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Game-Based Teaching and Coaching as a Toolkit of Teaching Styles

By Brendan SueSee and Shane Pill

There are many versions of the game-based approach (GBA) to teaching. Popular versions include teaching games for understanding (TGfU; Bunker & Thorpe, 1982), the tactical games model (Griffin, Oslin, & Mitchell, 1997), tactical decision learning model (Grehaigne, Wallian, & Godbout, 2005), play with purpose (Pill, 2007), and the game sense approach (GSA; Australian Sports Commission [ASC], 1996). Although there are differences between these versions, all GBAs view

> playing the game (modified or adapted for the players' abilities) as the central organisational feature of a lesson. The modified games create constraints that emphasize certain game features in order to develop understanding as students solve the problems they are presented with. (Breed & Spittle, 2011, p. 7)

Game-based approaches may be thought of as a "tactical" teaching style, instructionally distinctive by an emphasis on guided discovery. However, this article will show that it is more accurate to think of a GBA as a range of teaching styles or a "toolkit" of styles.

Game-based approaches may be thought of as a "tactical" teaching style, instructionally distinctive by an emphasis on guided discovery. However, this article will show that it is more accurate to think of a GBA as a range of teaching styles or a "toolkit" of styles. In this article, one GBA, the GSA, is used as an example to illustrate this idea. The GSA was released in 1996 as a sport coaching adaptation of TGfU (ASC, 1996). Like other GBAs, the GSA has been referred to as a teaching style (Light, 2014). However, the GSA is more than a style, method or strategy because GBAs use a range of teaching styles, which are referred to in this article metaphorically as a "toolkit" of styles (Pill, 2012). Further, it is helpful to view the teaching styles with a noncomparison approach (Mosston & Ashworth, 2008) rather than as a debate between a tactical style and a technical style.

Game-based approaches broaden the traditional understanding of sport as techniques (Kirk, 2010). They do this by promoting technical actions as the visible expression of players' thinking and problem-solving abilities, taught by a type of guided inquiry often labeled "discovery" (Breed & Spittle, 2011; den Duyn, 1997; Launder, 2001; Light, 2014; Pill, 2011a, 2011b, 2013). Further, "the central instructional strategy is the use of questioning to stimulate thinking about the game" (Pill, 2013, p. 9). Using the term "guided" does not imply an implicit "game as teacher" learning environment. Instead, it is a purposeful environment deliberately constructed and shaped by the pedagogical actions of the teacher (Pill, 2017). This purposefully constructed learning context engages the pedagogical application of game modifications to:

1. constrain and shape the game behavior of players toward the tactical and technical learning intention;
2. prioritize practicing skills within the context of games to increase the relevance and transferability of learning from practice to "match day" play;
3. place less emphasis on the development of specified techniques and more emphasis on adaptive movement responses; and
4. focus on player problem solving and decision making to assist in the development of their game thinking (ASC, 1996; Breed & Spittle, 2011; den Duyn, 1997; Light, 2013; Pill, 2007).

What Does It Mean to Develop 'Thinking Players'?

Like many words, the term "thinking" can have multiple definitions. The meanings of the term "thinking" can be considered using the spectrum theory (Mosston & Ashworth, 2008). Mosston and Ashworth (2008) suggested there are "three basic processes of conscious thinking: memory, discovery, and creativity" (p. 48). *Memory* requires the reproduction of knowledge or skills. The *discovery* process requires learners to produce knowledge that was previously unknown to them. It involves a "search" and cannot be done in one cognitive step. Finally, the *creative* process requires the learner to produce something that is "new, different, beyond commonly known or anticipated responses" (Mosston & Ashworth, 2008, p. 48). According to Zmigrod, Colzato and Hommel (2015), creativity can further be broken down based on Guilford's (1967) concept of convergent and divergent thinking. Zmigrod et al. suggested that "convergent thinking is associated with finding a single solution to a problem in an analytical, deductive way (i.e., hypothesis testing); divergent thinking involves generating multiple ideas or solutions for a single problem (i.e., brainstorming)" (p. 353). This concept illustrates that if the student solved the problem before (and is thus recalling knowledge), then it is a memory process.

Two Types of Discovery Thinking

Using a GSA can also provide opportunities for two different types of discovery thinking: convergent discovery and divergent discovery. Convergent discovery involves the learner discovering a solution to a problem that has only one solution. Divergent discovery requires the learner to produce multiple solutions to a single question or situation. To demonstrate how a GSA provides an opportunity to use either, the previous situation will be built on as a working model.

Mosston and Ashworth (2008) suggested that discovery, unlike memory, requires learners to produce information that was previously unknown to them. This knowledge "can include concepts, relationships between or among entities, principles, and theorems. Designing physical movements, games, strategies, choreography patterns, or interpreting movements all rely on discovery" (Mosston & Ashworth, 2008, p. 48). There are elements of overlap with regards to the discovery process and the creative process. The creative process often refers to a solution to a problem that is perceived as unique or original. This uniqueness or originality is contextual in the sense that it is usually referring to the individual. The individual has not

produced this response before, meaning that it has not been recalled. Others (Runco, 2014; Runco & Jaeger, 2012; Stein, 1953; Sternberg & Lubart, 1999) have supported this idea that creativity can be viewed as the formation of novel, original and high-quality ideas that are useful and adaptive.

Memmert (2015) suggested that convergent thinking "refers to the ability to find the ideal solution to a given problem" (p. 18). In other words, there is one solution to identify. Conversely, divergent discovery can be defined as "the unusualness, innovativeness, statistical rareness or uniqueness of solutions in a given task . . ." (Memmert, 2015, p. 18). The important thing on which to focus is that the person is thinking to produce two or more solutions to a stimuli or problem, not one.

From a sport teaching or coaching perspective, this means that opportunities arise in games where players face a problem and do not know the answer or solution. The teacher or coach has two options: Tell the player the answer(s) or create a learning episode where the player is required to discover or create an answer (or answers) to the problem. Given that in many sporting situations the participant is required to make decisions in the moment of play (Pill, 2014) to solve a problem (or problems) with no input from the teacher or coach, it may be worthwhile for the participant to gain confidence and experience in discovering or creating solutions to problems.

When using a GBA, the teacher/coach will have deliberately constructed a game or episode requiring the players to solve a problem. For example, a simple 2 vs. 1 possession game presents a problem for the two attackers as the defender is attempting to intercept the ball by applying pressure to the attackers. Players may find themselves in a game of lacrosse where they constantly lose possession of the ball as they frequently try to pass it. This situation requires students to produce a solution to this problem. Lacrosse is unique in many ways, particularly in that passing over a defender is less successful due to the stick giving the defender an even greater advantage (as opposed to passing when there is no defender between the two attackers). Therefore, it could be that there is one solution to this 2 vs. 1 possession game: to pass only when there is no defender between the attacker in possession and the other attacker. This is an example of an environment where convergent thinking is experienced. Alternatively, if a player were in a 3 vs. 1 situation, where there is more than one solution or option to solve the problem as there is more than one person to whom to pass, a situation is created in which divergent thinking can be experienced.

Thinking Players Are Decision Makers

The GSA has a distinctive focus on developing "thinking players" (den Duyn, 1997; Zuccolo, Spittle, & Pill, 2014). "Game intelligence" is sometimes associated with thinking players, and there is a focus on the development of this ability within a GSA (Hastie & Mesquita, 2016; Memmert, 2015; Pill, 2013, 2016a, 2016b). Lennartsson, Lidstrom and Lindberg (2015) explained game intelligence in two parts: 1) an ability to decide on a strategy for the situation, and 2) an ability to execute the chosen strategy. O'Connor and Larkin (2016) similarly explained game intelligence as the observation of the interaction between tactical and decision-making skills involving the player performing a correct action at the right time. Both explanations are consistent with the GSA equation for skilled performance: "technique + game context = skill" (den Duyn, 1997, p. 6). Within this equation, technical skills, or techniques, are "the specific procedures to move one's body to perform the task that needs to be accomplished" (Martens, 2012, p. 169). Game intelligence (or game sense) is thus a learned ability (Lennartsson et al., 2015). The GSA was proposed as a pedagogical toolkit to teach this ability (ASC, 1996; den Duyn, 1997; Pill, 2007; Pill & Hewitt, 2017).

Decision making is a key skill in sport performance, especially for the development of performance expertise in elite or high-performance sport settings. Decision making in high-performance settings becomes highly multifaceted due to the complexity of information and interaction dynamics occurring in a time-pressed performance context (Afonso, Garganta, & Mesquita, 2012). However, the GSA emphasis on the use of questioning (ASC, 1996) to stimulate player thinking could require some players to recall or reproduce knowledge and others to discover knowledge — all depending on their learning history (SueSee, Pill, & Edwards, 2016). This emphasis will be illustrated in the following examples.

Application

This article has introduced the GSA as focused on developing thinking players, outlined the previous association of this focus with a guided discovery style, and explained player thinking as either a convergent or divergent operation. This section will present examples from sport practice to illustrate the GSA as a pedagogical toolkit as it engages multiple (or a cluster of) teaching styles, using Mosston and Ashworth's (2008) spectrum of teaching styles to illustrate this toolkit metaphor.

What follows is an imagined dialogue between a teacher or coach and two players being questioned after playing a 2 vs. 1 keep-away game (Figure 1). Attacker 1 (A1) must stand in a hoop and attempt to pass the ball out to Attacker 2 (A2). Attacker 1 cannot leave the hoop but can pivot inside the hoop. Defender 1 (D1) attempts to touch or intercept the ball. Both A2 and D1 must be at least one meter from the hoop. Participants play in these positions for one minute and rotate so that all three play each position.

In a typical GSA format, game play is followed by a period of reflection on what occurred in the game. Therefore, after playing the game, the teacher or coach questions the players, as illustrated in Table 1. The players' responses and thinking are also shown. For this example, it is presumed that Player 1 (P1) has a great deal of experience playing invasion games and Player 2 (P2) does not.

For both players in this learning experience, questions were asked to stimulate thinking using the model of cognition presented by Mosston and Ashworth (2008). For P1, there was recall due to his or her previous experience and knowledge from playing invasion games. Mosston and Ashworth ex-

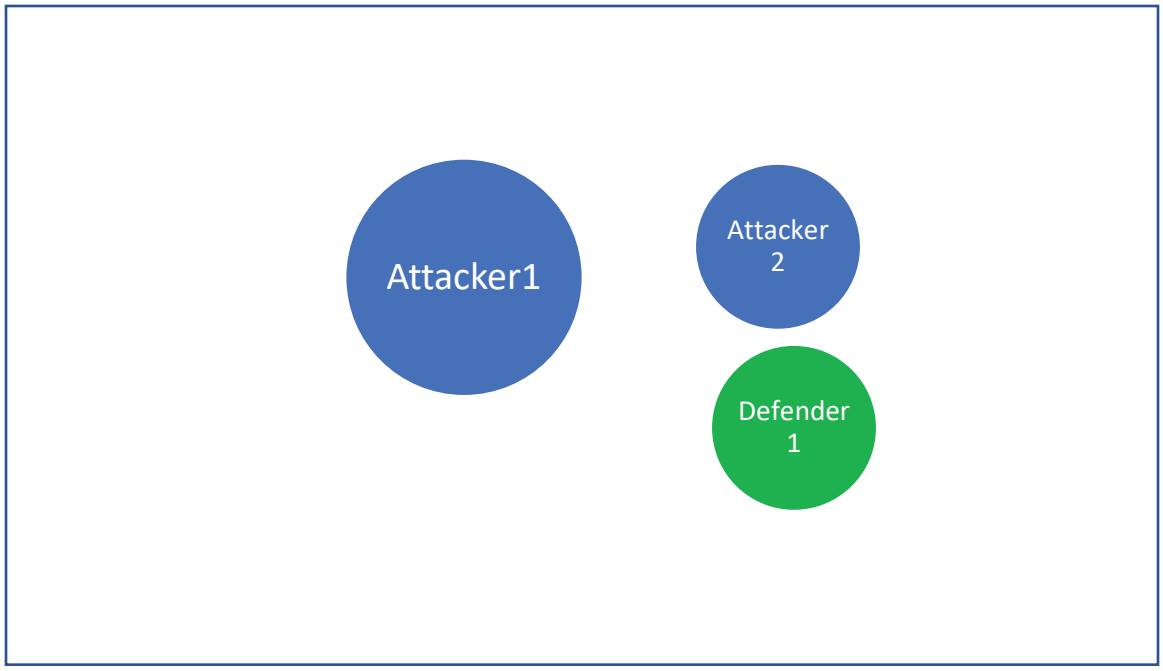


Figure 1. 2 vs. 1 keep-away game

plained this recall when they argued, "[I]f the learner already knows the answer . . . the question and answer experience reverts to a design variation of the Practice style (a review)" (p. 213). In other words, one cannot discover something that one already knows. It should be stressed that just because P1 was recalling it does not mean that P2 was not thinking. Player 2 has also been thinking, but he or she has a combination of memory and discovery due to having limited experience with invasion games. In two situations, P2 heard P1's answer and then may have "connected the dots" to discover a concept. Mosston and Ashworth explained this situation when they suggested, "When one learner has discovered the answer (anywhere in the sequence) and utters it aloud, the other learners who hear (or see) the response become receivers. They can no longer discover it" (pp. 220–221). In the case presented here, P2 did not discover the "what to do," but he or she may have discovered "how to do it" or how the concept worked in the game context. A GSA in this situation required thinking, but due to the learners' previous knowledge, they used different types of thinking (*memory* or *discovery*). Again, referring to Mosston and Ashworth's spectrum of teaching styles, Practice – Style B and Guided Discovery – Style F may have

Table 1. Possible Dialogue between the Teacher/Coach and Players

Teacher	Player 1	Player 2
How can A2 get into a good position to receive the ball?	Don't let D1 be between us. (Memory)	Don't know — run away? (Memory-guess)
Yes, P2, but will running away work if D1 is still between you and A1?		Not sure — I might need to have space between me and A1? (Discovered a concept)
How can you increase your chances of creating that space?	Run quickly in one direction and then change direction quickly. (Memory)	Like a zig-zag? Ah! (Discovered a concept by building on P1's answer, or it could have been memory as they just heard the answer from P1)
What will happen if you zig-zag slowly? Will it be as effective?	No. D1 will keep up, and there will be no space between us.	Ah! So, the faster I zig-zag, the harder it is for D1 to keep up? (Discovered a concept by building on P1's answer)

Note. A1 = Attacker 1; A2 = Attacker 2; D1 = Defender 1; P1 = Player 1; P2 = Player 2.

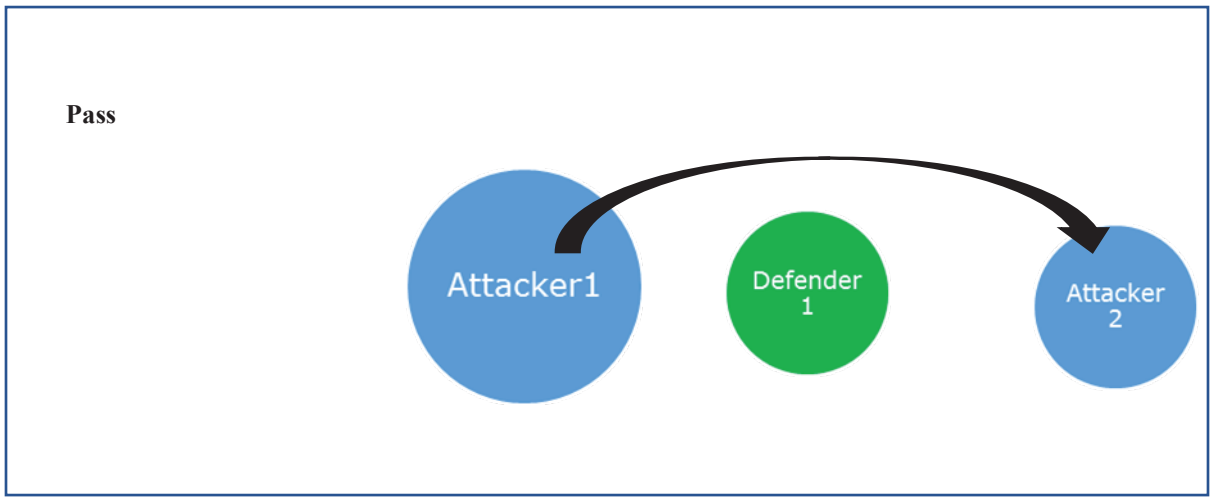


Figure 2. A pass to the long side of the rectangle

been in operation. The teaching or coaching episode may be a guided inquiry through the application of questioning, but it is not guided discovery for both players.

To extend this explanation, here is another example. A GSA could be used to create an environment that allows for teaching a concept (and for the student to use discovery or memory/recall), such as determining the best game situation to pass over the head of the defender rather than passing around the defender. The same game (Figure 1) is used in terms of the game environment (a rectangle), with A1 in a hoop in the middle, and A2 and D1 at least one meter from A1. The teacher/coach could ask all three players to perform 20 passes in total out of the circle. They could be instructed to do 10 passes to the longest part of the rectangle (Figure 2) and 10 to the shortest part of the rectangle (Figure 3). The teacher or coach then asks, "In which of these two situations is it most appropriate to do a pass over D1?" In this situation, two possible conscious thought processes could be used. If A1 has a lot of experience with invasion games, he or she would recall that a pass over D1 is most successful when A2 has space to run back or away from D1. He or she would be aware that when there is not a lot of space to run away from D1 (against the line or on the narrow side of the rectangle), the overhead pass is less successful. If A2 has little knowledge about invasion games, he or she would most likely experience this situation during the play and discover this concept — and would thus be using *discovery* as the conscious thought process.

This episode, illustrated in Figures 2 and 3, may also represent a Convergent Discovery – Style G (Mosston & Ashworth, 2008), as it requires A2 to use a discovery process to discover

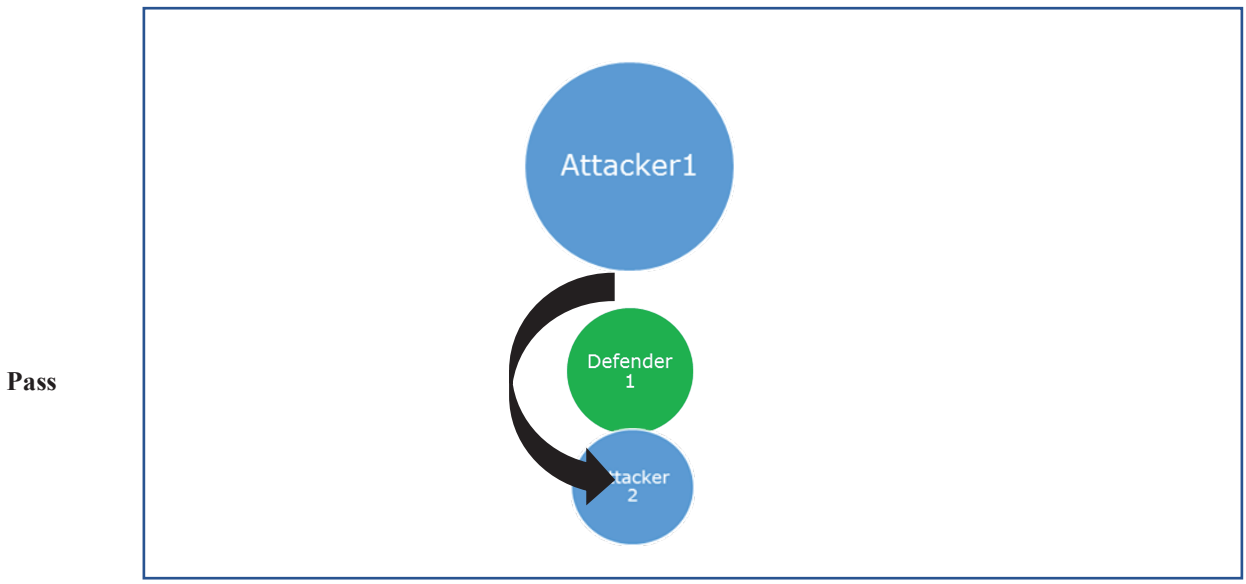


Figure 3. A pass to the short side of the rectangle

one correct answer. As mentioned previously, A1 may be using convergent memory as he or she *recalls* one known correct answer, whereas A2 may use convergent discovery due to the lack of initial knowledge about this invasion game, which means that he or she *discovers* the one correct answer to the situation.

Keeping with the same game (structure, playing area and attackers and defender) used in the two previous learning experiences, the teacher or coach could construct another learning experience that requires divergent thinking. Divergent thinking is the creation of two or more "responses to a single question/situation, within a specific cognitive operation" (Mosston & Ashworth, 2008, p. 247). During a divergent-discovery episode, the player needs to "search (the mediation phase — M) for a variety of solutions that will solve the problem" (Mosston & Ashworth, 2008, p. 249). This mediation phase involves the learner searching "for the specific cognitive operation that is triggered by the specificity of the stimulus (the question)" (Mosston & Ashworth, 2008, p. 51). Based on these descriptions of what constitutes a divergent-discovery episode, a scenario can be imagined in which the teacher or coach asks A2 to create three ways to create space (or get away) from D1. With regard to "thinking," it is important to consider that if only known responses are sought from the student, then the teacher is using a teaching style from what Mosston and Ashworth (2008) called the reproduction cluster, and it could not be described as divergent discovery because the player is recalling (memory) known ways or strategies to create space. Therefore, although the teacher or coach is guiding an inquiry, an episode like this one in a GSA is not guided discovery for the player.

To create an episode that requires the player (A2) to either use divergent designing (creativity) or divergent memory, the teacher or coach may, for example, ask A2 to generate multiple ways to create space (get away from D1) so that he or she can successfully receive a pass from A1. Attacker 2 then attempts to answer the question or solve the problem by designing successful strategies or, if he or she has a large amount of knowledge to draw on, by recalling strategies that had worked in the past in similar situations. This situation is one in which the teacher's or coach's knowledge of the player's cognitive history allows them to judge whether the player is recalling or creating.

Other factors such as speed to create the idea, accuracy, fluency and success of the solutions could be indicators of memory or discovery, as creativity is not usually known for its precision and perfection the first few times. "The creative process refers to responses that are perceived as unique or original — something that is new, different, beyond commonly known or anticipated responses" (Mosston & Ashworth, 2008, p. 48). Therefore, if a response is unique or original to an individual (i.e., they have not performed it before), then it will not have the characteristics of a speedy, polished and precise (skilled) performance. Either way, this episode would require A2 to create or recall responses that allow him or her to solve the problem set by the teacher or coach, and it does require some type of divergent thinking. Possible solutions are presented in Table 2.

These examples show that a GSA encompasses styles from Mosston and Ashworth's (2008) spectrum of teaching styles known as Practice – Style B, Guided Discovery – Style F, Convergent Discovery – Style G, and Divergent Discovery – Style H. These styles are clear examples of when a GSA is a metaphorical "toolkit." Mosston and Ashworth used a similar metaphor when they suggested "a repertoire of teaching-learning behaviors is the tool that all teachers rely on for creating worthwhile and challenging learning experiences" (p. 5). The situations presented in this article embrace the use of more than one teaching style when viewed from the position of the student. Because the game is always the central organizing feature, using a GSA creates learning experiences in which players use different types of thinking to solve the game "problem" — in this case, creating space between the attacking receiver and the defender trying to deny a pass-receive. In this way, the use of a GSA shares pedagogical similarities with the spectrum of teaching styles (Mosston & Ashworth, 2008) noncomparison approach and the concept of canopies of teaching styles.

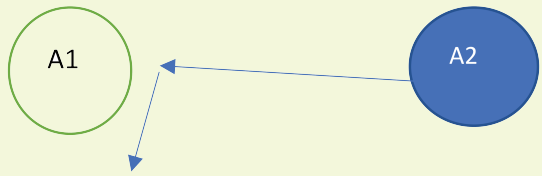
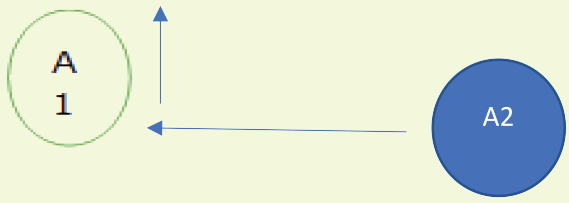
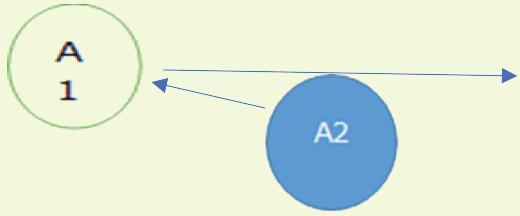
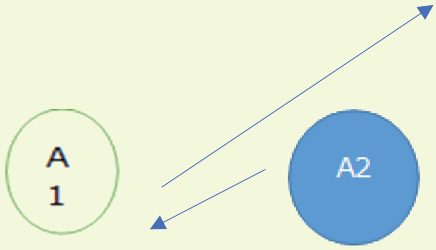
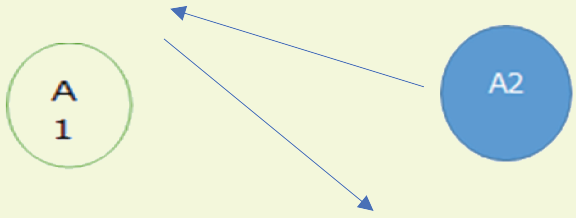
No teaching style is bad or good; rather, each style meets "a specific set of unique objectives or goals" (Mosston & Ashworth, 2008, p. 319). The pedagogical act of teaching and coaching involves the deliberate selection of a teaching style to prompt a desired mode of thinking from a student. If a teacher desires their student to recall information such as a skill or tactic, then he or she will use a teaching style from the reproduction cluster (Styles A–E), which requires the recall or application of that information or skill and thus requires the student to use the conscious thought process of *memory.* Alternatively, if the teacher wishes to create a learning experience that will require the student to create (or discover) a new response, then a teaching style from the production cluster (Styles F–K) must be used. In this situation, the students are required to use the thought process of *creativity* (or *discovery*), which promotes the production of knowledge that was not previously known.

Conclusion

This article has addressed the labeling of the GSA as guided discovery by shifting the focus from the observation and questioning by the teacher or coach to create an inquiry-oriented teaching episode, to the type of thinking that is prompted by the student. Examples were provided of how a GSA can be many teaching styles to players, which invokes the metaphor of the GSA as a pedagogical toolkit. Using the model of cognition provided by Mosston and Ashworth (2008), it has been suggested that there are three dominant conscious thought processes (memory, discovery and creativity) when one considers the development of thinking players in a GSA. In every learning episode in a GSA, the teacher or coach requires players to use one of these conscious thought processes. Whether the player uses the process the teacher or coach intends depends on factors such as compliance and cognitive history. The three examples provided showed that a teacher or coach may even be using two teaching styles in each learning experience.

To substantiate the proposition that GBAs develop thinking players and that a preferential selection of a GBA enhances the

Table 2. Possible Solutions to the Problem of Creating Space to Successfully Receive a Pass

Possible Solutions	Diagram
A2 leads in toward A1 and goes to the left.	
A2 leads in toward A1 and goes to the right.	
A2 leads in toward A1 and then straight back.	
A2 leads in toward A1's right and then straight back to left.	
A2 leads in toward A1's left and breaks back to the right.	

Note. A1 = Attacker 1; A2 = Attacker 2.

development of player perception and decision-making ability, a focus on understanding the cognitive operations of the player is required. Most of the research and scholarly literature on GBAs has focused on the pedagogical acts of the teacher or coach or on the observation of players' game behaviors (Stolz & Pill, 2014). No examples were found in the research on concrete changes in student thinking (memory, discovery or creativity) as a product of experiencing a GBA. There is therefore a clear and present need for research on what it means to develop thinking players via a GBA.

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