

# STUDENTS' TACTICAL UNDERSTANDING DURING A HYBRID SPORT EDUCATION/STEP-GAME APPROACH MODEL VOLLEYBALL TEACHING UNIT

*O CONHECIMENTO TÁTICO DOS ALUNOS DURANTE UMA UNIDADE HÍBRIDA DO MODELO DE EDUCAÇÃO DESPORTIVA E DO MODELO DE ABORDAGEM PROGRESSIVA AO JOGO NO VOLEIBOL*

*EL CONOCIMIENTO TÁCTICO DE LOS ALUMNOS DURANTE UNA UNIDAD DE HÍBRIDA DEL MODELO DE EDUCACIÓN DEPORTIVA Y DEL MODELO DE APROXIMACIÓN PROGRESIVA AL JUEGO EN EL VOLEIBOL.*

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## Keywords:

Learning.  
Declarative knowledge.  
Physical Education.  
Models, educational.

**Abstract:** Model-based research has been enhancing the positive effectiveness of both Sport Education and Step-Game Approach on students' technical, tactical and game-play improvements. Nevertheless, the analysis of students' declarative understanding on the game in this area was scarce. This study examined their declarative understanding on the game during their participation in a hybrid Sport Education/Step-Game Approach teaching unit. Ninety-six students with no previous experience in either model participated in a 24-lesson volleyball season. A video-based test was developed to assess students' declarative game understanding and applied before and after the teaching unit. Results showed that they improved in all tactical content taught during the unit. These results can find explanation on Sport Education features such as cooperative team practices and the possibility for being in roles other than players. Beyond that, instructional procedures considered by the Step-Game-Approach stimulated the development of students' tactical awareness.

## Palavras chave:

Aprendizagem.  
Conhecimento declarativo.  
Educação Física.  
Modelos educacionais.

**Resumo:** A investigação nos modelos instrucionais tem enaltecido o impacto positivo do Modelo de Educação Desportiva e do Modelo de Abordagem Progressiva ao Jogo no desenvolvimento técnico e tático dos alunos, assim como no desempenho geral no jogo. Todavia, a análise do conhecimento tático dos alunos neste âmbito tem sido escassa. O presente estudo tem como propósito analisar o conhecimento tático declarativo dos alunos durante uma unidade híbrida desses dois modelos na modalidade de voleibol. Noventa e seis alunos sem experiência prévia nos dois modelos participaram numa época desportiva com 24 aulas. Foi desenvolvido um teste de vídeo para analisar o desenvolvimento do conhecimento tático declarativo dos alunos, o qual foi aplicado antes e depois da unidade. Todos os alunos melhoraram nos conteúdos táticos ensinados, o que pode encontrar explicação no trabalho colaborativo em equipas, na possibilidade dos alunos participarem noutros papéis para além de jogadores e nos processos instrucionais, características dos dois modelos.

## Palabras clave:

Aprendizaje.  
Conocimiento declarativo.  
Educación Física.  
Modelos educacionales.

**Resumen:** La investigación en los modelos de instrucción ha enaltecido el impacto positivo del Modelo de Educación Deportiva y del Modelo de Aproximación Progresiva al Juego en el desarrollo técnico y tático de los alumnos, así como también en el desempeño general en el juego. Sin embargo, el análisis del conocimiento tático de los alumnos en este ámbito ha sido escaso. El presente estudio tiene como propósito analizar el conocimiento tático declarado de los alumnos durante una unidad híbrida de estos dos modelos en la modalidad de Voleibol. 96 alumnos sin experiencia previa en los dos modelos participaron en una temporada deportiva con 24 clases. Se desarrolló un test de vídeo para analizar el desarrollo del conocimiento tático declarado de los alumnos, que se aplicó antes y después de la unidad. Todos los alumnos mejoraron en los contenidos tácticos enseñados, lo que puede encontrar explicación en el trabajo colaborativo en equipos, en la posibilidad de que los alumnos participen en otros papeles además de como jugadores y en los procesos de instrucción, características de los dos modelos.

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## 1 INTRODUCTION

Team based activities where students can compete and interact have been the most prominent area in the vast majority of curricula in physical education setting (GREEN, 2008). Students refer their preference for these activities when compared to other areas of Physical Education curriculum (RIKARD; BANVILLE, 2006; TJEERDSMA; RINK; GRAHAM, 1996). Overall, students enjoy the playful component and the opportunities to socialize offered by these activities (SMITH; ST. PIERRE, 2009), however some students, mostly low skilled level and girls, perceived games instruction as boring content (CASEY; HILL; GOODYEAR, 2014; RIKARD; BANVILLE, 2006; SMITH; GREEN; THURSTON, 2009). The dominant technical and teacher-centred instructional approaches used in Physical Education (i.e. focused on repetitive, teacher directed and molecular approaches to team sports instruction) have been related with this student dissatisfaction (KIRK, 2010; RIKARD; BANVILLE, 2006).

Considering this gap, research has been showing the importance of instructional models, based on student-centred and tactic-to-skill approaches involving modified games (HARVEY; JARRET, 2014; HASTIE; MESQUITA, 2016). Sport Education (SE) (SIEDENTOP; HASTIE; VAN DER MARS, 2011) is regarded as one of these student-centred approaches, since allocates the student to the centre of the teaching and learning process and adopts more implicit and less formal strategies when compared to other models traditionally used in the school context (METZLER, 2011). SE spurred from Siedentop's perception that Physical Education, even when taught effectively, was not interesting or challenging enough to inspire students (SIEDENTOP, 2002). This model was design to provide students authentic and rich sport experiences in the context of Physical Education, helping them to develop as competent, literate and enthusiastic sports players (SIEDENTOP; HASTIE; VAN DER MARS, 2011). In order to do that, SE crafts six key-features that mimic the authentic form of institutionalized sport within the larger culture. These include (i) seasons, (ii) team affiliation, (iii) formal competition, (iv) record keeping, (v) festive climate and (vi) culminating event.

Research on SE has been providing a compelling argument for its effectiveness in Physical Education programmes worldwide, namely on students' competency, literacy and enthusiasm (ARAÚJO; MESQUITA; HASTIE, 2014; HARVEY; JARRET, 2014; HASTIE; MARTINEZ DE OJEDA; CALDERÓN, 2011; WALLHEAD; O'SULLIVAN, 2005). Specifically in the Brazilian reality, SE has been showing to be an appropriate model to be implemented, namely by improving students' knowledge and autonomy (GINCIENE; MATTHIESEN, 2017). Notwithstanding, it also demands extra and permanent work from the teachers, given the need to develop activities outside of classes (VARGAS; MORISSO, GONZÁLEZ; SAWITZKI, 2018). VARGAS, MORISSO, GONZÁLEZ and SAWITZKI (2018) have therefore suggested the need to examine this model in different environments to better know its advantages and constrains.

In the particularly case of students' competence, SE research has been showing its effectiveness when combined with other forms of game-based instruction

with specific framework to the content and learning tasks to be taught during the season. Namely, regarding students' game play performance improvements (i.e., decision making: what, when, and where to do; and skill execution: how to do) both on invasion (MESQUITA; FARIAS; HASTIE, 2012; PRITCHARD; MCCOLLUM; SUNDAL; COLQUIT, 2014) and non-invasion games (ARAÚJO; HASTIE; LOHSE; BESSA, MESQUITA, 2019; ARAÚJO; MESQUITA; HASTIE; PEREIRA, 2016). In particular on invasion games, MESQUITA, FARIAS and HASTIE (2012) found that a SE environment sustained by the learning tasks structure provided by the Invasion Games Competence Model (IGCM) offered students the possibility to improve their skill execution and decision-making, especially girls and students of lower skill-level. In the same line, PRITCHARD, MCCOLLUM, SUNDAL and COLQUIT (2014) aimed to investigate the effectiveness of a combined use of SE and Tactical Games, and found improvements on basketball game play performance for males and females of both classes.

With respect to non-invasion games, the Step-Game-Approach model (SGA) (MESQUITA; GRAÇA; GOMES; CRUZ, 2005) has shown to be a proper framework to be combined with SE (ARAÚJO; HASTIE; LOHSE; BESSA; MESQUITA, 2019; ARAÚJO; MESQUITA; HASTIE; PEREIRA, 2016). Famed upon didactical ideas from Teaching Games for Understanding model (BUNKER; THORPE, 1982) and Skill Development Approach (RINK, 1993), the SGA model presents students progressive (step-by-step) game problems that challenge their capacity for understanding their current performance profiles. In this model, three types of instructional tasks are implemented. These are known as acquisition tasks (focused on the development of a specific skill), structuring tasks (which focus on comprehending the tactical and technical skills of the game but without opposition) and adaptation tasks (in which the goal, action structure and basic tactical features are similar to the full volleyball game) (MESQUITA; GRAÇA; GOMES; CRUZ, 2005). ARAÚJO, MESQUITA, HASTIE and PEREIRA (2016) sought to investigate a hybrid combination of SE and SGA on students' game play performance, taking into account their sex and skill-level. Results showed both boys and girls improved in all the game play dimensions from their beginning to the end of the Volleyball unit and maintained those improvements to the retention test. These results were recently corroborated (ARAÚJO; HASTIE; LOHSE; BESSA; MESQUITA, 2019) through a longitudinal design. Specifically, all students (regardless of their gender and skill-level) improved from their first experience at the seventh-grade through to the end of the ninth-grade season.

Nevertheless, the analysis of students' game understanding (i.e., knowledge on decision making and skill execution) on these hybrid models has been scarce (ARAÚJO; MESQUITA; HASTIE, 2014; HARVEY; JARRET, 2014; HASTIE; MARTINEZ DE OJEDA; CALDERÓN, 2011; WALLHEAD; O'SULLIVAN, 2005). In fact, during game play, students' cognitive response selections and motor behaviour responses are sharply interconnected (THOMAS; THOMAS, 1994). In this way, the development of students' decision making ability is best improved based upon tactical awareness development (THORPE; BUNKER, 2010). Even though, to date and to our knowledge, only one study was focused on this issue (FARIAS; MESQUITA; HASTIE, 2015). In particular, FARIAS, MESQUITA e HASTIE (2015) through the use

of a video-based test showed that the combined application of SE and IGCM in soccer promoted improvements in game understanding to all students in most all the variables examined. In a deeply analysis the authors refer superior improvements to girls. Given all of these, the purpose of the present study was to analyse students' declarative game understanding during their participation in a hybrid SE-SGA volleyball unit. In addition, given the potential imbalanced power relations based on students' gender portrayed by accounts in earlier research (e.g. BROCK; ROVEGNO; OLIVER, 2009; HASTIE, 1998a; 1998b), this study also intends to verify if this alliance induce the same opportunities to both boys and girls.

## 2 METHODS

### 2.1 DESIGN AND PARTICIPANTS

Given recent recommendations for moving model-based research forward for a more interpretative approach. focusing on internal pedagogical practices (ARAÚJO; MESQUITA; HASTIE; PEREIRA, 2016; HASTIE; MESQUITA, 2016), it was not the aim of this study to demonstrate the superiority of this model over other forms of instruction. Therefore, in order to analyse students' game understanding, a pre- post-test quasi-experimental design was used, without the concurrent application of a control group.

The participants were 96 students (40 boys and 53 girls, aged from 16-18 years-old) from four randomly assigned classes, which had no previous experience both on SE and SGA models. However, students had previous experience with volleyball in Physical Education classes. The two teachers that applied the season had more than 10 years of experience and were knowledgeable and experts in volleyball and both models.

### 2.2 SE-SGA VOLLEYBALL SEASON

#### 2.2.1 SE features

A 24-lesson (45 minutes) volleyball season was design with the organizational features of SE (SIEDENTOP; HASTIE; VAN DER MARS, 2011). In order to promote *affiliation*, students were allocated within teams, stayed together throughout the unit and participated in a *formal competition*. Although teams were established through peer negotiation, the teacher supervised the process to assure intra-team heterogeneity and inter-team balance of skill-level. Within this teams, students were assigned with *different roles* other than player in a rotating basis, namely statistician and referee. The student-coach remained the same across the season and was chosen by the teacher in order to prevent potential imbalanced power relations within the teams (e.g. BROCK; ROVEGNO; OLIVER, 2009; HASTIE, 1998a; 1998b). Additionally, research (e.g. FARIAS; HASTIE; MESQUITA, 2017) has been showing that only participating in SE is not sufficient to maintain equity and inclusion. Therefore, although without compromising students' autonomy and the positive environment within the lesson,

they were held accountable for their fair-play behaviours. For instance, teams could accumulated point penalties if they showed actions that compromised fair-play, inclusive practices, peer encouragement, effort, and engagement in the managerial tasks.

The season followed a four-phase format (table 1). The first and second lessons of the season was dedicated to students' allocation within teams, distribution of team roles and diagnostic assessment. The period from lesson 3 to 12 was dedicated to skill development and pre-season scrimmages. The formal competition phase was held between lesson 13, and lesson 23 and 24 were dedicated to the *culminating event*.

Table 1 – SE-SGA unit outline.

Lesson	SE	SGA			
		Instructional objectives	Tactical skills	Technical skills	Instructional tasks
1 – 5	Pre-season. Rules of formal competition. Diagnostic assessment. Students' allocation to teams and introduction to team roles. Teachers-directed instruction.	Play de ball to the opponents' court.	Intervention. Opposition.	Set. Forearm pass. Underhand serve.	Acquisition. Structuring.
4 – 7	Pre-season. Teacher and student-coaches' shared instructional responsibility.	Cooperation with the partner.	Identification of responsibility zones. Adjustment to the ball trajectory. Preparing the set approaching the net. Transition.	Set. Forearm pass. Underhand serve.	Acquisition. Structuring. Adaptation.
8 – 12	Pre-season. Teacher and student-coaches' shared instructional responsibility.	Organize the attack and defence.	Decision making in the set. Defence tactical options.	Lower position. Overhead serve. Return to attack.	Structuring. Adaptation.
13 – 22	Formal competition. Student-coaches' instructional responsibility	Organize the attack and defence.	Attack options.	Tip. Spike.	Adaptation
23 and 24	Culminating event. Awards: winning teams. MVP and MFP.				Adaptation

Source: Authors

### 2.2.2 SGA features

The learning tasks of the season followed the didactical framework of the SGA (MESQUITA; GRAÇA; GOMES; CRUZ, 2005). In specific, the adaptation of learning tasks to the game's demands was emphasized through the use of three types of instructional tasks: *acquisition* (aim the improvement of skill efficiency and do not have contextual interference), structuring (follow the game's sequence of action but without opposition), and adaptation tasks (modified game with opposition character that allow the application of technical and tactical abilities to game context).

The 2vs2 game form was applied during the season, since is the most appropriate game form to develop basic individual and collective tactical and technical skills in Volleyball (ARAÚJO; MESQUITA; HASTIE; PEREIRA, 2016; MESQUITA; GRAÇA; GOMES; CRUZ, 2005). Tactical and technical skills were taught in alignment with the three types of learning tasks, increasing its complexity throughout the season. Specifically, in the beginning of the unit, technical and simple tactical skills (such as intervention and opposition) were taught mostly through the use of acquisition tasks. Structuring tasks were used in order to taught tactical skills related with cooperation with the partner (such as the identification of responsibility zones) and more complex tactical content were taught using adaptation tasks (e.g. decision making in the set, attack using the most appropriate skill, etc.). In order to adjust the content according to different skill-levels, intra- (changing accountability systems) and inter-variability (changing the complexity of the game) in the learning tasks were applied. Game rules and criteria of success of the tasks were also adapted to students' skill level (ARAÚJO; HASTIE; LOHSE; BESSA; MESQUITA, 2019; ARAÚJO; MESQUITA; HASTIE; PEREIRA, 2016). Furthermore, graded competition (SIEDENTOP; HASTIE; VAN DER MARS, 2011) in which each team created sub-teams who compete against other sub-teams within their skill-level was applied (ARAÚJO; MESQUITA; HASTIE; PEREIRA, 2016).

### 2.2.3 Instructional procedures

Since this was students' first experience with the SE-SGA approach, the initial phase of the season involved teacher-directed instruction to the whole class. As the season progressed, teachers increasingly shared the instructional leadership and the monitoring of the learning tasks with the student-coaches. More specifically, student-coaches led instruction of the simpler learning tasks. By the end of the season student-coaches were able to monitor and share instruction with the teacher in more complex learning tasks related to their own game problems. In order to develop a positive learning climate and promote high levels of engagement, the two teachers were also particularly diligent in terms of monitoring student cooperative work, peer interactions, and general sense of team affiliation.

## 2.3 DATA COLLECTION

In order to analyse students' declarative game understanding in volleyball, a video-based test was developed and applied before (pre-test) and immediately after

the unit (post-test) in a classroom apart from the gym (table 2). In the video test, skilful sixteen-year-old boys and girls played modified volleyball (1vs1, 2vs2 and 3vs3) and were recorded from the most adequate perspective for each situation. The video included 20 questions of offensive and defensive game situations, each one with tactical (with or without ball) or technical skills of SGA. The tactical and technical content observed in the game understanding test were aligned the content taught during the SE-SGA unit. Each video sequence began with 4–7 seconds of lead-up match situation showed on a large screen, followed of a still frame (20 seconds) to give students time to solve the question in a paper sheet (based on LUHTANEN; BLOMQUIST; KESKINEN; BROWN; VALOVIRTA, 2004). One point was granted when students selected the most appropriate option out of three (A, B and C). For instance, during a 2vs2 situation the video stop when the ball falls between two players, tending to the responsibility zone of one of them, and a question was prompted: 'Who should have played the ball?'. 'A – player with white t-shirt; B – player with black t-shirt or C – anyone regardless of the responsibility zone?' The overall index represented the sum of points related to decision-making, adjustment and skill execution both for offensive and defensive skills. Prior to the video test, all participants were given the same instructions on how to take the test and were then familiarized with the test by rehearsing one situation together with the tester. The test began after the rehearsal.

The development of the video-based test followed two strategies in order to fulfil the requirements for content and construct validity. First, a review of literature was conducted related with the examination of: (i) already existing categories in other observation instruments (BLOMQUIST; VÄNTTINEN; LUHTANEN, 2005; LUHTANEN; BLOMQUIST; KESKINEN; BROWN; VALOVIRTA, 2004); (ii) the assessment of students' tactical awareness (GRIFFIN; MITCHELL; OSLIN, 1997; MITCHELL; GRIFFIN; OSLIN, 1994; OSLIN, 2005; OSLIN; MITCHELL, 2006) and (iii) the tactical and technical principles considered in the SGA (ARAÚJO; MESQUITA; HASTIE; PEREIRA, 2016; MESQUITA; GRAÇA; GOMES; CRUZ, 2005; PEREIRA; GRAÇA; BLOMQUIST; MESQUITA, 2011). Secondly, three experts (one experienced physical education teacher, a researcher of physical education and instruction models and an expert in volleyball) evaluated the test as a valid measure to analyse the volleyball content according to previous literature in SGA (ARAÚJO; MESQUITA; HASTIE; PEREIRA, 2016; MESQUITA; GRAÇA; GOMES; CRUZ, 2005; PEREIRA; GRAÇA; BLOMQUIST; MESQUITA, 2011). In addition to this, the three experts agreed that the items test captured all of the technical and tactical behaviours that occur during the game. This panel also agreed the tactical principles considered in the game understanding test were aligned with instructional objectives and the content taught during the season (RINK, 2001). In order to establish the reliability of the test, other class of the same school completed the test on two different occasions. The test-retest method was calculated showing a mean percentage of agreement of 83%.

**Table 2** – Description of the game understanding test.

<b>Q1. Intervention</b>	Knows where to move to intercept the ball.
<b>Q2. Opposition</b>	Chooses targets to attack (in the attack, play the ball in the vulnerable space - empty space, weaker player, etc.).
<b>Q3. After the serve keeps ready to play</b>	After serving, the players enter to a central position in the court to continue playing.
<b>Q4. After the attack keeps ready to play</b>	After attacking the ball, the players enter to a central position in the court to continue playing.
<b>Q5. Responsibility zones 1</b>	Occupies and play the ball in the area of the court that it is of its responsibility.
<b>Q6. Responsibility zones 2</b>	Knows his responsible zone and does not interfere with his teammate.
<b>Q7. Adjustment</b>	After the first touch adjust his/her position to play the ball to his teammate
<b>Q8. Prepares the set approaching the net</b>	When the player doesn't receive / defend, he/she prepares to set, approaching the net.
<b>Q9. Transition</b>	After receiving/defending, the player prepares to attack.
<b>Q10. Identify the defensive zone</b>	In defense, goes to the adequate zone of the court, in order to the tactical system used by his team.
<b>Q11. Adapts the defence to the attack</b>	If the attack is carried out near the net, the player performs block.
<b>Q12. Adapts the block to the attack</b>	If the attack is carried out away from the net, adopts defensive position adjusted to the ball's trajectory.
<b>Q13. Knows to differentiate the quality of the 1<sup>st</sup> touch</b>	Plays the ball to the opponent court in the second touch, when the ball is too over the net (in bad conditions to the attainment of a quality setting to the attacker).
<b>Q14. Attack at the 2<sup>nd</sup> touch</b>	Plays the ball to the opponent court in the second touch, when he/she realizes that is the best tactical solution.
<b>Q15. Knows where to set</b>	Sets the ball near the net, to enable the best possible attack to the attacker.
<b>Q16. Adapts the set to the attacker position</b>	Adapts the type of setting to the striker position in the net.
<b>Q17. Set to the attacker potentially more effective</b>	Identifies and sets to the attacker potentially more effective.
<b>Q18. Adjust attack position to the set position</b>	Adjust his/her attack starting position to the distance between the ball and the net.
<b>Q19. Attack using appropriate technical skill</b>	In the attack, uses the most appropriate technical skill.
<b>Q.20. Support</b>	After setting, takes the correct position to support the attack of his/her team.

Source: Authors

## 2.4 DATA ANALYSIS

The exploratory data analysis revealed non-normality of the distribution of data. Therefore, in order to test differences between boys and girls in the two assessment moments, the Mann-Whitney test was used. In order to test intra-group differences from the pre-test (PreT) to the post-test (PosT) the Wilcoxon test was applied. The IBM Statistical Package for the Social Sciences, version 24, was used to data analysis.

## 3 RESULTS

The overall analysis showed an improvement on students' declarative game understanding. Table 3 showed that the improvements of overall participants are



**Table 3 – Students results in the game understanding test.**

	Overall				Girls				Boys			
	M(SD) PreT	M(SD) PosT	Z	p	M(SD) PreT	M(SD) PosT	Z	p	M(SD) PreT	M(SD) PosT	Z	p
Intervention	3,90(0,53)	3,87(0,61)	0,45	0,65	3,94(0,41)	4,00(0,0)	1,00	0,32	3,85(0,66)	3,7(0,9)	1,00	0,32
Opposition	3,98(0,21)	3,96(0,25)	0,56	0,58	4,00(0,00)	4,00(0,0)	0,00	1,00	3,96(0,31)	3,9(0,4)	0,57	0,58
After the serve keeps ready to play	3,97(0,31)	3,90(0,53)	1,00	0,32	3,94(0,41)	3,94(0,41)	0,00	1,00	4,00(0,00)	3,85(0,66)	1,41	0,16
After the attack keeps ready to play	3,87(0,61)	3,90(0,53)	0,38	0,70	3,83(0,70)	3,89(0,58)	0,45	0,65	3,92(0,47)	3,93(0,47)	0,00	1,00
Responsibility zones 1	3,90(0,53)	3,94(0,44)	0,45	0,65	3,83(0,70)	3,94(0,41)	1,00	0,32	4,00(0,00)	3,93(1,51)	1,00	0,32
Responsibility zones 2	1,94(1,40)	2,52(1,51)	2,71	0,007	1,91(1,39)	2,47(1,51)	1,96	0,05	1,97(1,42)	2,58(1,52)	1,89	0,06
Adjustment	3,10(1,38)	3,52(1,11)	2,34	0,02	2,92(1,45)	3,49(1,13)	2,13	0,03	3,32(1,27)	3,55(1,08)	1,00	0,32
Prepares the set approaching the net	2,61(1,50)	1,97(1,41)	3,43	0,001	2,58(1,51)	1,85(1,36)	2,98	0,03	2,65(1,51)	2,13(1,47)	1,81	0,07
Transition	2,61(1,50)	2,81(1,48)	1,06	0,29	2,36(1,51)	2,92(1,45)	2,24	0,02	2,95(1,45)	2,65(1,51)	1,15	0,25
Identify the defensive zone	3,71(0,90)	3,87(0,61)	1,39	1,67	3,66(0,96)	3,83(0,70)	1,00	0,32	3,78(0,80)	3,93(0,47)	1,00	0,31
Adapts the defence to the attack	3,55(1,07)	3,51(1,11)	0,30	0,82	3,38(1,22)	3,38(1,22)	0,00	1,00	3,78(0,80)	3,70(0,91)	0,47	0,65
Adapts the block to the attack	1,95(1,42)	2,35(1,50)	1,98	0,047	1,91(1,39)	2,25(1,50)	1,34	0,18	2,02(1,48)	2,50(1,52)	1,46	0,14
Knows to differentiate the quality of the 1 <sup>st</sup> touch	3,74(0,85)	3,74(0,85)	0,00	1,00	3,66(0,96)	3,60(1,02)	0,33	0,74	3,85(0,66)	3,93(0,47)	0,58	0,56
Attack at the 2 <sup>nd</sup> touch	2,10(1,45)	2,87(1,46)	3,70	<0,001	1,96(1,41)	2,64(1,51)	2,35	0,02	2,27(1,50)	3,18(1,36)	3,00	0,03
Knows where to set	3,06(1,40)	3,13(1,37)	0,36	0,71	2,75(1,49)	2,98(1,43)	0,85	0,39	3,47(1,15)	3,33(1,27)	0,71	0,48
Adapts the set to the attacker position	3,52(1,11)	3,74(0,85)	1,80	0,07	3,26(1,30)	3,60(1,02)	1,73	0,08	3,85(0,66)	3,93(0,47)	0,58	0,56
Set to the attacker potentially more effective	3,69(0,64)	3,73(0,63)	0,56	0,57	3,64(0,68)	3,62(0,76)	0,07	0,94	3,75(0,59)	3,88(0,33)	1,55	0,25
Adjust attack position to the set position	3,42(1,19)	3,67(0,97)	1,40	0,16	3,38(1,22)	3,58(1,08)	0,73	0,45	3,47(1,15)	3,78(0,80)	1,41	0,16
Attack using appropriate technical skill	2,29(1,49)	3,10(1,38)	4,22	<0,001	2,02(1,43)	2,87(1,47)	3,13	0,002	2,65(1,51)	3,40(1,21)	2,89	0,004
Support	1,94(1,40)	2,71(1,49)	3,70	<0,001	2,02(1,43)	2,70(1,50)	2,35	0,02	1,82(1,36)	2,73(1,50)	3,00	0,003

Legend: M(SD) – Mean and standard deviation

Source: authors

aligned with the content taught during the unit. Moreover, descriptive statistics revealed higher values on several questions of the game understanding tests at the entry point of the unit.

Considering students' gender, results showed that both boys and girls were at the same knowledge level at the entry of the unit. Indeed, differences were only found in three questions in the PreT, favouring boys, and in the PosT favouring girls. More specifically, in the PreT boys showed higher values in knowing where to set the ball ( $Z=2,46$ ;  $p=0,01$ ), adapt the set to the attacker position ( $Z=2,52$ ;  $p=0,01$ ) and attack using the most appropriate technical skill ( $Z=2,02$ ;  $p=0,04$ ). In the PosT girls showed higher values in intervention ( $Z=2,34$ ;  $p=0,03$ ) and opposition ( $Z=2,00$ ;  $p=0,04$ ).

The analysis of students' game understanding improvements according to their gender reveal that girls seems to took more advantage from the unit. Namely, girls improved in all the tactical content taught during the unit, whilst boys improved only in knowing when to attack at the second touch, attack using the most appropriate skill and support.

#### 4 DISCUSSION

The present study provides evidence that students' declarative game understanding improved when participating in a combined use of SE and SGA. In general, all students showed improvements in the volleyball content taught during the hybrid unit. In particular, students' showed improvements in both attacking (e.g. identification of the responsibility zones, preparing the setting, attack at the second touch, and attack using the most appropriate skill) and defensive skills (e.g. adjustment and decision making in the block according to the attack) of the 2vs2 game. Results also show a possible ceiling effect in the rest of the test questions. As it can be possible to observe, students showed high scores at the entry of the unit in most of the questions of the game understanding test in which they did not show improvements.

The development of students' game understanding in this hybrid unit can find explanation on both SE and SGA features. The cooperative team practices within SE has been associated with a positive impact of the model on students' cognitive outcomes (BROWNE; CARLSON; HASTIE, 2004; FARIAS; MESQUITA; HASTIE, 2015; HASTIE; CALDERÓN; ROLIM; GUARINO, 2013; HASTIE; SINELNIKOV; GUARINO, 2009), since it encouraged questioning, integration and application of cognitive concepts among students (DERRI; EMMANOUILIDOU; VASSILIADOU; TZETZIS; KIOUMOURTZOGLOU, 2008). In addition, it is suggested that the possibility given to students to participate in roles other than players, could also had a positive impact on students' volleyball content knowledge. For instance, the statistician role gave students the opportunity for learning through observation of peers during game-play practice. Such observation of teammates performance might helped students to develop game concepts (technical and tactical), since it involved analysis and evaluation of peer performance, and following application by students in their own practice of the concepts observed (FARIAS; MESQUITA; HASTIE, 2015; HASTIE;

SINELNIKOV; GUARINO, 2009). In addition to this, students also needed to know game rules and protocols during their referring duties, under the penalty of failing a contribution to their team scoring.

Nevertheless, this results are not aligned with previous research on volleyball SE units (PRITCHARD; HAWKINS; WIEGAND; METZLER, 2008). This reinforces the need to combine SE with other instructional models with specific framework to the content and learning tasks to be taught during the season. In fact, the instructional procedures considered by the SGA might stimulated the development of students' tactical awareness, given that they were systematically called to respond and reflect on their own game problems. The SGA model emphasises the need of understanding the game, being learning a constant process of searching solutions to problems emerged during practice (MESQUITA; GRAÇA; GOMES; CRUZ, 2005; PEREIRA; GRAÇA; BLOMQUIST; MESQUITA, 2011). Even during early stages of learning, the tactical proficiency (i.e. understand the meaning and the context of its application) is required. In this way, the didactical framework of SGA established an intricate interaction of both technical and tactical skills, aligned with the game structure and the learning objectives. It is important however to state that technical skills were not inconsiderate in this unit, but they only arose after game appreciation and contextualization of their necessity in each learning stage (PEREIRA; GRAÇA; BLOMQUIST; MESQUITA, 2011).

Notwithstanding, in a more detailed analysis, this study also showed that students' gender was a differentiating factor to game understanding improvements. That is, girls seem to took more advantage from the unit. Although these findings contradict several studies related with gender inequity, in which the theme of dominance of boys consistently arises (ENNIS, 1999; FLINTOFF, 2008; NICAISE; BOIS; FAIRCLOUG; AMOROSE; GENEVIÈVE, 2007; WILLIAMS; BEDWARD, 2010), they corroborate previous research on both SE (e.g. MESQUITA; FARIAS; HASTIE, 2012; PEREIRA; HASTIE; ARAÚJO; FARIAS; ROLIM; MESQUITA, 2015) and SGA (MESQUITA; GRAÇA; GOMES; CRUZ, 2005). In fact, although some authors have recognized the potential of SE to be a highly inclusive pedagogical model (HASTIE; MARTINEZ DE OJEDA; CALDERÓN, 2011; WALLHEAD; O'SULLIVAN, 2005) this model alone, as other instruction models, is not sufficient to maintain equity and an inclusive environment (FARIAS; HASTIE; MESQUITA, 2017). Therefore, specific interventions that used pedagogical resources of both SE and SGA models should be implemented in order to prevent the so called "Darwinism in the gym" (POPE; O'SULLIVAN, 2003). In this study for instance, the content and formal competition could be more adjusted to girls than boys. That is, taking into account the link between game performance and understanding (FARIAS; MESQUITA; HASTIE, 2015), perhaps the adaptation of learning tasks, task modification and different criteria of success sustained throughout the unit were not sufficient. Boys may have needed a more challenging content and game form (probably the use of the 3vs3 game), in order to adjust the content and learning tasks to their skill level.

Although the present study makes a contribution to the research on model-based practice, specifically related with SE and SGA, there are certain limitations

that should be acknowledge. As aforementioned, the goal of this study was not to demonstrate the superiority of this approach over other forms of instruction, and therefore a quasi-experimental pre- post-test design was used, without the application of a control group. Regarding this point, some authors (for instance, HASTIE; MESQUITA, 2016) have been suggesting the need to move research forward by focusing on internal pedagogical practices of the models applied, rather than compare one model with other. Specifically, not only analysing if the model works, but more importantly how it works and how it can be improved. That being said, these results should be treated cautiously, particularly not generalizing to other similar situations. Certainly, while labour intensive, replications of this study are warranted, with the application of a control group and larger sample sizes. In addition, the results of this study are limited to interferences made from a single unit experience. In fact, research has been suggesting that the application of more than one unit consecutively over time might provide better insights regarding students' learning (ARAÚJO; HASTIE; LOHSE; BESSA; MESQUITA, 2019; ARAÚJO; MESQUITA; HASTIE; PEREIRA, 2016). Future research should therefore extend the analysis of this hybrid instrucional model beyond one or two units, particularly with the application of longitudinal data collection designs.

## 5 CONCLUSIONS

Previous literature has enhanced the positive effectiveness of both SE and SGA on students' technical, tactical and game play improvements. The present study moves research forward by showing that students' declarative game understanding improvements are possible through the alliance of these two models. The analysis of students' game understanding improvements according to their gender also showed that girls seemed to take more advantages from this hybrid unit.

Future research should analyse the impact of these hybrid instructional models with the application of a control group, larger sample sizes, and more longitudinal data collection that extends beyond one or two units. In addition, despite students' gender has been considered in the present study, future research should also consider other variables which could interfere with students' outcomes. For instance, variables related to the teacher (e.g., experience with the model, sport content knowledge), students (e.g., skill-level and prior sport experience), student motivation (e.g. goal orientation and perceived autonomy), and student engagement (measured through either game involvement or physical activity).

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