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Making Sense of Gameplay in Team Sports and Games: From Theories of Learning to Teaching Practices

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Since the seminal publication on the Teaching Games for Understanding Model (TGfU), there has been several additional Game-Understanding Based Approaches (GUBAs) put forward in the literature concerning teaching team sports and games (TSG). The characteristics of three leading learning theories (behaviorism, cognitivism and constructivism) are summarized under the scope of the practices used to teach TSGs. These practices and the content taught (in both depth and breadth) should both vary depending on the cognitive level and experience of the learners. As prerequisites to understanding gameplay, the authors consider (a) a shared gameplay vocabulary, (b) the learners' perception of gameplay, and (c) reflection on action as a door opener toward game understanding. Putting the light on gameplay understanding means a profound reassessment of teachers' practices (Pigeon et al., 2026) which could navigate between pedagogical approaches and their underpinning learning theories depending on the teaching-learning context.

Keywords: *team sports and games; game-understanding based approaches; gameplay; learning theories; teachers' practices*

Introduction

In modern physical education, team sports and games (TSGs) occupy a significant place in the school curriculum and in sport education[1] as well. Since the seminal publication of Bunker and Thorpe (1982) on the Teaching Games for Understanding Model (TGfU), there has been several additional models put forward in the literature with regard to gameplay understanding as a central component of the TSG pedagogical content knowledge. We refer to these models as being game-understanding based approaches (GUBAs) (Pigeon et al., 2026). The shift from a skill-based and teacher-centered approach to a game-based and student-centered approach for the teaching/ learning of TSGs has, in itself, meant a reexamination of the conduct of PE lessons. Moreover, the refocus toward gameplay and a realignment on students' needs and characteristics, in a developmental, multidimensional and educational perspective,

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[1]In this article, sport education refers to children's, adolescents' and older students' educational experiences in out-of-PE- lessons sport programs offered them under the form of intramural and interschool competition, community-led sport leagues programs, specialized summer camps, etc. Through coaching, PE-trained educators and other sport educators contribute largely to the participants' sport education.

has led to the recognition of gameplay understanding as a key catalyst for learning.

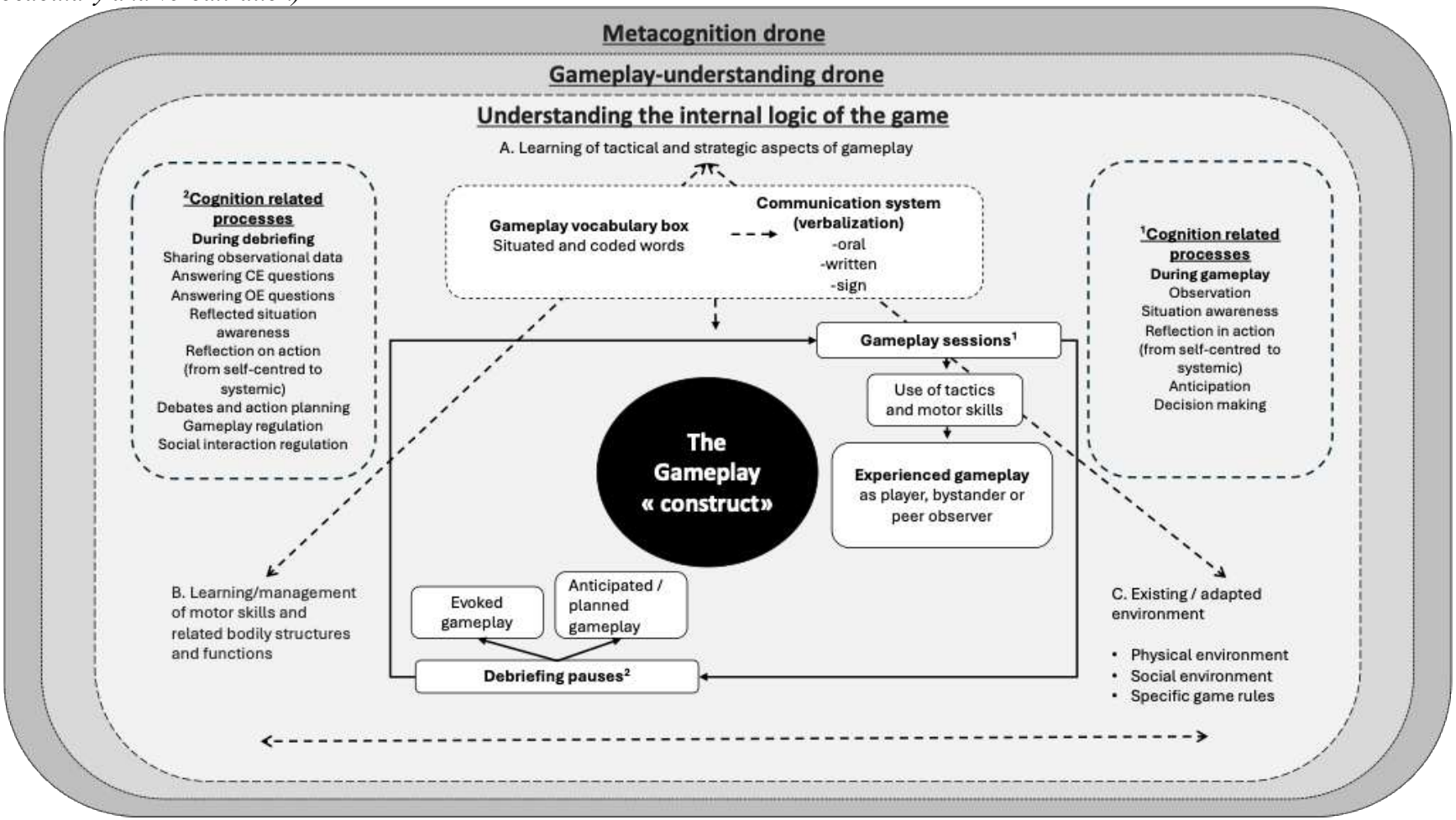
In everyday life, understanding means grasping the meaning of words (mastering more or less complex concepts or constructs), establishing or recognizing relationships between ideas, events or people, applying or developing rules if and when appropriate. In short, understanding implies mentally functioning successfully with regard to convergent or divergent thinking (Cropley, 2006; Guilford, 1967), using one's practical, analytical or creative intelligence (Sternberg, 1985; 2005). Expressed in a different way:

> [. . .] understanding is about *grasping* and *seeing* in which one is able to grasp mentally how the different aspects of a system or structure depend upon one another and is able to anticipate how changes in one part of the system will lead (or fail to lead) to changes in another part as well as see new possibilities (Almond, 2015, pp. 18-19).

Therefore, as stated by many authors, students' understanding of the game must be a central concern for PE teachers while teaching TSGs (Bunker & Thorpe, 1982; Godbout & Gréhaigne, 2020), considering that during gameplay, players' actions must depend upon teammates and opponents' actions. In other words, to play well and achieve the collective goal of defeating the opponent, they must constantly anticipate the movements of their teammates and the opponent's tactics to ultimately adapt their actions accordingly in order to score goals and prevent the opponent from scoring.

Figure 1 illustrates the systemic nature of gameplay understanding which may be viewed as the result of proper/meaningful connections between various elements of the learning system pertaining to (a) concepts, ideas, and mental schemas and processes leading to tactics and strategy, (b) motor skills and related bodily structures and functions, and (c) the social and physical environment, including specific game rules. Dotted lines joining these three fulcrums illustrate the potential reciprocal influence of these elements in a gameplay context. Beyond the cognitive and physical dimensions, connections between these elements have repercussions on each student's social and affective development not discussed in this paper. At the center of the figure, one finds the **gameplay construct** (illustrated by a nonexistent black design in Figure 1 as a projection of the game understanding drone), that is a virtual representation of elements of gameplay (action rules, play organization rules and motor skills) and their relationships. The unfolding of the PE lesson involves mainly two complementary components: (a) **experienced gameplay** (as a player, a formal observer or a bystander, related to a gameplay session conducted according to agreed-upon rules in some adapted physical environment; (b) **evoked gameplay** and **planned gameplay** related to a debriefing pause involving various types of exchanges among students or between students and their teacher. Experienced gameplay and related exchanges draw from the cognitive, physical, social and affective dimensions of the student and, in return, have an impact on them. Two interacting dimensions, the cognitive and physical ones, remain particularly solicited in the understanding/ learning process. Above the visible bidimensional system, one may think of some hovering consciousness functioning as a drone computer, targeting the experienced gameplay and the evoked one.

Figure 1. *Bidimensional Illustration of the Systemic Nature of Gameplay Understanding and Related Communication Tools (gameplay vocabulary and verbalization)*



On the right- and left-hand sides of the figure, various cognition-related tasks/ processes involving the learner one way or the other may be thought of as light projectors targeting either the experienced gameplay (during play sessions) or the evoked gameplay (during debriefing pauses). Depending on the level of cognitive activation of the system (use of underpinning learning theory), projectors associated with particular processes or tasks may produce convergent lighting (which illuminates known connections) whereas others, associated with different processes/ tasks, emit divergent lighting (which illuminates new forming connections). At a lower level of activation, some projector may stay inactive, the concerned cognitive process not being activated. Each process has its particular light that enlightens particular connections between elements of the construct. Those enlightened connections are registered by a hovering drone computer (gameplay-understanding drone) and, once confirmed, stored in a learning file (long-term memory file) as either declarative, procedural or conditional knowledge). Depending again on the level of cognitive activation of the system, the gameplay construct may be envisioned as a puzzle whose pieces (connections) are concepts, ideas and elaborated schemas, all contained within a given framework. Connections recognized by the drone computer are readily filed and included in the framework through assimilation. Connections that do not fit in the framework may at first be discarded; should they, however, be confirmed as valid, the drone-computer will adjust the framework through accommodation so that the new connections can be included in the picture.

Finally, above the understanding/learning level, one may think of a second hovering mechanism (**metacognition drone**) whose function is to register the functioning of the drone computer. If not activated, the mechanism stays there, without registering anything. When activated through **metacognitive** awareness, it can detect which projector tends to stimulate the understanding/learning drone and eventually can inform it; this one, in return, may adjust its registering system and pay more or less attention to the lighting provided by one projector or another (metacognitive regulation). The activation of the meta-drone requires an activation of the system at a constructivist or socio-constructivist level.

As part of the system, the **vocabulary box** contains situated and coded words particular to one or several related sports or games while the **communication system** refers to the oral (sometimes written or sign) expression of thoughts and thinking processes (the 'cognition' side of the system) related to varied elements of the system. At some point in the learning process, verbalizing in gameplay language might represent the embodiment of gameplay understanding.

Thus, this figure illustrates a one-student bubble and refers to this student's understanding processes. In the dynamics of a class group, one teacher deals with as many interacting systems as there are students and, consequently, faces the challenge of helping each one of them achieve understanding and learning. In a teaching/learning context, underpinning learning theories will guide teachers into determining which parts of the system should be activated and to what extent, given the students' level of both cognitive capacity and playing experience. Accordingly, the selected level of activation will bring teachers to choose between (a) acting as the sole leader, (b) considering students as informed accomplices, or (c) acknowledging students as managers of their learning and, thus, playing the role of a facilitator. As it will be briefly addressed in

the section 'GUBA-Related Teaching Practices and Underpinning Learning Theories', readers may note that those choices are not 'cast in stones', as there is no one-size-fits-all pedagogical practice to teach TSGs (Moran et al., 2026; Rink, 2001). Depending on the learning context (e.g., students' background and characteristics, learning objectives), the teacher could wander between (a), (b) and (c). That is to say, a teacher who predominantly wishes to adopt the role of a learning facilitator/catalyst could be, at some point, acting more as a sole leader to teach, among other things, game rules or technical components of a precise motor skill. Teachers' proficiency to identify the appropriate time to choose and apply these strategies is vital to bring students to understand TSGs and to play them better.

All that being said, the double purpose of this paper is (a) to examine underlying perceptual and thinking processes that make it possible for students to understand gameplay when they engage in TSGs in a learning context, and (b) to acknowledge GUBA teaching practices that make use of such processes under the scope of given learning theories.

Learning Theories Underlying the Teaching/Learning of Team Sports and Games

As suggested by the progressive shift from a teacher- and skill-centered to a student-centered and game-based approach to the teaching/learning of TSGs alluded to in the introduction, one may conclude that there is or will also be a shift in the underlying learning theories involved. Learning theories define the contexts and processes through which learning occurs, providing teachers with models to develop pedagogical practices which in turn should lead to better learning. Over the last 5 or 6 decades, three main theories have shaped instructional design: behaviorism, cognitivism/social cognitivism, and constructivism/social constructivism. It is not the purpose of this paper to discuss each of these extensively; others, like Ertmer and Newby (2013) or Powell and Kalina (2009) for instance, have done it in a better way. The following words from Ertmer and Newby (2013, p. 46) have a particular significance given the context in which new models were developed with regard to the teaching of TSGs: 'Although learning theories typically are divided into two categories, behavioral and cognitive, a third category, constructive, is added here because of its recent emphasis in the instructional design literature.'

Behaviorism

Behaviorists see learning as changes in either the form or frequency of observable performance. Key elements remain the stimulus, the response, and the association the learner makes between the two. In the learning process, there is no attempt to determine the structure of students' knowledge nor to assess which mental processes they need to resort to (Winn, 1990). This author argues that behavioral theory is inadequate to prescribe instructional strategies that teach for understanding. Behaviorists attempt to prescribe strategies that are most useful for building and strengthening stimulus-response associations (Winn, 1990), including the use of instructional cues, practice, and reinforcement. These prescriptions have generally

been proven reliable and effective in facilitating learning that involves discriminations (recalling facts), generalizations (defining and illustrating concepts), associations (applying explanations), and chaining (automatically performing specified procedures). According to Ertmer and Newby (2013, p. 49), 'it is generally agreed that behavioral principles cannot adequately explain the acquisition of higher-level skills or those that require a greater depth of processing (e.g., language development, problem solving, inference generating, critical thinking) (Schunk, 1991)'. This school of thought considers knowledge to be a reality external to the learners that they need to acquire. Thus, based on curricula, competency frameworks, textbooks and pedagogical content knowledge rather than on students' cognitive involvement, the teachers determine and organize what needs to be learned (Jonnaert et al., 2008). It follows that behaviorists adhere to a highly interventionist conception of teaching (Vienneau, 2017) in which teachers seek to shape their students' behavior and actions (Boutin, 2000) by exposing them to certain stimuli (Vienneau, 2017). Students would therefore learn by reproducing the behaviors requested, explained and/or demonstrated by the teacher (Nadeau, 2001).

For instance, having students practice a specific throw, a particular feint or perform a certain motor pattern (e.g., a learning activity to practice a basketball layup while respecting a certain footwork) as demonstrated by the teacher or a student could be representative of a behaviorist approach to learning. Having students use specific words when referring to gestures or particular tactics is also representative of a behaviorist approach to learning. Readers may consult Table 1 and section 'GUBA-related teaching practices and underpinning learning theories' for additional examples.

Cognitivism and Social Cognitivism

Ertmer and Newby (2013) stated:

> Cognitive theories focus on the conceptualization of students' learning processes and address the issues of how information is received, organized, stored, and retrieved by the mind […] Knowledge acquisition is described as a mental activity that entails internal coding and structuring by the learner. (p. 51)

Thus, when thought of as a result rather than a process, understanding is viewed as composed of a knowledge base in the form of rules, concepts, and discriminations (Duffy & Jonassen, 1991).

Cognitivist teaching must be based on students' mental structures, or schemas, to be effective. Information should be organized so learners may meaningfully connect new information with existing knowledge in order to make new connections. Examples of this type of cognitive strategy are analogies and metaphors. In the same line of thought, cognitive strategies may include the use of framing (see Godbout 2023, for a presentation of Data-Frame Theory of Sensemaking and Sensemaking Processes), outlining, mnemonics, concept mapping, advance organizers, and so forth (West et al., 1991). Examples of advance organizers related to team sports are offensive and defensive matrices of play (which 'represent a true systemic view of tactical decisions in play' according to Gréhaigne & Godbout, 2014, p. 107), action plans or strategies in view of coming matches, and one's 'educated assessment of both competency networks involved into gameplay' (Godbout & Gréhaigne, 2020, p. 443). Whereas

strategies may be seen as a short-term advance organizers targeting one or a few coming matches in specific contexts of play, matrices of play may be referred to on a longer term as they relate to the internal logic of the game, regardless of the opponents. In each case, the content of the advance organizer may have been suggested by the teacher, thus relating to cognitivism, or may be progressively developed (constructed) by the learners.

Finally, some critics are of the opinion that cognitivism puts too much emphasis on memorization and recall of facts to the detriment of higher-order skills such as creativity and problem solving. For their part, cognitivists claim that the ability to recall facts and concepts is essential to higher-order thinking, and therefore the two are interdependent rather than mutually exclusive (Brown et al., 2014).

In turn, the premise underlying social cognitivism, or social cognitive theory (SCT) (Bandura, 1986), is that learning is a cognitive process inseparable from the context in which it occurs, like the family or the school for instance (de la Fuente et al., 2023). The theory sustains that portions of an individual's knowledge acquisition can be directly linked to observing others within the context of social interactions, experiences, and outside media influences (Margolis & Mead, 2022). In this line of thought, Bandura (1977) developed a theoretical model of observational learning, defined as a social learning process that involves observing and modeling the behavior of others, in which they made a distinction between learning and performance. Learning was associated with the ability to describe observed behavior at a later time, whereas performance represented the extent to which the individuals' behavior changed through observation (i.e., that they actually engaged in the observed behavior) (Fryling et al., 2011).

From a practical point of view, cognitivism relies on understanding rather than on sheer memory. Instead of blindly reproducing a motor skill, the student is explained the purpose of the movement and its kinetic requirements. For instance, a pass to a partner does not always require as much force compared to a shot on goal since the ball holder wants the teammate to catch the pass, contrary to the goalkeeper. Moreover, during a handball lesson, a teacher could explain that a relevant pass is generally made to a teammate who is at more than an arm's length away from an opponent to prevent it from being intercepted. Readers may again consult Table 1 and section 'GUBA-related teaching practices and underpinning learning theories' for additional examples.

Constructivism and Social Constructivism

Ertmer and Newby (2013) highlight differences between constructivism and cognitivism, as well as behaviorism related to knowledge conceptualization; they wrote:

> Constructivists do not share with cognitivists and behaviorists the belief that knowledge is mind-independent and can be 'mapped' onto a learner. They do not deny the existence of the real world but contend that what we know of the world stems from our own interpretations of our experiences. (p. 55)

Thus, constructivism (individual constructivism) equates learning with creating meaning from experience. Learning always occurs in a context, and this context is inseparable from the knowledge embedded in it (Bednar et al., 1991).

Piaget stated that children's mental schemas are constructed through assimilation and accommodation processes when going through four different developmental stages (Wadsworth, 2004). While the first two stages (sensorimotor and preoperational stages) occur from birth through 7 years of age, the third (concrete operational stage) seems to occur at the time of primary school, from seven to eleven years old. The fourth stage, the formal operational stage, usually takes place later, from eleven years old to adulthood (Piaget, 1953). At the time of the concrete operational stage, children begin to replace intuitive thought with their own logical reasoning. In the formal operational stage, adolescents, up to adulthood, will start using higher levels of thinking or abstract ideas to solve problems (Powell & Kalina, 2009). This implies that game-understanding related learning should be targeted mainly at the formal operational stage corresponding more or less to high school level since, as mentioned by Ertmer and Newby (2013), tasks that require an increased level of processing are usually primarily associated with strategies having a stronger cognitive emphasis (e.g., schematic organization, analogical reasoning) and tasks demanding high levels of processing are better performed with strategies advanced by the constructivist perspective (e.g., situated learning, social negotiation).

Regarding social constructivism, it postulates that learners' construction of knowledge results from social interaction, interpretation and understanding (Vygotsky, 1962). In the same vein, Powell and Kalina (2009) mentioned that: 'In cognitive constructivism, ideas are constructed by individuals through a personal process, as opposed to social constructivism where ideas are constructed through interaction with the teacher and other students.' (p. 241) As the making of knowledge is inseparable from the social environment in which it is produced, learning is viewed as a process of active knowledge construction within and from social forms and processes (Adams, 2006). In that respect, one can deduce that learning is essentially situated for social constructivists.

Moreover, social constructivism emphasizes the importance of language in the process of intellectual development. Therefore, 'social constructivism is a highly effective method of teaching that all students can benefit from, since collaboration and social interaction are incorporated. (Powell & Kalina, 2009, p. 243) Dialogues or small group debates become the medium by which ideas are shared, discussed and developed. The discussion is often with more knowledgeable others, but this need not always be the case; verbal exchanges with peers can be of equal value. It is with reference to existing knowledge and understanding (schemas) that new ideas and understanding can be constructed during shared verbalization (Pritchard, 2009).

Compared to cognitivism, constructivism relies on understanding as well but based on the learners' construction of knowledge through assimilation and accommodation rather than being dependent of the teacher's choices and explanations. For instance, faced with a high number of lost balls in a prior gameplay session, as reported by teammates observers during the debriefing pause, the team is challenged to develop a strategy and an action plan to be tried out during the next gameplay session(s). Should there be an improvement during following encounters, students might adapt their related mental tactical schema (accommodation), thus confirming a new understanding and learning. As was the case for the two previous learning theories, readers may consult

Table 1 and section 'GUBA-related teaching practices and underpinning learning theories' for additional examples.

Which Way Should One Go?

So far, we have seen a glimpse of three main learning theories, behaviorism, cognitivism and constructivism in addition to the social perspectives for cognitivism and constructivism. Faced with these five theories, notwithstanding many others not discussed in this paper, which path should physical educators follow in the teaching/learning of TSGs? As a premise, the authors take it for granted that the prime objective of the learning program is each student's personal (although possibly shared) development rather than a 'winning at all costs' result, hence an educational perspective. In the next sections of the article, the authors will attempt to discuss a possible answer to the above question. Overall, the teaching-learning context implemented must first be consistent with the students' specific characteristics and, above all, their desire to learn.

Cognitive Maturation as a Key Criterion

Facts are not taught the same way that concepts or problem-solving are; likewise, one's teaching approach differs depending on the proficiency level of the learners involved. The instructional strategies employed and the content addressed (in both depth and breadth) would both vary depending on the cognitive level and experience of the learners (Ertmer & Newby, 2013). It is not a matter of working without a theory but rather a matter of choosing wisely, given information gathered about the students' present level of competence and the type of learning task, the appropriate approach for ensuring the optimal results; different strategies based on different theories appear to be necessary. As stated by Ertmer and Newby (2013, p. 57):

> Jonassen (1991) has described three stages of knowledge acquisition (introductory, advanced, and expert) and argues that constructive learning environments are most effective for the stage of advanced knowledge acquisition, where initial misconceptions and biases acquired during the introductory stage can be discovered, negotiated, and if necessary, modified and/or removed. Jonassen agrees that introductory knowledge acquisition is better supported by more objectivistic approaches (behavioral and/or cognitive) but suggests a transition to constructivist approaches as learners acquire more knowledge which provides them with the conceptual power needed to deal with complex and ill-structured problems.

Although a constructivist approach may be viewed as the proper way of tackling learning, one must recognize that less cognitive-demanding methods may be more appropriate in a 'progressive development' perspective based on the learners' capacities. This is particularly the case when time comes to opt for a social-cognitive or a social-constructivist teaching/learning strategy, especially regarding tactical learning in TSGs.

Fitting Cognitive Load as a Complementary Criterion

Whether within a constructivist or a cognitivist approach, even learners who have reached the formal operational stage, which implies complex mental operations, may nevertheless have difficulties perceiving or managing too much information at the same time. In such instances, limiting extraneous information and using scaffolding may be effective to adapt the learning-activity cognitive load (Harvey & Cope, 2025).

Prerequisites to Understanding Gameplay

Appropriate and Shared Gameplay Vocabulary

Whatever the communication channel applied in the learning process, be it understanding and answering questions, exchanging opinions or ideas, contributing to an action plan, using an observational instrument, providing information to teammates, etc., learners need to use an appropriate situated language, which could prove to be a challenge for learners in TSGs.

As stated by Godbout and Gréhaigne (2021, p. 51): 'Verbalization facilitates learners' reflection, understanding and observation by providing a database in view of exchanging with other players. One must differentiate the learner's construction of tactical knowledge and his/her acquisition of gameplay language.' Essentially, gameplay language is a matter of declarative knowledge. The terminology involved already exists in the learners' social environment and their community's culture, hence the reference to situated language. As learners are exposed to various gameplay experiences, the teacher using his/her pedagogical content knowledge, transmits this declarative knowledge through straightforward information, recall questioning or similar '*behaviorist*' teaching strategies, to help each member of the class group or the team develop a declarative memory (Hove & Martinez, 2024), thus a gameplay vocabulary box composed of situated language (as illustrated in Figure 1). For a more elaborate discussion on students' development and use of gameplay language, readers may consult Godbout and Gréhaigne (2021).

Learners' Perception of Gameplay: Situation Awareness

For learners, understanding gameplay primarily calls for, to start with, experiencing gameplay as a player or an observer and gathering information as the encounter between opponents unfolds. The notion of situation awareness (SA), originally developed by Endsley (1995) in relation with incidents- or crises-related working environments, appears appears to be quite suitable for the conditions in which players find themselves in invasion TSGs. According to Godbout (2023):

> The SA construct relates to an individual's level of consciousness of the particular situation he is involved in, given that the situation calls for some action based on this individual's decision. The efficiency of one's SA is particularly critical in time-constrained situations with potential serious repercussions. (p. 164)

The SA process put forward by Endsley develops in three phases, namely 'the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future' (Endsley, 1995, p. 36). In gameplay, the three phases lead naturally to decision and action.

The perception of the importance of elements in the environment during a match may prove challenging for players and/or observers. Among the varied physical activities, TSGs, and more so invasion TSGs, are the most demanding in terms of tactical complexity (Méndez-Giménez et al., 2012). Throughout a match, while ensuring the defense of its own camp, each team must coordinate its actions to recapture, conserve, and move the ball toward the adverse camp so as to bring it into the scoring zone and effectively score (Gréhaigne et al., 1997). This implies for instance (a) managing the space with regard to defensive and offensive shifts, (b) taking into account the current configuration of play, that is the positioning of all players, teammates and opponents, on the court, (c) considering which player is in possession of the ball (or of any other object fought for), and (d) considering potential offensive or defensive actions given the competency network of both teams. 'The basic challenge for each player is to cooperate with partners in order to oppose more effectively the opponents either while attacking (keeping defense in mind) or while defending (keeping ready to attack)' (Gréhaigne et al., 2001, p. 60). Given the number of potential turnarounds during a match, TSGs may be portrayed as highly nonlinear activities in addition to forcing significant time constraints on players.

For players and teammates observers, perceiving the gameplay reality goes beyond seeing or looking; it relies on informed observation which, in turn, implies the use of frames of reference. Given the complexity of invasion TSGs, there will be a need for several particular frames targeting different aspects of gameplay such as, for instance offensive players' use of space and positioning during an attack, defensive players' use of space and positioning during the opponents' attack, and so on. SA considered at the time of gameplay may be referred to as either current player-SA or current observer-SA (See Godbout & Gréhaigne, 2022, p. 67 in AJSPO, for more details on various types of situation awareness). While current player-SA sustains reflection in action and leads naturally to decision-making, current observer-SA is more likely to be referred to at the time of reflection on action as will be discussed in the following section. Current observer-SA may also contribute to observational learning mentioned earlier in connection with both later performance and learning, that is the description of observed players' behaviors at the time of reflection on action.

Reflection on Action: Opening the Door Toward Sensemaking of Gameplay Events

Gameplay-related exchanges among learners or between learners and their teacher are often based on perceptions that may be more or less sound depending upon the students' level of experience. However, when exchanges are based on detailed gameplay observations, they usually are more accurate and may lead to more authentic learning (Gréhaigne et al,. 2021). For instance, if players discuss about the exact number of shots on goal they did in the previous match, the information is more objective and relevant than trying to speak out loud about scoring chances. In

organizations, the expression 'debriefing' usually refers to 'a meeting that takes place in order to get information about a particular piece of work that has been finished, for example about what was done successfully and what was not' (Cambridge University Press, 2011). In a learning context, following a gameplay session, teachers often plan some kind of pause from the sport activity not only to prevent physical exhaustion but mostly to encourage learners into reflecting on their gameplay experience, identifying problems encountered, verifying prior hypotheses, suggesting possible action plans for following gameplay sessions, etc. In these 'debriefing' pauses, reflection on prior action will be sustained by what Godbout and Gréhaigne (2022) have labelled reflected situation awareness (RSA) based on frames of reference. They wrote: 'Reflecting on prior game play is a pedagogical strategy that makes it possible for players to evoke reminiscences of last encounters and, through convergent and/or divergent thinking, assess the strategic or tactical efficiency of choices made' (p. 67).

In such debriefings, players of a same team, and teammate observers if it applies, may exchange on their perception of prior gameplay and develop a socially shared SA, given that common frames of reference were used. The particular frames used at this time by players and teammate observers, on which they based their reflected SA, will likely evolve depending on conclusions they draw from their exchanges.

Exchanges between the PE teacher and students, or exchanges among students themselves create many understanding opportunities for the learners: (a) consolidating one's gameplay language; (b) confirming prior gameplay hypotheses; (c) recognizing relationships between ideas, events or players through convergent thinking; (d) establishing new relationships between ideas, events or players through divergent thinking; (e) consolidating action or play organization rules (convergent thinking); (f) hypothesizing new action or play organization rules (divergent thinking); and so on. In reference to Almond's definition of understanding presented earlier, one might consider that gameplay understanding is a matter of progressively establishing connections between words, ideas, events, players, as they relate to TSGs.

GUBA-Related Teaching Practices and Underpinning Learning Theories

The concrete teaching practices used by PE teachers to teach TSG logically depend on the pedagogical approaches they choose to implement, which, as illustrated in Table 1, are usually grounded in particular learning theories. In essence, these practices must be determined by players' needs in terms of learning (how, what and when players must learn). According to the literature on teaching TSGs, practices that are based on socio-cognitivism or socio-constructivism (or on some combination of both) seem more appropriate to teach this kind of activity (Harvey & Cope, 2025; Yan et al., 2023), considering their collective and ever-changing nature. On the other hand, the reader may note that a teacher could sometimes navigate between pedagogical approaches and their underlying theories by using different kinds of practices in accordance with the teaching context. For instance, it could be deemed appropriate for a teacher that is implementing a GUBA to eventually resort to behaviorist practices to teach ultimate-frisbee (often referred to as 'ultimate') constitutive rules/terminology to novice students or even different ways of throwing the frisbee.

Table 1. *Examples of GUBA-related Teaching Practices and Underpinning Learning Theories*

Categories of practices	Subcategories	Concrete practices	Underpinning learning theory
Game related	Basic rules and choice of activity	Teacher presents verbally constitutive rules of the game (immutable) and court arrangement	Behaviorism
		Teacher determining verbally adjustments to some rules with explanations	Cognitivism
		Having students discuss potential adjustments to some rules to be tried out	Socio-constructivism
	Using adapted rules to create problem solving	Teacher uses regular rules only and tells players how to play	Behaviorism
		Teacher determining in advance (in a sequence) different adaptations	Cognitivism
		Players on both teams decide to adapt the game (with the teacher's help) to ensure better equiprobability or to create a specific problem to solve.	Socio-constructivism
Student-tasks related	Observation of performances	Teacher determining content of formal observation with explanations	Cognitivism
		Having teams determine formal observational criteria	Socio-constructivism/ cognitivism
		Having teams discuss frame(s) of reference for informal observation in view of situation awareness	Socio-cognitivism
		Teacher suggesting frame(s) of reference for informal observation in view of situation awareness	Socio- cognitivism
		Teacher showing games statistics of professional players with explanations	Cognitivism
	Reporting/sharing observational data/information	a- During a pause between gameplay sessions, teacher giving feedback to correct players' gameplay (based on his/her observations and the predetermined learning objectives) b- During gameplay, using stops on site, teacher giving sensory cues related to 'when' and 'how' execute certain actions in play (action relevance and process).	a- Behaviorism b- Cognitivism

Categories of practices	Subcategories	Concrete practices	Underpinning learning theory
	and reflective activities	Players having formal observers report results to the class-group	Socio-constructivism/ cognitivism
		Players having formal observers (a) report results to their team (b) for further discussion	Socio-constructivism
		Reflection on observations: (a) self; (b) shared	(a) Constructivism
		Reflection on game play: (a) self; (b) shared	(b) Socio-constructivism
Learning-environment related	Regulation	Teacher writing reminders for adjustments on blackboard	Cognitivism
		Teacher using task cards on the walls as reminders	Behaviorism/ Cognitivism
		Teacher commenting video-recordings of gameplay for the whole group	Socio-cognitivism
		Teams debating on data provided by peer observation or content of videorecording of their gameplay	Socio-constructivism
		Homework: observing matches on TV and writing report	Constructivism
	Learning project (e.g., several sessions are regrouped into a season and/or tournament)	Teacher (a) organizes every step of the learning project alone/(b) organizes every step of the learning project alone but explains why each time in relation with the learning project	(a) Behaviorism (b) Cognitivism
		Students have roles and responsibilities in the organization of the learning project (e.g., a team formation committee; refereeing; the culminating event organizing committee, etc.)	Socio-constructivism

Game-related Practices

Among the biggest concerns for teachers, the main one is ensuring that the proposed game situations are meaningful to students, regardless of the used pedagogical approach or practices. Students are much less likely to engage in any learning process if the game or the context is not meaningful to them. Among other things, not only the stakes of the matches must be of importance to them, but they must also have a sense of belonging to their team (team's affiliation). Therefore, giving weight to match results and ensuring a certain stability to their team formation is essential (Gréhaigne et al., 2021). This last point may be especially relevant for teachers who can create promising learning projects in the form of a season of formal and fair competition ending by a tournament which is in line with what is advocated by Siedentop in the Sport Education Model (Siedentop et al., 2011).

In GUBAs, gameplay modifications are usually either proposed to students or determined by them in order to put forward specific game problems related to their level of play (Gréhaigne et al., 1999). Teachers who choose the rules alone and impose the activity on the students are usually more aligned with a behaviorist or cognitivist approach. Usually, they choose to do so because they don't have much time to teach or the students don't have a lot of experience in sports or games in general. In the same vein, a teacher could use direct teaching practices to 'model' players' behaviors (behaviorism) in order to help them learn new skills or refine flawed ones that prevent them from playing the game adequately. On the other hand, they can progressively adopt a more constructivist approach by involving initiated students in choosing the rules or the context of the game if the time is not an issue. In a 'purely' socio-constructivist view, students with more experience could be led to choose the activity and the rules themselves, and even the adaptations needed to better adjust the level of play so that everyone remains within an optimal learning zone.

Formalized Regulation for Students: Students' Observations and Reflective Activities

These nuances regarding the learning theories could also apply to other categories of teaching practices that are common to most of the GUBAs. For instance, most of them advocate the use of performance observation (players' own observations and perceptions during gameplay as well, as for some, peer observations) to foster players' reflection on the efficacy of the action plan they implemented to solve a specific game problem. The teacher's elected practices to determine the object of the observation and/or the way it will be conducted could be seen either as a cognitivist or constructivist way. Using performance observation in order to determine exactly what students will do and how is more closely related to a cognitivist approach (or in a socio-cognitivist approach if peer observation is proposed), whereas giving students the outlines and directions on performance measurement so that they can determine their own measurement object and strategy is more consistent with a socio-constructivist paradigm.

Another shared feature between GUBAs is, as mentioned above, the opportunity given to players to reflect on their actions during the game in order to consider possible game solutions to play better. When the theme of the reflective activity is

determined by the teacher, for example in the form of a pre-match speech or feedback given to participants during or after the game, the primary aim is to quickly draw students' attention to specific aspects of performance that they consider important for playing more effectively. The teacher could also use open-ended questions on specific aspects of the game to do so. This kind of practice would be more aligned with a cognitivist/socio-cognitivist paradigm. Two sets or periods of gameplay interspersed by a systematic team-discussion period (often referred to as debate of ideas) could also be proposed to students to allow them to discuss their observations within their team to find ways to improve their gameplay, the intent being to elicit a deeper reflection on their part (Gréhaigne & Godbout, 2021). From a practical point of view, debating with peers is a social learning process for players generally associated with socio-constructivism and considered by the authors as being as much important as acquiring the motor skills required for every action in the game. The way teachers intervene in the debate process could, however, offer a different indication of the pedagogical paradigm used. Indeed, teachers may 'assert themselves' in the discussions and dictate to students what to do (a behaviorist orientation) or propose and explain their own vision of solutions to game problems (a socio-cognitivist orientation). Teachers with a more socio-constructivist approach will prefer to remain supportive during the discussions, listening attentively and alternately to student groups and intervening (scaffolding) only when they request it or when the reflection/discussion stagnate and they are unable to find solutions (Zerai et al., 2008). Either way, the teacher should not assume that simply asking players to discuss their thoughts will automatically lead to effective game plans and strategies. In a socio-constructivist perspective, their main role is to nourish the discussions and be patient and wait for students to reflect further on the problem. If the problem is meaningful enough to the players, they will eventually experiment different actions or game plans to solve it. Teachers should then try to encourage students to search for solutions and, in some cases, emphasize the importance of certain observations or statistics provided by the players.

Overall, if the teacher determines the object of reflection or guides the students toward a specific one, it illustrates a more cognitivist orientation. On the other hand, should a teacher allow students to decide or discover their own reflection subject, a more socio-constructivist approach would then be involved with the purpose of developing students' autonomy. The teacher would then assume that the learning-process time could be far more important and that students have sufficient situation awareness to perform the regulation task correctly. Different teaching practices sustained by underpinning learning theories will undoubtedly activate, at different levels, various systemic cognitive connections as shown in Figure 1. While behaviorist practices may particularly activate the vocabulary box and motor development zones, cognitivism-related practices will activate several connections related to strategic and tactical learning and even more so constructivism-related practices. In both cases, the addition of a social perspective, either socio-cognitivism/socio-constructivism will significantly further increase the level of activation particularly in relation with the social environment and both the social and affective development.

Conclusion

A question that remains: is a cognitivist or a constructivist approach better suited to teach TSGs? Why implement a constructivist approach if being given the answer lets students play better? One of the most important factors to consider when choosing between a cognitivist or constructivist approach to the learning process is the basic nature of team games and sports, particularly for territorial invasion games. Indeed, the random and constantly changing nature of players' actions on the field, combined with the vagaries of luck or chance occurrences, requires players to progressively develop a high degree of autonomy (Malho, 1974). This is truer since gameplay is often continuous and the ability or capacities of teachers to guide and teach numerous players simultaneously is nearly impossible. Thus, this desire to empower players and enable them to understand the game seems to align much better with constructivist or socio-constructivist principles, taking for granted that learners' cognitive development is sufficient. However, this form of learning sometimes requires a significant amount of time or resources, which is not always available to teachers, especially in schools where the number of sessions of physical education classes is often insufficient and the ratio teacher-students too high, making proper scaffolding difficult.

Furthermore, beyond the teaching strategies used by teachers, it is crucial to remember that most students naturally adapt to their environment and learn the game even if the teaching strategies are not optimal. The most striking example that justifies the essence of socio-constructivist approaches is seeing children engaging in free play in parks and learning to play the sport on their own, without adult supervision, simply by playing and observing friends.

In addition, learning to play TSGs involves learning not only about the internal logic of the game and about collective tactics and strategies, but also about rules and terminology in addition to the mastery of particular motor skills. Despite their focus on understanding, GUBAs cannot escape this reality. As a result, even if a particular game-understanding approach is considered as being cognitivist or constructivist, it is likely that at some point, PE teachers will resort to behaviorist strategies to teach either rules of the game, gameplay vocabulary or motor skills.

Finally, designing a particular approach to be constructivist or socio-constructivist does not make it so necessarily. In the end, it is the way a particular teacher implements the approach that brings students either to rest on the formers' instructions or to take charge of their learning with the help of an informed facilitator.

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