during game play was reduced. The less skilled player would seem to have inferior decision-making ability. Skill may be a limiting factor in decision-making (French & Nevett, 1993).

Knowledge and game play are significantly related on both the pretest and posttest. Procedural knowledge and game execution offered the greatest influence in this relationship. The strength of this relationship between the selection of an action and the method for carrying it out has previously been hypothesized (McPherson & Thomas, 1989).

The relationship between knowledge and skill appears to have undergone a change as a result of instruction during this study. On the pretest declarative knowledge had the main impact in the relationship with skill. On the posttest, however, this was replaced by procedural knowledge. This finding appears to add some credence to the contention that declarative knowledge must be developed first to provide a foundation for the development of procedural knowledge within a given knowledge domain (Anderson 1982; Chi & Rees, 1983). This assumption has been questioned

recently by researchers examining skilled motor performance (Allard, Deakin, Parker & Rodgers, 1993).

Student Interview Responses

The student interview data are presented in three sections. The first section describes the students' attitudes towards the games for understanding and technique methods of instruction and their impressions of the format of a typical physical education lesson. It includes the student responses to the first five questions from the interview protocol. The second section examines their responses to questions six through eight concerning the components of game play (rules, skills, decisions and a game) that the students would teach a friend based on their experiences with field hockey. The third section includes the students responses to the final two questions from the interview protocol. It describes the pupils' perceptions of their teacher's instruction and also the students' level of motivation during the unit.

In each section it will be specified where student responses differ between the two treatments.

Student Attitudes

The first question asked the students if physical education had been any different this semester. Across both approaches students indicated that there were different teachers and that they also worked on a unit for longer than previously. The following statements reflect this perception:

> We have different people helping us.
> We've only had one thing to work on that's field hockey and usually we have more than one thing to do.
> Before we did basketball for 3-4 weeks and then we did something else.
> We do one whole unit (field hockey) through the semester this time.

In question two students were asked to describe what they did in a typical physical education lesson. There was a clear discrepancy between the pupils responses for each teaching approach. Students in the technique group indicated that there was a prevalence of drills in their classes. They suggested that a typical lesson involved drills and then playing a short game at the end. They complained that they usually only had a little time to play a game at the culmination of a class.

> First we do drills then we play a game, but we only have two to five minutes to play a game
> She (the teacher) would tell us what we were going to do and have someone demonstrate it and then she would put us into groups to do the drill and then we would probably get a game in at the end.
> We do partner drills and group drills, then we might do a scrimmage.

Students in the games for understanding group referred to their typical lesson as more game-oriented. The students suggested that they started working in small-sided games and moved into larger games.

> Sometimes we play two-on-two games and sometimes we get into two teams and play one big game.
> First we might get in small squares with 3 or 4 people and we play a miniature game and sometimes she'll stop us and tell us a different thing to do.
> We go straight into little game situations.
> We play games in little groups. Sometimes we play bigger games she stops us to tell us what we're doing wrong. Then we practice what we did wrong in little groups. We practice shooting or try out a new drill or rule in the game.

The third question asked the students what they enjoyed most about field hockey. For both teaching approaches students identified their favorite element of the lesson as game play. This finding is supported by previous action research examining student perceptions of games instruction (Burrows, 1986; Turner, in press). These studies also suggest that students enjoy participating in games more than any other element of sports instruction. When asked to specify what they enjoyed most about games students noted that they liked the concept of teamwork and being able to play in different positions. Students in the technique group indicated:

> Playing games; it's more fun than doing drills.
> I like being able to play the attacker and being able to get into the game.
> Playing games; I like how people work together and do teamwork
> Everybody works together to do one thing in a game. A lot of teamwork.

Students in the games for understanding group said:

> I like playing games, they're interesting. I like being with a team and I like trying different positions.

> I like the games the most, we're on teams and we get to practice the skills we've learned.
> I enjoy learning how to play the game. I think I like playing offense the best and being able to move the ball around and pass the ball.

Based on this interview data and the predominance of games in the understanding approach it could be argued that students would prefer more game-related instruction. The student responses to question four which asked if there was anything that they had not enjoyed about the unit add some credence to this suggestion. Students in the technique group indicated:

> I don't really like it when we have to do dribbling as a warm-up or as a practice.
> We have to pass it back and forth and it gets kind of boring because you're just passing it back and forth. You're right in front of each other and you don't really have any defense.
> I'd like to go right into the games and we have to do drills.

In general, the students had few dislikes. Half of the students who were interviewed indicated that they liked everything about the units. In responding to question four "is there anything you don't like about this unit? "Not really" was the predominant response. In the games for understanding group two students also indicated that they didn't like small group work.

> I don't like it when we have to break up into little groups when it's not necessary.
> Sometimes I don't like the little groups I'm in. I don't always get along with them.

For question five students were asked about their perceptions of their success at playing field hockey. Seven of the nine students interviewed in the games for understanding group perceived themselves as being "good" at field hockey or having "improved a lot". The other two students believed they were "OK". In the technique group three of the nine said they were "good". Four students considered themselves to be "OK" and two said that they were "poor at field hockey". The students interviewed from the games for understanding group, in general, seemed to be more confident about their ability than students in the technique instruction group.

When asked to identify what kinds of things had led to their success students in both groups identified performing well on certain skills. They suggested that they were good at passing and shooting. Pupils in the understanding group also noted that they were good at playing goalkeeper and those in the technique group claimed that they were good at dribbling. There was a subtle difference between the two groups in terms of their descriptions about these skills. In the games for understanding group the students tended to elaborate about the tactical context of the skills more than those students in the technique group.

Students in the technique group indicated:

> I know how to dribble and shoot and make good passes.
> I'm good at passing and shooting.

Students in the games for understanding group said:

> I'm sort of good at passing. If someone is open I'm good at finding who I should pass to.
> I'm good at either getting open for passes and creating space or being able to stop with the ball and look at other people for places to pass.

The second group of responses appears to indicate that an increased understanding of games may be achieved via teaching for tactical awareness, thereby empowering children to solve the various problems posed by each game situation (Mitchell, Griffin & Oslin, 1994).

Components of Game Play

Questions six through eight concerned aspects of game play. In question six students were asked to describe what rules and skills they would teach a friend. The pupils in both approaches identified similar rules: obstruction, the use of a high stick, hitting an opponent's stick rather than the ball, illegal use of the back of the stick, illegal contact with the ball using the feet, and the need to be inside the penalty circle to shoot for goal. Some stated:

> You can't use the back of your stick or bring the stick back above the waist.
> Don't let the ball touch your feet and shoot inside the circle.
> You can't turn your back against your opponent if you have the ball.
> You can't hit anybody with the stick.

Question six also asked the students to identify the skills that they would teach a friend. There was a difference in the descriptions from the two treatment groups. Students in the technique group

identified passing, shooting and dribbling and focused on giving cues for effective technique.

> When dribbling you shouldn't put the ball too far away from your stick.
> Act like the ball was glued to your stick and then just tap it.
> In the shooting range don't have a big back swing just kind of push it in.

In the games for understanding group students also suggested teaching their friend passing, dribbling and shooting skills but they emphasized the importance of tactical factors in teaching these skills. They also talked about creating space as a skill.

> Don't just shoot it right away without looking at the goal. Look at the goal and shoot it accurate and don't just shoot it as hard as you can.
> Think before you pass the ball and make sure the defense won't be on the person you're going to pass it to, and if the person is guarded by defense you should take it up yourself and try to shoot for goal.
> Look up so you can see the options, look for the open pass.
> You need to create space and movement so its harder for defenders to mark you.

Students in the understanding group would appear to recognize the importance in game performance of the combination of tactical awareness and skill execution--a prime tenet of the games for understanding approach (Bunker and Thorpe, 1986; Turner and Martinek, in press).

In question seven students were asked to describe the choices or decisions they would teach a friend about during a game. Pupils in the technique group showed little consistency in their suggestions. A variety of responses that were seldom duplicated by two students included: look for players who are open, when to shoot at the goal, decide who will take the short corners, make wise decisions, don't let the ball out of play, cooperate, spread out, and set up to shoot. Several students said:

> Just make wise decisions and don't let the ball out of play.
> Play with the rest of the team and cooperate.
> When to shoot and when not to shoot.

There was more of a consensus among students in the understanding group regarding the decisions that they would tell a friend to make during a game. These included: seeing if a player was open before passing the ball, shooting if the chance was there to shoot but avoiding the shot if it was likely to be be blocked, taking on an opponent if other players on the team were guarded or if it was likely an opponent could be beaten, creating space by spreading out wide. Students in the games for understanding group suggested:

> They have to decide whether to shoot or pass. If they're close enough and they've got a wide open shot they should take it, but if the goal is blocked and there's somebody else on your team that's wide open you should pass it to them.
> They might have to dribble up the court by themselves when everybody is guarding somebody else and they're open and they could pass it when somebody cuts to an open space, or shoot if they're open inside the circle.
> Spread out wide so they have more space to maneuver.

The student responses concerning decisions during a game seem to coincide with the results for decision-making on the game play protocol. In the first section of the results it was demonstrated that students in the games for understanding group made significantly better decisions than those in the technique group on the posttest. Decisions concerning passing and dribbling were significantly better. The interview data offers evidence that coincides with the findings from the decision-making component of the game play protocol. The data indicate that students were conscious of the necessity for good decisions during games and knew what criteria (appropriate conditions) were necessary in games to facilitate effective passing, dribbling and shooting decisions.

One example from the data above concerns dribbling: "they might have to dribble up the court by themselves when everybody is guarding somebody else and they're open." This coincides with criteria on the game play protocol for an appropriate dribbling decision: "advancing the ball up court when not closely guarded". This combination of the quantitative data and the student interview data suggests that individuals may have access to their procedural knowledge used in a sport context, a point which some motor behaviorists have questioned (Abernethy, Thomas, & Thomas, 1993).

Question eight asked the pupils to select a game to teach a friend that was similar to field hockey. Students in both of the treatment groups identified either soccer or basketball. They indicated that these games both had shooting and scoring. Students

in the technique group focused predominantly on similarities in skills (dribbling and passing).

> You have shooting into a goal, dribbling.
> You have to pass and dribble.

In contrast students in the games for understanding group suggested that you have to make similar decisions and that teammates have to make themselves ("open") available for a pass.

> You have to get open for passes and you have to make overlapping runs where if someone has the ball you can get open so they can pass it to you.
> It's more strategy. You're making the smart passes. You have to think about your passes and where they go.

In both approaches students identified two other invasion games (Thorpe, Bunker & Almond, 1984) as similar to field hockey. Soccer, basketball and field hockey are all further delineated as invasion games with a focused target (a specific fixed goal). The similarity between these games is that in all three the teams intermingle and attempt to out-score the opposing team by invading its territory (Werner & Almond, 1990).

One of the hypothesized benefits of teaching from a games for understanding perspective is that as different games are learned, strategies from one particular invasion game may be transferable to another invasion game (Turner & Martinek, in press). The interview data for students in the games for understanding group suggest that this transition of strategies between invasion games is feasible when this teaching approach is utilized.

Student Perceptions of Instruction and their Motivation

The final two interview questions concerned the students perceptions of the instructors' teaching and the students' level of motivation. For both teaching approaches the students indicated their teachers had adequate knowledge because they provided appropriate correction and were able to demonstrate. In response to the question "Did your teacher seem comfortable teaching this material?" Several students said:

> I felt like he could teach anybody and he showed us how to do stuff if any body needed help.
> She knew a lot of the skills and if you did something wrong she knew exactly how to correct stuff.
> He would demonstrate things he wouldn't just explain.

Students also noted one subtle difference, they perceived instructors as teaching both skill and strategy when they used the games for understanding approach. This was not evident in their comments about technique teaching. Students in the games for understanding group noted:

> The way he acted. By stopping the game to show us different choices we could make and showing us how to do it.
> She knew how to teach and how to tell us how to do things better with skill and strategy.

The final question asked students if they were motivated to learn field hockey and if so why this was the case. Students in the understanding group were very positive. They suggested that the activity had been fun. However, four of the students interviewed in

the technique group indicated that they were not motivated; either because they didn't like sports or because they would rather be doing a different unit. The remaining five students in the technique group were very positive about the learning experience.

Summary of Student Interview Data

The interview data provide some interesting insights into the effects of the games for understanding and technique approaches to teaching. The students clearly perceived a difference in the lesson formats of these two methods of instruction. They described the format for technique instruction as drills prior to playing a game at the end of class. Students in the games for understanding approach were cognizant that they worked in small games; practising skill and strategy in game-like settings and sometimes in bigger games.

All of the students identified games as the most enjoyable part of their physical education lessons regardless of the teaching approach. Students in the technique group expressed a dislike for static drills. On the other hand, students in the games for understanding group had slightly higher self-perceptions regarding their success in the unit.

Students in both groups identified similar rules to teach a friend about playing field hockey. Those pupils in the technique group identified specific technique cues as important for skill acquisition. In contrast, students in the games for understanding group emphasized the importance of teaching tactical factors as they related to learning similar skills. Students in this group were also

consistent in identifying certain types of tactical decisions as important for playing hockey. Pupils in the technique group were more sporadic in the types of decisions they considered to be important. These ranged from organizational decisions to strategic ones.

In identifying a similar game to field hockey students under both approaches selected similar invasion games (basketball and soccer). However, students in the games for understanding group suggested more commonalties in the tactical aspects of these games and decision-making where as pupils in the technique group saw more similarities among the skills.

Finally, students in both groups perceived their teachers as having appropriate knowledge. Those pupils in the understanding group were very positive about the unit where as half of those in the technique group were somewhat indifferent.

Teacher Perceptions

The final section of results deals with the instructors' perceptions of their teaching. They were asked to keep a journal for each class they taught. The purpose was to provide a record of the teachers' (Kerry's and Tony's) comments about their instruction each day.

The instructors focused their entries around four questions. They were also asked to make any additional comments as a response to question five. Each teacher's responses was examined

separately relative to their teaching of technique and games for understanding lessons.

The first question asked: "How did you feel about the content of your lesson under this games approach?"

For the technique lessons Kerry showed some variation in his responses. He indicated that in a third of the lessons there was ample content but that he needed to test the students a little more, particularly those students in the 7th grade. However, he also noted that: "the game at the end appeared to indicate that they were insufficiently skilled to move on much quicker".

Tony suggested that the progression of her lessons fitted her perception of the technique method of instruction. She indicated that the practices went from "static practice, to slightly more dynamic and into a game at the end--this was appropriate for the technique method."

For his games for understanding lessons Kerry indicated that there was a lot of material to cover but that the students generally worked very hard. He stated that "there was a lot to get through, but most of it could be done in the process of the games."

Tony also indicated that the content was appropriate under the games for understanding approach. She posited that it was challenging for the students to find ways of solving the problems that occurred in games. For example, pupils discovered methods to evade an opponent but still maintain possession of the ball. A salient point noted about the playing of games in previous research (Ross,

1994; Turner & Martinek, 1992). She also posited that providing specific game conditions was very helpful in teaching concepts during game play. These included giving the ball carrier four seconds to make his/her decision and also assigning one player from each team to a side line to help create space. In one of her journal entries she stated:

> I thought the four second delay of defense was an excellent task to get the offense to see the field.
> The content approached a recurring problem (width in attack) throughout this unit--very appropriate and in touch with their needs.

The second question asked of the teachers was: "What kinds of things did you do to teach the content under this approach?" The teachers' comments about the structure of the technique lessons appear to coincide with comments that the students made in their interviews. Kerry indicated that for every lesson under the technique approach he talked to the students initially about the skill, explained each drill and provided an example (demonstration). The students then practised the drill.

Tony also indicated that she used drills as the predominant mode of instruction for this approach. She also provided feedback and demonstrations as tools to facilitate skill correction. She noted the emphasis on skill execution and the transition from skill drills to a game at the end of a lesson.

Tony also suggested that in some drills a weak passer was deliberately avoided by other members of the group under the

technique instructional approach. A similar problem was noted by Nevett et al. (1993) in their study of youth baseball. For example, they noted that the ball wasn't thrown to second base because the perception of the fielders was that the second base player would drop the ball. So the young players threw it to first or third base.

In the games for understanding approach Kerry indicated that small games were the predominant mode of instruction. In small games strategies such as creating the best opportunity to score were discussed. The benefits of good control, accurate passing, and shooting at the appropriate moment were also examined. Interestingly the point about timing of the shot was also mentioned by the students in their interviews.

Kerry also talked about the importance of the teachable moment in the games for understanding approach, a point which other authors have also noted (Metzler, 1990; Werner, 1989).

> I stopped the games on a regular basis to find out from the kids why things were not going very well. I asked questions concerning the benefits of effective movement in defense and attack.

He also commented about the transition of the teaching material under the games for understanding approach:

> I started in small games, stopped the game to make points about overcrowding--conditioned the games--asked the kids why and got them to do it. I worked on small games and then a large game.

This notion of helping children to see the need for specific strategies in games is crucial to teaching games for understanding (Turner & Martinek, in press). Tony also talked about a similar method of teaching during the understanding approach--i.e., working in small games (2 versus 2). After stopping the play in these games she would discuss the situation with the students by utilizing a questioning technique.

> I froze the students in the action and tried to draw out the main points using examples which were presented during the activity.

In using the small games she imposed restrictions to cause the players to spread out on the court and support the player on the ball. She mentioned that she would often do this by "starting off in small games, restricting a player to the sideline, discussing with the students the advantages of this and repeating it in a 5 v 5 game."

Tony also discussed the combination of rules, skills and strategies and how this approach enabled these aspects to be applied in a game. An example of this approach is illustrated in the following quote:

> Short corner, rules and skills--all students had the opportunity to experience these first hand as they were applied in the game. The game emphasized cutting, good passing, stick-work and decision-making.

Question three asked the teachers to indicate how effective they were in delivering the content. For the technique approach

both teachers indicated in the majority of their journal entries that they had been fairly effective.

> I thought I'd explained what we were supposed to be doing reasonably well although the practice did not turn out to be very dynamic.
> The simple concept to get across was understood easily.

Kerry and Tony indicated that they also felt competent in delivering the content under the games for understanding approach. They suggested that their ability to intervene during game play had improved. Student task time and their interactions with the students both increased as they were more succinct in making pertinent points during instruction. In response to this question, for example, Tony said:

> I found it easier to narrow the focus and find an example in the activity relating to the lesson material.
> Students understood the need for shooting inside the circle, so delivery and reception were successful--students worked hard especially on quick releases.

Question four asked the teachers to indicate how the students responded to their instruction. Kerry indicated that there was some variability in the responses of his students during technique instruction. On some occasions he noted that the students listened to his instructions very well despite cold weather conditions. Commenting on over a third of the lessons he suggested that they showed little enthusiasm.

> At times they displayed an apparent lack of interest. They didn't really adhere to the instructions very well (boredom?).

A similar pattern emerged for Tony's perceptions of her students during "technique" teaching. She noted that for about two thirds of her lessons the students responded reasonably well. In the remainder of the classes, however, they were lethargic and lacked enthusiasm.

> Students were involved and responded well to corrective feedback. They also followed instructions and worked hard on skills.
> The students needed to be refocused a number of times. They made it worse by passing too hard and goofing off.
> They could not transfer the skills to the game.

Kerry suggested that the students responded more favorably to the games for understanding approach. However, he did not elaborate about why this was the case.

Tony also indicated that the students seemed to gain a lot from the games for understanding approach. She posited that it really made them think about what they were trying to do during games and that they could understand the major points from practice scenarios with little prompting from her. She also felt their tactical understanding was much improved. The following statement reflected her perception:

> They responded well and can hit the main points without very much leading from me. Students are relating answers to their own experience rather than regurgitating my information.

> This group really tried to figure out different ways of getting past opponents. They contributed a great deal. They also used "shadowing" successfully to delay the offense.
> Students also enjoyed the lesson and interacted freely during instruction and contributed by indicating what they experienced.

The final question asked the teachers if they would like to make any additional comments about their lesson. The purpose of this question was to allow the teachers to comment on anything about the lesson that they considered to be pertinent.

In a number of his entries for technique teaching Kerry commented that the students were eager to get into a game situation. This appears to augment the data from the student interviews which showed that the part of the lesson the students enjoyed the most was game play. There were also comments indicating the students worked hard. These were offset, however, by other entries which suggested the students were distracted by other factors, (someone's birthday or the warm weather).

> Right from the start they were eager to get into a full game situation . . . . their tackling has improved, but their game play strategies are still poor!
> It was warm in the gym, and some of them were more worried about getting a drink than attending to the skill drills.

Tony's additional comments on the technique approach also provide some interesting information. She indicated that there was a decrease in skills during game situations. She also noted that

students exhibited reasonable enthusiasm but that they tended to be more attentive during drill practice at the start of a class.

> When the drill was new at the beginning of class students were more focused. I saw that once in the game many passes were rushed and wasted.

In commenting on his games for understanding classes Kerry noted that sometimes the success of the practices was dependent on how the students were grouped for the small games and practices. In general, he suggested that there was good progress and that students were able to apply strategies in game situations.

> The success of this class in terms of how well they get through the work is highly dependent on how we split them into groups. There is a big discrepancy between 5 or 6 very able kids and 3 or 4 not so able.
> Practices went well and a few in particular showed a high level of ability in the small games.
> Being in the game situations seemed to increase the salience of the points we were trying to get across.

Tony also indicated that there was a very good use of tactics by the students in her games for understanding classes. She stressed the importance of teaching concepts in games but noted that the students were longing for a big game. She also commented on their willingness to take on new ideas.

> Each time new material is presented the students are willing to take on the challenge. Students took initiative and tried different ways of spreading the field. Students worked hard and seemingly enjoyed the openness of the tasks.
> They really enjoy full court games and ask for them.

Summary of Teacher Perceptions

For technique lessons the teachers indicated that the material was adequate and that their was a smooth transition in their lessons from static drills to game play. For this approach both teachers indicated that the lessons incorporated basic skill instruction including demonstrations and feedback, and culminated in game play at the conclusion of a lesson. Both teachers considered themselves to be fairly effective in delivering the content under this approach. They also suggested that in one third of their lessons the students lacked enthusiasm and had to be refocused on the tasks. The instructors commented that the students were very eager to get to the game in the lesson. A point which previous action research has also established about this teaching approach (Turner, 1993). The teachers also noted a deterioration in their students' skill level during game play.

For their games for understanding lessons the teachers indicated that there was plenty of material to cover and that the use of problem solving and specific conditions (i.e., one player from each team on the sideline) during games were beneficial teaching strategies to illustrate concepts (e.g., width in attack). They both indicated that teaching took place predominantly in small game situations and that a combination of skill and strategy instruction occurred in these scenarios. They also mentioned the use of questioning and teachable moments as integral components in this teaching strategy. Kerry and Tony suggested that these methods

helped to initiate discussion and enhance the students' ability to think. Both teachers felt they were effective in delivering the material. They believed their students' tactical understanding improved. They also indicated that it was important to group students of similar ability together and that the pupils were willing to experiment with ideas under this approach.

CHAPTER IV

SUMMARY, CONCLUSIONS, IMPLICATIONS FOR TEACHING AND RECOMMENDATIONS

Summary

The following findings are based upon the data and their analyses. They are offered within the limitations of this research. The findings are organized in response to the questions that structured the study.

1. Are there any significant differences among the games for understanding, technique and control groups regarding the development of game playing ability (control, decision-making, and execution) in middle school children?

This study found significant differences among the games for understanding, technique and control groups for the control and decision-making variables during game play on the posttest. The games for understanding group was significantly better at controlling the ball and making passing and dribbling decisions than the other two groups. There was also a main effect for game execution. The games for understanding group was significantly better at passing and tackling execution than the technique group. This difference

remained constant from pretest to posttest and no interaction effect resulted from the treatments over time.

2. Are there any significant differences among the games for understanding, technique and control groups regarding the development of declarative and procedural knowledge related to game play?

The games for understanding and technique groups scored significantly higher than the control group for declarative knowledge on the posttest. The games for understanding group scored significantly higher than the technique and control groups for procedural knowledge on the posttest. No significant differences were found among the groups on the declarative or procedural knowledge pretests.

3. Are there any significant differences among the games for understanding, technique and control groups regarding the development of specific field hockey skills?

There were no significant differences among the groups for the accuracy variable. A significant effect was found between pretest and posttest for time, on the time variable, but the accuracy component of the skills test did not indicate a significant change. A significant interaction effect was found between the teaching approach and time variables but a post hoc analysis failed to locate any significant differences among the three groups on the pretest or posttest. The failure to find a significant difference appears to be attributed to disparate variability within each of the three groups.

4. Are there significant relationships among game playing ability, (control, decision, and execution), hockey knowledge, (declarative and procedural), and skill (accuracy and time)?

The canonical analyses show that skill and game play are significantly related on the pretest and posttest. As time increased on the skill test (indicating a decrease in skill) effective decision-making during game play was reduced. The less skilled player would seem to have lower decision-making ability.

Knowledge and game play were significantly related on both the pretest and posttest. Procedural knowledge and game execution offered the greatest influence in this relationship. The strength of this relationship between the selection of an action and the method for carrying it out has previously been hypothesized (McPherson & Thomas, 1989).

The relationship between knowledge and skill appears to have undergone a change as a result of instruction during this study. On the pretest declarative knowledge had the main impact in the relationship with skill. On the posttest, however, this was replaced by procedural knowledge. This finding appears to add credence to the contention that declarative knowledge must be developed first to provide a foundation for the development of procedural knowledge within a given knowledge domain (Anderson; 1982; Chi & Rees, 1983).

5. What perceptions do students hold about the games for understanding and technique models of instruction?

The students perceived a difference in the lesson formats of these two methods of instruction. They recognized the format for technique instruction as drills followed by a game at the end of a class. Students in the games for understanding approach were cognizant that they worked in small games, practising skill and strategy in game-like settings and sometimes in bigger games.

All of the students identified games as the most enjoyable part of their physical education lessons. Students in the technique group expressed a dislike for static drills with no defense. Students in the games for understanding group had slightly more positive self-perceptions regarding their success in the unit.

Both groups identified similar rules to teach a friend about playing field hockey. Upon selecting specific skills to teach a friend students in the technique group focused on specific technique cues for the skill. In contrast, students in the games for understanding group emphasized the importance of teaching tactical factors as they related to learning similar skills. This group was also consistent in identifying certain types of tactical decisions as important for playing hockey. Pupils in the technique group showed more variation in the types of decisions they considered to be important. These ranged from organizational decisions to strategic ones.

The pupils in both groups selected basketball and soccer as similar games to field hockey. Students in the games for

understanding group suggested more commonalties in the tactical aspects of these games and decision-making, where as pupils in the technique group saw more similarities among the skills.

Students in both groups perceived their teachers as having adequate knowledge to teach the hockey unit. Those pupils in the understanding group were very positive about the unit where as half of those in the technique group were somewhat indifferent.

6. What do the teachers perceive about their delivery of the games for understanding and technique models of instruction?

For technique lessons the teachers indicated that the material was adequate and that their was a transition in their lessons from static drills to game play. For this approach both teachers indicated that the lessons incorporated basic skill instruction including demonstrations and feedback, and culminated in game play. The teachers considered themselves to be fairly effective in delivering the content under this approach. They also suggested that in one third of their lessons the students lacked enthusiasm and had to be refocused on the tasks. The instructors commented that under this approach the students were very eager to get to the game in the lesson. The teachers also noted a deterioration in their students' skill level during game play.

For the games for understanding lessons the teachers indicated that the use of problem solving and specific conditions (i.e., one player from each team on the sideline) during games were beneficial teaching strategies to illustrate concepts (e.g., width in attack). They

both indicated that teaching took place predominantly in small game situations along with a combination of skill and strategy instruction. They also mentioned the use of questioning and teachable moments as components in this teaching strategy that helped to initiate discussion and enhance the students' ability to think.

Both teachers felt they were effective in delivering the material. They believed their students' tactical understanding improved under this approach. They also indicated that pupils were willing to experiment with ideas.

Conclusions

This study measured certain characteristics of cognitive strategies and motor skill in the hockey performance of middle school students. On the basis of this research significant differences were found between the technique and games for understanding methods for teaching field hockey. Students in the games for understanding group were better at controlling the hockey ball during a game and made superior tactical decisions compared to students in the technique and control groups. These findings appear to help validate the games for understanding model of instruction.

The results for game play are very interesting in light of previous research which suggests that the major component of performance that discriminates child expert and novice players is decision-making (French & Nevett, 1993; French & Thomas, 1987). Response selection and decision-making have to be learned in high strategy sports (Thomas, 1994) and an instructional approach that

facilitates the transition in decision-making from novice to expert is invaluable (Housner & French, 1994). The present research indicates that teaching games for understanding may assist in this process to a greater extent than the technique approach to games instruction.

Although there was a significant difference between the games for understanding and technique groups in terms of game execution there was no interaction effect with the treatments over time. These results suggest that while students in the games for understanding group were capable of making more correct decisions in specific game situations they were not always capable of executing the decisions effectively in their game performances. The "what to do" and "how to do it" distinction that Bunker and Thorpe (1982) highlight in stage 4 (decision-making) of their model may be unique to complex motor skills, unlike verbal skills where knowing what to do is enough (Magill, 1993).

The focus on teaching tactical awareness and decision-making prior to skill execution is clearly a tenet of the games for understanding model. If an incorrect decision is made then the skill cannot be effectively executed in the game. This study has validated the games for understanding model by showing that decision-making can be taught more effectively under this teaching approach than by using the technique teaching approach.

This study also showed that for both technique and games for understanding groups declarative hockey knowledge improved over the course of the study. This is very important since it is suggested

that for younger athletes knowledge is potentially the major factor in determining game performance (Abernethy, Thomas, & Thomas, 1993).

An individual's knowledge appears to proceed from a less sophisticated declarative form to a more developed procedural form. The games for understanding approach reflects this premise with its emphasis on game appreciation (stage 2) and tactical awareness (stage 3) prior to decision-making (stage 4). The games for understanding group scored significantly higher for procedural knowledge than the technique and control groups. This finding indicates that teaching games for understanding can provide students with more advanced production systems that define particular game situations and the actions to be implemented in response to these situations. Students were put into game-related environments and taught how to match game conditions with the selection of appropriate responses in the context of games. The importance of procedural knowledge to success in high-strategy sport is evident (McPherson & Thomas, 1989) and the need for instructional strategies that lead to the development of effective procedures should be a major goal for youth sport (Thomas, 1994). Teaching games for understanding may provide a viable solution.

The results also indicated that for hockey skill there was a significant pretest and posttest difference for time on the time variable. However, there were no significant differences between the treatment groups for the time or accuracy components of the

skills test. These data suggest that the change in emphasis from a technique to a games for understanding approach does not adversely affect subjects' performances on specific field hockey skills. Previous research (Lawton, 1989; Rink, French & Werner, 1991) also supports this hypothesis.

In contrast, the knowledge and game play results favor the games for understanding approach. This suggests that the processes used when learning the larger game or sport may be quite different from learning a motor skill alone (Housner & French, 1994). Therefore, the contextual nature of the model with its focus on instruction in game-like contexts appears to enhance its validity.

The student interview data indicate that the pupils were able to delineate between the lesson formats for technique and games for understanding teaching. Regardless of the instructional approach, students enjoyed game play more than any other aspect of the lesson. Upon selecting specific skills to teach a friend students in the technique group focused on specific technique cues for the skill. However, in high-strategy sports, like field hockey, the student has to contend with changing task demands and the defense-offense interaction. An understanding of strategic factors is important. Students in the games for understanding group emphasized the importance of tactical factors as they related to learning skills.

Given the above, these same students were consistent in identifying certain types of tactical decisions as important for playing field hockey. Pupils in the technique group, on the other hand, were

more sporadic in identifying decisions which ranged from tactical to organizational selections. These findings coincided with the results from the decision-making component of the game play protocol and the procedural knowledge scale. They suggest that students in the games for understanding group made better decisions in games. The interview data also indicated that they were aware of the importance of decision-making during game play.

Students in the understanding group also recognized commonalities in tactical aspects of similar games where as technique group students noted similarities in skills. Of the students interviewed those in the games for understanding group were more positive about their field hockey experiences than those receiving technique instruction. More enthusiasm seemed to be generated among students when a teaching for understanding perspective was adopted.

The teachers in this study clearly recognized the differences in the instructional formats of the treatments. Students were apparently less enthusiastic during technique teaching and their skills were more prone to deteriorate during game play. Teachers noted the use of problem solving and specific conditions during games for understanding teaching as beneficial strategies to illustrate tactical concepts. They contended that students' tactical awareness was enhanced as a direct result of teaching for understanding. They also indicated that students enjoyed games the most regardless of the teaching approach.

Implications for Teaching

In teaching games for understanding the "ball roller" approach is not advocated. Timely teacher intervention in the game situation is critical (Hellison & Templin, 1991). It takes considerable pedagogical skill and needs a lot of practice. Tactics and strategies have to be understood first by the teacher, and introduced to students in language and through imposed conditions that can be easily comprehended. At every step in the games for understanding approach the learner is shown how a concept fits into the larger context of the game. Critical for the teacher is the ability to build a modified game which can assist the players understanding. The modified game must preserve the contextual nature of the game, but not place too great a technical demand on the players in the early stages. It takes a talented teacher to know what game situations will yield games of appropriate difficulty and when to make suggestions (Werner, 1989). As a student in one of the games for understanding groups noted in an interview in this study: "the teachers, they understood when you had a problem in a game and they helped us work it out."

In teaching for understanding in the present study the teacher's assistance to students took several forms. Simplifying the problem was one form of assistance. Using a three against one game situation in a defined area (20 X 10 yard grid) presented the opportunity to emphasize the essential points in possession play to

the students. Questioning was another instructional method used to assist the students' tactical understanding and decision-making.

The use of imposed conditions during the games for understanding curriculum helped the children to see the importance of specific game tactics (using a two-touch condition--one touch to control the ball and one touch to pass--to show that passing quickly will cause defenders a problem because they have little time to adjust their positions). Similarly, in another condition the ball carrier was allowed 4 seconds (when he/she stood still) before a tackle could be made by an opponent. This provided adequate time to make a decision about who to pass to; teammates were then asked: "So how can other players help in this instance?" "By moving to space to get open." The 4-second condition was later removed but looking for an open player to pass to was still emphasized. The children subsequently appeared to take their time to make a decision when they were not under pressure from an opponent. Teammates also moved quickly into supporting positions to help the player in possession of the ball.

This study suggests that using these types of instructional methods as a part of teaching games for understanding can help students make correct tactical and strategic decisions that better equip them to play games. Thomas (1994) has indicated that effective decision-making and developing procedures should be a major goal for teaching games and sports. However, highly developed productions may not develop until children can practice

and use strategy/skill combinations in actual game play. The present study identified a number of practices that teachers and coaches can use that are implied in the games for understanding teaching approach:

- Explain why a strategy is needed.
- Discuss and practice different tactical options in game-related situations.
- Practice procedural knowledge and skill execution together.
- Encourage skill development, but reward players who select the correct response even if the execution is not perfect.
- Teach rules and strategies together so that each player's understanding is enhanced.
- Stress the importance of developing both game understanding and skill improvisation within the context of the game.

Recommendations For Future Research

The findings of this study suggest some substantiation of the validity of the games for understanding model. However, research must continue with increased refinement. Future research should be bounded by several considerations. One consideration would be to describe the interconnections between various stages of the model. While the model assumes linear direction among the stages, little is known about the relative impact each stage has on one another. For example, one could study how (or if) the experience of the game (Stage 1) impacts on the students appreciation of the game (Stage 2). Or how does game appreciation relate to tactical awareness (Stage

3)? An extension of this type of inquiry might also include the identification of various instructional strategies that influence each stage (Turner & Martinek, in press). By knowing this, more credible information about the model's utility can infuse into inservice delivery programs.

Continued research will also require an improvement in the sophistication of the tools needed to determine the power of the games for understanding approach. For example, ways of determining if there is a more global impact on knowledge development. This study used only domain specific questions to determine the hockey knowledge of the learners. Future inventories should also include items that describe general problem-solving ability (i.e., metacognitive or strategic ability). Having this information will have important implications regarding carry-over effects to other settings beyond the walls of the gymnasium and athletic field.

Moreover, the assessment of decision-making ability needs broader application in future investigations. This study described those decisions that were made by performers who were executing a predetermined skill (e.g., passing a hockey ball). Little is known, however, about those who are indirectly involved offensively or defensively but must make decisions about where or when to move or who to guard. Thus far, the view of decision-making has been rather restricted and has failed to look at all decisions and their interrelationships.

The magnitude of this issue was put into perspective by Hughes (1980) who noted that in a 90-minute soccer game the ball is only in play for about 60 minutes. In an even game each team will have possession of the ball for 30 minutes. During this time the ball is often in flight and outside of the playing area of any one of the 22 players. An individual player in a team, on average, cannot have possession of the ball for more than two minutes. What is the player doing for the other 58 minutes that the ball is in play? Making judgements, decisions and selections.

The assessment of these decisions requires observation of participants when they are not in possession of the ball. Some form of systematic observation is warranted. The Game Performance Assessment Instrument (GPAI; Griffin, Oslin & Mitchell, 1993) is currently being developed. The GPAI may provide a way for coding performance that demonstrates an understanding of tactical problems and the ability to solve them by selecting and applying appropriate responses. Movement off the ball to support a teammate is a critical variable for observation by this instrument.

Investigations also need to extend the present research on the effectiveness of the games for understanding and technique interventions by describing how these treatments are mediated by students cognitive processing strategies. For example, Good and Brophy (1990) have suggested that the conceptual tempo (a type of learning style) of a student has a significant impact on decision-making during learning. Conceptual tempo refers to two types of

psychological dispositions that a student might have: one that is impulsive and the other that is reflective. According to Good and Brophy cognitively impulsive students respond quickly when given several options from which to choose. That is, little thought may be given to the differences existing among the options. Reflective thinkers, on the other hand, tend to study the differences carefully before deciding which one to select. These two concepts could have variable effects on learning where providing game-like situations and spontaneous decision-making opportunities are the standard mode of instruction. The extent to which these as well as other cognitive styles interact with the effectiveness of games for understanding and technique approaches remains empirically untested.

Another important consideration in future research relates to the teacher's ability to use the games for understanding approach. In teaching games for understanding tactics and strategies peculiar to specific games have to be understood first by the teachers, and introduced to students in language and through imposed conditions that can be easily understood. Hellison and Templin (1991) note that timely teacher intervention in the game situation is crucial to this approach. Transmitting knowledge to learners so that it is easily comprehended has become known as "pedagogical content knowledge." Future research into games for understanding might focus on identifying the effectiveness of types of pedagogical content knowledge utilized by teachers to deliver subject matter to students

under this approach. Research might uncover what knowledge, cognitive and motor processes to teach and how students can be best helped to acquire cognitive and motor skill.

Finally, while both cognitive and psychomotor areas have been the primary focal points of past studies the present research also examined the affective domain. The student interview data in the present study together with previous action research (Burrows, 1986; Turner, in press) refer to the affective component as one of the most apparent benefits that can result from adopting a games for understanding approach to instruction. However, Lawton (1989) examined this area in his study but failed to find conclusive evidence for this hypothesis. Future research could utilize specific instrumentation such as the Physical Activity Enjoyment Scale (Kendzierski & DeCarlo, 1991) and the Intrinsic Motivation Inventory (McAuley, Duncan & Tammen, 1989) to assess affective variables. This would provide a more extensive profile emerging from a games for understanding approach to physical education instruction.

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APPENDICES

APPENDIX A

INFORMED CONSENT FORM

December 1, 1993

Our Lady of Grace School

Dear Parent/Guardian:

The purpose of this letter is to ask for permission for your child to be videotaped during research on their physical education classes at Our Lady of Grace School. The reason for videotaping is to study the type of game skill instruction that is provided during physical education classes by your child's physical education teacher.

In order for your child to be videotaped please complete the form below and return it to your child's teacher by December 8th.

To be returned to your child's teacher by December 8th.

My child_____ has my permission to be videotaped during physical education.

___ I do not give permission to videotape my child.

_____
Parent/Guardian

APPENDIX B

LESSON PLANS FOR TEACHING

TECHNIQUE AND GAMES FOR UNDERSTANDING CLASSES

Technique Approach

Lesson 1

Grip (basic dribble)
Teaching points: (1) Keep ball glued to stick. (2) Left hand top Right hand low. (3) Rotate stick through bottom hand.

Free dribble.

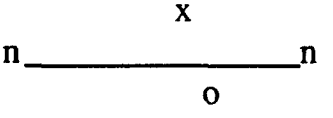
Footwork and body position.
Teaching points: (1) feet spread. (2) Knees bent - back straight. (3) Face of stick in contact with ball. (4) Eyes forward - ball in vision. (5) Shuffling movements of the feet.

Free dribble.
Reverse stick and stop (on teacher command).

"Policeman" (teacher directs- students follow).
Move to the left. In order to move to the right reverse the stick.
Rule - Cannot use back of the stick.

Follow Your partner (scatter formation).

Beat partner to the side.



Begin opposite partner.
Attempt to reach the cone before your partner.
Stay on your side of dotted line.
Teaching points: (1) keep shoulders square (obstruction rule).
(2) Reverse stick to change direction.

6 v 6 (whole group gameplay).

Technique Approach

Lesson 2

Push Pass
Teaching Points: (1) Right hand low on stick. (2) Step and push from right leg, transfer weight to left leg. (3) Ball level with left foot. (4) Finnish low, stick at full stretch. (5) No backswing.

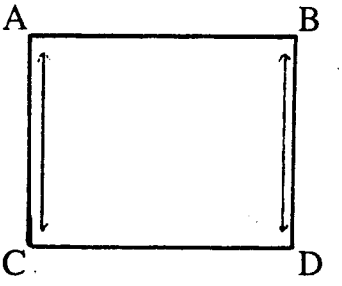
Receiving the ball.
Teaching Points: (1) Get in line with ball, (2) Stick on ground - right hand low down on stick. (3) Stick vertical, give with the ball.

Four players in grid square

One ball between two players

A pushes ball to B

C pushes ball to D
Lines show accuracy of passes

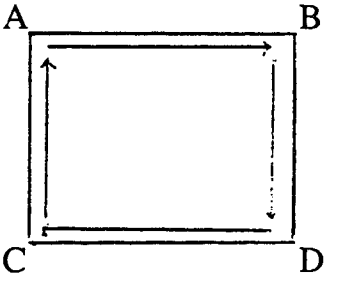


Four players in grid square

One ball between four players

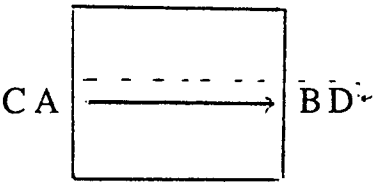
Push ball along lines of square

Clockwise and counter-clockwise



Four players in one grid square
One ball

A passes to B then runs behind D
D passes to C then runs behind C
Likewise C and D



Once they have got the idea
Task application-- count number of passes in one minute.

6 v 6 (full group) game.

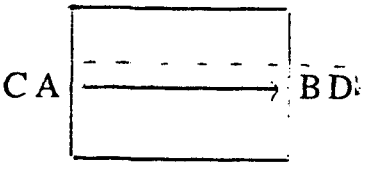
Technique Approach

Lesson 3

Passing, receiving and moving
Review Teaching points for passing and receiving.

Four players in one grid square
One ball

A passes to B then runs behind D
D passes to C then runs behind C
Likewise C and D



Once they have got the idea
Task application-- count number of passes in one minute.

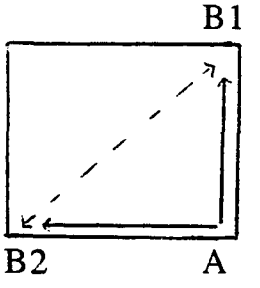
Two players in one grid square
one ball

A pushes ball to B at B1

B returns ball to A and runs to B2

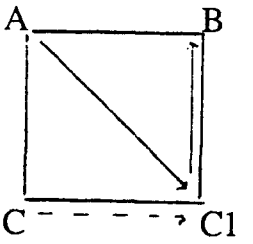
A passes ball to B2

B sends ball back to A and returns to B1



Once they have got the idea
Task application-- count number of passes in one minute.

Three players in one grid square



One ball

A passes to C1

C moves to collect and passes to B

Repeat from B with C moving back to start and passing from A

6 v 6 (full group) game.

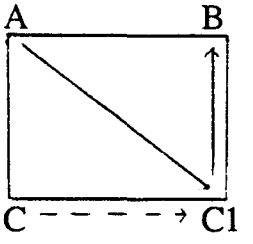
Technique Approach

Lesson 4

Review Push Pass
Teaching Points: (1) Right hand low on stick. (2) Step and push from right leg, transfer weight to left leg. (3) Ball level with left foot. (4) Finnish low, stick at full stretch. (5) No backswing.

Receiving the ball.
Teaching Points: (1) Get in line with ball, (2) Stick on ground - right hand low down on stick. (3) Stick vertical, give with the ball.

Three players in one grid square



One ball

A passes to C1

C moves to collect and passes to B

Repeat from B with C moving back to start and passing from A

In pairs push to partner

1 v 1 try to push ball past partner

Open grid (group moving all over large grid with partner)

Pass and move
(pass to partner and move into new grid)

Practice stopping ball on teacher's command

6 v 6 full game.

Technique Approach

Lesson 5

Free dribble (revise previous teaching points)
Stop and go on teachers command.

Partner leads, follow partner with ball where ever he/she can go. On teacher command stop. Can you touch partner with your stick. If so good control. Switch over; repeat with a different partner.

Practice change of speed when dribble, get close to person and move quickly away, also change of direction.

Go through slowly with them

(1) 1 v 1 Teach front tackle.
In general space:

Teaching points: Attacker approaching. (1) Tackler ready, crouching. (2) Feet spread, ready to move forward or back. (3) stick on ground. (4) Take ball and stick.

(i) Attempt to win the ball by hooking ball away from opponent (demonstrate).

(ii) As (i) but this time take ball and stick in tackle.
NB. When tackling, stick should be close to ground--no backswing. Any contact with opponent's stick or body before the ball is an infraction of the rules.

(iii) Bulldog tackle
2-3 tacklers attempt to rob players of hockey balls as they move across open grid.

Rules:
(1) No backsticks.
(2) "Feet" - avoid contact of any body parts with the ball.
(3) Cannot support stick with your leg in order to resist opponent.

(4) No hitting opponents stick with your stick.
(5) Obstruction.

6 v 6 game.

Technique Approach

Lesson 6

Review front tackle

Teaching points: Attacker approaching. (1) Tackler ready, crouching. (2) Feet spread, ready to move forward or back. (3) stick on ground. (4) Take ball and stick.

Rules:
(1) No backsticks.
(2) "Feet" - avoid contact of any body parts with the ball.
(3) Cannot support stick with your leg in order to resist opponent.
(4) No hitting opponents stick with your stick.
(5) Obstruction.

Teach Open tackle

In pairs along grid line.

Demonstration.
Dribbler on the right of the sideline at the end
Tackler behind him/her his right (open side).

Both start to go to the other end of the grid--tackler chases and makes a one handed jab to winkle the ball of its course.

(i) Repeat with other partner being tackled.

(ii) Bulldog tackle
2-3 tacklers attempt to rob players of hockey balls as they move across open grid.

Full game 6 v 6.

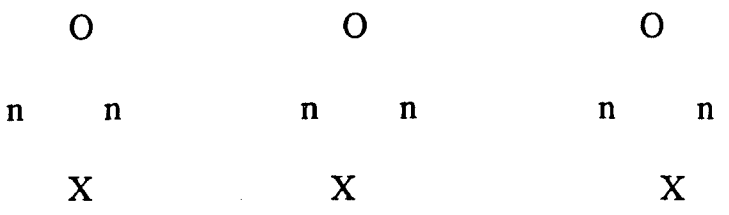
Technique Approach

Lesson 7

Shooting

In 10 X 20 grids
With a partner. (1 ball per group)
Push the ball through the cones to score. 1 point for each successful shot.

Control before shoot, try to ensure good first touch and then shoot.



Progression: narrow the distance between the cones.
Teaching points: (1) Accuracy before power. (2) Shoot for the corners.

Add Goalkeeper between the cones.
* Goalkeeper can use stick and feet to stop the ball.

In 40 x 30 grid
6 v 6 game

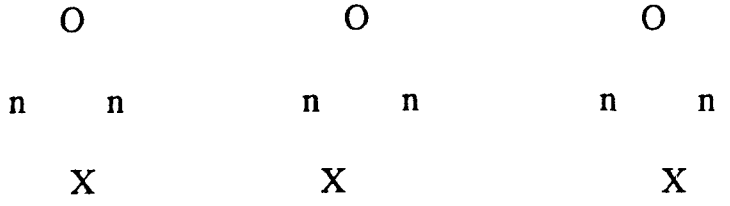
NB. Rule: to shoot must be inside circle.

Technique Approach

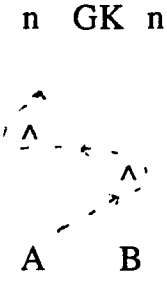
Lesson 8

Revise shooting

Revise using goalkeepers and shooting practice from previous lesson with goalkeepers.



Dribble around cones and shoot at goal.



6 v 6 Full game.

Technique Approach

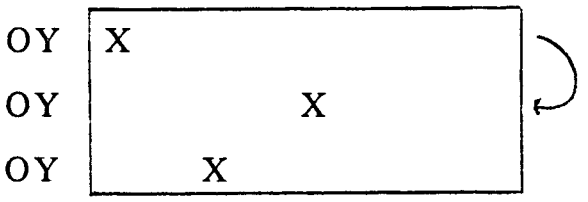
Lesson 9

Teach support in attack

(1) Open grid pass and move with a partner

Talk about timing pass when no other people in the way.

(2) In 3's



Pass between 3 x's from one end of the court to the other. When get to end return to back of line. Every player must touch the ball twice before reach the end.

2. (a) Try with team turning round and coming back with next team going for first time.

3. Repeat as above but this time a defender will attempt to intercept ball.

4. Try with two defenders as in bulldog tackle.

Full game: 6 v 6

Technique Approach

Lesson 10

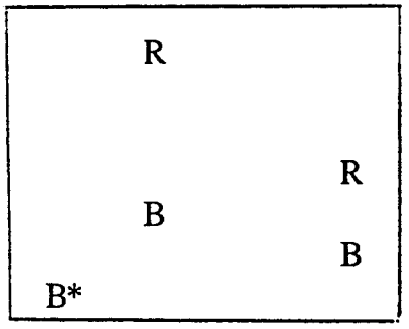
In 3's pass and move all over grid avoiding other players

5 Players

Half pitch area

3 v 2 (3 blue, 2 reds)
One of the members of the blue team starts with ball. Blues score by making 5 passes, (normal rules). The reds score by intercepting the ball.

3 attempts to score. If ball intercepted or goes out of grid counts as one attempt.



The 5 passes don't have to involve all 3 blue players.

Demonstrate to the blue team that the timing and direction of the pass is all important.

Full game
Re-emphasize the above point while students are playing the game. Stop game to demonstrate.

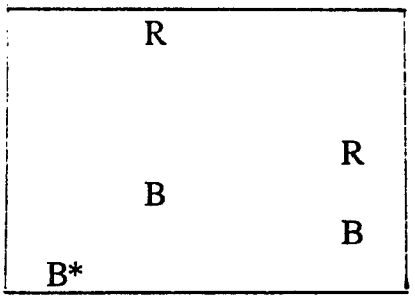
Technique Approach

Lesson 11

Half pitch area

3 v 2 (3 blue, 2 reds)
One of the members of the blue team starts with ball. Blues score by making 5 passes, (normal rules). The reds score by intercepting the ball.

3 attempts to score. If ball intercepted or goes out of grid counts as one attempt.

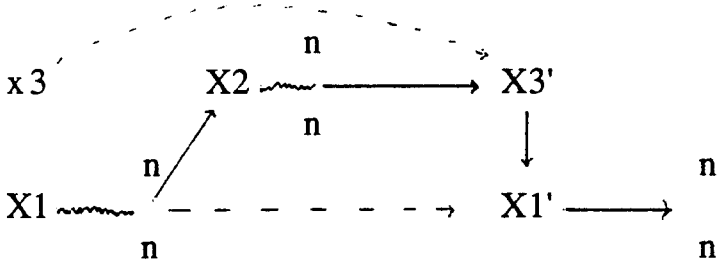


The 5 passes don't have to involve all 3 blue players.

Demonstrate to the blue team that the timing and direction of the pass is all important.

Players X1, X2, X3

Player X1 dribbles the ball through the cones passes to X2 who dribbles through the cones and passes to X3 who has moved ahead of X2. X3 passes the ball back to X1 to shoot at the goal



3 trials then rotate positions X1 becomes X2, X2 becomes X3 and X3 becomes X1.

6 v 6 Full game.

Technique Approach

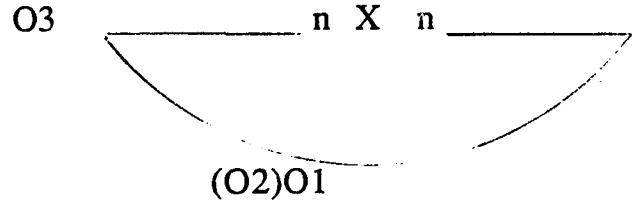
Lesson 12

Short corner
For all offenses inside the circle except those that directly prevent a goal from being scored. Make sure students understand what these rules are:

In this instance a penalty stroke is awarded.

Demonstrate technique for taking the corner.

(i) To begin with set up with a goalkeeper and 3 attackers.



Attackers (0's) align outside the circle. Cannot enter the circle until the ball has been struck. The ball must be stopped before it is hit for goal. (Demonstrate how this is done).

O3 Push the ball with the care of a pro-golfer.
Line up left shoulder with stopper's stick. Follow through with stick a little further than normal. O1 The target is the stopper's stick.

O1 stopper- eyes on ball all the time. Bottom hand low on stick. Reach cushion to begin with and then immediate stop.

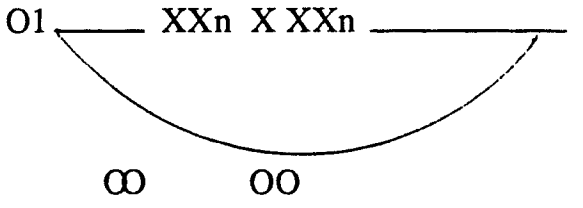
02 striker-eyes on the spot where the ball will be stopped.--shoulder pointed to target. Short step on to the ball and push for goal.

rotate positions.

(2) Practice from both sides

Defenders and goalkeeper assemble behind the goal line. (NB. in full 11 v 11 game only 5 defenders are allowed behind the goal line, the rest must be at the half-way line).

Attackers (0's) align outside the circle.
Defenders (x's) cannot move over the goal line until O1 has passed the ball. The ball must be stopped before an attacker can shoot at the goal.



All attackers must be outside of the circle prior to the ball being struck initially.

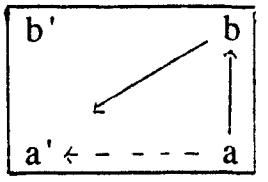
6 v 6 game - Integration of short and long corners.

Technique Approach

Lesson 13

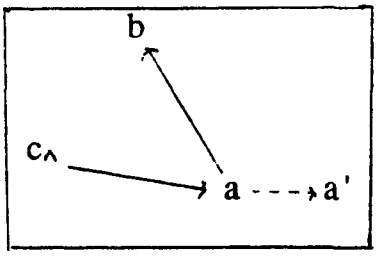
Creating space

(a) Pass ball to partner (b) as below.
B must control and pass to space for (a) to move to.



As above but this time c is defender as in diagram below.

C starts at cone passes the ball to "a" and waits for "a" to pass the ball to "b" before moving to "b" and attempting to tackle "b". "a" should then move to space to receive a return pass from "b". When passing breaks down players should return to start positions.



Go to full game
Emphasize attackers passing to space for teammates to run on to.

Players support ball carrier.

Technique Approach

Lesson 14

Teach penetration in attack

Passing in pairs (open grid)
Emphasize push pass teaching points for partner to run on to. Pass ahead of teammate.

At the attacking end use direct through passes towards the goal. As in the example below:

Set this situation up
3 Students
X1 has the ball X2 makes the run past the cone to receive the ball and shoot

n GK n

X2 O

X1

(1) the effectiveness of the penetrating pass depends on the understanding between the player in possession of the ball and the receiver. The timing of the run (receiver) and the timing of pass by the player in possession.

Back to full game play
Condition the game (two touches--1 to control, 1 to pass) will encourage quick release of ball. Want supporting players to make attacking runs.

The value of penetration

1. The shortest route between two points and thus the quickest;

2. It can achieve a quick break which does not allow the opposition time to reform;

3. If used when appropriate it can give the attacking team a chance to have more players in attack than the number of players the opposing team has in defense i.e. numerical superiority.

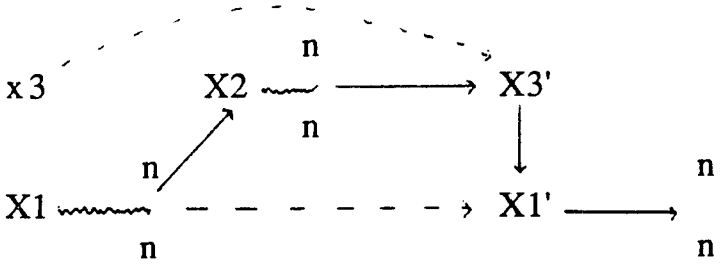
Technique Approach

Lesson 15

Review width in attack

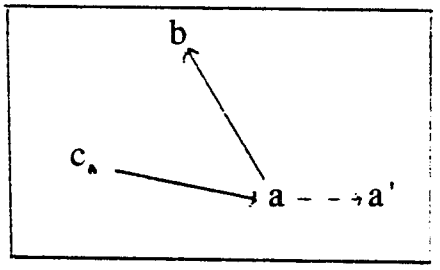
Players X1, X2, X3

Player X1 dribbles the ball through the cones passes to X2 who dribbles through the cones and passes to X3 who has moved ahead of X2. X3 passes the ball back to X1 to shoot at the goal



3 trials then rotate positions X1 becomes X2, X2 becomes X3 and X3 becomes X1.

C starts at cone passes the ball to "a" and waits for "a" to pass the ball to "b" before moving to "b" and attempting to tackle "b". "a" should then move to space to receive a return pass from "b". When passing breaks down players should return to start positions.



Go to full game

Games for Understanding Approach

Lesson 1

2 v 2 games (score by controlling ball over end line) 20 x 10 grids. Make sure they stay in boundaries.

1 v 1 games (score by controlling ball over end line) 8 x 12 grids. Try to pair them with a student of similar ability.

Let them play (show obstruction why impossible to play the game if obstruct) use example from their games.

Teach need for rules about "feet" and "sticks"

What do you need to do to score?

Get past opponent.

(1) push ball to reverse side past opponent (strategy go to his/her right)--demonstrate
(2) Change of pace.

Let them play again.

What might help you beat your opponent?
Fake ball to one side and go to the other.
Encourage defender to go for ball.

If extra student encourage them to referee. Let them play.

1 v 1 games with small goals.

Games for Understanding Approach

Lesson 2

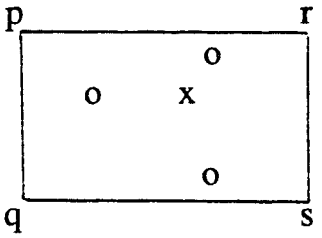
2 v 2 games (20 x 10 grids) small (1 yard goals) no goalkeepers.

Teach them to referee themselves
(feet, backsticks, obstruction)

Encourage only 1 person from each team to challenge for the ball.

Problems in games (creating space)
O with the ball should draw the defender and then slip the pass to a teammate.

3 v 1 & direction - in 2 grids. Three score by controlling the ball over the end line r,s.



O draws defender x and passes to teammates in order to score. X attempts to tackle and pass the ball over the line p,q.
Teammates position in space. Square of passer or penetrate past defender to receive pass. Talk about angles.

Teach push pass if need arises. 1 with 1 is ok if that is what seems appropriate but move quickly to 3 v 1 again.

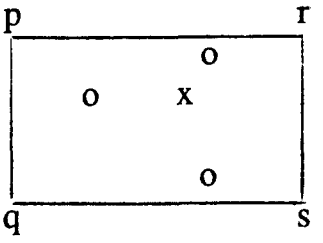
3 v 3/ 2 v 2 games.

Games for Understanding Approach

Lesson 3

3 v 1 & direction - in 2 grids. Three score by controlling the ball over the end line r,s.

Encourage good refereeing



O draws defender x and passes to teammates in order to score. X attempts to tackle and pass the ball over the line p,q.

Tactical considerations:
Try to bring out by questioning.

Teammates position in space for the passer.

Ball carrier needs to attack the X by moving toward rs.
Decision about when to pass. Timing of the pass will be crucial.
Too early and the defender has time to get across to the receiver.
Too late and the defender will rob the attacker of the ball.

Will almost certainly need to work on passing.
If really bad passing use static 1 with 1 drill.

Perhaps try (travelling and passing) more game relevant.
Pass on the move with sympathy to partner as indicated
in the practice over the page:

Two players in one grid square

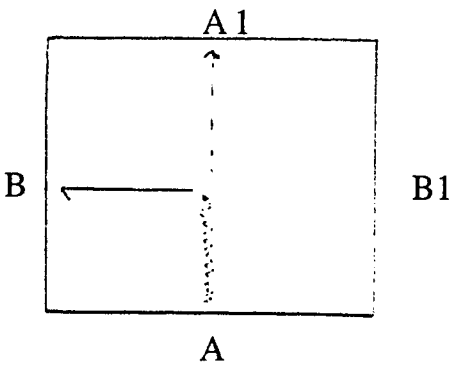
One ball

A dribbles across square

passes to B, continues to A1.

B collects ball and repeats passing to

A1 and continuing to B1



Encourage speed with good technique
also continue run after passing the ball.

Show reverse push

Return to 3 v 1 practice
Re emphasize points above

Go to 3 v 3 Gameplay if time.

Games for Understanding Approach

Lesson 4

Begin 3 v 3, 3 v 2 or 2 v 2 gameplay depending on numbers.
Emphasize rules, good refereeing.

Look for weaknesses e.g.. receiving

Two players in one grid square

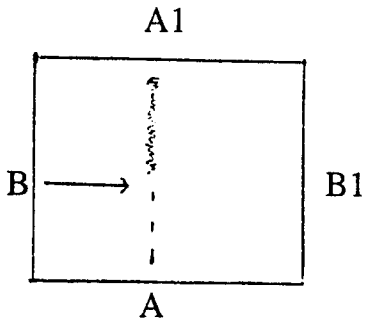
One ball

A starts running to A1

B passes ball so A can receive

in the middle of the grid

A continues to A1



A and B repeat in reverse order
Teach reversal of stick to receive from right side

Set up 3 v 1 and direction
encourage moving to space to receive the ball

Return to 3 v 3 games.

Games for Understanding Approach

Lesson 5

3 v 3/ 2 v 2 games.

When they play try to highlight rule violations--especially when students attempt to win the ball from an opponent.

1 v 1 Game in grid square.
Two players in grid square.

One ball per pair.

Each player aims to dribble the ball over opposite goal line.

Revise getting past an opponent.

(1) push ball to reverse side past opponent (strategy go to his/her right)--demonstrate
(2) Change of pace.

Let them play again.

What might help you beat your opponent?
Fake ball to one side and go to the other.
Encourage defender to go for ball.

How can the defender make it difficult for the attacker to get past him/her?

In 10 x 10 grid

(i) Shepherd opponent (backpedal) attempt to keep distance from him/her to end of grid.
Talk about when you would do this in game. E.g. to buy time for a teammate (recovering defender). In this instance let the attacker make the mistake.

Let them do this.
(20 x 10 grid)

A & B are defenders (B recovers)
A is defender trying to help his/her teammates by not committing to the tackle too early.

(ii) Repeat (i) but if opponent loses control of the ball defender takes it.

Teach Front Tackle
(obstruction rule, no hitting opponent's stick in attempt to win ball).

Go through slowly with them

1 v 1- Teach front tackle.

Teaching points: Attacker approaching. (1) Tackler ready, crouching. (2) Feet spread, ready to move forward or back. (3) stick on ground. (4) Shepherd him/her to your right. (5) Go forward or back to make the dribbler commit. (6) Take ball and stick when he is in weak position to play ball.

(iii) Repeat (ii) but this time attempt to win the ball by hooking ball away from opponent (demonstrate). Explain when you would do this i.e., last ditch tackle, or very confident you can win the ball.

(iv) As two but this time take ball and stick in tackle.
NB. When tackling stick should be close to ground--no backswing. Any content with opponent's stick or body before the ball is an infraction of the rules.

Rules:
(1) No backsticks.
(2) "Feet" - avoid contact of any body parts with the ball.
(3) Cannot support stick with your leg in order to resist opponent.
(4) No hitting opponents stick with your stick.
(5) Obstruction.

Back to small side games.
Teach tackling skills in games.
3 v 3/2 v 2 games.

Games for Understanding Approach

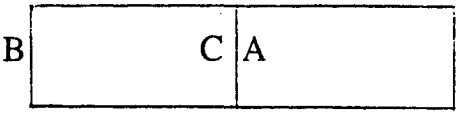
Lesson 6

3 v 3/ 2 v 2 games.

When they play try to highlight offenses.
Especially when students attempt to win the ball from an opponent.
Try to stop game when open side tackle is appropriate.

Go to recovering defender practice.

2 v 1



In 10 x 10 grids.
Teach open side tackle
1 v 1 game in grid square
Two players in grid square.

One ball per pair.
In pairs along grid line.

Demonstration.
Dribbler on the right of the sideline at the end.
Tackler behind him/her on his/her right (open side).

Both start to go to the other end of the grid--tackler chases and makes a one handed jab to winkle the ball off its course.

Tackle game (end to end).

When the tackle has been made the successful partner retrieves the ball and tries to make for his/her end line to score (by controlling the ball over the end line) and he/she is now chased by the new tackler. Continue until a result is achieved. The loser begins as the tackler at the end.

Return to 2 v 2/ 3 v 3 games.
Review tackle opportunities in games.

Games for Understanding Approach

Lesson 7

3 v 3/ 2 v 2 games.

Receiving and shooting.
In 3's
B pushes the ball for A to run on to.
A collects, shoots and returns to start position. A repeats 6 times.
C acts as goalkeeper and returns the ball to B.

Progression
B acts as a defender and after passing the ball to A chases and puts pressure on A when shooting

4 v 2
Shooting

The 4 X's attempt to score between the cones while the 2 O's (defenders) try to tackle them.
Rules: Push shooting only. The x shooting must be in the final grid square.
(N.B. include other rules already covered).

Return to 3 v 3 games

Games for Understanding Approach

Lesson 8

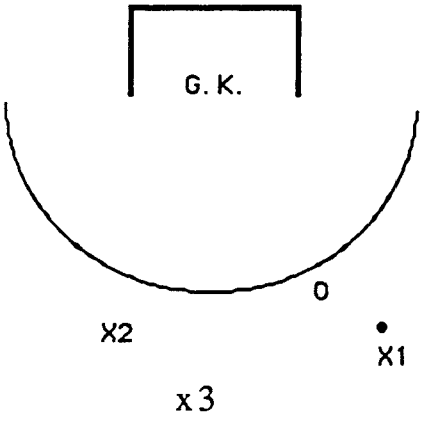
3 v 3/ 2 v 2 games.

Receiving and shooting.
In 3's
B pushes the ball for A to run on to.
B acts as a defender and after passing the ball to A, chases and puts pressure on A when shooting
A shoots and returns to start position. A repeats 6 times.
C acts as goalkeeper and returns the ball to B.

n n
C

A B

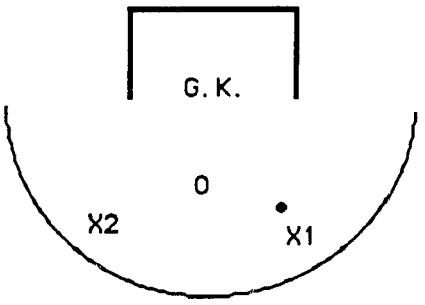
Set up practice as below:
Ask students what players should do here:
X1 takes the ball towards O, and as O gets close, pass the ball to X2.
X2 needs to be inside the circle to shoot.



x 3

Set up practice as below:

X3 passes to x1, x1 needs to shoot and x2 should move towards the goal in case that the ball comes back out from the goalkeeper or goal posts.



x3

Go to small-sided games.

Games for Understanding Approach

Lesson 9

Aim Teach support for player with the ball

Set up 3 v 3/ 2 v 2 games--no goalkeepers

Let them play

Stop game. Problem--crowding around the ball (beehive). No continuity in passing.

(Condition to impose) when you have the ball no one can tackle you when you are still. Free push to opponents when this rule is violated.

But if you stand still for longer than 4 seconds you can be tackled.

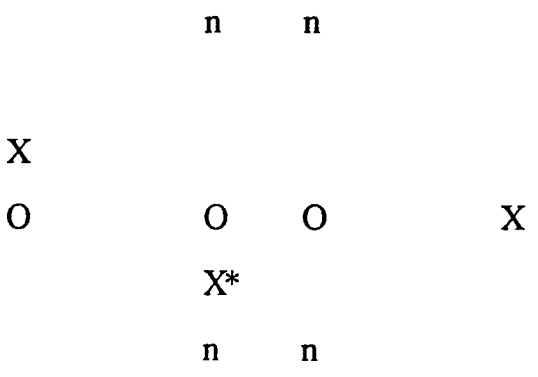
So how can other players on your team help you?

By positioning themselves very quickly where the ball can be passed to them. They need to move to get open--position in space

The player with the ball has a little time to make the decision.

Demonstrate:

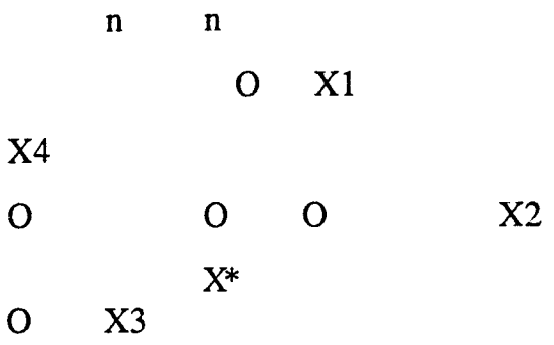
X= attackers, O = defenders



Notice: support on both sides (width). Harder for defenders to stop because attack is spread out.

Now go to full game (5 v 5/6 v 6) add goalkeepers--but the same tackling condition applies.

Demonstrate



Now teach support for player is all-around. In front (X1), to both sides X2/X4 and behind (X3).

You have time to get into a position to support the player with the ball because they cannot be tackled for four seconds.

Remove tackling condition and see how they handle the game.

Games for Understanding Approach

Lesson 10

3 v 3 games/ 3 v 2 games

Aim--to produce fluid movement from defense to attack and attack to defense making all players understand the need to attack and defend as a team.

(1) Each team to have two players in attack and one in defense. (small goals but no Goalkeepers). Make sure defender stays in defensive half of field. Why? In case the other team gains possession of the ball.

(2) As above but make players interchange by stipulating that when the player defending gains possession of the ball then that player becomes one of the attacking players on his/her team, thus causing one of the other players to take a defensive role.

Full game

(1) Will need to vary according to numbers.

Goalkeeper, 2 defenders and 2/3 attackers (condition as in (1) above).

Defenders should stay in defensive area and attackers in attacking half (penalize players who violate the condition).

Ask children why this condition is imposed?

Will reduce crowding around the ball, causing players to spread out in the area.

Ask children advantages/ disadvantages to this type of condition. See if students notice an advantage for the attacking team (more space).

(2) Remove restriction on players and allow them free movement. Watch for effect on game. Does play deteriorate? If so why? See if students understand.

Games for Understanding Approach

Lesson 11

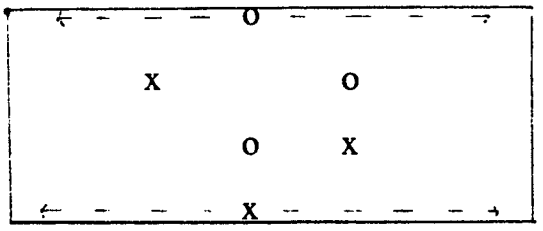
Aim: teach width in attack

Set up 3 v 3/ 2 v 2 games--no goalkeepers

Let them play

Make it a condition that one player from each team must stay within 2 yards of the touchline.

e.g.



Why is this beneficial?

Creates more space for the attackers.

In this instance it also means that one attacker will always be unmarked because players have to stay on respective lines. Ball must reach wide player once before a shot can be taken on goal.

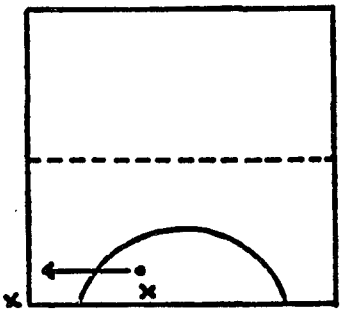
Switch to full game

Let all players experience game as outside players

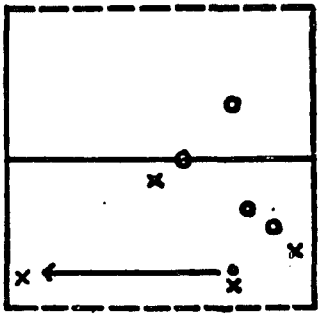
Same condition applies. Player on touchline should move up and down side line. Should create advantage because defensive player will have defender on opposite side line.

Stop the game in these situations and demonstrate to the students.
Defending half

a. In the defending half of the field support is given to the player in possession of the ball out on the sideline, thus using the width of the field.

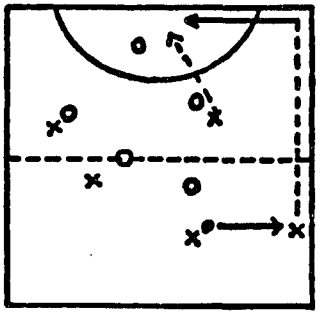


b. In midfield players need to recognize the time to give cross passes from one outside player to another. This will cause the defense to spread out or the attacking player will be left free.



At the attacking end use an outside player in order to take the play into the goal area behind the defense. This is a useful route to goal when the direct route is blocked.

e.g. The ball is passed square to an outside player who takes it to the goal line and then centers behind the opposing defensive players.



The effectiveness of the use of width depends on:

1. The ability of the player in possession of the ball to be able to appreciate when opponents are marking deeply thus leaving the space for the pass square across the field.

2. The ability of players to realize that when they are being closely marked in the attacking area it is advantageous to move back and out to receive a wide square pass.

Value of width:
1. To alter the position of play from the area where the defenders have become concentrated; thus the player receiving the ball will have a much clearer passage to the goal.

2. To use to advantage all of the players on the team especially the furthest away players from the current area of play, who are so often the unmarked players.

3. To tempt players of the defending team into spreading, thus creating gaps in their defensive structure.

Games for Understanding Approach

Lesson 12

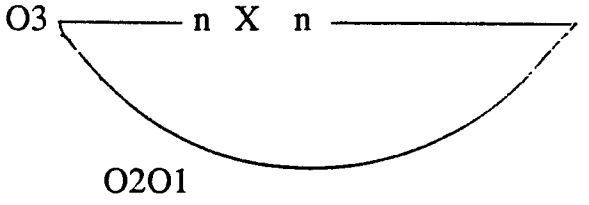
Short corner

Start with small sided games.
First offense you see stop the game and bring group in to see the situation.
We need to take a closer look at this situation.

Short corner.
Question students to ascertain the answers.
For all offenses inside the circle Make sure students understand what these rules are: feet, backsticks, obstruction.

Exception those situations that directly prevent a goal from being scored.
In this instance a penalty stroke is awarded.

(i) To begin with set up with a goalkeeper and 3 attackers.



Allow students to experiment in this situation from either side
Stop group and bring them in.

Explain:
Attackers (0's) align outside the circle. Cannot enter the circle until the ball has been struck. The ball must be stopped outside the circle before it is hit for goal. (Let children experiment how this is done).

Let them practice and ask them what they think?
Which side is better? Why?

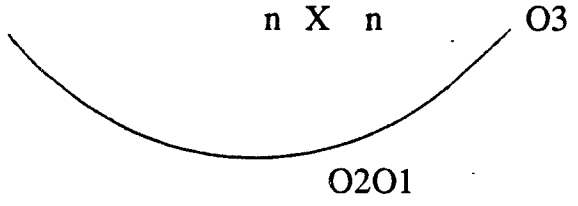
Strategy
From the left as shown in diagram above.
(a) Shooter o2 feet and stick are in favorable position for immediate hit. Stick will be hidden from goalie just prior to shot.

(b) o1 (Stopper) ball travels natural stopping side for stick -- easier to avoid being hit by the shooter's stick.

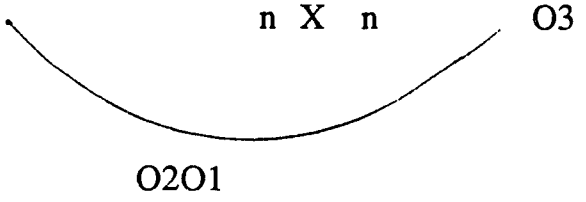
(c) The shot will be made across the difficult (left) side of the defenders-- if the shot is made from the position on the diagram above.

From the right:
(a) the shooters stick can be seen by the defense all the way.

(b) the shot is made across the goal favoring the defenders easy (open) side.

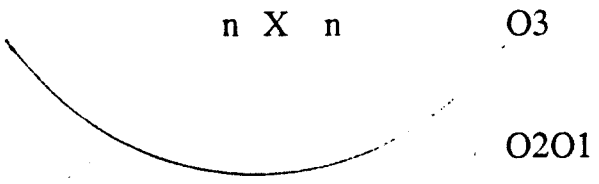


NB. If students position in situation below: What is disadvantage?



Answer: Defenders will be very close to ball when it is stopped.

What about angle of shot?



If as above: very narrow from here.

Try to draw these points out by questioning students. Probably don't make them all at once intersperse with practice.

Teach technique.

O3 Push the ball with the care of a pro-golfer.
Line up left shoulder with stopper's stick. Follow through with stick a little further than normal. O1 The target is the stopper's stick.

O1 stopper- eyes on ball all the time. Bottom hand low on stick. Reach cushion to begin with and then immediate stop.

02 striker-eyes on the spot where the ball will be stopped.--shoulder pointed to target. Short step on to the ball and push for goal.

Game play to finish (6 v 6 integration of short corners).

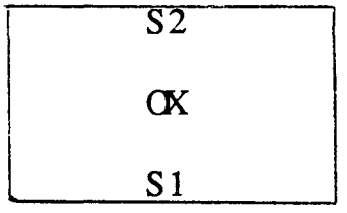
Games for Understanding Approach

Lesson 13

Begin in full game
(goalkeepers and short corners).

Creating space (20 X 10 grid)
We are having difficulty finding space so we are going to work on this.

S1 feeds the ball to X
X can either turn and pass the ball to S2 or pass the ball back to S1

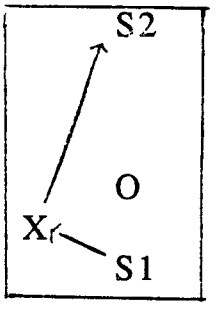


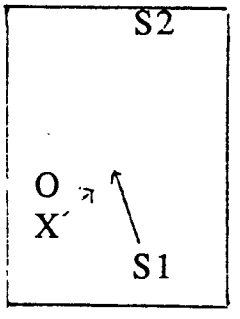
X should feint to move in one direction before checking and quickly moving away from his/her opponent in the other direction in order to receive the servers pass.

By moving away at an angle as (opposed to straight) in the diagram below X can observe the movement of the defender. X will create space in a central position if O follows for s1 to play the ball into or will have the space in which to turn if O does not follow.

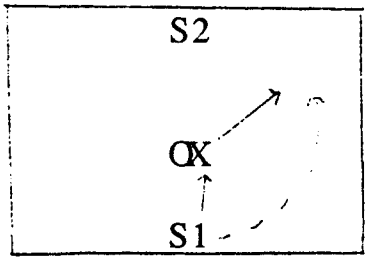
Emphasize quality of pass from the server

3 turns in each position before rotating positions.





As above but S1 feeds the ball to X and then goes on an overlap run for X to return the ball to S1 and pass to S2.



Return to full game. Emphasize attackers making runs (cutting) away from central positions to make space.

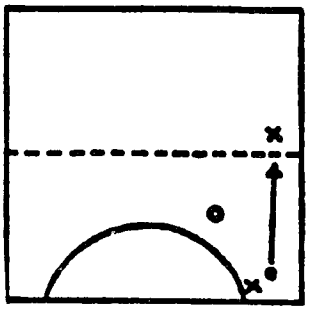
Turning if not closely marked.

Support players should either offer support from behind or overlap.

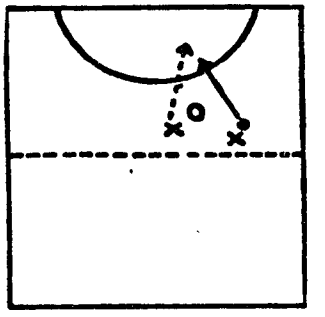
Games for Understanding Approach

Lesson 14

Begin in full game.
Goalkeepers (rotate every 5 minutes) and short corners to be used.
Teach penetration in attack.
Teach from a defensive situation in the game.
Use long straight passes through the spaces considering the non-stick side of the opponent
e.g.. direct up the right side line from a right defensive player.



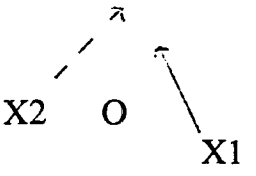
At the attacking end use direct through passes towards the goal. As in the example below:
Stop the game in a situation where this would be appropriate and show the students what can happen here.



(1) The effectiveness of the penetrating pass depends on the understanding between the player in possession of the ball and the receiver. The timing of the run (receiver) and the timing of the pass by the player in possession.

Set this situation up:

X1 has the ball and X2 makes the run to receive the ball and shoot.



Back to full game play.
Condition the game (two touches--1 to control, 1 to pass) will encourage quick release of ball--want supporting players to make attacking runs.

The value of penetration:
1. The shortest route between two points and thus the quickest.

2. It can achieve a quick break which does not allow the opposition time to reform:

3. If used when appropriate it can give the attacking team a chance to have more players in attack than the number of players the opposing team has in defense i.e. numerical superiority.

Games for Understanding Approach

Lesson 15

Review width in attack.

Full game situation

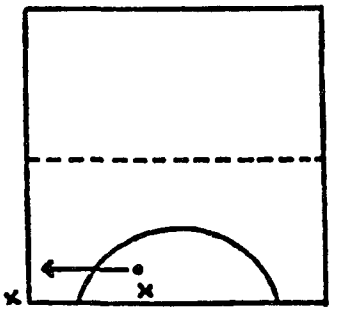
Let all players experience game as outside players

Same condition applies as in lesson 11. Player on the touchline should move up and down the side line. This should create an advantage.

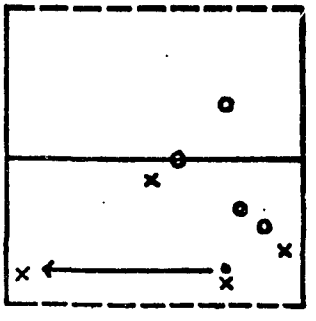
Stop the game in these situations and demonstrate to the students:

Defending half

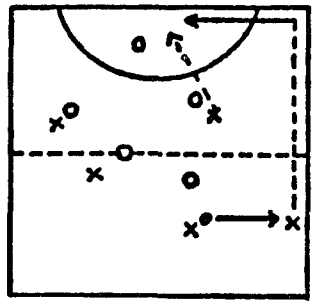
a. In the defending half of the field support is given to the player in possession of the ball out on the sideline, thus using the width of the field.



b. In midfield players need to recognize the time to give cross passes from one outside player to another. This will cause the defense to spread out or the attacking player will be left free.



At the attacking end, use an outside player in order to take the play into the goal area behind the defense. This is a useful route to goal when the direct route is blocked.
E.G. The ball is passed square to an outside player who takes it to the goal line and then centers behind the opposing defensive players.



Remove sideline restriction

Review support for player on the ball.
Use two touch condition (one to control, one to pass)--no dribbling. (player in possession cannot be tackled but cannot dribble)

Players should feint to move in one direction before checking and quickly moving away from their opponents in the other direction in order to receive the ball from the passer.

Emphasize attackers making runs (cutting) away from central positions to make space.

Remove all conditions and go to full game.

APPENDIX C

HOCKEY KNOWLEDGE TEST

Full name: _____ Hockey Knowledge Test # ___
Circle one answer only.

1. Which answer is not a part of the hockey stick?

a. Handle. b. Toe. c. Arm. d. Heel. e. Cannot answer.

2. What is the main advantage of a short backswing?

a. Less time is needed to hit the ball.
b. More spin is put on the ball.
c. A better angle is obtained in shooting the ball.
d. The ball is hit harder.
e. Cannot answer.

3. What is reverse sticks?

a. The use of the round side of the stick.
b. The use of the stick with its toe pointing upward.
c. The use of the stick with its toe pointing downward.
d. The use of the stick so that the round side of the toe points upward.
e. Cannot answer.

4. What is the most important thing to remember when dribbling?

a. To hold the stick at a 45° angle to the ground.
b. To form a straight line from the elbow to the back of the stick.
c. To keep the ball in front of the feet.
d. To grip the stick so that the back of the left hand faces the direction you want to dribble.
e. Cannot answer.

5. What is the position of the arms when dribbling?

a. Left arm bent and right arm straight halfway down the stick.
b. Right arm bent and left arm straight halfway down the stick.
c. Left arm bent and right arm bent halfway down the stick.
d. Right arm straight and left arm straight halfway down the stick.
e. Cannot answer.

6. When is the best time to use a dribble which does not keep the ball very close to the stick?

a. When the player is in the defensive half of the field.
b. When the player is in the offensive half of the field.
c. When the player is ahead of the other teammates and opponents.
d. When the player is behind the other teammates and needs to catch up.
e. Cannot answer.

7. What should you remember when passing the ball to a moving teammate?

a. Hit the ball ahead of the teammate.
b. Run along beside the teammate.
c. Stay behind the teammate.
d. Send the ball across the field to the teammate.
e. Cannot answer.

8. Which pass is the most accurate (exact/on target).

a. Push.
b. Scoop.
c. Drive.
d. Flick.
e. Cannot answer.

9. What is the major difference between a push pass and a drive?

a. The push pass has no backswing.
b. The push pass is more exact.
c. The push pass requires more strength.
d. The push pass takes longer to perform.
e. Cannot answer.

10. What does the term "tackling" mean?

a. Taking the opponent out by tripping.
b. Taking the opponent out by falling into him or her.
c. Taking the ball away from an opponent.
d. Taking the ball down the field.
e. Cannot answer.

11. When is the most effective time to tackle an opponent?

a. At the same time an opponent touches the ball with his stick.
b. Just after the opponent touches the ball with his stick.
c. Just before the opponent touches the ball with his stick.
d. When the ball is farthest away from the opponent's stick.
e. Cannot answer.

12. What is the major reason for offensive (attacking) players to spread out?

a. It forces players to play their positions.
b. It causes order.
c. It decreases the possibility of injury.
d. It creates spaces in the defense.
e. Cannot answer.

13. An offensive player is covered (marked) by a defensive player. The only open offensive player is 5 yards away. What pass would be the best to use?

a. Flick.
b. Drive.
c. Scoop.
d. Push pass.
e. Cannot answer.

14. Why is the push pass a good way to attack in the striking circle?

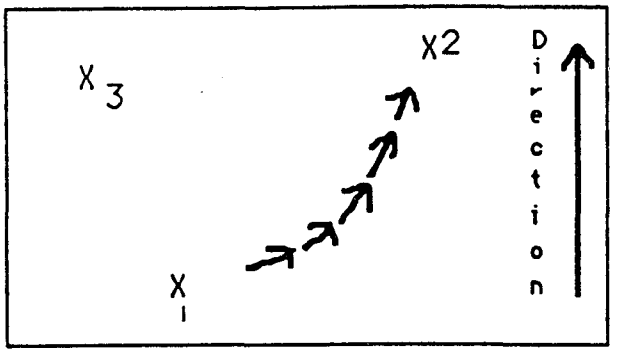
a. It is a good way to hit the corners of the goal.
b. It is not likely to be called dangerous hitting.
c. It is not easily defended because it has no backswing.
d. It may be effective in lifting the ball off the ground.
e. Cannot answer.

15. An attacking player receives the ball after it has been stopped from a penalty corner hit. What is the best thing to do?

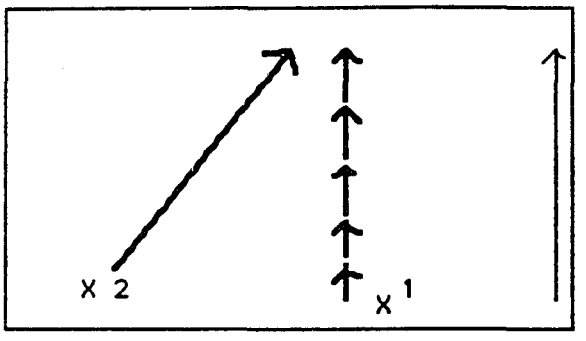
a. Strike it for goal.
b. Pass it back to the wing.
c. Control the ball and dribble it closer to the goal.
d. Pass the ball to the defensive back on his/her team.
e. Cannot answer.

16. Which diagram shows a through pass from player X1 to X2? The broken arrow indicates the path of the ball, and the solid line shows the path of player X2, when necessary to receive the ball.
The arrow at the side of each diagram indicates direction of play.

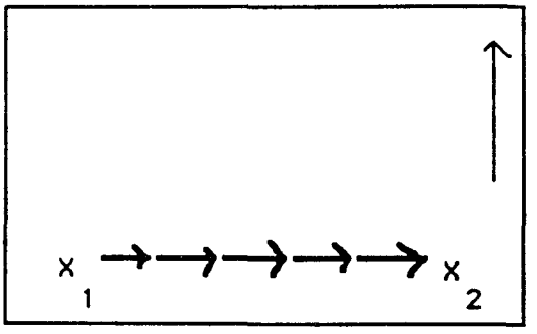
a.



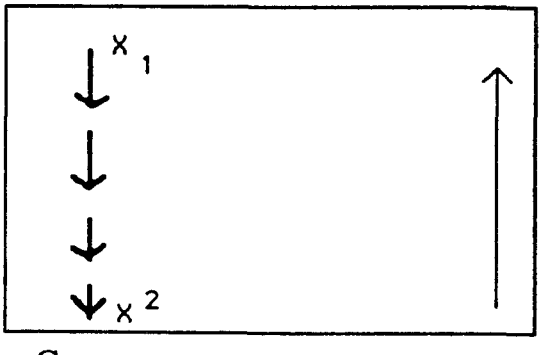
b.



c.



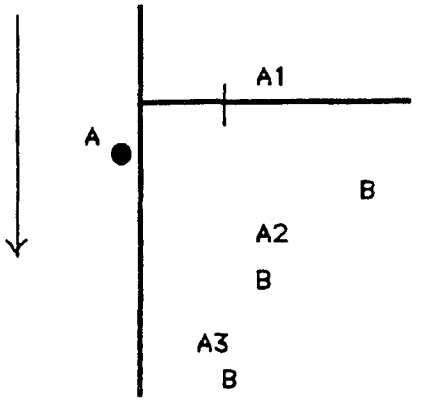
d.



e. Cannot answer.

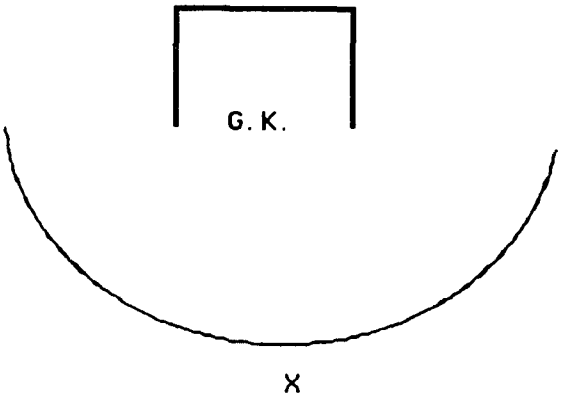
17. The diagram below shows that a member of team A is about to push the ball in from the side. The arrow indicates the direction team A is moving. What would be the best pass to use?

a. Push the ball straight ahead and follow it.
b. Push the ball to teammate A1.
c. Push the ball to teammate A2.
d. Push the ball to teammate A3.
e. Cannot answer.



18. In the diagram below:
G.K. = goalkeeper, X = attacker with the ball.

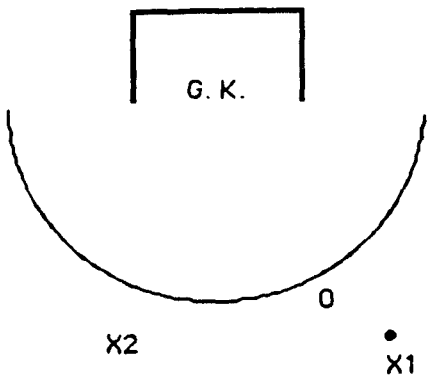
X should:
a. Shoot from this position.
b. Get inside the circle and shoot for goal.
c. Dribble around the goalkeeper to score.
d. Try any of the three suggestions above.
e. Cannot answer.



19. In the diagram below:
O = defender, X1 = attacker with the ball, X2 = attacker,
G.K. = goalkeeper

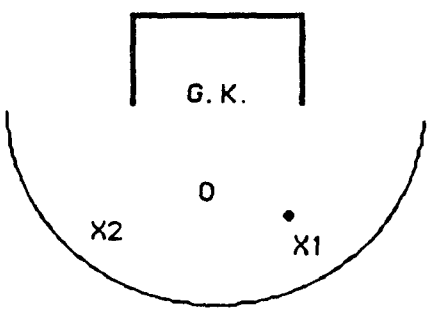
X1 should:

a. Shoot for the goal from his/her position at this moment.
b. Take the ball towards O, and as O gets close, pass the ball to X2.
c. Dribble around O.
d. Pass at once to X2.
e. Cannot answer.



20. In the diagram below:
G.K. = goalkeeper, X1= attacker with the ball, X2 = attacker,
O = defender.
X1 shoots the ball towards the goal, X2 should:

a. Stay exactly where he/she is positioned.
b. Cover the space behind his/her teammate in case of a break by the defence.
c. Move towards the goal in case that the ball comes back out from the goalkeeper or goal posts.
d. Run towards his/her teammate.
e. Cannot answer.



21. How can an offensive player create space?

a. Move away from the ball.
b. Move away from spaces.
c. Cut to the goal.
d. Position between the defense and the ball.
e. Cannot answer.

22. What is the best strategy on a free hit?

a. To take the hit quickly and send it as far as possible upfield toward the attacking goal.
b. To take the hit quickly and send it to a cutting teammate.
c. To take the hit slowly to give your teammates plenty of time to set up.
d. To take the hit quickly and pass it to a space where you think a teammate might cut.
e. Cannot answer.

23. A blue defensive player hits the ball with the rounded side of the stick causing the ball to go out over the sideline. What is result of this action?

a. Hitting with the rounded side of the stick results in a free hit for the opponents.
b. Hitting with the rounded side of the stick is legal.
c. Hitting the ball over the sideline results in a side-in for the blue team.
d. Hitting the ball over the sideline results in a side-in for the red team.
e. Cannot answer.

24. Where must the attackers position initially on a penalty corner?

a. Inside the circle.
b. Outside the circle.
c. On the end line.
d. On the sideline.
e. Cannot answer.

25. An unintentional foul is committed by the defense outside the striking circle. What is the official's decision?

a. A penalty corner.
b. Side-in.
c. Free hit.
d. Long hit.
e. Cannot answer.

26. A player's feet are out of bounds while dribbling up the field. What should the official do?

a. Stop play; free hit for opponents.
b. Nothing; legal play.
c. Stop play; push-in for opponents.
d. Stop play; on side bully.
e. Cannot answer.

27. When may movement occur on a penalty corner?

a. When the goalie says, "Go".
b. When the player taking the corner is ready.
c. When the ball is struck by the player taking the initial hit.
d. When the official blows the whistle.
e. Cannot answer.

28. What foul occurs when a player cuts between the opponent and the ball?

a. Advancing.
b. Obstruction.
c. Sticks.
d. Blocking.
e. Cannot answer.

29. Why is it good for the offense to pass the ball from one side of the field to the other?

a. It allows a few passes to cover a long distance.
b. It causes the goalie to pay attention.
c. It makes the opponents anticipate through passes.
d. It forces the defense to change positions.
e. Cannot answer.

30. What should you do as soon as you have made a successful tackle?

a. Dribble three times and pass.
b. Look to pass the ball.
c. Drive the ball as hard as you can.
d. Dribble to the sideline.
e. Cannot answer.

APPENDIX D

TEACHERS JOURNAL FORMS

Journals

(1) How did you feel about the content of your lesson under this games approach?

(2) What kinds of things did you do to teach the content under this approach?

(3) How effective were you in delivering the content?

(4) How did the students appear to respond to your instruction?

(5) Are there any other comments you would like to make?

APPENDIX E

TREATMENT VALIDATION PROTOCOL

Treatment Validation

	yes	no
1. The students spent most of the lesson in games or game related situations.		
2. The students spent the lesson learning specific skills taught by the teacher before playing a game.		
3. The teacher started the lesson with skill instruction.		
4. The teacher intervened in game play or game related practices to explain strategies to students.		
5. The teacher based his/her teaching on observations of an initial game or game related situation (e.g. 3 v 1, 3 v 3).		
6. The major emphasis of the lesson was skill teaching.		
7. The major emphasis of the lesson was tactical instruction in games or game-like practices.		

APPENDIX F

HENRY-FRIEDEL FIELD HOCKEY TEST

Henry-Friedel Field Hockey Test

Directions:

The player stands behind the starting line, inside the goal area, with hockey stick in hand, and ready to run. At the signal "ready, go!" the clock is started as the player runs forward towards the target area. As the player crosses the 7-yard mark, the ball is rolled in from the 10-yard mark--alternately from the left or right side line.

The player fields the ball on the run and within the 2-yard square target area, dribbles toward the person standing in the dodge square and does a right dodge around him/her. The stationary person then moves out of the testing area in order not to obstruct the player on his/her return. The player continues dribbling up to the line goes around the obstacle as if doing a circular tackle, and dribbles back downfield, moving within the 1.5 yard lane. Before getting to the restraining line, but within the lane, the player pushes the ball, aiming for the goal area. The clock is stopped as soon as the ball crosses the starting line or a sideline.

A trial is discounted and repeated only if the ball is inaccurately rolled so that it does not pass through the target area.

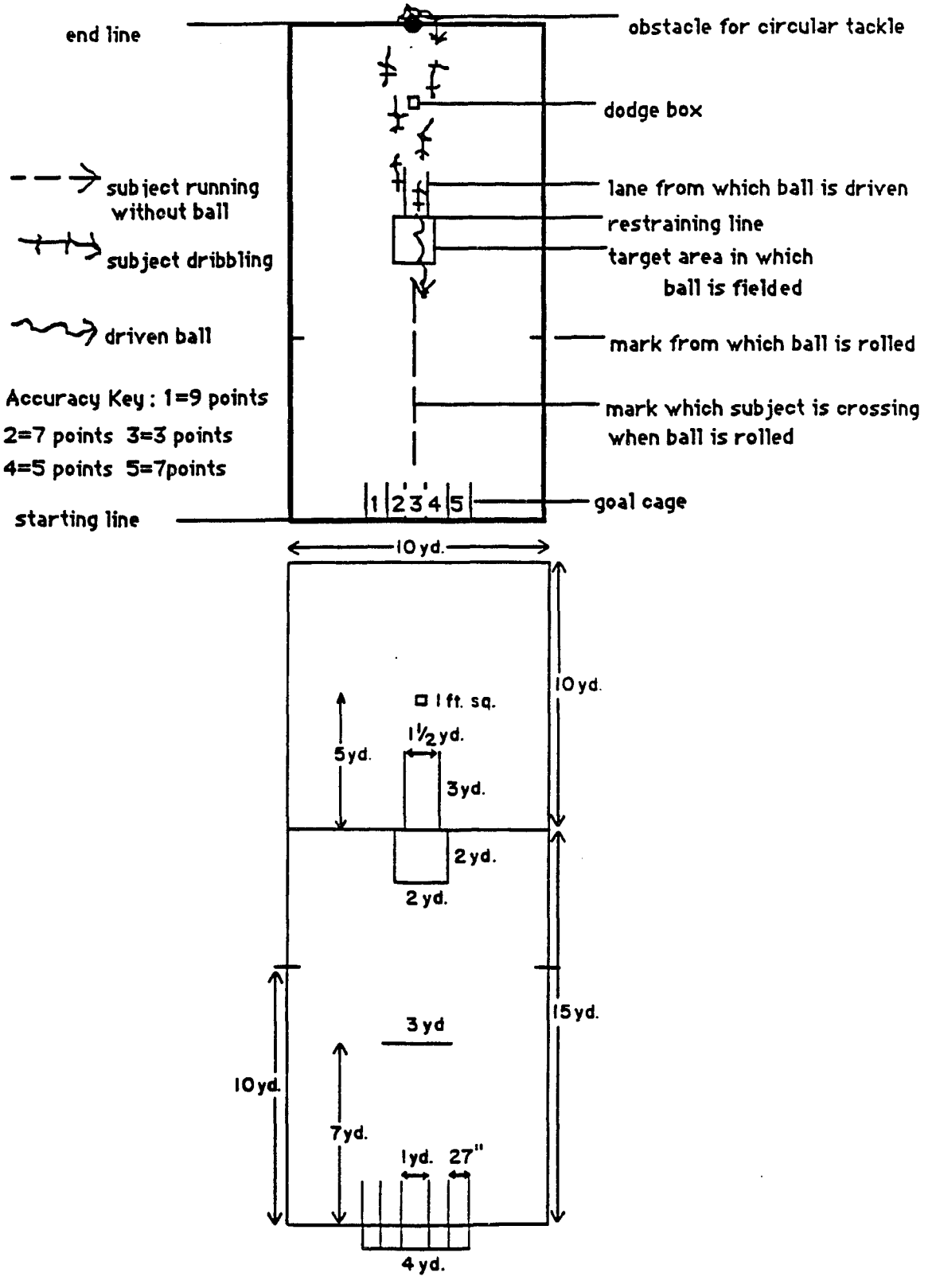
Scoring.

The time for a trial is the elapsed time in seconds and tenths of seconds from the word "Go!" until the driven ball crosses the starting line or the sideline or comes to a stop within the testing area plus:

1. **One second for omitting the dodge.**
2. **One second for using reverse sticks during the circular tackle.**
3. **One second for the driven ball going over the sideline or not reaching the starting line.**
4. **One second for not fielding an accurately rolled ball within the target area.**
5. **One second for using the back of the stick.**
6. **One second for stepping over the shooting line.**

Accuracy

The accuracy score on the trial is determined by the division on the starting line through which the ball passes. **Areas 1 through 5 score respectively 9, 7, 3, 5, 7. Any area on the starting line outside of the goal scores 1. The score is 0 if the ball goes over the sideline or if it does not reach the starting line.** The higher score is the better score.


end line
obstacle for circular tackle
dodge box
subject running without ball
subject dribbling
driven ball
lane from which ball is driven
restraining line
target area in which ball is fielded
mark from which ball is rolled
Accuracy Key : 1=9 points
2=7 points 3=3 points
4=5 points 5=7points
mark which subject is crossing when ball is rolled
1 2 3 4 5
goal cage
starting line
10 yd.
10 yd.
1 ft. sq.
1½ yd.
5 yd.
3 yd.
2 yd.
2 yd.
15 yd.
3 yd
10 yd.
7 yd.
1 yd. 27"
4 yd.

APPENDIX G

INTERVIEW PROTOCOL

Student Interview Questions

1. Is physical education any different this semester?
If no--why not?
If it is how is it different?

2. What do you do in a typical PE lesson?

3. What have you enjoyed most about your PE lessons doing field hockey?
Why have you enjoyed this part of the lesson?

4. Is there anything that you have not enjoyed about this unit?
Why?

5. How successful have you been at playing field hockey?
What kinds of things have you done well at?

6. If you were teaching a friend about field hockey what kinds of rules would you teach this person?
What kinds of skills would you try to teach this person?

7. If you were teaching your friend field hockey what kinds of decisions or choices would you tell this person that he/she might need to make when playing in a field hockey game?

8. If you were to teach your friend another game that is similar to field hockey what game would you teach?
What kinds of things would you try to teach this person that are similar to field hockey?

9. Did your teacher seem comfortable teaching this material?

10. Were you motivated to learn field hockey?
Why?