

The theory and practice of modifying soccer: Maximizing learning outcomes in elementary school physical education

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Abstract

Physical education (PE) has been affirmed over the past decade as a vital part of school curriculum. Drawing from Newell's theory of constraints (1986) and a comprehensive review of evidence-based literature, this study meticulously investigates pedagogical practices, effective activity modifications, and the implementation of a game-like progression within elementary school PE, with a focus on augmenting learning outcomes across the psychomotor, cognitive, and affective domains. This paper places a primary emphasis on soccer—an open-skill team sport taught in PE programs globally—as its situational conditions make it an ideal option for maximizing students' learning. The study equips readers with an extensive array of pedagogical resources, including a diversified range of activity types, innovative instructional strategies, and a detailed five-unit soccer lesson specifically designed for elementary school PE. The study underscores the significance of modifications to activities, rules, and equipment, all aimed at increasing learning opportunities, fostering developmentally appropriate motor-skill perception, and promoting moderate-to-vigorous physical activity. It posits that to achieve specific learning goals, a PE teacher should be adept at tailoring the task's rules and equipment to align with contextual situations. Furthermore, the inclusion of multiple training phases in the curriculum is recommended. The study concludes by outlining prospective pathways for teacher education programs and professional development, emphasizing the critical need for inclusive adaptations. The aim of these modifications is to ensure an inclusive PE environment that accommodates students from all backgrounds and skill levels, providing them with the necessary support to maximize their potential, foster success, and encourage a physically active lifestyle.

Keywords: Motor learning, sports skills, ecological dynamics, nonlinear pedagogy, evidence-based practices

Introduction

The prevailing literature asserts that schools are obligated to impart skills promoting a physically active lifestyle and strive to ensure all children engage in the daily recommended amount of physical activity (Centers for Disease Control and Prevention, 2019; Institute of Medicine [IOM], 2013). Physical Education (PE), widely acknowledged by educational authorities, researchers, and policymakers as an indispensable facet of the elementary school curriculum, plays a pivotal role in nurturing these skills and fostering a lasting engagement in physical activity. The implementation of the Every Student Succeeds Act (ESSA; U.S. Congress, 2015) in the United States has further evidenced this recognition. ESSA, signed into law in December 2015, embraces a more holistic approach to student success. It considers several nonacademic components related to student development (e.g., interpersonal skills, communication, and engagement). This legislative framework has already begun to influence the role of PE in public schools, highlighting the importance of these nonacademic components and emphasizing a comprehensive approach to education.

In this context, sports activities over the past decade have become pivotal in achieving diverse student learning outcomes within school contexts (Bailey et al., 2009; IOM, 2013). PE, as a unique subject area, simultaneously targets psychomotor, cognitive, and affective learning domains (Metzler, 2017). As such, participating in PE regularly has a noticeable impact on students' development of fundamental motor skills (psychomotor; Barnett et al., 2016; Logan et al., 2015), cognitive abilities (Dalziel et al., 2019), and social-emotional learning (affective; Wigelsworth et al., 2020).

Consequently, PE teachers should employ diverse pedagogical strategies to maximize student learning outcomes through meaningful experiences that foster physically active lifestyles (Beni et al., 2019). Meaningful experiences in PE encompass motor competence, social interaction, challenge, fun, and personally relevant learning (Moon, 2022). This serves as a foundation for elementary school PE teachers in designing and implementing effective teaching strategies (Ní Chróinín et al., 2018). The notion of a “teacher as a curriculum developer” emphasizes the distinctive role and expertise of PE teachers (Clandinin & Connelly, 1992). According to Society of Health and Physical Educators (SHAPE) America's National Standards and Grade-Level Outcomes for K–12 PE, PE programs must align with a standardized curriculum to reinforce educational goals, which

include psychomotor, cognitive, and affective domains (SHAPE America, 2024). However, it is essential to consider how PE teachers are provided the tools and freedom to develop courses tailored to their student populations and the goals of their classes, balancing standardized requirements with individualized approaches. This balance ensures that PE programs effectively contribute to the holistic development of students, aligning with both educational standards and the unique needs of the learners.

To effectively implement these teaching practices, educators must be aware of the shifting landscape of PE. This landscape has evolved considerably, driven by contributions from key figures such as Wade (1967) and Worthington (1974), and the development of pedagogical models like the Games for Understanding tradition in the United Kingdom and the game sense model in Australia (Pill & Reynolds, 2020). While these contributions have profoundly shaped PE discourse and practice, certain outdated and disconcerting practices, as identified by Metzler (2017) and Wein (2007), are still employed.

This discrepancy highlights a significant gap between the current understanding of effective PE teaching and its practical application in schools. Specifically, educators often struggle to balance standardized curricula, which may emphasize uniformity and specific skill sets, with the diverse needs of students, who vary widely in their physical abilities, interests, and socio-cultural backgrounds. This misalignment can result in suboptimal learning experiences, where some students may not fully engage or benefit from PE. For example, despite evidence-based recommendations advocating for children to engage in moderate-to-vigorous intensity physical activities for at least 60 minutes daily (McKenzie & Smith, 2017), there is a conspicuous lack of effective strategies and practical resources for PE that can maximize learning outcomes and improve students' participation. While research supports various innovative and inclusive teaching strategies, these are not always effectively integrated into everyday practice, leading to inconsistencies in the quality and effectiveness of PE instruction across different schools and regions.

This study aims to address these inconsistencies by presenting robust examples of modified soccer games, insightful pedagogical principles, and strategies for designing engaging and meaningful PE lessons. Soccer presents a compelling example for enhancing student learning. As an open-skill team sport, soccer requires players to adapt to constantly changing environments and unpredictable situations, making it ideal for developing various competencies (Ali, 2011; Silva et al., 2016). As one of the most popular team sports for elementary school students (Hulteen et al., 2017; Parrish & Nauright, 2014), soccer holds tremendous potential for transforming PE instruction. However, conventional drill-oriented teaching and coaching methodologies often fail to effectively adapt individualized practice programs to game demands, thereby failing to provide meaningful PE experiences for students (Beniet al., 2019; Metzler, 2017; Nunome et al., 2006; Pill, 2012; Wein, 2007; Williams & Hodges, 2005). Incorporating a transformation of soccer skills is beneficial for PE teachers because of the necessity to satisfy student learning outcomes in all three domains (SHAPE America, 2024).

This adaptation is in the context of PE teachers' strategies to encourage students' engagement with soccer and generate the latter's interest in fostering physical fitness throughout their lives (Silva et al., 2016). Thus, PE teachers need to modify and organize soccer game programs that take into account various motor development levels and abilities of students to enhance their educational effectiveness (Pill, 2012; Vantinen et al., 2010).

By connecting theory and practice, this study hopes to contribute significantly to academic discourse and, more importantly, stimulate the application of research insights in real-world PE contexts, enhancing the quality of PE instruction and student learning experiences. This study also ambitiously embarks on an exploration of the practical application of Newell's theory of constraints (1984, 1986), investigating how elementary PE teachers can integrate innovative soccer modifications into their pedagogical practice, drawing from a rich background in literature.

Grounded in a comprehensive examination of key pedagogical principles necessary for designing a PE lesson, this research not only provides theoretical insights, but offers tangible examples of modified soccer games. These examples serve as illustrative tools, guiding the creation of learning environments that catalyze meaningful experiences, foster cognitive game comprehension, and bolster student engagement in tasks, thereby enriching the overall educational impact of PE.

Theoretical Background

Newell's Theory of Constraints

Newell (1984, 1986) suggested that children's motor skill learning is based on the dynamic interactions among three constraints: the task, the individual, and the environment (Figure 1). The combination of these constraints influences how a person moves (Gagen & Getchell, 2004). For instance, in sports movements (e.g., kicking, throwing, running, sliding, dodging), individual factors (e.g., hand size, vision) can interact with task factors such as the size and weight of the ball, and with environmental factors including outdoor lighting and wind. These three constraints not only interact but can also be modified to encourage specific types of movement while discouraging others, thereby influencing movement as a whole (Gagen & Getchell, 2004; Goodway et al., 2019). Specifically, the modification of the elements within the task, individual, and environment may induce a shift from a non-proficient pattern of performance to a proficient pattern (Davids et al., 2005; Newell, 1986).

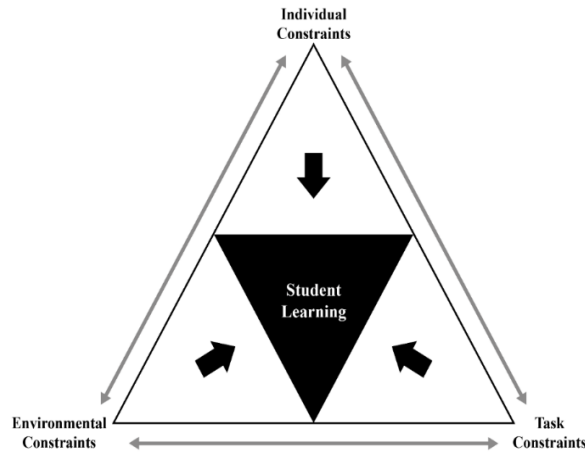


Figure 1. Newell's theory of constraints

Task. Tasks are generally operationalized as any specific activity that a learner performs to obtain an outcome (Gallahue et al., 2012). These activities also generally have a predefined structure with goals, rules, and/or equipment (Newell, 1986). Task constraints relate to specific, intentional motor activities that the teachers assign. Constraints for a task may include—inter alia—task type and the outcomes desired, such as objective control skills (e.g., kick, stationary dribble).

These constraints encapsulate several facets, including the nature of the task and the desired outcomes. For example, tasks may be classified by their inherent complexity or the level of precision they require, ranging from simple, repetitive motions to complex, coordinated movements. The desired outcomes of a task can also be as specific as developing objective control skills (e.g., kick, stationary dribble), enhancing coordination, or promoting cognitive development through strategic decision-making and problem-solving. Task constraints can also include the equipment used and the rules governing the activity. For instance, the size, weight, and shape of a ball in a soccer drill would impact the strategies and techniques used by students. Similarly, the rules and guidelines of an activity can serve as constraints by shaping the ways students approach and navigate tasks. In essence, task constraints can play a crucial role in shaping the learning experience. By carefully managing these constraints, educators can guide students towards desired learning outcomes, cater to individual needs, and foster an environment conducive to development and success. The strategic manipulation of task constraints, therefore, forms an integral part of effective pedagogical practice in PE.

Individual. Individual constraints, also known as organismic constraints, are defined as internal conditions that influence an individual's development (Newell, 1986). These constraints are bifurcated into two distinct types: structural constraints and functional constraints. Structural constraints pertain to an individual's anatomical characteristics (e.g., height, weight, limb length, and body composition). Functional constraints are linked to specific abilities, such as balance, coordination, and cognitive factors like attention, motivation, or memory (Newell, 1986). These characteristics can be classified as either “affordances” or “rate limiters,” meaning they can either facilitate or impede the successful execution of a task (Renshaw et al., 2010). For instance, a student's limb length (structural) may affect their ability to reach or extend during activities. Balance and coordination (functional), influence how effectively a student can control their movements and respond to dynamic situations. The learner, or student, must contend with both constraints, which are often not easily altered. Thus, understanding these constraints allows educators to tailor their instructional approaches to accommodate the diverse needs of students.

To effectively navigate the terrain of individual constraints, strategic adjustments are typically made to task and environmental constraints because these are often more readily adjustable. However, this does not mean individual constraints cannot be manipulated. For instance, motivational constraints—a key example of functional constraints—can be altered to enhance student participation. This can be achieved by adjusting task constraints to create more engaging and achievable activities, such as introducing stimulating targets like a bowling pin to aim at, incorporating thematic elements such as an ocean theme into PE lessons, and ensuring early and consistent opportunities for success. Such strategic modifications aim to cultivate a dynamic, engaging, and effective learning environment that caters to students' individual needs while maximizing their developmental potential. By aligning task and environment constraints with the unique characteristics of individual constraints, teachers can foster an environment where students are motivated and capable of achieving their full potential.

Environment. Environmental constraints encompass physical and sociocultural elements external to an individual's body that can influence motor activity and learning, including ground surface, ambient light, gymnasium dimensions, temperature, weather conditions, and time of day (Newell, 1986). While modifying these environmental conditions can be challenging, some adjustments are feasible, such as controlling indoor

temperature, providing outdoor cover from the sun, rain, or wind, and managing the time of day for task execution. However, in a school setting, PE classes are typically scheduled according to a fixed timetable, limiting the flexibility to choose optimal times for physical activities. Recognizing this limitation, teachers can still make strategic environmental adjustments within these constraints to enhance learning. It is worth noting that the line between environmental and task constraints can often become blurred. For instance, modifications in the size, shape, color, texture, and weight of equipment can also serve as constraints within the environment. Using brightly colored balls can help maintain students' attention and enhance visibility, while lighter or softer balls can be safer and more manageable for younger or less skilled students. A meaningful PE class integrates a variety of equipment options tailored to enhance student learning. Further, while PE courses are often structured around units focused on specific activities (e.g., soccer, badminton, or physical fitness tests), teachers can still introduce tailored equipment to accommodate different skill levels and needs within each unit. During a soccer unit, varying the size of the goals or the type of balls used can help cater to different age groups and skill levels. In a badminton unit, using rackets of different sizes or shuttlecocks of varying speeds can provide appropriate challenges for all students. Additionally, during physical fitness tests, offering alternative exercises or modified equipment can ensure that all students participate meaningfully. By carefully modifying environmental constraints and thoughtfully selecting equipment, teachers can create an inclusive and supportive PE learning environment that addresses the diverse needs of students and maximizes their developmental potential.

Drawing from Newell's theory of constraints, to better accommodate students who have different levels of development, PE teachers should devise a lesson plan with strategies that could help change task, individual, and environmental constraints in different ways (Renshaw et al., 2010). More specifically, they should use modified game forms with simplified rules to help enhance the moderate-to-vigorous physical activity levels of students and their learning outcomes (Weaver et al., 2013). In essence, when teaching students with different backgrounds and levels of development, PE educators should employ Newell's theory of constraints (1984, 1986) to understand students' characteristics and apply practical strategies for successful PE lessons so students can have individualized learning experiences that are meaningful and effective. Table 1 provides examples of how PE teachers can comprehend individual constraints and apply modifying strategies to optimize student learning outcomes.

Table 1. Constraints when striking with a paddle or racket (modified from Gagen & Getchell, 2004)

Theory Individual constraint(s)	Practice Modification to improve performance outcome
Physical - Low visual perception - Small hands/short arms	Equipment - Increase color or size of ball for visibility - Smaller grip, shorter handle, larger striking surface
Maturity - Coordination not well developed	Equipment - Stationary or slow-moving ball, larger ball, larger striking surface
Maturity - Little experience with judgment of moving objects	Rule - Allow a moving ball to bounce more than once before striking
Motivation - Motivated to learn, but short attention span	Equipment - Have enough equipment for each student to provide optimal movement time
Motivation - Low motivation	Rule - Introduce varied activities/modifications that provide similar practice for all students

Literature review: Pedagogical practices to maximize student learning

Adaptive strategies for promoting effective student learning

Current literature demonstrates that student learning should not be a "one size fits all" approach but rather an emergent, individualized process influenced by different variables, in different contexts, and at different times within the classroom environment. Various pedagogical studies and strategies are needed to respond effectively to the multiple changing contexts in which a PE teacher works and the diverse backgrounds of children (Gagen & Getchell, 2006). This adaptive pedagogical approach guides students in demonstrating flexibility, originality, and efficiency in their movement patterns and achieving learning outcomes. Instead of relying solely on traditional, teacher-led methods, practitioners could develop learning contexts in which students are actively engaged in creating their own learning experiences. This shift motivates students to find their own solutions within specific environmental and task "constraints" (Newell, 1986), ultimately supporting their learning. By fostering an

environment where students are encouraged to explore and adapt, teachers can better cater to the unique needs and abilities of each student, promoting more effective and inclusive learning experiences.

Enhancement of students' perception skills

In an expanding body of literature, an increasing emphasis is being placed on the paramountcy of coordination abilities and perceptual-cognitive processes in efficiently executing intricate movement patterns—an integral element of soccer performance (Davids et al., 2008; Nunome et al., 2006; Roca et al., 2013). Despite the development of various motor skills in PE classes, elementary school students often struggle to accurately assess rapidly changing scenarios and apply the appropriate motor skills in real-world sports games. This challenge highlights the need for integrating perceptual-cognitive training in PE curricula to better prepare students for the complex demands of sports activities. By enhancing students' perceptual skills, teachers can help them develop the ability to process information quickly and respond with appropriate movements, thereby improving their overall performance in dynamic sports environments. The cognitive process, defined as the means through which individuals acquire knowledge via thoughts, experiences, and senses (Ward & Williams, 2003), is thus integral. Cognitive skills encompass the perceptual process, which allows for the efficient processing of received information, thereby enabling individuals to react appropriately to the situation and respond through dynamic movement (Abernethy et al., 1993). The significance of cognitive processes within the realm of sports performance cannot be overstated, given the reliance of successful performance on effective perceptual and decision-making processes (Gréhaigne et al., 2001; Vaeyens et al., 2007).

Perception, defined as the process of gathering information about objects and events in one's environment through the various senses, including sight, hearing, and touch, is instrumental in this context. During this process, information received by the brain is integrated and interpreted (Abernethy et al., 1993). The ability to effectively use this perceived information to respond appropriately to different situations forms the basis of perceptual skill (Williams, 2000). These perceptual skills are a determining factor influencing students' successful performance in real-life sports situations, especially concerning the application of motor skills and decision-making abilities (Baker et al., 2003; Williams, 2000). Hence, sports events that transpire in complex and rapidly evolving environments (e.g., soccer, basketball, badminton, tennis) offer the opportunity for the acquisition and application of perceptual skills (Gréhaigne et al., 2001).

Perceived information, mainly input by sight, plays a vital role in all human actions requiring motor skills (Posner et al., 1976). To help students learn and develop motor skills more effectively, PE teachers are advised to teach students a visual search strategy where they can focus on the perception process of visual information and use the acquired information strategically. For instance, PE teachers may advise students to focus on players instead of objects within lessons to enhance their ability to anticipate and respond to movements. This strategy is used to help students better understand game dynamics and improve decision-making skills. PE teachers should ensure students concentrate on how players move and interact with their environment, such as observing how a player positions themselves relative to the ball and other players. This detailed focus can help students understand the context of movements and make better decisions during gameplay. Careful planning by PE teachers is crucial when designing lessons where students apply visual cues to games. For example, teachers should guide students to focus not just on the players but specifically on the players' motions within the context of their environment. This means understanding the interaction between players and objects, such as how a player dribbles a ball or moves to receive a pass. Such practical strategies should be tailored to each student's motor skill proficiency, as students' abilities can vary widely even within the same age group or grade.

Therefore, to develop the ability to use visual cues effectively, students need guidance that helps them learn motor skills and acquire knowledge about the diverse features of games. PE teachers should suggest effective training methods that balance students' perceptual and cognitive training. This involves providing specific drills and exercises that enhance students' ability to process visual information and make quick, accurate decisions during gameplay (Dalziell et al., 2019; Rink & Hall, 2008). One sport with which PE teachers could effectively use perception skill training is soccer. Soccer presents numerous complicated situations with rapid changes and fast-paced moments, making it an ideal sport for practicing perception skills (Roca et al., 2013). Under the pressure of time and space, students must synthesize various pieces of information, such as the ball and the motions of teammates or opponents, before executing efficient movement patterns. Therefore, quickly assessing the situation is crucial, leading to the development of successful motor skills (Williams, 2000).

To organize and implement meaningful perception skill training programs, PE teachers should create game scenarios that allow students to identify crucial visual cues. For the most effective student performance, PE teachers should suggest practical strategies that help students focus their visual attention on the most relevant information sources (e.g., ball position, teammates, open space) at appropriate times and in specific contexts. Guiding students to understand “when” and “where” to look is important for successful motion performance. For example, to predict the shooting direction of a striker in soccer, PE teachers could emphasize focusing on body-based cues, such as the position of the striker's stepping foot. This visual search strategy helps students stay focused on key cues and enhances their decision-making ability (Williams et al., 1994). In addition, using video simulation clips related to various patterns of soccer plays could be provided to students and a series of processes could be repeated where they analyze and predict the pattern of opponents' attack routes and pass directions, both of which could influence the development of students' perception skills.

Essentially, elementary school students require training not only in motor skill acquisition but also in understanding games, including the ability to judge situations appropriately and perform effectively. To help students transfer their learned motor skills to real-life sports situations, PE teachers should suggest various concrete visual search strategies through perception skill training. By incorporating a range of strategies, such as focusing on specific visual cues and using video simulations, teachers can maximize student learning and development of perception skills (Di Tore et al., 2016).

Quality of task presentation and instruction

The primary goal for PE teachers is to promote and foster a lifestyle of physical activity in students (SHAPE America, 2024). Teachers have the ability to foster such learning through the quality of task presentation and instruction delivered throughout a lesson (Rink, 2020). Recommendations for task presentation include checking for student understanding prior to the initiation of practice, repeating instructions often, and presenting the task in various ways (e.g., visual demonstration, auditory cues, kinesthetic practice without equipment). Specifically, repetition of instructions can facilitate short-term memory retention, while diverse task delivery and demonstration can enhance working memory capacity and declarative knowledge (Harvey et al., 2014). Understanding these key aspects of student learning—described as a “relatively permanent improvement over a period” of time—during new skill instruction can provide PE teachers with the knowledge to deliver effective task presentations and ongoing instruction (van Abswoude et al., 2018, p. 12). A student’s working memory capacity and declarative knowledge base can significantly influence learning if quality instruction is provided (van Abswoude et al., 2018). To deliver quality task presentation and instruction, it is imperative to understand students’ individual learning preferences (Rink, 2020). Students have varied learning styles, including visual, auditory, and kinesthetic preferences. Visual learners benefit from demonstrations and visual aids, auditory learners respond well to verbal instructions and discussions, and kinesthetic learners prefer hands-on activities and physical practice (Paintendre et al., 2023). Accommodating these different learning styles, PE teachers can enhance student engagement and effectiveness in learning new motor skills. This approach not only addresses the diverse needs of students but also maximizes the potential for each student to develop a lasting interest in physical activity.

Modified soccer activities

Soccer’s requirement for players to dynamically switch between offensive and defensive positioning as they move on a field of large dimensions makes it a complex sport for elementary school students to learn (Roca et al., 2013; Vaeyens et al., 2007). It is especially difficult for students of low skill levels to understand and play soccer adequately (Mesquita et al., 2012). In order for PE teachers to help students understand soccer, they need to create an environment with different methods for leading meaningful lessons (Beni et al., 2019). Specifically, when organizing a soccer unit program, it is vital for PE teachers to consider the varying motor development and performance levels of their students. Previous experience has revealed that PE teachers cannot expect to employ a similar methodology for all students every day in the classroom, even while using the national standards (SHAPE America, 2024), as students have unique learning needs and are at different stages of development. In turn, there are instances when the students’ or the individual’s learning conditions require an approach outside of traditional teaching methods. As such, PE teachers need to accommodate individual, connected, adaptive, and flexible curricular and pedagogical practices (Gagen & Getchell, 2006). This might be the case, for instance, when conveying core lesson concepts to a large group in a short period, devising space and equipment variations, and adhering to safety regulations. To meet the challenges of such classrooms, it is necessary to construct modified soccer activities that emphasize the value of contextualized, game-based training that provides opportunities for the acquisition of fundamental soccer skills (e.g., passing, shooting, and dribbling). Transformed activities, based on Newell (1986)’s approaches, modify the traditional characteristics of soccer to a simpler form (e.g., changing the game rules, equipment, or the number of players), emphasizing the intention of teachers’ design in PE lessons.

These modified activities help students understand the practical applications of these skills and how they contribute to overall physical fitness and coordination. By illustrating the broader benefits of learning soccer skills—such as improved teamwork, strategic thinking, and general motor skills—PE teachers can address the needs of students who may not initially see the value in learning soccer or participating in sports. Furthermore, these activities should be designed to boost active participation by inducing enjoyment, interest, and motivation for a physically active lifestyle. This approach ensures that all students, regardless of their initial interest in soccer or sports in general, can find value in the physical activities provided. By highlighting the diverse ways in which physical activity can be enjoyable and beneficial, PE teachers can help students develop a lasting appreciation for maintaining an active lifestyle, which is crucial for their overall health and well-being (Teixeira et al., 2012; Varol, 2018). In summation, to successfully teach soccer lessons, PE teachers may use diverse modification strategies to maximize educational learning outcomes for elementary school students.

Practical approaches

This section presents pedagogical practices that introduce effective and varied options for creating learning environments and producing meaningful experiences by developing students’ capacity for cognitive game comprehension and engagement in tasks. As students develop an understanding of tactical problems and appropriate solutions, teachers can increase the complexity of the game using modified teaching strategies;

working with levels of complexity affords a way of teaching soccer games in a developmentally appropriate manner. Specifically, this section includes useful examples of modified soccer games that build students' skills and enable them to gain tactical knowledge at various motor development levels.

Activity 1: Four-zones ball gathering game. This activity divides a field into four zones: north, south, east, and west. The goal of this modified soccer activity is for students to learn and practice soccer dribbling skills while being fully engaged. Students are divided into four teams of students and are assigned to one of the four zones. The teams try to collect as many balls as possible from each zone and return them by dribbling quickly and accurately to their own zone within the given time (usually five minutes). Students must stay constantly moving for the entire duration of the activity and cannot stay in one specific area, including their own team's zone.

This activity addresses the psychomotor domain by offering moderate-to-vigorous physical activity as students move continuously with the ball, changing speed and direction. It also helps improve cardiovascular fitness. In addition to learning ball-handling skills and physical fitness, students are required to make judgments about which zones to target, the best paths to dribble back to their own zones, and how to navigate around other players—engaging the cognitive domain. Furthermore, the activity requires students to practice mutual communication skills, such as coordinating with teammates to strategize the collection and return of balls, which improves team cooperation and benefits the affective domain.

PE teachers can present this modified game activity in various ways while considering students' developmental and ability levels. For example, teachers can modify task and environment constraints by using cones and hula hoops to separate areas, increase the number of zones, or change the distance between zones. These modifications provide options for adjusting the level of difficulty and physical intensity. Additionally, teachers can use different sizes of soccer balls to challenge students' dribbling skills, which adds variety and accommodates differentiated instruction. By dribbling different sized balls, students can improve their adaptability and control, essential skills in soccer. By clearly highlighting the broader benefits of physical activity, teamwork, and strategic thinking in Four-Zones Ball Gathering Game, PE teachers can help motivate students who may not initially see the value in soccer or sports in general.

Activity 2: Small-field soccer with four goalposts. This modified activity uses smaller field dimensions to support students with lower motor skills, increasing their chances of active participation and enhancing their opportunities to learn and practice soccer skills they might struggle with on a regular-sized field (Sarmiento et al., 2018). The field is divided into a smaller playing area with goalposts placed in four locations—north, south, east, and west—using various equipment such as hurdles or cones (Figure 2).



Figure 2. Activity 2: Small-field soccer with four goalposts

Two goalposts are designated for each team to defend, and two are for them to attack. Each team's objective is to score the most goals during a given time to win. The rules of the game, such as no offside, no corner kicks, no penalties, and/or prohibition of the goalkeeper's hand use, along with the number of team members, location of the goalposts, and field size, are tactically adjustable based on lesson objectives and students' skill levels. For instance, using hurdles as goalposts can help improve students' accuracy in shooting, as the smaller target requires more precise aim. Planning lessons around this setup can also enhance quick decision-making skills in a dynamic, confined space. If this activity is performed indoors (gym), substituting a foam dice for a soccer ball can increase students' motivation by adding a fun element and maintaining safety (Figure 3).



Figure 3. Small-field soccer in an indoor gym using a foam-dice

This activity addresses the psychomotor domain by requiring students to dynamically transition between defense and offense, continuously moving with the ball. It also engages the affective learning domain by developing social and communication skills through passing and teamwork. Additionally, adapting this activity using Newell's modified strategies can create positive learning experiences, promoting long-term physically active lifestyles (Ní Chróinín et al., 2018; Rink & Hall, 2008; SHAPE America, 2024). By incorporating varied materials and adjusting the game's constraints, PE teachers can ensure that all students, regardless of skill level, remain engaged and motivated, thereby fostering a lifelong interest in physical activity.

Activity 3: Circle pass game. This activity emphasizes students' tactical skills, particularly within the cognitive domain. The goal of this game is to "find and utilize empty space," which is one of the most challenging tactical concepts in soccer (Drost & Todorovich, 2013). Utilizing empty space means recognizing and moving into areas on the field where there are no defenders, allowing players to receive passes more easily and create scoring opportunities. This concept requires a high level of situational awareness and strategic thinking, making it difficult for students to master but ultimately enhancing cognitive learning skills. Teachers can encourage tactical thinking by asking open-ended questions rather than giving direct instructions. For example, teachers might intentionally ask, "Where do you think the best place to move is if you do not have the ball?" or "How can you create more space for your teammates?" The existing literature supports that the quality of questions is critical to learning core concepts and should be an integral part of the planning process (Rink, 2020). Furthermore, communication is a key component of the Circle Pass Game activity, as it helps improve students' learning outcomes. Students without the ball learn how to move effectively to create space and make themselves available for passes. The Circle Pass Game not only enhances their understanding of tactical concepts but also promotes teamwork, cooperation, and communication. The following is an example of an implementation script:

Student A: Teacher, what happens if a ball goes out of the circle?

PE teacher: Good question! If a ball goes out of the circle, the last student who kicked the ball becomes the tagger. Okay, so how can you avoid becoming the tagger?

Student B: We can dribble a ball and pass it to our classmates.

PE teacher: Remember, if you do not want to be the tagger, you can only touch the ball five times including passing and receiving. And how can you navigate getting a ball from your friends?

Student C: Well, if you don't have a ball, you should find an empty place where you will be able to receive a pass.

Student B: Students with a ball should be constantly interested in the movements of their friends who move into empty spaces.

PE teacher: That is right. The strategy of using empty space is great. Therefore, this game is important because the movements of students without a ball are crucial. This is one of the most important strategies in an authentic soccer game.

PE teachers should not assume that students' acquisition of basic soccer skills during practice will automatically transfer to an actual soccer game. They should help students who lack athletic ability to participate and make special efforts to ensure these students do not feel alienated or incompetent (Williams & Hodges, 2005). Activities should be structured to be enjoyable and to meet diverse motor skill abilities, rather than simply becoming a "ball-chasing" game (Teixeira et al., 2012). As seen in the above situations, PE curricula that incorporate diverse modified strategies can aid the development of students' cognitive abilities and enhance their game knowledge, including the importance of psychomotor skills, such as proper movement with or without the ball (Gonçalves et al., 2017; Lopes et al., 2017). Affectively, this practice illustrates how collaborative contexts can increase student engagement in deliberate discourse with teachers and peers to discuss and evaluate their performance, comprehension, and future learning paths. Further, through problem-solving, encouraging dialogue, and scaffolding the discovery of contents and movement patterns, emphasis is placed on shared learning goals, which moves teachers out of the role of "experts" and into the role of collaborative learners with students. PE teachers should strive for significant educational outcomes, including helping students comprehend the nature and structure of soccer games through questioning and feedback. Additionally, they should offer various modified games strategically designed to teach certain skills and knowledge to students of all ability and experience levels to support present enjoyment and lifelong physical activity (Rink & Hall, 2008).

Sample five-unit soccer lesson

PE teachers need to set up soccer programs that maximize student learning outcomes by using various modified pedagogical strategies. This section describes a sample lesson which focuses on students' motor skills, movement manner, and comprehension of strategic knowledge required in a regular soccer game. The following lessons have determined that the core content of soccer is the passing skill—a key competency in playing soccer (Table 2). Passing requires a comprehensive understanding of various skills and tactical knowledge, such as accurate pass skill performance, pass timing understanding, and ability to judge situations for offense and defense (Wein, 2007; Williams & Hodges, 2005). In other words, passing is a sophisticated perceptual-motor skill that entails identifying who to pass the ball to and then kicking the ball towards that person or target (Oppici et al., 2017). Perception, decision-making, and passing are inextricably linked and originate from a player's interaction with their environment—a successful pass requires perceiving contextual factors (e.g., distance, angles, force, and other players movements) and organizing a functional kicking technique to effectively kick the ball to the targeted

player. Hence, students need to understand activity outcomes (e.g., understanding game strategy, or effective use of practiced skills in live play) to learn the strategies of invasion games (i.e., stochastic interactions between teammates and opponents, resulting from a large pitch, the specific rules of the game, and the varied player positions; Sarmiento et al., 2018), and to acquire skills necessary for the performance of soccer movements.

Furthermore, a student who has a low level of tactical understanding is at risk of being alienated from participating in the game. If students are repeatedly engaging in inefficient movements, such as only concentrating on and chasing after the ball, they tend to lose motivation and interest. To solve these problems and maximize educational effects, PE teachers need to organize programs to revise soccer rules; for example, abolishing off-side rules or changing the size of the field. They can also use balance beams, hurdles, and handball goalposts instead of regular soccer goalposts to adjust challenges to different student ability levels, which can help maintain student interest and engagement.

Table 2. Content analysis of passing skills

Objectives	Offensive skills	Defensive skills
Deliver and keep possession of a ball	Move around the person with the ball; pass accurately for short distance	Block pass path
Advance into opponent space	Move to empty space; 2 to 1 pass	Block space (perform prediction and movement)
Score/goal	Move to empty space around the goal-line area, Pass to a player moving toward empty space (through-pass)	Defense around goal line area, Remove a ball from a dangerous zone

There are three modified strategies for soccer lessons that focus on learning passing skills (Table 3). The first strategy is an *attack reinforcement* rule that emphasizes offensive play. In soccer, where mainly the foot is used, it is difficult for a striker with a ball to move more freely than a defender. For this reason, PE teachers should opt for modified rules that focus more on offensive play. Some examples are passive-defense rules, which limit the skill of the defender (e.g., no taking over a ball, no blocking a pass, and no physical contact), rules that increase the number of strikers (e.g., five strikers versus two defenders), and rules for expanding the goal-line area. By applying these modified rules, PE teachers can help students become more interested and motivated to actively participate in moderate-to-vigorous physical activity.

The second modified strategy includes skills restriction rules, through which PE teachers can provide opportunities for students to strengthen their ball-passing skills. Specifically, teachers can limit meaningless passing situations in which students behave repetitiously by purposely designing a ball-passing rule that encourages students to pass under their waist (e.g., no long-distance pass where the ball flies over the waist). Through implementing this strategy, teachers can provide students with opportunities to improve the accuracy of pass skills in game-like situations.

In the third modified strategy, there are *space restriction* rules. To increase students' understanding of the importance of space utilization, at the beginning of the class, the teacher can create limiting rules so that students can play only in narrowed or restricted spaces (relative to a standard soccer field). Invasion games (e.g., basketball) require players to find and utilize empty space; students who are beginners and required to play in a big field may have difficulty understanding how to use space efficiently. PE teachers, therefore, should encourage strategies of efficiently using space by limiting students' movement to one of the three spaces (i.e., defense, middle, or offense) so that students will move around intentionally and learn to move effectively in the relevant space. This is similar to Net Ball or Lacrosse.

Table 3. Examples of modified soccer game rules: Passing skill

Modification rule	Objective	Modification activities
Attack reinforcement	Emphasis on attack, offense-reinforcement, and defense limiting	A limited number of defenders for each of the three spaces, and adjusted goalpost size (e.g., hurdles, handball, and mini goalposts) Passive defense (e.g., no blocking pass path and no body contact)
Skills restriction	Emphasis on pass accuracy	No dribbling and no passing under the waist
Space restriction	Emphasis on understanding empty space	Modifying the field size from a small one to a gradually larger one Three-space field division (e.g., defense–middle–offense) or two-space field division (e.g., defense–offense)

In light of the recommendation that soccer instruction should prioritize not just psychomotor development, but also cognitive and affective facets, a more comprehensive teaching approach is essential. This broader focus is particularly crucial, as these cognitive and affective capacities can significantly boost player performance in several critical areas. They can enhance players' abilities to anticipate opponents' actions, make effective decisions under pressure, modulate changes in movement speed and direction, and perform advanced spatial-temporal coordination tasks specific to soccer, such as passing and shooting.

To translate these insights into practical teaching methods, this paper presents a sample five-unit lesson in Table 4. This table delineates five comprehensive soccer units, each offering specific guidelines and tactics for PE teachers. By following these methods, educators can maximize multiple learning objectives. These objectives include acquiring diverse soccer skills, enhancing understanding and application of game strategies, and improving tactical knowledge, such as the ability to effectively utilize open spaces through teamwork.

Table 4. Sample five-unit soccer lesson plan: Passing skill

Unit	Objective	Learning activities
1	Pass to maintain possession of the ball	Circle pass game (four versus one or five versus two), passive defense, no dribbling
2	Pass for attacker for score	Modifying field size, space field division (three fields), utilize goalpost size alteration, goalpost size alteration, no defense pressure, no dribbling, pass under the waist
3	Pass for score	Limit field space (dividing only two fields as offense and defense), pass under the waist, passive defense
4	Using pass skill for offense and defense	Six-versus-six game (modifying field size)
5	Using pass skill for offense and defense	Eight-versus-eight game (expand the field size or no limitations on moving space)

Implications for education

As alluded to previously, Newell (1984)'s theory of constraints guides learning within a dynamic interaction system that encourages learners to constantly modify their performances to the constraints of specific tasks/activities, the environment, and the characteristics of other players. To teach open-skills team sports, a range of approaches must be employed because of the many hurdles faced throughout learning and teaching processes. Soccer is a game that is constantly altered by the movements of its players and frequently modifies its own constraints, thus increasing the challenge for a player to be successful based on the result of previous encounters. Therefore, when teaching soccer and other sports in PE classes, it is necessary to utilize modified methodology for effective pedagogy. This corroborates prior evidence demonstrating the beneficial effects of modified soccer on skill development. Specifically, PE teachers regard modified soccer as a helpful way to develop different student learning outcomes (e.g., technical capabilities, tactical awareness, communication and task reception). This study aims to create useful resources to provide teachers the opportunity to maximize these outcomes. This paper proposes that two practical implications be considered in the teaching of soccer in PE lessons:

First, a PE teacher should be required to modify a task's rules in order to attain the targeted learning goals. For example, students who are more often in possession of the ball (i.e., touch the ball with their foot) are typically more successful, since effective movements help the development and consolidation of motor skills. To accomplish this, adjusted restrictions that make the task of the defenders more difficult (e.g., passive defense, restricted defensive zone area) might be used to enhance the passing success rate. Also, meaningless dribbling should be avoided, and, in any case, its implementation should be restricted with a maximum number of dribbles determined by the task's objectives. In addition, a PE teacher should understand that altering equipment, which is a task constraint, has an effect on how perception, cognition, and skills develop. If established performance intersects with the new task restrictions, the skill gained with a specific piece of equipment (e.g., small sized goalpost) may positively transfer (e.g., accuracy of shooting). In order to practice in such a way that maximizes learning outcomes, learners need to frequently react to contextual situations and to explore the diversity of their performance responses. Essentially, these enabling constraints allow learners to construct abilities that lead to more in-depth comprehension of the game rules and more sophisticated play later in the game.

Second, a PE teacher should consider including multiple training phases (micro or macro-cycle stations) in their curriculum. This entails methodically adjusting one or more training components in a progressive manner (i.e., intensity of tasks, developmental level of instruction). Specifically, a PE teacher may organize a task/activity session or a sequence of sessions in one of the following ways: 1) by considering the different students' levels of proficiency on the various tasks to be given (e.g., two vs. one setting, ability to pass the ball with defenders around); 2) by identifying the limits that are significant in different contexts and that must be considered during practices (e.g., number of balls, number of moments of contact with the ball); and 3) by taking advantage of

presenting appropriate functional feedback and important cues linked to the aim and key aspects of task dynamics (Rink, 2020). Ultimately, these pedagogical approaches allow learners to develop their essential skills and understand critical strategies effectively, which helps the student adapt from training to soccer games successfully.

The aforementioned theory-based recommendations for sports pedagogy provide a significant theoretical foundation for understanding game modification approaches in this respect. Thus, this article recommends that modified methods be used in soccer units to promote and maintain children's sport participation. Although this paper indicates that the endorsement of modified activities might help encourage and maintain engagement in soccer, further research should be conducted to determine ways for developing best practices models.

Conclusion

Effectively educating students on the complexities of soccer requires modifying the PE curriculum in elementary schools. Drawing from Newell's theory of constraints (1984, 1986), this paper offers pedagogical practices, effective modification activities, and game-like progression for maximizing student learning when instructing soccer. Such practices provide useful modification strategies for developing tactical skills and cognitive knowledge for students with various backgrounds and motor development levels. The modification activities presented here describe typical constraints and offer different options for implementing a situational approach, specifically by using smaller teams and smaller field dimensions to increase the number of opportunities and promote students' learning outcomes (Sarmento et al., 2018). PE educators, through the examples of various modified soccer games that are illustrated in this paper, should try organizing lessons that can maximize educational outcomes by taking into account the different levels of motor development and using appropriate transformation strategies. This pedagogical approach fosters healthy habits for elementary school students, helping them enjoy sports and participate in physical activity throughout their lifetime.

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