

SPORTS EDUCATION

Game Performance Improvements in Sport Education and Tactical Games Models

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Abstract

The Tactical Games Model (TGM) is summarized as a physical education model where the emphasis is on developing the underlying core components of games and sports to develop the tactical and performance skills of participants, known as game performance (Metzler, 2011). The Sport Education Model (SEM) is a physical education model structured and sequenced in a league-based format to provide students with a realistic feeling of being part of a sports team and to gain an understanding of all aspects of competitive organized sport. Evidence to support the SEM successfully developing game performance skills is limited and inconsistent (Farias et al., 2015). The purpose of the study was to investigate the game performance of pre-service physical education teachers in two different instructional models, SEM and TGM, from pre-test to post-test. Forty-six male ($n = 32$) and female ($n = 14$) participants took part in either a SEM or TGM Team Handball Unit. Each unit consisted of 10 lessons planned and implemented by the instructor. The game performance components Adjust, Support, and Passing were examined by the researchers using the Game Performance Assessment Instrument (Oslin et al., 1998) through four-minute observations in a

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small-sided game situation at pre-test and post-test. No significant ($p > .05$) interaction was found between SEM and TGM instructional models over time for game performance variables. No significant ($p > .05$) difference was found in game performance between SEM and TGM instructional models. A statistically significant ($p < .05$) main effect was found for time, such that game performance scores increased from pre-test to post-test for both SEM and TGM instructional models. Based on the findings of the current study, both SEM and TGM instructional models may increase game performance when instructed with fidelity. The results could be explained through understanding the connection the SEM and Situated Learning Theory (Lave & Wenger, 1991) and/or team cohesion. The results have practical implications for physical educators, and directions for future research are discussed.

In the past 20 years, models-based instruction in physical education has been investigated in multiple studies (Casey, 2014; Kirk, 2013; Metzler, 2011). Hastie and Casey (2014) defined an instruction model as "...a way of organizing the interdependent elements of curriculum, learning, and teaching to achieve specific learning outcomes. Acting essentially as a blueprint..." (p. 422). The Tactical Games Model (TGM) is an instructional model formalized by Oslin et al. (1998) and was previously referred to as Teaching Games for Understanding (TGfU). TGfU was developed by Bunker and Thorpe (1982) and the main objectives were to build strategic and tactical skills in sports. Similar to the original objectives of TGfU by Bunker and Thorpe (1982), TGM is summarized as a physical education model in which the emphasis is on developing underlying core components of games to develop the tactical and performance skills of students (Metzler, 2011). TGM utilizes a task sequence that aims to specifically place students in modified game-like settings where students experience problems that must be solved by cognitive decision-making and psychomotor skill execution. Through creating authentic, intentional, representative, and focused game situations the tactical awareness, decision-making, and skills of students are heightened in the TGM (Metzler, 2011).

The Sport Education Model (SEM) is an instructional model that has been investigated in more than 60 peer reviewed research-based studies through observation and or participation (Hastie & Casey, 2014). Daryl Siedentop, the creator of the SEM, defined the model

as a teaching model that is, “designed to provide authentic, educationally rich, sport experiences for girls and boys in the context of school physical education” (Siedentop, 1998). The SEM is structured and sequenced in a league-based format to provide students with a realistic feeling of being part of a sports team and to gain an understanding of all aspects of competitive organized sport. Researchers (Curtner-Smith & Sofo, 2004; Hastie & Sinelnikov, 2006; Sinelnikov et al., 2007) concluded that use of the SEM can facilitate development of students’ personal and social skills as well as motivation and cognitive understanding (Farias et al., 2015). However, evidence to support the SEM successfully developing the game performance, decision-making, and skill execution of a student is limited and inconsistent (Farias et al., 2015). Hastie (1998) found inconsistent results when investigating the SEM and field hockey skills, where lower-skilled students showed little growth in tactical understanding and higher-skilled students did not improve at all. Pritchard et al. (2008) saw improvement solely in decision-making, and no improvements in tactical understanding or skill execution in volleyball players during a SEM unit. Researchers have suggested that the SEM consistently impacts social and cognitive skills (Hastie et al., 2011; Wallhead & O’Sullivan, 2005). However, researchers have recently called for new SEM research where specific pedagogical strategies are used to develop the tactical understanding and skills of students (Griffin et al., 1997; Hastie et al., 2011; Pereira et al., 2015; Wallhead & O’Sullivan, 2005).

The Situated Learning Theory has been utilized in models-based instruction, and specifically the SEM and TGM (Greeno, 1997; Kirk & MacDonald, 1998; Kirk & MacPhail, 2002; Lave & Wenger, 1991). Lave and Wenger (1991) proposed that active interactions of culture, socialization, and physical aspects of the environment are crucial for learning. The contextual factors surrounding learners form a relationship of connections integral to learning. A situated learning perspective assumes that for one to learn there must be active engagement and participation in the process rather than just absorbing information passively. Situated Learning Theory involves the learner creating new knowledge in collaboration with what the learner already knows in an active, social, and integrated context (Kirk & MacPhail, 2002). The unique perspective explained by Lave

and Wenger (1991) is called legitimate peripheral participation in a community of practice. The authors explained that this approach to understanding learning consisted of the learner having a highly interactive role in the learning process rather than passively absorbing a concrete set of facts or knowledge, which are then intended to be applied later, the learner must engage actively in the execution of skills and exploration of content in an authentic social setting. Lave and Wenger (1991) continued to describe legitimate peripheral participation in communities of practice through further specification. For example, classes, teams, teachers, or schools in general all are forms of communities of practice. Legitimate peripheral participation in communities of practice is more than a student or intern participating in a single role playing a small piece in a large puzzle; rather, it is about a deeper process where the learner must engage in several or many roles all of which challenge the learner with different responsibilities, interactions, relationships, and involvements that all act together. Considering the underlying concepts of the Situated Learning Theory along with the specific core components of the SEM and TGM, the Situated Learning Theory was utilized as the theoretical framework for the current research.

The ability of one instructional model to impact game performance differently compared to another was part of the catalyst for the current study. The inconsistencies found in SEM research related to the ability of students to improve tactical understanding and skill execution during a SEM unit supports research in the described area to be valuable. Of additional interest was the comparison of game performance in a SEM to game performance in a TGM, which was designed specifically with game performance as a core goal. Game performance is summarized as the demonstration of a variety of skills related to tactical understanding, decision-making, and problem-solving, in a live game-like situation (Oslin et al., 1998). A core feature of game performance assessment, one that was made central to the current study, is that the components are being assessed during live gameplay.

The current research aimed to extend existing literature pertaining to instructional models in physical education and game performance assessment. The purpose of the study was thus to explore the game performance of pre-service teachers in SEM versus TGM

Team Handball Units over time from pre-test to post-test. Drawing from previous research, participants were expected to improve game performance to some extent from pre-test to post-test in both SEM and TGM instructional models. Further, participants were expected to improve game performance to a greater extent from pre-test to post-test in the TGM Team Handball Unit than in the SEM Team Handball Unit based on the emphasis and specific focus of the TGM on tactical and skill development. Exploring the interaction between instructional model and time relative to game performance was thus a key feature of the study.

Method

Participants

Participants were 46 male (69.6%) and female (30.4%) pre-service physical education teachers enrolled in two physical education skills courses offered by the same institution. Participants ranged in age from 18 to 31 years ($M = 19.5$, $SD = 1.9$), and consisted of first-year (41.3%), second-year (43.5%), and third-year (15.2%) students. The experience of participants was measured on a Likert scale from 1 (None), 2 (Beginner), 3 (Intermediate), 4 (Advanced) to 5 (Expert). The range of participants' experiences before participating in the study included the following: Team Handball 1 - 3 ($M = 2.4$, $SD = 0.7$), TGM 1 - 4 ($M = 2.2$, $SD = 0.7$), and SEM 1 - 3 ($M = 1.5$, $SD = 0.7$). Any student physically unable to participate in the entire Team Handball Unit was not considered for participation in the study. In the event a participant was injured or hindered in any way during the study that led to limited participation, the participant was removed from the study. One class of participants ($n = 23$) was invited to participate in a SEM Team Handball Unit for 10, 75-minute lessons. A second class of participants ($n = 23$) were invited to participate in a TGM Team Handball Unit for 10, 75-minute lessons. The institution where the units were implemented and data collected was located in a northern New England state. The institution was a public coeducational liberal arts institution with approximately 6,000 enrolled students. The primary researcher and unit instructor for both the SEM and TGM Team Handball Units was a first-year full-time faculty member with 10 years of physical education teaching experience. The primary researcher instructed the Team Handball Units

but was not the course instructor for the Physical Education courses in which the Team Handball Units were embedded.

Testing Instrument

The Game Performance Assessment Instrument (GPAI; Oslin et al., 1998) was used to measure the game performance of participants. Game performance components—Adjust, Support, and Passing—were measured for all participants using the GPAI at two time intervals, pre-test (beginning of Team Handball Unit) and post-test (end of Team Handball Unit). The number of appropriate decisions/executions (A) of each skill component (Adjust, Support, and Passing) while engaged in a live game-like situation was divided by the number of appropriate decisions/executions (A) plus any inappropriate decisions/executions (IA) for each component ($A/(A+IA)$). A score for each game performance component was calculated and analyzed individually. To address the rare circumstance where a participant scored no appropriate or inappropriate tallies, 0, each component score began with a constant, 10, therefore avoiding mathematical issues faced with dividing by zero (Memmert & Harvey, 2008). All scores were between 0 and 1.0, and the closer a participant scored to 1.0 the better his or her performance (Mitchell et al., 2006).

The GPAI contains seven components: Adjust, Support, Skill Execution, Base, Cover, Guard/Mark, and Decision-Made. Adjust, Support, and Passing (Skill Execution) were specifically selected to examine in the current study due to the nature of team handball and the core skills that are embedded in the flow of the sport. Adjust and Support are core skills of any territorial/invasion ...game, and thus logical choices for team handball. Adjust was a component of the GPAI referring to “movement of performer, either offensively or defensively, as necessitated by the flow of the game” (Oslin et al., 1998). In the current study, adjust was operationally defined as the ability of students to transition from offense to defense in a team handball modified live game-like situation. Support was a component of the GPAI referring to “being in a position to receive a pass” (Oslin et al., 1998). Support was operationally defined in the current study to measure the ability of a student to move to open space to receive a pass from a teammate in the flow of a live game-like situation in team handball.

A third component, Passing, was specifically selected due to the nature of team handball. Skill Execution was a component of the GPAI referring to “efficient execution of selected skills” (Oslin et al., 1998). For the current study, Passing was evaluated as the specific component of Skill Execution. Passing was operationally defined as the ability of students to execute an overhand or wrist pass on target to a teammate to move the ball throughout a live game-like situation in team handball. The rules dictate that a player must stop for at least three seconds after every three steps taken and cannot move until that time has passed, limiting mobility of a player with the ball forcing him or her to pass often. Additionally, passive play, or a team possessing the ball without making attempts to pass or shoot, is illegal in team handball. For the stated reasons, Passing was a logical component to observe in team handball as a pass is likely to have many opportunities to be observed.

A team handball-specific version of the GPAI (Appendix C) was used for data collection through observation of the performance components Adjust, Support, and Passing. One of the strengths of the GPAI was that the instrument was adaptable and flexible based on the characteristics of the sport or activity (Mitchell et al., 2006). The unit instructor was trained in observing game performance skills in the sport of team handball, and upon observation could evaluate whether a skill demonstrated by a player was a correct decision (appropriate) or incorrect decision (inappropriate) or an effective skill execution (appropriate) or ineffective skill execution (inappropriate).

Oslin et al. (1998) conducted preliminary validation for the GPAI. Observer reliability for the GPAI was confirmed using an event-recording method where 48% of the interobserver agreement measured very high ($> .90$), 48% were high ($.80 - .90$) and 2% were below acceptable level ($< .80$). Reliability was confirmed using the test-retest method, and all GPAI components scored a stability-reliability coefficient above the desired level of acceptance ($> .80$). Regarding discriminant validity, the GPAI discerned between low and high skilled students during gameplay in 66% of observations, which was reported as a moderate yet acceptable value of validity. Validity was confirmed using face validity, content validity, and construct validity (Oslin et al., 1998). Face validity was determined by

95% of participants responding favorably to being assessed authentically on a modified version of a Wiggins questionnaire. A panel of experts determined content validity and content was revised until a consensus was reached. Construct validity data allowed the researchers to determine that the GPAI was able to distinguish between high and low ability players with independent t-tests showing significant differences in skill execution across all sports examined: volleyball, soccer, and basketball (Oslin et al., 1998).

Procedures

Institutional Review Board approval for the study was obtained. The instructor of each course was sent a letter requesting permission to invite students enrolled in the courses to participate. With their agreement, intact sampling was then used to invite college-aged male and female pre-service physical education teachers from the two skills courses to participate in the study. The students in the courses had an opportunity to review the purpose of the study, details of the procedures, and the role of a participant as outlined on the informed consent document. Those students interested in participating signed the informed consent. Prior to beginning the study, all participants were asked to complete a demographic questionnaire, which collected information such as age, gender, class, and experience with team handball and the instructional models.

A GPAI was completed by the instructor of each unit after finishing a required GPAI practice session, which consisted of two hours of video analysis, observation, and repetitive practice using the GPAI developed for the current study. The GPAI was adaptable in that there were seven components that make up the original GPAI, but any single component can be used independently to evaluate a skill given the specificity of the sport or activity. The same GPAI tool was used in the current study to determine the scores of each student for the performance components Adjust, Support, and Passing at both pre-test and post-test for the SEM and TGM units.

During the pre-test and post-test, each student, one at a time, was observed by the unit instructor for a total of four minutes in a live game-like situation to generate an Adjust, Support, and Passing score for each student. The unit instructor placed a tally mark for every observation of each performance component and decided whether an appropriate or inappropriate execution of the compo-

ment occurred. Participant observations occurred across two instructional days for both the SEM and TGM Team Handball Units. A random number generator (Haahr, 1998) was used to determine the participants who would be observed on each day. Specifically, for the SEM and TGM Team Handball Units, the first GPAI (pre-test) observation was completed for 12 randomly selected students (Group A), for four minutes each, at the beginning of the unit. A second GPAI (pre-test) observation occurred the day after the first observation to observe a separate 11 students (Group B) to total 23 pre-test observations in each Team Handball Unit. The third GPAI (post-test) observation was for the same 12 students observed in the first pretest for each Team Handball Unit and occurred at the end of the unit. The final and fourth GPAI (post-test) observation was for the same 11 students from the second pre-test, for four minutes each, and also was completed at the end of the unit. The pre-test and post-test GPAI scores were used to compare the scores of each student over time and between the two instructional models used, SEM and TGM. Both the TGM Team Handball Unit and the SEM Team Handball Unit were planned, designed, and implemented by the primary researcher/unit instructor.

Model Implementation

A full review of the SEM and TGM instructional models is beyond the scope of this study. However, the authors include specifics regarding elements and characteristics of the models used, as well as information about the prior experience of the instructor with the models in use per the recommendations of Hastie and Casey (2014).

Sport Education Model

The SEM was conducted over 10 days in 75-minute classes. The selected sport was team handball. With an extensive review of literature completed, and while using the *Complete Guide to Sport Education* (Siedentop et al., 2011), the SEM Team Handball Unit was designed by the unit instructor. Each core characteristic of the SEM was incorporated and implemented during the 10-day unit: Seasons, Formal Competition, Affiliation, Record Keeping, Festivity, and Culminating Events. The unit consisted of an introduction, SEM background, team handball background, warm up and cool down, skills combine, creation of teams, role assignments and trainings,

duty team trainings, team practices of the “skill of the day,” pre-season game play, regular season game play, post-season tournament, championship game, and a culminating awards ceremony. During the first team meetings on day one, teams were given the opportunity to create nicknames, a team name, select a team color, team mascot, and create a team cheer. Immediately, a fun team atmosphere was created and each team wore the team colors for all competitions moving forward. Each participant remained with the team assigned for the duration of the unit and was able to track individual and team progress throughout the season by visiting the league website. Each day of the seven-day regular season consisted of formal competition in addition to the one day of pre-season play and one day of post-season play totaling nine days of formal competition out of the 10-day unit. Four teams competed at a time over two team handball courts with the fifth team in the league fulfilling the duty team roles. Games consisted of five versus five on each court. Formal competition took place between 60-70% of each 75-minute class. Formal competition consisted of an official on each court, timed substitutions, statistics recorded, and game scores kept on a flip card scoreboard. Each game score was recorded to form a wins and losses record for each team which was used to determine the seeds in the post-season playoffs. In addition to a team record, individual game statistics were recorded using a digital app. Game statistics that were recorded included: assists, blocks, goals, saves, and steals. A festive environment was encouraged from day one of the unit. Other features of this SEM unit were: a league website, all-star break festivities, skills competition, and awards ceremony. Additionally, the team that won the championship received individual prize packages as a trophy.

Tactical Games Model

The TGM was conducted over 10 days in 75-minute classes. With an extensive review of literature completed and while using *Teaching Sport Concepts and Skills: A Tactical Games Approach, 3rd ed.* (Mitchell et al., 2013), the TGM Team Handball Unit was designed by the unit instructor. The following description of the unit explains how each core characteristic of the TGM was implemented along with what was completed each day of the 10-day unit. The unit consisted of an introduction, background of TGM, team handball background, then daily lessons intentionally organized to increase

tactical awareness, understanding, and skill acquisition. Each day of the 10-day unit was structured into five parts: warm up, modified game, practice task, small-sided game, and closure. Each day began with dynamic stretching led by the unit instructor. Next, a modified game was played by all participants with the focus of reviewing/practicing tactical skills learned in previous lessons. Following the modified game, a “skill of the day” was introduced, demonstrated, and context provided for when, why, and how to implement the skill with emphasis made to connect the tactical use of the skill and how the skill transfers to other invasion games. Next, a practice task followed, which consisted of specific drills/activities planned and led by the unit instructor with the “skill of the day” as the focus. The practice task always utilized a grid approach. In a grid approach, the entire court space was divided with cones into a large grid of 12 squares, and participants were organized in small groups of three to four per grid for optimal participation and opportunities to practice the skill. Participants self-selected the small groups based on classmates of similar abilities. Lastly, a small-sided team handball game consisting of five versus five was played by all members of the class over two courts, where participants had the opportunity to apply all skills learned in an authentic game-like situation. Teams were selected for small-sided games by the unit instructor on a daily basis based on similar ability levels to encourage developmentally appropriate competition. At the conclusion of the small-sided game, the unit instructor led a brief closure where participants engaged in an active question-and-answer debrief and student demonstrations were provided. The focus of each closure was to review the “skill of the day” and make connections to the underlying purpose of the skill from a tactical perspective, along with how the tactical concept can apply or transfer to other invasion games.

Prior Experience

The primary researcher of the current study was also the unit instructor who implemented each of the instructional models used. The unit instructor completed a Bachelor of Science degree in Physical Education in addition to a Master of Education degree in Physical Education with a concentration in Advanced Level Coaching at the same institution. Prior to conducting the study, the unit instructor had completed three years of doctoral coursework in a Ph.D.

program at the same institution with a concentration in Teaching and Administration, and was a doctoral candidate in the program prior to data collection. Instructional models, and specifically the SEM and TGM, were studied in-depth throughout the completed coursework at the highest level of understanding, analysis, and synthesis. In addition to extensive instructional model coursework, the instructor had logged hundreds of hours over a span of 10 years teaching full-time physical education at the middle school level in public education as well as college-aged students in higher education. Within these 10 years both the SEM and TGM were designed and implemented by the unit instructor in several courses each year across multiple activities, including flag football, lacrosse, basketball, archery, and bowling.

Statistical Analysis

The data were analyzed using SPSS version 24. Data were screened for normality using skewness and kurtosis, missing data, and outliers. Outliers were defined as any score greater than ± 3.3 standard deviations from the mean of a normally distributed variable (Warner, 2014). Descriptive statistics were analyzed for demographic variables. A series of t-tests were run to determine if game performance differences existed between Group A (observed on day one) and Group B (observed on day two) for both the SEM and the TGM. A correlation was run to determine if any relationships existed between the experience participants had in team handball, SEM, and TGM and game performance results on the pre-tests. The basic assumptions of multivariate analysis of variance (MANOVA) were tested prior to conducting the analysis. A 2 (PE model) x 2 (time) mixed factorial MANOVA was conducted to analyze differences in game performance scores between the two physical education instructional models over time. An alpha level of .05 was used to establish statistical significance.

Results

The data were screened for missing data, normality, and outliers. No missing data was found. No outliers were determined. Normal skewness and kurtosis distributions were observed for all dependent variables except the Passing pre-test distribution was leptokurtic. The basic assumptions of a mixed factorial MANOVA were exam-

ined. The Box's Test of Equality of Covariance Matrices was non-significant ($p > .05$). The assumption of homogeneity of variance of the differences was assessed using Levene's Test of Equality. The assumption was met for all variables.

The researcher concluded from the results of the t-tests that no significant mean differences existed ($p > .05$) in game performance variables between Groups A and B for SEM nor TGM. Therefore, Groups A and B were combined into one group for each instructional model (SEM: $n = 23$, TGM: $n = 23$). A correlation was run to determine if any relationships existed between prior experience and game performance scores. No significant linear relationship (r values ranged from -0.01 to 0.52 , $p > .05$) existed between Adjust, Support, and Passing, and experience with team handball, SEM, and TGM; therefore, analysis of covariance (ANCOVA) was deemed unnecessary.

A 2 (PE model) x 2 (time) mixed factorial MANOVA was conducted to analyze differences in the game performance components, Adjust, Support, and Passing over time (pre-test to post-test) across two conditions (SEM and TGM). The results of the MANOVA are presented in Table 1. No significant interaction was found across the three dependent variables: Adjust, Support, and Passing, $\Lambda = 0.92$, $F(3, 42) = 1.26$, $p > .05$, $\eta_p^2 = 0.083$ (Table 1). For the time variable, performance was significantly different from pre-test to post-test, $\Lambda = 0.51$, $F(3, 42) = 13.63$, $p < .05$, $\eta_p^2 = 0.49$ (Table 1). For instructional model, performance was not significantly different across the SEM and TGM models, $\Lambda = 0.86$, $F(3, 42) = 2.28$, $p > .05$, $\eta_p^2 = .14$ (Table 1).

One-way repeated measures analyses of variance (ANOVAs) were used to analyze the significant main effect for time. Significant differences were found across time in all measures: Adjust, $F(1, 44) = 32.05$, $p < .05$, $\eta_p^2 = .42$, Passing, $F(1, 44) = 5.00$, $p < .05$, $\eta_p^2 = .10$, and Support, $F(1, 44) = 20.98$, $p < .05$, $\eta_p^2 = .32$. Performance was significantly higher for all three game performance components, Adjust, Passing, and Support, at post-test than at pre-test (see descriptive statistics for Adjust, Passing, and Support across time, in the SEM and TGM Units in Table 2).

Discussion

The purpose of the current study was to measure the game performance of pre-service physical education teachers in SEM versus TGM Team Handball Units over time from pre-test to post-test. The hypotheses were twofold: (1) participants were expected to improve game performance from pre-test to post-test in both SEM and TGM instructional models, and (2) participants were expected to improve game performance to a greater extent from pre-test to post-test in the TGM Team Handball Unit than in the SEM Team Handball Unit given the more explicit focus on technical and tactical skill development in the TGM (Griffin et al., 2013). The hypotheses were partially supported and considered in terms of interdisciplinary literature.

The first hypothesis was supported in the current study. Participants in both SEM and TGM Team Handball Units significantly improved game performance across all three areas, Adjust, Support, and Passing, from pre-test to post-test. Although the current research adds an element of comparison between SEM and TGM instructional models that to our knowledge has yet to be explored, the results are similar to prior studies discretely involving the SEM, TGM, and GPAI. Harrison et al. (2004) reported a significant improvement from pre-test to post-test scores in volleyball skills and knowledge when the TGM was used. Pritchard et al. (2008) found that game performance improved over time across a 17-lesson SEM volleyball unit. Blomqvist et al. (2001) saw an increase in serving skills, tactical awareness, and badminton knowledge over time in an eight lesson TGM badminton unit. Hastie et al. (2009) discovered that game performance as measured using the GPAI improved over time in a 10-lesson badminton unit. Taken together, this previous research supports the current findings that both SEM and TGM instructional models can significantly influence game performance as measured using the GPAI.

A core purpose of any instructional model is to educate students and enhance the learning process. The specific objectives, task presentation, and overall structure varies from instructional model to instructional model. However, each has the expectation that when instructed with fidelity students will learn to some degree in cognitive, affective, or psychomotor domains (Metzler, 2011). Additionally, individuals tend to improve on tasks over time simply due to the ef-

fects of practice. Thus, despite structural and functional differences in the two instructional models, opportunities were provided to all participants to practice task-relevant skills and to learn from competent instruction. This may explain why game performance scores increased among participants in both the SEM and TGM Team Handball Units from pre-test to post-test, and why other researchers have concluded similar results in the past.

The second hypothesis was that participants would improve game performance scores to a greater extent from pre-test to post-test in the TGM Unit than in the SEM Unit. No significant interaction was observed in game performance scores between pre-service physical education teachers in the TGM versus SEM instructional models over time; therefore, support for this hypothesis was not found. This result differed from original expectations, as the TGM is an instructional model specifically designed to teach and practice tactical and strategic core components of games and sports (Griffin et al., 2013); whereas, the SEM is designed to provide authentic team-based sport experiences with a focus on appreciating and valuing sport. The researchers measured Adjust and Support, two tactical/decision-making skills that the TGM was designed to specifically develop through the structure and objectives of the model. Additionally, Passing was a measure of psychomotor skill, which was also specifically embedded in all TGM lessons for practice and development during the practice task. Although it was somewhat surprising that participants did not significantly improve game performance over time to a greater extent in the TGM compared to the SEM, the finding partially corroborated prior research. For instance, Harrison et al. (2004) found no significant difference between the instructional models TGM and Skill Teaching when examining volleyball skills and knowledge. Looking beyond the learning objectives of the instructional models themselves may therefore be necessary to better appreciate the observed results.

The lack of significant differences in game performance between the SEM and TGM instructional models in the current study may also indicate that a SEM has the potential to increase game performance scores to a similar degree to that of a TGM. What could help account for the game performance improvements found among participants in the SEM, despite not explicitly emphasizing the technical and tactical components of the task?

The game performance improvements observed among participants in the SEM Unit could be explained in part through the perspectives of Situated Learning Theory and cohesion. Each theoretical perspective will be discussed to provide rationale for findings of the current study.

Situated Learning Theory

The Situated Learning Theory (Lave & Wenger, 1991) explains learning through legitimate peripheral participation where learning occurs best through a highly active authentic learning process. Legitimate peripheral participation involves meaningful experiences of culture, socialization, and interaction in the environment of the learner where relationships and connections are formed to attach value to the learning process. It is predictable that if a student does not value the experiences in sport/education or form meaningful relationships with those within the learning environment, then motivation, interest, and effort to support teammates could be lacking. Due to the core components and primary features of both the SEM and TGM, the opportunities for students to engage in legitimate peripheral participation are greater in the SEM than in the TGM. As evident by prior SEM research (Hastie, 1996), the social interactions that students have and relationships that formed through the SEM were a major strength of the instructional model. The primary features of the SEM, namely affiliation, festivity, and culminating event, were all directed toward creating a positive social atmosphere in the class (Siedentop et al., 2011). To this point, the findings of the current research could possibly be attributed to the inherent primary features of the SEM, which facilitate an educational experience and environment like that described by Lave and Wenger (1991) in the Situated Learning Theory.

Another feature of Situated Learning Theory that has arisen in the literature is the notion of communities of practice. Patton et al. (2005) examined a mentoring process between university mentors and physical education teachers in a two-year study. The authors examined the mentoring process grounded in the Situated Learning Theory and a conceptual framework called communities of practice. Communities of practice was described by Kirk and MacDonald (1998) as any group whose members contribute through shared practices in any context or environment. The participants of the cur-

rent study in both the TGM and SEM Team Handball Units represent such a community respectively. The authors summarized that through the mentors and teachers sharing experiences, supporting, and learning from each other, new skills, knowledge, and trust developed and contributed greatly to the learning process. The authors suggested that through a community of practice, with shared ideas, trust, commitments, and collaboration, such positive results were possible. A shift occurred between the mentors and teachers from the periphery, to becoming legitimate peripheral participants in a community of practice. Griffin et al. (2005) wrote that Situated Learning Theory was a strong framework to ground research in models-based instruction and specifically the TGM. The authors explained that learning is inseparable from the culture and environment in which it takes place. The authors wrote on the concept of communities of practice and outlined the connections to legitimate peripheral participation by Lave and Wenger (1991) and communities of practice consistent with Patton et al. (2005). The authors concluded that the social and cultural teaching environment contributes greatly to the learning process (Griffin et al., 2005).

In comparing the two instructional models, the SEM is arguably the more socially driven. For example, when engaged in live gameplay, a decision to Adjust, Support, or Pass within the SEM Unit could have been as much a social decision to help a teammate as it was a cognitive, technical, or tactical one. This may connect to a primary feature of a SEM, Affiliation. Observed during data collection was the cognitive and tactical awareness to recognize the need to support a teammate, the physical skill of making a cut to get open to position oneself to receive the ball, and perhaps of most significance the desire, motivation, and effort to want to support your teammate and score a goal. In the SEM, teams were formed early on in the unit, lesson number one. Students stayed with the same team for the duration of the unit and played with the same teams daily. Students were at times coached by teammates and then at other times were in charge of coaching other teammates. It is feasible that a strong feeling of affiliation was formed over the duration of the unit, or at least that a stronger feeling was developed among participants in SEM than among those in TGM where there was no emphasis placed on team affiliation. In the SEM, students were intentionally placed in an en-

vironment of camaraderie, excitement, and peer competition which could have increased team cohesiveness, motivation, and the relationships formed between teammates. Through the lens of Situated Learning Theory, the team affiliation observed among participants in the SEM could help explain some of the game performance improvements observed in the SEM Unit and help to account for the lack of game performance differences between the SEM and TGM instructional models. The Situated Learning Theory may therefore be a relevant theoretical basis for interpreting the results of this study.

Cohesion

Considering the features of a SEM, cohesion may be another relevant theoretical lens through which to view the current findings. The term cohesion as it is used today in exercise and sport dates back to research done by Festinger et al. (1950). A more thorough and updated definition of cohesion was presented by Carron et al. (1998) as “a dynamic process which is reflected in the tendency for a group to stick together and remain united in the pursuit of its instrumental objectives and/or the satisfaction of member affective needs.” Researchers and practitioners further distinguish between task and social cohesion, where task cohesion reflects how well team members work together toward a common performance goal, and social cohesion reflects the interpersonal attraction or affiliation among team members (Carron et al., 1985). Based on these features of cohesion, it seems reasonable that the cohesiveness between teammates that exists in the SEM could differ from the cohesiveness of teams in the TGM. Recent research supports the SEM as an effective instructional model for helping to develop team cohesion in students (Kao, 2019). Opportunities to make autonomous learning decisions, adopt roles that contribute to the collective effort and goals of the team, and engage in positive social interactions among peers are processes of SEM team scenarios that facilitate team cohesion (Kao, 2019). If the SEM has the capacity to facilitate performance improvements based on team cohesion, what remains then is support for a cohesion-performance relationship.

Literature in education as well as in sport, exercise, and performance psychology has offered consistent support for the links between cohesion and performance (Beal et al., 2003; Carron et al., 2002; Eys et al., 2015; Jensen et al., 2021). Cohesion and success are

thought to be bidirectional, meaning as cohesion increases so too does success and also as success increases so too does cohesion (Eys et al., 2015). Although researchers have suggested that task and social cohesion may at times pose disadvantages (Hardy et al., 2005), generally the presence of task and/or social cohesion is thought to favorably influence the performance of team members (Carron et al., 2002). Taking together the literature on SEM-cohesion and cohesion-performance relationships, the SEM could facilitate improvements in game performance among participants by enhancing the cohesion of team members. This seems especially salient given that some of the key factors that enhance cohesion are core elements of a SEM instructional model. Several of these key cohesion factors are discussed below as they relate to the current research, including distinctiveness, democratic leadership, motivational climate, and role clarity/acceptance.

Cohesion can increase with the feeling of distinctiveness, meaning that when those on a team feel special or different, they may feel a greater sense of cohesiveness (Carron & Eys, 2012). The SEM unit began with the creation of nicknames, team slogans, colors, handshakes, etc. all aimed toward building a strong, positive, distinct team climate. From day one, the SEM emphasized a fun, exciting, and engaging environment that was meant to replicate the feeling of being part of an authentic professional team in an organized league. According to Carron et al. (2002), team-building experiences may have a large impact on team cohesion and in turn team performance. Since in the SEM students remain in an intact team for the duration of the unit, the opportunities for students to develop distinctiveness and become more cohesive are embedded through the primary features of the SEM: affiliation, festivities, competitive-format, etc. These primary features are exclusive to the SEM and are not emphasized or present in the TGM. The TGM, in contrast, did not provide specific opportunities for participants to develop these distinct team qualities. Considering the specific features of the instructional models, participants in the SEM could have experienced greater cohesion because they had the opportunity to feel more distinct or special, having been part of a team, than those in the TGM. This increased team cohesion among participants in the SEM unit may have influenced to some extent the game performance improvements observed in the current study.

Cohesion is also generally higher when a coach/leader uses a democratic, more inclusive style of decision-making (Carron & Eys, 2012). In the SEM participants often have opportunities to coach/lead teammates, as one of the features of the SEM is for participants to experience the role of team coach for the day. The researchers witnessed a more democratic approach to running practice tasks when student-coaches were leading than would have been demonstrated by the unit instructor. Conversely, in the TGM, the unit instructor is the leader for all activities and practice tasks. Given this distinction between the instructional models, the participants in the SEM most likely experienced a more democratic leadership style than those in the TGM from an instructional perspective. Thus, the opportunity to be more cohesive from a democratic coaching/leadership perspective would likely be higher in the SEM.

Additionally, the motivational climate of the team impacts cohesion. Both task and social cohesion are often improved in task-involving motivational climates, those in which the emphasis is placed on effort and personal improvement, viewing mistakes as opportunities to learn, and a common understanding that each team member fulfills a valued role (Boyd et al., 2014). The more valued and supported group members feel the more cohesive the group is likely to be (Carron & Eys, 2012). In the SEM, participants are invited to work together toward a common goal and demonstrate enthusiasm and affiliation toward the team. The SEM has also been linked to greater satisfaction of relatedness as a basic psychological need linked to self-determined motivation (Perlman, 2010). Together these features of the SEM seem to promote a task-involving motivational climate wherein team cohesion can thrive. This too could favorably influence the game performance of pre-service teachers in the SEM, and help account for the lack of game performance differences observed between instructional models in the current study.

Groups that demonstrate high levels of cohesiveness and team success possess goal clarity and acceptance, role clarity and acceptance, and role performance (Carron et al., 2002). When individuals understand and accept their roles, and are able to competently carry out their roles, groups are more effective and cohesive (Eys et al., 2015). More specifically, when individuals understand the scope of their responsibilities, the behaviors necessary to fulfill their role, how

they will be evaluated, and the consequences for not fulfilling their role, the likelihood of them being successful in their role is greater (Beauchamp et al., 2002). As stated, students selecting, fulfilling, and being held accountable for established roles within the SEM team and league format makes the experience very unique. Participants in the SEM were provided clear descriptions and expectations for the selected roles, and it was made clear what the consequences would be should participants fail to fulfill the role. There were no assigned or selected roles that participants undertook in the TGM. Participants in the SEM thus had a greater opportunity to be autonomous, empowered, and motivated in their roles than those in the TGM. This aspect of the SEM could also have led to higher team cohesion and perhaps help account for game performance improvements.

The finding that participants across both the SEM and TGM instructional models improved game performance to a similar extent supports the notion that game performance can be improved through different approaches. While the TGM may have contributed explicitly to game performance improvements by focusing on the technical and tactical aspects of game performance, the SEM may have contributed indirectly to game performance improvements by facilitating distinctiveness, and other features that develop greater cohesion among team members. These different paths to increase game performance could help explain why participants in the SEM performed more comparably to participants in the TGM than was originally hypothesized based on the explicit learning objectives of the instructional models. Future research should examine cohesion, both task and social, in physical education models-based instruction research, especially the SEM, as this concept could contribute greatly to the interpretation of the results of the current study.

Strengths, Limitations, and Future Directions

No known research has been conducted comparing game performance scores between the SEM and TGM specifically. From a practical perspective, the results should be considered because of the nature and objectives of both models. Since the TGM was developed to enhance skill development, decision-making, and tactical awareness, it was expected that the scores on the post-test would be higher than the SEM whose objectives and goals are more affective. Since both models did result in significant improvements in the game

performance of students, and neither model was found to be significantly different than the other, it is suggested that both the TGM and SEM can be just as effective a means of improving game performance scores. It was expected that the SEM would result in lower game performance scores due to the fact that game performance was not a primary feature of the model (Siedentop et al., 2011). The researchers concluded that despite this, the SEM had potential, when delivered with fidelity, to impact the game performance scores of students positively in ways not traditionally expected from the SEM.

The participants in the current study were all pre-service physical education teachers. At the time of this study, no known research has been conducted with pre-service physical education teachers as players in a SEM unit as in the current study, and limited research was found for pre-service physical education teachers' participation in the TGM (Blomqvist et al., 2001). Blomqvist et al. (2001) examined the TGM with pre-service physical education teachers but did not discuss the possible implications of the participants being pre-service physical education teachers. Very limited prior research with similar participants was available to compare. The researchers examined the means and standard deviations for experience with team handball, TGM, and SEM for all participants. The means ranged from 1.45-2.37 (1 = None, 2 = Beginner, 3 = Intermediate, 4 = Advanced, 5 = Expert) where SEM scored the lowest, then TGM, and team handball the highest. On average, participants identified closer to a 2, Beginner, more so than any other level of experience. It is suggested that being pre-service physical education teachers had no discernible influence on the results of the current study.

Physical educators may feel that the TGM is the best instructional model to increase game performance; however, the researchers found support for the SEM as another possible option to achieve the desired objectives traditionally reserved for the TGM. For physical educators perceiving the SEM as largely a cognitive and affective/socially focused model that lacks skill and tactical development, the researchers concluded that is not always the case. Supported by the findings of the current study, physical educators who have a preference between the SEM and the TGM can select either model and feel more comfortable and confident that improvements in game performance can be an achievable outcome.

Researchers have often explored the SEM from a qualitative perspective (Pereira et al., 2015). Bessa et al. (2019) reported in a review of SEM research published prior to 2018 that a small percentage (27%) of SEM research has utilized a purely quantitative approach and called for further quantitative SEM research to extend the literature. Thus, the current study added to the call and provided further evidence that student skill and decision-making can improve through the use of instructional models.

One limitation of the current study was the structure and time-frame in which the unit instructor planned and implemented the TGM and SEM units. Due to the nature of education and the sequencing of curriculum, an educator is often limited by the available minutes in a lesson, lessons in a week, and weeks in a unit. Across the vast amount of research regarding both the SEM and TGM the duration of units, frequency of lessons, and length of lessons varies greatly from study to study (Hastie et al., 2011). Additionally, the creators of the SEM and TGM offer suggestions for desired length of units but recognize that length may vary from sport to sport for many reasons. To facilitate transparency in this limitation, as suggested by prior instructional model researchers, the current researchers have provided a rich description of the SEM and TGM units in the Method section (Hastie & Casey, 2014). On a final limitation note, the sampling method and sample size could impact the generalizability of the findings, as the participants were drawn from a single institution. Future researchers should look to access a larger, broader sample of participants to see if the findings generalize to other learning institutions and participants.

Future researchers should also explore the various components of the GPAI and how scores may differ across other instructional models when homogenous samples are utilized as in the current study. Future researchers should utilize other methods of data collection to compare the SEM and TGM further, such as mixed methods or multiple observers to determine inter-rater reliability. Of increasing popularity is the combining of different instructional models to form hybrid models as a means of incorporating the strengths of each model into one unit (Farias et al., 2015; Gil-Arias et al., 2021). Based on the results of the current study it is suggested that the SEM and TGM be explored as a hybrid model utilizing certain

core components and primary features of each model. Both models showed an increase in game performance scores and resulted in no significant difference between the two, thus supporting the effectiveness of both instructional models for increasing game performance. Future research should continue to investigate the SEM and TGM grounded in the Situated Learning Theory and also through the concept of communities of practice as this could additionally contribute to explaining the results of the current study and help ground future studies examining the SEM, TGM, and models-based instruction. Lastly, based on the findings of the current study, cohesion, both task and social, should be explored in models-based instruction, and specifically in the SEM and TGM. Jensen et al. (2021) used a mediation model to better understand team cohesion as a mediating factor in the relationship between cultural ideologies and performance. Although no mediation was found by the authors in that study, future researchers might consider cohesion as a mediating variable in the SEM-game performance relationship considering the promising findings discussed.

Conclusion

In conclusion, the game performance of pre-service physical education teachers was examined in two instructional models, the SEM and TGM. The researchers found no significant difference between the two. Both instructional models, SEM and TGM, were effective in significantly improving students' GPAI scores for Adjust, Support, and Passing over time. The current study provided evidence for the use of both the SEM and TGM in improving game performance among participants, and that in some cases, when delivered with fidelity the SEM can be as effective as the TGM in increasing game performance.

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