



Learning to teach physical education through student-centered approaches: An incursion into physical literacy

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“Se fôssemos um ser definido, seríamos então um ser perfeito, mas limitado, materializado como as pedras. Seríamos uma estátua divina, mas não poderíamos atingir a Divindade. Seríamos uma obra de arte e não vivente criatura, pois a vida é um excesso, um ímpeto para além, uma força imaterial, indefinida, a alma, a imperfeição.”

Teixeira de Pascoaes, in ‘O Pobre Tolo’

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Resumo

O objetivo desta tese foi compreender como professores estagiários (PEs) aprendem a implementar abordagens de ensino centradas no aluno (ACAs) na educação física (EF) e de que forma estas práticas criam condições para o desenvolvimento da literacia física (LF) nos alunos. Particular atenção foi dada ao papel de contextos de formação organizados como comunidades de prática (CdP) e à forma como estes ambientes colaborativos sustentam a aprendizagem profissional dos PEs e os seus processos de decisão pedagógica. Enquadrado num paradigma interpretativo, o estudo adotou um desenho de investigação-ação participativa, integrando métodos qualitativos e quantitativos. Participaram quatro professores estagiários, um professor cooperante e 54 alunos do ensino secundário, acompanhados ao longo de um ano letivo no âmbito de um programa de formação inicial de professores de EF. Os dados foram recolhidos através de observações de aulas, diários reflexivos, entrevistas de grupo focal e observações de jogo. A análise envolveu análise temática e procedimentos estatísticos adequados ao contexto do estudo. Os resultados indicam que a aprendizagem profissional dos PEs se desenvolveu através da participação em CdPs, nas quais facilitadores mais experientes apoiaram os PEs através de processos de scaffolding que promoveram reflexão colaborativa, experimentação pedagógica e resolução partilhada de problemas. Neste contexto, as ACAs foram progressivamente implementadas nas aulas de EF, criando condições para experiências de aprendizagem significativas. Estas práticas promoveram participação, colaboração, confiança e compreensão do jogo, contribuindo para o desenvolvimento da LF dos alunos. Globalmente, os resultados destacam a importância de programas de formação de professores sensíveis ao contexto, mostrando como as CdPs e os processos de scaffolding pedagógico podem apoiar os PEs na implementação de ACAs que promovam o desenvolvimento da LF na EF escolar.

PALAVRAS-CHAVE: FORMAÇÃO DE PROFESSORES DE EDUCAÇÃO FÍSICA; COMUNIDADES DE PRÁTICA; SCAFFOLDING; ABORDAGENS CENTRADAS NO ALUNO; LITERACIA FÍSICA

Abstract

The aim of this thesis was to understand how preservice teachers (PSTs) learn to implement student-centered approaches (SCAs) within school-based physical education (PE), and how such pedagogical practices create conditions for the pedagogical development of physical literacy (PL) among students. Particular attention was given to the role of teacher education contexts organized as communities of practice (CoPs), and to how these collaborative environments support PSTs' professional learning and pedagogical decision-making. Grounded in an interpretative paradigm, the study adopted a participatory action research design, integrating qualitative and quantitative methods. Four PSTs, one cooperating teacher, and 54 secondary school students participated in the study and were followed over the course of one school year within a physical education teacher education program structured around collaborative pedagogical inquiry. Data were collected through lesson observations, reflective diaries, focus group interviews, and game-play observation. Data analysis involved thematic analysis and statistical procedures appropriate to the study context. The findings indicate that PSTs' professional learning developed through participation in CoPs, where more experienced facilitators supported PSTs through scaffolding processes that enabled collaborative reflection, pedagogical experimentation, and shared problem solving. Within this context, SCAs were progressively enacted in PE lessons, creating conditions for students to engage in meaningful learning experiences. These practices fostered participation, collaboration, confidence, and game understanding, which collectively contributed to the development of PL. Overall, the findings highlight the importance of context-sensitive teacher education programs, showing how CoPs and pedagogical scaffolding can support PSTs in learning to implement SCAs that promote the development of PL in school-based PE.

KEYWORDS: PHYSICAL EDUCATION TEACHER EDUCATION; COMMUNITIES OF PRACTICE; SCAFFOLDING; STUDENT-CENTERED APPROACHES; PHYSICAL LITERACY

List of abbreviations

PE – Physical Education

SCAs – Student-Centred Approaches

SE – Sport Education

GBAs – Game-based Approaches

CL – Cooperative Learning

PETE – Physical Education Teacher Education

CoPs – Communities of Practice

CTs – Cooperating Teachers

USs – University Supervisors

PL – Physical Literacy

Chapter I – Introduction

1.1. Rationale

Over the past decades, physical education (PE) has increasingly been challenged to move beyond narrow performance-oriented conceptions of learning toward pedagogical approaches that support meaningful and inclusive engagement in physical activity (Casey & Kirk, 2020). This shift also reflects broader educational agendas that emphasize the development of competencies for 21st century, such as collaboration, critical thinking, and responsible participation, widely articulated in international frameworks and policy guidelines for education and sustainable development (Cobo, 2013; UNESCO, 2015). Within PE, these priorities have been closely associated with the need to create learning experiences that enable students to find personal meaning and enjoyment in movement, fostering forms of participation in physical activity that individuals value and are motivated to pursue beyond school contexts (Beni et al., 2022; Kretchmar, 2008).

Traditional instructional practices have often emphasized the acquisition of isolated motor skills, physical fitness outcomes, or sport-specific techniques, frequently positioning students as passive recipients of instruction rather than active participants in the learning process (Kirk, 2010). Within such teacher-centered instructional environments, learning tasks and decisions are typically controlled by the teacher, leaving students with limited opportunities to actively interpret game situations, negotiate solutions with peers, or take responsibility for their own learning. While such approaches may contribute to the development of certain skills-based competencies, they have been criticized for offering limited opportunities for students to engage in decision-making, social interaction, and reflective learning within authentic movement contexts (Dyson et al., 2010; Goodyear & Dudley, 2015).

In response to these concerns, contemporary perspectives in sport pedagogy increasingly emphasize the importance of designing learning environments that promote active participation, autonomy, and meaningful engagement in movement experiences (Casey, 2014; Dudley et al., 2022). Within this view, PE is conceptualized not merely as a site for skill acquisition, but as a pedagogical space in which students learn to navigate dynamic physical, cognitive, social, and emotional challenges through participation in varied movement contexts. Consequently, attention has progressively shifted toward pedagogical approaches

that encourage students to engage with tasks, collaborate with peers, make decisions, and reflect on their experiences during participation (Casey & Kirk, 2020; Dyson et al., 2010).

However, creating such learning environments places considerable demands on teachers. Teaching in PE frequently involves navigating complex and dynamic classroom situations in which students' actions, interactions, and emotional responses evolve rapidly and often unpredictably. Teachers are therefore required to design learning tasks, manage social dynamics, and make ongoing pedagogical decisions in response to emerging learning opportunities and challenges (Goodyear & Dudley, 2015). This complexity is particularly evident in game-based and collaborative learning contexts, where students' participation unfolds through continuous interaction with peers, tasks, and environmental constraints, requiring them to find and execute appropriate movement solutions (Harvey et al., 2016; Renshaw et al., 2018).

Within this context, pedagogical approaches that foreground students' active engagement and participation have gained increasing prominence within PE research and practice. Among these approaches, student-centered pedagogies have been widely discussed as promising avenues for promoting meaningful and multidimensional learning in PE settings (Dudley et al., 2022; Hastie & Wallhead, 2016).

Student-centered approaches in PE

In response to increasing recognition of the limitations associated with traditional teacher-centered instruction in PE, student-centered approaches (SCAs) have been widely advocated as pedagogical avenues capable of supporting more meaningful and participatory learning experiences. Within sport pedagogy, several pedagogical models exemplify this orientation, including Sport Education (SE), Game-Based Approaches (GBAs), and Cooperative Learning (CL) (Dyson et al., 2004; ; Pill et al., 2023; Siedentop et al., 2019). Rather than prescribing rigid instructional procedures, these approaches function as pedagogical frameworks that shape the organization of learning environments and the forms of participation available to students. Through carefully designed tasks and social structures, SCAs

encourage students to actively engage in decision-making, collaboration, and problem-solving within authentic movement contexts.

SE, for instance, structures learning around persistent team affiliation, role playing, and formal competition, fostering students' sense of belonging, responsibility, and engagement in authentic sport experiences over extended periods of time (Hastie & Wallhead, 2016; Siedentop et al., 2019). GBAs prioritize learning through modified games and tactical problems, encouraging students to perceive game situations, make decisions, and adapt their actions within dynamic and unpredictable environments (Pill et al., 2023). CL organizes instructional tasks around principles such as positive interdependence, individual accountability, face-to-face interaction, and group processing, promoting shared regulation of learning and ethical participation among students (Dyson et al., 2004).

Across these pedagogical approaches, learning is conceptualized as emerging through students' active engagement with tasks, peers, and contextual constraints. More than exclusively focusing on the physical-motor domain of learning (e.g., technical skills), SCAs create conditions that support the simultaneous development of physical competence, tactical understanding, social interaction, confidence, and motivation. Empirical research has consistently shown that when enacted responsively, these pedagogical approaches can enhance students' engagement, quality of participation, and understanding of game-play, while also contributing to more inclusive and equitable learning environments (Farias et al., 2018; Gil-Arias et al., 2021; Harvey et al., 2016). Supporting this body of evidence, a recent systematic review with meta-analysis identified several SCAs, particularly SE and GBAs, as among the most effective pedagogical avenues for promoting learning across multiple domains associated with holistic development in PE (Dudley et al., 2022).

Despite this growing body of evidence, research has also highlighted that the educational potential of SCAs does not reside solely in their design features, but in the ways these approaches are interpreted and enacted by teachers in practice. Implementing SCAs requires teachers to make ongoing pedagogical decisions, adapt tasks to students' needs, and balance competing demands related to class organization, behavior management, and curricular expectations. Central to this process is the gradual transfer of responsibility to students, whereby learners are encouraged to participate in decision-making, assume greater ownership of their

learning, and progressively develop the capacity to recognize and respond to their own learning needs across different domains of participation. Consequently, the enactment of SCAs places considerable demands on teachers' pedagogical judgement, content knowledge, and capacity to scaffold learning over time (Chang et al., 2020; Iserbyt et al., 2016).

The pedagogical complexity of enacting SCAs in PE

Although SCAs are frequently presented in the literature as promising avenues for promoting meaningful and multidimensional learning in PE, their enactment in everyday school contexts has been widely described as complex and contingent. Research in sport pedagogy has consistently emphasized that pedagogical models such as SE, GBAs, and CL do not function as self-contained or self-executing interventions (e.g., the mere implementation of structural features such as persistent team affiliation, modified games, or role-playing may not automatically generate the intended learning outcomes). Rather, their educational potential depends largely on how teachers interpret, adapt, and negotiate pedagogical principles in relation to specific learners, content demands, and contextual constraints (Casey & Kirk, 2020; Goodyear & Dudley, 2015).

From this perspective, teaching through SCAs can be understood as an ongoing process of pedagogical decision-making rather than the implementation of predefined instructional scripts. Teachers are required to design and adapt learning tasks, manage social dynamics, and respond to emergent issues related to student engagement, skill disparities, and classroom organization. These demands are particularly visible in dynamic learning environments such as games-based PE lessons, where students' actions, interactions, and emotional responses evolve rapidly and often in unanticipated ways (Harvey et al., 2016; Renshaw et al., 2018).

When teachers encounter difficulties in navigating these complexities, research suggests that pedagogical drift toward more directive, teacher-centered practices may occur, particularly under conditions of time pressure, behavioral challenges, or institutional accountability (Goodyear & Dudley, 2015; Silva et al., 2021). Such shifts do not necessarily reflect resistance to SCAs; rather, they often signal the challenges teachers face in sustaining approaches that demand high levels of pedagogical judgement, adaptability, and tolerance for uncertainty. Consequently,

the enactment of SCAs has been characterized as a non-linear process, marked by moments of progression, regression, and reconfiguration over time (Beni et al., 2022; Casey, 2014).

Within this body of literature, there is growing recognition that understanding the pedagogical value of SCAs requires attention not only to their intended design features, but also to the situated processes through which they are enacted in practice. This includes examining how teachers learn to navigate the complexities of school life, how pedagogical intentions are negotiated in situ, and how instructional decisions are shaped by contextual and relational factors (MacPhail et al., 2013; MacPhail & Tannehill, 2012).

Such considerations become particularly salient within physical education teacher education (PETE) contexts, where preservice teachers (PSTs) are simultaneously learning to teach and to manage the practical demands of professional practice. For PSTs, engaging with pedagogically complex approaches such as SCAs may involve navigating unfamiliar instructional situations, making pedagogical decisions under conditions of uncertainty, and negotiating classroom dynamics while still developing their professional knowledge and confidence. Consequently, understanding how PSTs learn to enact SCAs requires attention to the professional learning environments in which they are embedded.

PSTs' professional learning in PETE: communities of practice and pedagogical scaffolding

Within PETE, increasing attention has been given to understanding teacher learning as a situated, social, and developmental process rather than as the acquisition of discrete pedagogical skills (MacPhail, 2011). From sociocultural perspectives, learning to teach is understood as participation in professional practices where knowledge, beliefs, and pedagogical understandings are shaped through interaction with more experienced members of the teaching community (Lave & Wenger, 1991; Wenger, 1998). In this sense, teacher learning is not limited to the transmission of instructional techniques, but involves a gradual process of becoming a participant in the everyday practices of the profession.

Within this perspective, communities of practice (CoPs) provide a useful conceptual lens for examining how PSTs' professional learning unfolds within school-based environments. CoPs are commonly described as social configurations in which learning occurs through sustained participation in shared practices, mutual engagement, and the negotiation of meaning around common concerns (Wenger, 1998). In teacher education contexts, such communities may include PSTs, cooperating teachers (CTs), university supervisors (USs), and other members of the school community who collectively participate in the processes through which teaching practices are enacted and refined (MacPhail et al., 2013).

Participation in these professional communities can create opportunities for PSTs to observe, experiment with, and reflect upon pedagogical practices while gradually assuming greater responsibility for teaching. Through interaction with more experienced practitioners, PSTs may gain access to pedagogical knowledge that is often tacit, context-specific, and difficult to acquire through formal coursework alone. Consequently, learning to teach becomes closely intertwined with the relational and organizational conditions that shape participation within school settings.

Within PETE contexts, growing attention has also been given to the role of pedagogical scaffolding as a key mechanism supporting PSTs' engagement with the complexities of teaching practice. Scaffolding refers to the contingent and adaptive support provided by more experienced others, such as CTs or USs, enabling novice teachers to engage in instructional practices that initially exceed their independent capabilities (van de Pol et al., 2010; Wood et al., 1976). Moving beyond a fixed prescription of procedures, pedagogical scaffolding evolves in response to PSTs' developing understanding, confidence, and professional judgement. In this sense, scaffolding may also involve problem-solving oriented forms of pedagogical mediation in which PSTs are progressively supported to analyze teaching situations, discuss possible instructional responses, and gradually assume greater autonomy in their pedagogical decision-making.

Empirical research suggests that pedagogical scaffolding practices, including collaborative lesson planning, co-teaching, and guided reflection, can support PSTs' attempts to enact SCAs in school settings (Goodyear & Dudley, 2015; Silva et al., 2021). However, the effectiveness of such support is highly context-dependent and

shaped by factors such as relational trust, institutional cultures, and the degree of alignment between university-based and school-based pedagogical expectations (Zeichner, 2010).

Overall, this body of literature suggests that PSTs' capacity to engage with pedagogically complex approaches such as SCAs cannot be understood independently of the professional learning environments in which they are embedded. Participation in CoPs and the provision of pedagogical scaffolding appear to play a central role in supporting PSTs as they learn to navigate instructional complexity and progressively assume responsibility for student-centered teaching practices in school contexts.

Student learning in student-centered PE environments

A growing body of research in sport pedagogy has sought to examine how students experience learning within student-centered pedagogical environments. Studies investigating the implementation of pedagogical models such as SE, GBAs, and CL have consistently reported that these approaches can promote forms of engagement and participation that extend beyond the development of isolated technical skills (Farias et al., 2018; Gil-Arias et al., 2017; Harvey et al., 2016).

Within these pedagogical environments, learning often emerges through students' active involvement in tasks that require decision-making, collaboration, and adaptation to dynamic game situations. Rather than simply reproducing predetermined motor actions, students are encouraged to interpret game situations, coordinate actions with peers, and regulate their participation in response to evolving task and social demands. Such learning conditions create opportunities for students to develop tactical awareness, social interaction skills, confidence, and a deeper understanding of game-play while actively participating in meaningful movement experiences.

Qualitative research has further highlighted that students participating in SCA-informed learning environments frequently report increased perceptions of autonomy, belonging, and responsibility during PE lessons (Farias et al., 2020). These experiences appear to be closely linked to the pedagogical structures embedded within these approaches, such as shared decision-making, role

responsibilities, collaborative problem-solving, and authentic game contexts. Through these pedagogical arrangements, students are positioned as active contributors to the learning process rather than passive recipients of instruction.

Despite these insights, the relationship between pedagogical processes and student learning remains only partially understood. Much of the existing literature has tended to focus on particular dimensions of learning in isolation, such as students' perceptions, engagement levels, or selected performance indicators (Mesquita et al., 2012; Pritchard et al., 2008). As a result, there remains limited understanding of how learning processes unfolding within PE lessons are reflected across students' participation, interaction, and performance in authentic movement contexts over time.

Addressing this challenge requires research approaches capable of examining how pedagogical conditions shape students' opportunities to participate, interact, and express learning in context. In particular, pedagogical environments informed by SCAs appear to create conditions in which multiple dimensions of learning can emerge simultaneously through students' situated engagement in movement activities. Within this perspective, observable forms of student participation in games and collaborative learning situations (e.g., decision-making, coordinated interaction with peers, adaptation to task demands) may provide ecologically grounded indications of learning processes occurring within PE lessons. These situated expressions of learning offer valuable insight into how students engage with and make sense of movement experiences over time.

Physical Literacy as an interpretative lens for understanding student learning in PE

Within contemporary debates in PE, the concept of physical literacy (PL) has increasingly been proposed as a holistic educational orientation capable of capturing the multidimensional nature of learning in movement contexts. Drawing on philosophical foundations rooted in monism, phenomenology, and existentialism, Whitehead (2010) conceptualized PL as the motivation, confidence, physical competence, knowledge, and understanding that enable individuals to value and take responsibility for engagement in physical activity throughout the lifespan. Within

this perspective, movement is understood not merely as a mechanical or instrumental activity, but as a meaningful way through which individuals interact with and make sense of the world.

Central to this conceptualization is the idea that PL represents a dynamic and evolving disposition rather than a fixed set of competencies or an end-state to be achieved. The attributes commonly associated with PL – such as motivation, confidence, competence, and knowledge – are understood as interdependent and mutually reinforcing, developing through individuals' participation in diverse movement experiences across time (Cairney et al., 2019; Whitehead, 2010). Consequently, PL is increasingly described as an emergent capability shaped by the quality of the learning environments and experiences through which individuals engage in physical activity.

Despite growing scholarly and policy interest in PL, its operationalization within educational research remains a matter of ongoing debate. Many attempts to assess PL have relied on composite assessment frameworks combining questionnaires, fitness tests, and motor competence batteries (Barnett et al., 2023; Cairney et al., 2019; Longmuir et al., 2015). While such approaches have contributed to advancing understanding of selected attributes associated with PL, they have also been critiqued for their limited sensitivity to pedagogical context and for the risk of abstracting learning from the instructional processes through which it is produced (Edwards et al., 2017).

From a pedagogical perspective, recent scholarship has therefore emphasized the importance of examining how learning processes unfolding within PE lessons may resonate with dimensions commonly associated with PL, rather than attempting to measure the construct as a unified outcome (Dudley et al., 2022). In this sense, PL can be approached as a conceptual lens through which the multidimensional nature of students' learning experiences in PE can be interpreted.

Within student-centered pedagogical environments, several observable forms of participation and engagement appear to align with attributes commonly associated with PL. Behaviors such as decision-making in game situations, coordinated interaction with peers, confidence in participation, and sustained engagement in learning tasks may reflect integrated expressions of physical, cognitive, social, and psychological processes emerging through participation in

movement contexts. Although such indicators do not represent direct measurements of PL as a holistic construct, they provide ecologically grounded insights into how students engage with and develop meaningful relationships with movement activities over time.

Accordingly, the present thesis does not seek to measure PL as a predefined or decontextualized outcome. Instead, it adopts a process-oriented perspective that examines how pedagogical conditions created through SCAs may support the emergence of learning experiences aligned with selected dimensions commonly associated with PL. In particular, attention is given to forms of student participation, interaction, confidence, and game understanding that can be observed and interpreted within authentic learning contexts in school-based PE. From this standpoint, examining how these dimensions unfold within pedagogical environments shaped by SCAs may contribute to a deeper understanding of how holistic learning processes associated with PL can emerge in practice.

1.2. Research problems and aims

The review of the literature presented in the previous section highlights a persistent tension between the growing prominence of PL as a holistic educational orientation for PE and the challenges associated with its pedagogical enactment in everyday school contexts. While SCAs have been widely discussed as pedagogical avenues aligned with multidimensional and process-oriented conceptions of learning, considerably less is known about how such approaches are enacted over time in authentic PE lessons, particularly when implemented by PSTs. Moreover, existing research has often focused either on pedagogical models or on selected learning outcomes in isolation, offering limited insight into how professional learning processes, pedagogical enactment, and students' learning experiences intersect within real-world teaching contexts.

Within PETE, these issues are further complicated by the fact that PSTs are frequently required to engage with complex and demanding pedagogical approaches while still developing their professional knowledge, judgement, and identity. Research suggests that the successful enactment of SCAs may depend not only on curricular intentions, but also on the forms of pedagogical mediation,

support, and professional learning opportunities available to PSTs during their school placement. However, there remains limited empirical evidence examining how such support is organized, how PSTs engage with it, and how it shapes their capacity to sustain SCAs in practice.

At the same time, important questions remain regarding how students experience learning within SCA-informed PE lessons and how their learning may be expressed over time. While qualitative studies have provided valuable insights into students' perceptions and experiences, and quantitative research has examined changes in selected performance indicators, relatively few investigations have sought to examine these dimensions in relation to one another within longitudinal, process-oriented designs situated in authentic PE contexts. As a result, there is still limited understanding of how pedagogical processes enacted by PSTs may be reflected in students' learning experiences and observable expressions of learning within school-based PE.

These considerations point to the need for research that examines learning in PE as a pedagogical and professional learning process unfolding over time, rather than as a predefined set of outcomes. In particular, there is a need to better understand how PSTs learn to enact SCAs, how participation in professional learning environments such as CoPs and processes of pedagogical scaffolding shape this process, and how students' learning experiences and participation evolve within these pedagogical conditions.

Accordingly, the overarching aim of this research is to examine how PSTs learn to enact SCAs within school-based PE, and how these pedagogical practices create conditions through which dimensions associated with PL may emerge in students' learning experiences. Rather than attempting to measure PL as a unified outcome, the study adopts a process-oriented perspective that examines how professional learning, pedagogical enactment, and student participation intersect within authentic PETE and school contexts.

To address this overarching aim, the research is guided by the following specific objectives:

1. To explore how pedagogical mediation and professional learning processes, such as participation in CoPs and pedagogical scaffolding, shape PSTs' capacity to engage with and sustain SCAs during their school placement;

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2. To examine how PSTs engage with and enact SCAs in school-based PE, with particular attention to the pedagogical decisions, adaptations, and challenges encountered in their everyday teaching practices;
 3. To examine students' experiences of learning in reference to PL domains (physical; cognitive; social; psychological) within student-centered PE lessons taught by PSTs, focusing on how learners perceive, interpret, and make sense of their participation within these pedagogical conditions;
 4. To examine changes in selected observable indicators of students' game-play performance across instructional units implemented through SCAs, particularly in relation to physical and cognitive dimensions of learning (e.g., skill efficacy, decision-making).

1.3. Thesis structure

This dissertation follows the writing and formatting conventions of the Faculty of Sport, University of Porto (FADEUP), and adopts a Scandinavian-style thesis structure organized around a coherent body of peer-reviewed academic articles. This model is widely recognized within sport pedagogy and education research for its capacity to support cumulative knowledge development, promote the early dissemination of doctoral research, and foreground the integration of theoretical and empirical inquiry. The choice of this structure reflects both institutional guidelines and the nature of the present research, which was conducted as a program of interrelated studies rather than as a single standalone investigation.

The dissertation is organized into four main chapters and includes six academic articles – two theoretical and four empirical – each addressing a specific aspect of the overarching research aim while contributing to a coherent line of inquiry.

Chapter I functions as the introductory and integrative chapter of the dissertation. It establishes the conceptual and theoretical foundations of the study, situates the research within contemporary debates on student-centered pedagogies, teacher education, and PL in PE, and articulates the research problems and aims guiding the investigation. This chapter also provides an overview of the dissertation's structure and clarifies how the individual articles collectively contribute to the overarching research agenda.

Chapter II comprises the theoretical component of the dissertation and includes two complementary articles that together construct the conceptual framework underpinning the empirical studies. The first article is a narrative review that synthesizes research on pedagogical processes shaping PL development, with particular attention to the role of teacher education, pedagogical mediation, and learning environments. The second article is a theoretical essay that conceptualizes PL as a holistic, pedagogically situated, and process-oriented educational construct, and examines its alignment with SCAs in PE. Together, these articles establish the philosophical, conceptual, and pedagogical foundations that inform the empirical investigation.

Chapter III presents the empirical component of the dissertation and is organized around four interrelated studies conducted within a PETE context. The first empirical article examines the role of CTs and school-based professional communities in supporting PSTs' immersion within the educational community, focusing on how contextual and relational conditions shape professional learning. The second empirical article explores pedagogical scaffolding processes during school placement, analyzing how different forms of mediation supported PSTs' enactment of SCAs in practice. The third empirical article adopts a qualitative approach to examine students' learning experiences and perceived outcomes within student-centered PE lessons taught by PSTs, highlighting the multidimensional and non-linear nature of learning processes associated with PL. Finally, the fourth empirical article employs a quantitative design to examine changes in students' game-play performance across successive instructional cycles implemented through SCAs. Drawing on systematic observation in authentic game contexts, the study provides complementary evidence on how learning processes unfold over time, while also exploring potential gender-related patterns in these developments.

Chapter IV provides the final discussion and synthesis of the dissertation. This chapter integrates the theoretical perspectives and empirical findings presented across the preceding chapters, discussing their collective contribution to understanding PL development as a pedagogical and professional learning process. It outlines the theoretical and practical implications of the research for PE pedagogy and teacher education, acknowledges the study's limitations, and proposes directions for future research.

For clarity and coherence, references are provided at the end of each chapter, and the full bibliographic details of each article are included in their respective sections in accordance with the citation guidelines of the journals to which they were submitted or published. A summary table outlining the overall structure of the dissertation and the positioning of each article is provided to guide the reader through the organization of the thesis. Table 1 presents an overview of the complete structure of the dissertation.

Table 1. Overview of the structure, content, and studies included in this dissertation.

Chapter I	Introduction
	This chapter introduces the dissertation by presenting the rationale and relevance of the study, outlining the research problems and objectives, and providing an overview of the overall structure of the thesis.
Chapter II	Theoretical Articles
Narrative Review	Teixeira, J., Mesquita, I., & Farias, C. <i>Pedagogical processes shaping physical literacy in physical education: A narrative review</i> Under review in Journal of Physical Education and Sport
Theoretical Essay	Teixeira, J., Farias, C., & Mesquita, I. <i>Physical literacy within physical education: A holistic and student-centred approach</i> https://doi.org/10.5628/rpcd.25.02.91 Published in Revista Portuguesa de Ciências do Desporto
Chapter III	Empirical Articles
Empirical Study 1	Teixeira, J., Mesquita, I., & Farias, C. <i>Cooperating teachers as facilitators of preservice teachers' immersion in the educational community: A physical education teacher education case study</i> https://doi.org/10.1177/1356336X251399869 Published in European Physical Education Review
Empirical Study 2	Teixeira, J., Mesquita, I., & Farias, C. <i>Scaffolding preservice teachers' use of models-based practice in physical education: A participatory action research</i> https://doi.org/10.1123/jtpe.2025-0125 Published in Journal of Teaching in Physical Education
Empirical Study 3	Teixeira, J., Mesquita, I., & Farias, C. <i>Enacting student-centered approaches for physical literacy development: A participatory action research study with preservice teachers</i> Under Review in Quest

Empirical Study 4	Teixeira, J., Mesquita, I., Pereira, C., & Farias, C. <i>Students' game-play performance as an expression of physical literacy: A yearlong study in student-centered physical education</i> Under Review in Cultura, Ciencia y Deporte
Chapter IV	Final Considerations
	This chapter provides a synoptic discussion of findings from the theoretical and empirical articles and outlines the main contributions, implications, and directions for future research.

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Chapter II – Theoretical Articles

Narrative Review

Pedagogical processes shaping physical literacy in physical education: A narrative review

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Abstract

Physical literacy (PL) has gained increasing prominence as an educational reference for physical education (PE), offering a holistic perspective that integrates physical, cognitive, social, and psychological dimensions of learning. Despite its widespread adoption in policy and research, the enactment of PL in educational practice remains inconsistent and is often constrained by reductive or outcome-oriented interpretations that limit its translation into meaningful pedagogical practice. This narrative review examines PL as an educational horizon shaped by pedagogical processes rather than as a fixed outcome or predefined construct. Drawing on literature from teacher education and PE pedagogy, the review synthesizes research on situated learning, pedagogical mediation, and student-centered pedagogical models. The analysis highlights how learning in PE emerges through socially situated experiences, mediated by teachers' pedagogical decision-making and sustained within rich and inclusive learning environments. Student-centered pedagogical models are discussed as learning architectures that can support holistic development when enacted flexibly and responsively. Overall, the review reframes PL as the cumulative result of coherent pedagogical processes, emphasizing the importance of teacher education, particularly the preparation of preservice teachers, in developing the pedagogical capacity to mediate learning and enact rich, inclusive, and meaningful PE experiences.

Keywords: physical education; physical literacy; pedagogy; student-centered learning; pedagogical models

Introduction

Over the past two decades, physical education (PE) has faced persistent questions regarding its educational coherence and relevance, particularly when learning is reduced to short-term performance, fitness, or easily measurable outcomes (Hardman & Green, 2011; Kirk, 2009). Contemporary curricular agendas increasingly call for PE to support more comprehensive forms of student development – physical competence, cognitive understanding, social

connectedness, and psychological growth – through meaningful, inclusive, and developmentally coherent learning experiences (Ennis, 2011; UNESCO, 2015).

Within this landscape, physical literacy (PL) has gained prominence as an educational horizon¹ for PE, grounded in holistic perspectives that integrate physical, cognitive, social, and psychological dimensions of learning (Cairney et al., 2019; Whitehead, 2010). Conceptually, PL has been defined as the motivation, confidence, physical competence, knowledge, and understanding that enable individuals to value and take responsibility for engagement in physical activities throughout the life course (Whitehead, 2010). Complementary frameworks and policy-oriented definitions further emphasize PL as a lifelong, inclusive, and context-sensitive learning process, highlighting not only movement proficiency but also learners' dispositions, agency, and capacity to engage meaningfully with diverse physical activity contexts (Sport Australia, 2019).

Yet, despite its widespread visibility in policy and research, the enactment of PL in schools practice remains uneven and conceptually fragile, frequently characterized by inconsistent interpretations and a narrow emphasis on selected learning outcomes (Longmuir et al., 2015; Sport Australia, 2019). Reviews consistently report a predominant and narrow focus on physical or motor-oriented outcomes, while the social, psychological, and cognitive dimensions central to PL remain comparatively underexplored (Carl et al., 2022; Dudley et al., 2022). More importantly, PL does not emerge automatically from participation in PE lessons or from curricular frameworks that rhetorically endorse physical literacy while failing to specify pedagogical architectures and leaving mainstream teaching practices largely misaligned with its pedagogical requirements. Instead, PL is shaped by the quality of learning experiences, teachers' pedagogical mediation, and the social and institutional conditions that frame teaching and learning (Casey & MacPhail, 2018; Farias et al., 2020; Goodyear & Dudley, 2015).

A growing body of research indicates that student-centered approaches – such as Cooperative Learning (CL), Sport Education (SE) and Game-Based Approaches (GBAs) – function as coherent learning architectures capable of

¹ The term educational horizon is used in an epistemological and pedagogical sense. Physical literacy is understood not as a fixed or terminal outcome, but as an open-ended orienting framework that informs how teaching and learning are designed and enacted in context. In this sense, it functions as a regulative educational reference whose realization is necessarily situated, processual, and context-dependent.

supporting learning across physical, cognitive, social, and psychological domains, while fostering student agency, motivation, and meaningful engagement (Casey & Kirk, 2020; Farias et al., 2020; Metzler, 2017). However, teaching for PL through student-centered approaches places exceptionally high professional demands on teachers. Beyond the specific content knowledge of the PE subject-matter, it requires the capacity to design rich learning environments, orchestrate pro-social interactions, diagnose learners' needs, and sustain a progressive transfer of responsibility and decision-making to students and peers over time (Goodyear & Dudley, 2015; van de Pol et al., 2010).

These demands are particularly acute in physical education teacher education (PETE) and during school placement training, which represents a critical professional moment for preservice teachers (PSTs). Placement is not only a formative stage for learning to teach, but also a decisive point for pedagogical renewal and PSTs' retention in the profession (Calderón & MacPhail, 2021). Professional learning in this phase is increasingly understood as a situated, ill-structured problem-solving process, through which PSTs not only acquire pedagogical and content knowledge, but also develop a meta-understanding of how they learn to teach and how they can progressively improve their practice through experiential learning, reflection, and social mediation with peers and more knowledgeable others (e.g., cooperating teachers, experienced school teachers, and teacher educators). Indeed, research consistently shows that PSTs often struggle to enact student-centered and model-based pedagogies when confronted with contextual constraints, entrenched school cultures, and the everyday complexities of real classrooms (Silva et al., 2021). Without sustained and expert pedagogical mediation (e.g., from informed mentoring), there is a risk of instructional drift and a return to traditional, teacher-directed practices, thereby undermining the educational ambitions associated with PL.

Accordingly, this narrative review examines PL not as a predefined construct or fixed outcome, but as an educational horizon shaped by situated pedagogical and professional processes. Drawing on literature in PE pedagogy and teacher education, the review synthesizes evidence across four interconnected domains that are central to the development of PL in school contexts: (i) pedagogy and the construction of meaningful and inclusive learning environments that support holistic

engagement with movement; (ii) student-centered pedagogical models as pathways for fostering the physical, cognitive, social, and psychological dimensions of PL; (iii) PE teachers' professional learning and pedagogical mediation as conditions for translating PL-oriented intentions into practice; and (iv) educational communities and scaffolded support processes that sustain teachers' capacity to enact PL-informed pedagogies over time.

Methodological approach

Narrative reviews are particularly well suited to synthesizing broad conceptual fields and supporting critical interpretation of theoretical and empirical developments over time (Collins & Fauser, 2005). Unlike systematic reviews, which prioritize exhaustive coverage and procedural standardization, narrative reviews allow for greater interpretive flexibility and conceptual breadth. This makes them especially valuable for examining complex educational phenomena characterized by multiple theoretical traditions, diverse pedagogical orientations, and evolving bodies of research (Greenhalgh et al., 2018). Given that this review examines PL as an educational horizon – understood as an open-ended, processual, and context-dependent pedagogical orientation rather than a discrete or fully measurable construct – a narrative review was considered the most appropriate methodological approach. Such a perspective requires engagement with heterogeneous bodies of literature, including conceptual, theoretical, and empirical work, and calls for an interpretive synthesis capable of capturing how PL is articulated, mediated, and enacted across different pedagogical and institutional contexts.

Accordingly, the review was guided by an interpretive and integrative orientation, drawing on literature from PETE, PE pedagogy, and broader educational theory. Rather than aiming to catalogue all existing studies on PL, the focus was placed on identifying and synthesizing contributions that have been particularly influential in shaping understandings of how teaching and learning are mediated through pedagogical practices and contextual conditions in PE. This selective and purposeful approach is consistent with recommendations for narrative reviews that privilege conceptual coherence and analytical depth over procedural exhaustiveness (Collins & Fauser, 2005).

Relevant literature was identified through an iterative search process across major academic databases, including Web of Science, Scopus, ERIC, APA PsycINFO, and Google Scholar. Searches combined key terms related to PE, PL, pedagogy, student-centered learning, and pedagogical models. These database searches were complemented by targeted examination of reference lists from seminal texts and influential reviews, allowing for the inclusion of foundational theoretical contributions alongside contemporary empirical work.

The analysis followed a thematic and interpretive logic, organizing the literature around interconnected conceptual domains rather than chronological or methodological categories. These domains included learning as a situated and relational process, educational communities and professional cultures, teachers' learning and pedagogical mediation, scaffolding as a mechanism for supporting learning and change, and student-centered pedagogical models as architectures for meaningful learning experiences. Within and across these domains, the literature was examined critically to identify patterns, tensions, and convergences in how pedagogical processes have been conceptualized and enacted in PE. Rather than generating prescriptive conclusions, this approach seeks to offer a coherent and context-sensitive account of how pedagogical processes shape educational experiences aligned with the development of PL.

Pedagogy as an avenue for PL

From curricular intentions to lived learning experiences

Over recent decades, educational reforms in PE have increasingly positioned PL as a guiding educational purpose for teaching and learning, framing participation in PE as a means of fostering holistic, meaningful, and lifelong engagement with movement (Cairney et al., 2019; UNESCO, 2015; Whitehead, 2010). However, a persistent gap remains between such curricular aspirations and students' lived experiences in PE lessons (Kirk, 2009). This gap points to a fundamental issue: educational intentions alone are insufficient to generate meaningful learning unless they are translated into coherent pedagogical processes that shape how learning is enacted in practice (Ennis, 2011). Pedagogy, therefore, operates as a critical bridge between educational aims and practice. It is through pedagogical mediation that

curricular intentions are interpreted, enacted, and experienced by learners. In this sense, pedagogy cannot be reduced to the selection of content or instructional techniques; it encompasses the design of learning environments, the structuring of interactions, and the ongoing interpretation of students' engagement and responses. Without such mediation, curricular aspirations, such as PL development in students, risk remaining rhetorical rather than transformative.

Understanding PL as an educational horizon reinforces the centrality of pedagogy. PL does not emerge as a direct outcome of curricular alignment or exposure to physical activity, but as the cumulative result of educational experiences that are meaningful, coherent, and sustained over time (Dudley et al., 2022). These experiences are shaped by how tasks are framed, how learners are invited to participate, and how movement is positioned as a site for personal and social meaning-making. From this perspective, PL is not taught as content but developed through experience, underscoring the pedagogical nature of its realization.

Rich, meaningful, and inclusive learning environments

If PL is to be developed through experience, then the quality of learning environments becomes a decisive factor. From a pedagogical perspective, student-centeredness provides a key avenue for fostering such environments, as it foregrounds learners' needs, agency, and participation as central to the teaching–learning process. Research in PE consistently indicates that learning environments characterized by active participation, shared responsibility, and meaningful engagement are more likely to support holistic learning outcomes across physical, cognitive, social, and psychological domains (Dudley et al., 2022; Goodyear & Dudley, 2015; Hodges-Kulinna et al., 2024).

Rich learning environments in PE are those that invite students to participate as active contributors rather than passive recipients of instruction. Opportunities for decision-making, collaboration, and reflection enable learners to engage more deeply with movement experiences and to perceive learning as personally relevant. Participation, in this sense, extends beyond physical involvement to include emotional investment and social interaction, all of which influence students' motivation and persistence (Ntoumanis et al., 2021). From this student-centered perspective, inclusivity emerges as a central pedagogical outcome. Teaching

practices such as those espoused by student-centered pedagogical models, that recognize learners' diverse backgrounds, abilities, and experiences, create conditions in which all students can experience success and a sense of belonging. Rather than privileging normative performance standards, inclusive learning environments emphasize progression, effort, and engagement, thereby supporting equitable participation in learning. This orientation aligns closely with the educational aims of physical literacy, which prioritize confidence, motivation, and lifelong engagement over short-term performance outcomes (Whitehead, 2010). The alignment between learning goals, pedagogical tasks, and social interactions is critical in sustaining such environments. When tasks are coherently designed to reflect educational intentions, and when interactions reinforce those intentions, learners are more likely to experience continuity and meaning in their learning. Conversely, misalignment (e.g., promoting autonomy rhetorically while maintaining highly directive practices) can undermine engagement and dilute educational impact (Casey & MacPhail, 2018). Effective pedagogy therefore requires careful orchestration of tasks and interactions to ensure that learning environments genuinely support holistic development.

Central to the creation of meaningful learning environments is pedagogical intentionality. Intentional teaching involves purposeful planning, adaptive implementation, and continuous responsiveness to learners' needs and contextual conditions. In alternative to following rigid instructional scripts, intentional pedagogy is characterized by informed decision-making that remains sensitive to emerging learning opportunities and constraints (Darling-Hammond et al., 2017). In the context of PL, such pedagogical intentionality supports the development of coherent learning trajectories, through which learners' experiences are connected, progressive, and educationally purposeful. If the development of PL is contingent on the quality of these pedagogical experiences, it becomes necessary to examine which teaching architectures have demonstrated capacity to structure rich and inclusive learning environments in PE.

Student-centered pedagogical models as pathways for the development of PL

Pedagogical models as learning architectures for the development of PL

Student-centered pedagogical models have increasingly been proposed as coherent frameworks for organizing teaching, learning and assessment in PE. Rather than representing isolated methods or instructional techniques, pedagogical models offer structured learning architectures that integrate curricular aims, pedagogical principles, roles, tasks, and forms of assessment into meaningful and sustained learning experiences (Casey & Kirk, 2020; Metzler, 2017). Understanding these models as learning architectures shifts attention away from questions of technical effectiveness toward considerations of educational intent and coherence. Each model embodies particular assumptions about learning, participation, and the role of the teacher and students. As such, models shape not only what is taught, but how learners engage with content, with one another, and with the learning environment. This perspective aligns with calls to move beyond fragmented approaches to teaching and toward pedagogies that provide continuity, depth, and purpose (Casey & Kirk, 2020).

From a holistic educational standpoint, pedagogical models offer a promising avenue for supporting learning across multiple domains. By intentionally structuring social interaction, decision-making, responsibility, and reflection, models can create conditions for integrated development encompassing physical competence, cognitive understanding, social engagement, and affective growth. This multidimensional orientation resonates strongly with educational frameworks such as PL, which emphasize learning as a holistic and lifelong process rather than the mastery of discrete skills (Cairney et al., 2019; Whitehead, 2010). Importantly, viewing models as architectures underscores that their educational value does not reside solely in their formal characteristics, but in how their underlying principles are interpreted and enacted in practice. Coherence between pedagogical intentions and implementation is therefore central to their contribution to meaningful learning. Among the range of pedagogical models developed in PE, Sport Education (SE), Cooperative Learning (CL), and Game-Based Approaches (GBAs) have received substantial empirical and theoretical attention, particularly in relation to student-centered and inclusive pedagogies. While distinct in their pedagogical emphases, these models share a common commitment to engaging learners as active

participants in meaningful, socially situated learning experiences, thereby offering viable pathways for the development of physical literacy.

Sport education

SE seeks to create authentic sport experiences by emphasizing extended seasons, team affiliation, role-playing, and formal competition, fostering a sense of belonging, responsibility, and identity among learners (Siedentop et al., 2019). Empirical research indicates that SE can enhance students' motivation, enjoyment, and critical thinking, while also supporting learning in physical and cognitive domains, including skill development, tactical understanding, and appreciation of sport as a cultural practice (Araújo et al., 2014; Ntoumanis et al., 2021). These outcomes reflect learning experiences that extend beyond immediate performance outcomes, contributing to confidence, engagement, and sustained participation. From a PL perspective, SE provides conditions for meaningful engagement through socially embedded participation, supporting the integrated development of physical competence, social connection, and psychological engagement.

Cooperative Learning

CL foregrounds structured collaboration as a central mechanism for learning. Through carefully designed tasks that require positive interdependence, individual accountability, and collective reflection, CL promotes shared responsibility and active engagement among learners (Dyson et al., 2004). Empirical studies in physical education have shown that cooperative structures can enhance students' social skills, empathy, and sense of inclusion, while also supporting cognitive engagement and motor learning through peer interaction and dialogue (Silva et al., 2024). By creating learning environments in which success is collectively negotiated rather than individually prescribed, CL aligns closely with the holistic orientation of PL, fostering social connectedness, confidence, and meaningful participation alongside physical and cognitive development.

Game-Based Approaches

GBAs, seminally derived from the Teaching games for understanding (TGfU), prioritize tactical understanding, decision-making, and contextualized skill development. Building on the foundational principles of TGfU, these approaches situate learning within modified and representative game environments that invite learners to engage cognitively and physically with game-related problems, fostering

deeper understanding, adaptability, and transfer of learning (Pill et al., 2023). Empirical evidence indicates that GBAs can enhance students' enjoyment, engagement, and motivation, while supporting the development of decision-making skills and game awareness across diverse contexts (Harvey & Jarret, 2014; Mesquita et al., 2012). Such outcomes reflect gains across physical, cognitive, and psychological domains, reinforcing the potential of GBAs to contribute to PL by promoting agency, understanding, and sustained engagement with movement.

Collectively, these pedagogical models contribute to learning across physical, cognitive, social, and psychological domains, creating conditions for experiences that are meaningful, participatory, and developmentally appropriate. When enacted with pedagogical coherence and contextual sensitivity, SE, CL, and GBAs align closely with the educational attributes associated with physical literacy, particularly those related to confidence, motivation, agency, and long-term engagement with movement.

Flexible, complementary, and contextualized use of student-centered pedagogical models

Despite their potential, the implementation of student-centered pedagogical models in PE is not without challenges. Research consistently indicates that adopting models in a rigid or technical manner can lead to superficial change, limited impact, or eventual abandonment (Casey & Kirk, 2020). Effective implementation requires teachers to interpret and adapt model principles in relation to contextual constraints, learner characteristics, and educational priorities. A growing body of literature advocates for a flexible and complementary use of pedagogical models, rather than strict adherence to a single approach. Hybrid or blended pedagogies allow teachers to draw on the strengths of different models, tailoring learning environments to support diverse learning goals and student needs (Silva et al., 2024). Such flexibility, however, places increased demands on teachers' pedagogical judgement. This requires ongoing scaffolding – of both student learning and teachers' professional practice – to ensure coherence between intentions and experiences. Teachers must be supported in making informed decisions about task design, progression, and interaction, particularly when navigating the complexities of student-centered learning environments.

From this perspective, student-centered pedagogical models should not be understood as ready-made solutions, but as pedagogical resources whose educational value depends on how they are enacted in practice. Their contribution to the development of PL is shaped less by their formal characteristics than by teachers' capacity to interpret pedagogical principles, adapt them to contextual conditions, and sustain pedagogical intent over time through informed mediation.

Teacher professional learning and pedagogical mediation

Professional learning as a progressive and contextual process

Teacher professional learning has increasingly been conceptualized as a progressive, situated, and context-dependent process rather than as the accumulation of declarative knowledge or discrete technical competencies. Traditional accounts of teaching competence, often grounded in linear models of knowledge transmission and skill acquisition, have been shown to inadequately capture the complexity, uncertainty, and judgement inherent in teaching practice. Contemporary perspectives emphasize that learning to teach involves developing the capacity to interpret pedagogical situations, exercise professional judgement, and act purposefully within specific social and institutional contexts (Cochran-Smith & Lytle, 1999; Schön, 1987).

From this perspective, professional learning is inextricably linked to practice-based experiences. Teachers develop professional knowledge through sustained engagement in authentic teaching situations, whereby learning occurs through participation, experimentation, and reflection rather than through the application of abstract principles. This view aligns with conceptualizations of professional learning as an ongoing, inquiry-oriented process embedded in everyday practice, through which teachers learn to read learning environments, respond to students' needs, and adapt pedagogical strategies to evolving circumstances (Darling-Hammond et al., 2017; MacPhail, 2011). In PE, the situated nature of professional learning is particularly pronounced. Teaching is characterized by dynamic, embodied, and socially complex learning environments that require teachers to balance instructional, relational, and organizational demands simultaneously. As such, professional learning cannot be reduced to knowing *what* to teach or *how* to teach

in abstract terms; it involves developing sensitivity to *when*, *why*, and *for whom* particular pedagogical decisions are appropriate (Casey & MacPhail, 2018; Kirk, 2009). This reinforces the view that PE teachers' professional learning unfolds through engagement with practice, interaction with others, and reflective sense-making rather than through the transmission of prescriptive pedagogical models.

The notion of *learning to teach by teaching* captures this process-oriented understanding of professional learning, positioning practice as a central site of learning rather than as a context for applying prior knowledge. Professional understanding is continuously shaped through experience, reflection, and engagement with the complexities of authentic teaching contexts (Armour, 2010; Schön, 1987). This account aligns with sociocultural perspectives that conceptualize learning as participation in practice, where professional learning is supported through guided participation and the progressive assumption of responsibility within situated contexts (Lave & Wenger, 1991). Framed in this way, professional learning provides a clear conceptual bridge to pedagogical mediation and scaffolding, highlighting how teachers' capacity to enact and sustain pedagogical innovation develops over time.

In contrast, transmissive models of teacher education – centered on the delivery of decontextualized knowledge and prescriptive methods – have been widely criticized for their limited influence on teaching practice (Armour, 2010). Such approaches tend to position teachers as implementers of predefined techniques, offering little preparation for the adaptive, relational, and decision-making demands of real teaching contexts. Research indicates that teachers educated primarily through transmissive models often experience difficulties in enacting innovative or student-centered pedagogies and in responding flexibly to contextual constraints, particularly when these approaches challenge established teaching traditions (Silva et al., 2021). In PE, these tensions are particularly pronounced. Preservice and early-career teachers frequently report a disconnect between theoretical coursework and the realities of school practice, especially when attempting to implement student-centered or models-based practices (Silva et al., 2021). Contextualized school immersion within the educational community (Teixeira et al., 2025), supported by structured opportunities for reflection and dialogue, can mitigate this disconnect by enabling teachers to experiment, adapt, and learn

through engagement with authentic teaching contexts. Beyond representing a mere exposure to practice, such immersion functions as a pedagogically mediated process that supports sustained professional growth. Crucially, this capacity is not developed through transmissive preparation alone, but through participation in situated professional contexts that both legitimize and challenge pedagogical innovation.

Educational communities and situated learning in PE

Learning as a situated, social, and relational phenomenon

Learning in teacher education, particularly within PE, is increasingly conceptualized as a situated, social, and relational phenomenon, emerging through participation in meaningful professional practices rather than through the individual acquisition of decontextualized knowledge. From this perspective, learning to teach is understood as a process of becoming (i.e., developing ways of thinking, acting, and relating as a teacher) that is inseparable from the social and cultural contexts in which pedagogical activity takes place (Lave & Wenger, 1991; Wenger, 1998).

Situated learning theory challenges transmissive models of education by emphasizing that knowledge is constructed through engagement in shared practices, negotiation of meaning, and interaction with others, as evidenced in empirical studies of professional learning in PE (Armour & Yelling, 2007; Parker et al., 2012). Central to this view is the concept of *legitimate peripheral participation*, which describes how newcomers initially engage from peripheral positions and gradually move toward fuller participation as they gain competence, recognition, and a sense of belonging within a community (Lave & Wenger, 1991). Learning, therefore, is not merely cognitive or technical, but deeply intertwined with identity formation, social relationships, and the affordances of specific learning environments.

Within PE, this perspective is particularly salient. Learning in PE unfolds in highly interactive settings, where students learn with and through others while negotiating roles, rules, responsibilities, and shared understandings of movement practices (Ennis, 2011; Kirk, 2009). Thus, motor learning, tactical understanding, and social development are embedded in collective activity, peer interaction, and

shared experiences of success, challenge, and failure. These processes are difficult to capture through individualized or outcome-driven lenses, yet they are central to how learning is experienced and sustained in PE contexts.

Moreover, learning in PE is markedly shaped by affective and relational dimensions. Feelings of belonging, recognition, and psychological safety influence students' willingness to engage, take risks, and persist in learning tasks (Ntoumanis et al., 2021). Conversely, experiences of exclusion or marginalization can significantly constrain participation and undermine learning. Conceptualizing learning as situated and relational thus provides a more nuanced understanding of how educational experiences in PE are constructed and why pedagogical environments matter. This perspective aligns closely with holistic educational orientations, such as PL, which emphasize meaning, agency, and engagement as central features of learning.

Educational communities and PSTs' professional learning

If learning is fundamentally situated and social, then teachers' professional learning must also be understood as a collective and context-dependent process. Recent research in physical education teacher education (PETE) has consistently shown that learning to teach is not reducible to formal training or the accumulation of theoretical knowledge, but emerges through participation in professional communities where practices, values, and meanings are co-constructed over time (Teixeira et al., 2025; Valério et al., 2022). In PE, educational communities extend beyond individual classrooms to encompass teaching departments and broader professional networks. These interconnected contexts form educational ecologies that shape what counts as legitimate practice, which pedagogical approaches are valued, and how innovation is supported or constrained (Casey & Kirk, 2020; Goodyear et al., 2014). Teachers' pedagogical choices are therefore influenced not only by personal beliefs or training, but also by the cultures, norms, and relationships that characterize their professional environments (Silva et al., 2021).

Collaborative engagement within educational communities has been identified as a key driver of PE teachers' professional learning and pedagogical development. Processes such as shared planning, peer observation, collective reflection, and informal dialogue enable teachers to construct situated professional

knowledge that is responsive to the realities of practice (Teixeira et al., 2025). In PE, such collaborative dynamics have been associated with increased openness to student-centered pedagogies and models-based approaches, supporting teachers in moving beyond traditional, teacher-directed practices (Goodyear et al., 2014).

However, meaningful participation in educational communities requires time, legitimacy, and supportive institutional conditions. Teachers in early career stages or in initial teacher education often rely on mediation by more experienced colleagues to gain access to valued practices, understand implicit norms, and feel “authorized” to experiment pedagogical innovations (Parker et al., 2012; Valério et al., 2024). Educational communities thus function simultaneously as learning environments and as social arenas where power, identity, and belonging are negotiated. Recognizing this dual character is essential for understanding how pedagogical development unfolds and why some innovations take root while others falter.

Communities of practice as avenues for teacher professional learning

Despite widespread recognition of the potential of Communities of Practice (CoPs) – commonly understood as groups of individuals who share a concern or passion for a particular domain and deepen their knowledge through participation in shared practices (Wenger et al., 2002) – to support learning and pedagogical development, several scholars have cautioned against overly romanticized portrayals of these communities (Fernandes et al., 2022; Parker et al., 2012). Engagement in a CoP does not automatically lead to learning, collaboration, or innovation. Communities may also reproduce hierarchical relations, reinforce dominant norms, and marginalize alternative perspectives, thereby constraining pedagogical change. In PE, entrenched cultural norms – such as the prioritization of sport performance, teacher-directed approaches, or skepticism toward student-centered pedagogical models – can be reinforced within professional communities, limiting opportunities for innovation (Silva et al., 2021). Teachers occupying peripheral positions, including PSTs or early-career professionals, may feel compelled to conform to established practices in order to gain acceptance and legitimacy, even when those practices conflict with broader educational aims.

Structural constraints further shape the functioning of CoPs. High workloads, prescriptive curricula, accountability pressures, and limited institutional support can reduce opportunities for meaningful collaboration and critical reflection (Armour & Yelling, 2007; Parker et al., 2012). Under such conditions, collaboration may become superficial or instrumental, diminishing its capacity to foster sustained pedagogical learning. Acknowledging these limitations does not diminish the value of educational communities; rather, it underscores their contingent nature. CoPs are not inherently transformative; their educational impact depends on facilitation, pedagogical leadership, and alignment with institutional structures that support learning and experimentation (Wenger et al., 2002). For communities to function as engines of pedagogical innovation in PE, conditions must be created that promote legitimate participation, critical dialogue, and support for pedagogical risk-taking.

This critical stance is particularly important when considering ambitious educational orientations such as PL, which require sustained changes in pedagogical practice and professional culture. Within these professional ecologies, scaffolding emerges as a key mediating process through which mentors, teacher educators, and experienced colleagues can support PSTs in developing pedagogical decision-making and progressive autonomy, thereby strengthening their capacity to teach in ways that meaningfully contribute to the development of PL.

Scaffolding and teachers' professional learning

Scaffolding theoretical foundations

Pedagogical scaffolding has long been recognized as a central concept for understanding how learning can be supported in complex educational settings. Rooted in sociocultural theory, scaffolding builds on Vygotsky's notion of the zone of proximal development, which conceptualizes learning as occurring in the space between what learners can do independently and what they can achieve with appropriate support (Vygotsky, 1978). From this perspective, learning is inherently relational and mediated, unfolding through interaction with more knowledgeable others. Within educational research, scaffolding has been used to describe the contingent support provided by teachers as learners engage in problem-solving

activities that exceed their current level of competence (Farias et al., 2018; Wood et al., 1976). Rather than simplifying tasks or removing challenge, scaffolding involves structuring learning situations, offering prompts, feedback, and guidance that enable learners to engage productively with complexity. As competence develops, support is gradually withdrawn, allowing learners to assume increasing responsibility for their own learning.

Importantly, scaffolding is not specific to any single subject area or educational level, but represents a general pedagogical principle applicable across teaching and learning contexts. In this sense, scaffolding mediates the relationship between learners, the content being learned, and the instructional intentions that shape learning experiences. Its relevance therefore extends across educational settings, encompassing both student learning and teacher learning, and supporting progression toward autonomy, responsibility, and independent engagement with increasingly complex tasks.

Contemporary conceptualizations emphasize that effective scaffolding is both contingent and responsive. Contingency refers to the alignment between the support provided and learners' immediate needs, while responsiveness highlights teachers' capacity to interpret learners' actions and adapt mediation accordingly (van de Pol et al., 2010). This dynamic nature distinguishes scaffolding from prescriptive instructional routines, positioning it instead as a form of situated pedagogical decision-making exercised in real time. In PE, where learning environments are embodied, social, and often unpredictable, such responsiveness is particularly critical for supporting holistic learning and meaningful engagement.

From this broader perspective, scaffolding can be understood not only as a mechanism for supporting students' learning trajectories, but also as a powerful framework for teacher education. In both initial and continuing teacher education, scaffolded support enables teachers to progressively develop professional competence, pedagogical confidence, and capacity for independent decision-making. Whether applied to students' learning or to teachers' professional development, scaffolding thus functions as a mediating process through which autonomy and responsibility are gradually assumed within situated educational contexts.

Scaffolding as mediation of professional learning

While scaffolding has been extensively examined in relation to student learning, its relevance for PE teachers' professional learning has gained increasing attention. From a situated learning perspective, teachers – particularly those in initial or early-career stages – also operate within zones of proximal development, facing pedagogical challenges that require mediation, guidance, and support (Teixeira et al., 2025). In this context, scaffolding functions as a mechanism through which professional learning is mediated. Mentors, cooperating teachers, and teacher educators support novice and PSTs in identifying pedagogical problems, interpreting classroom situations, and exploring alternative courses of action. Rather than prescribing solutions, scaffolding helps teachers learn how to frame problems pedagogically, fostering deeper understanding of teaching as an interpretive and decision-driven practice.

A key function of scaffolding in professional learning is its role in supporting problem identification. Novice teachers often struggle not only with how to respond to pedagogical challenges, but with recognizing what the problem actually is. Through dialogue, modelling, questioning, and shared reflection, scaffolding can make tacit pedagogical knowledge explicit, enabling teachers to develop diagnostic competence and situational awareness (van de Pol et al., 2010). Over time, effective scaffolding supports the progressive construction of autonomy. As teachers gain confidence and competence, external support is gradually reduced, allowing them to take greater ownership of pedagogical decision-making. This progression aligns with views of professional learning as a developmental trajectory, rather than a linear acquisition of techniques, and underscores the importance of sustained, responsive mediation within authentic teaching contexts.

Scaffolding, agency, and pedagogical sustainability

Beyond immediate learning gains, scaffolding plays a crucial role in supporting teachers' professional autonomy and the sustainability of pedagogical innovation. Rather than positioning teachers as implementers of externally defined practices, scaffolding enables them to develop the confidence and competence required to interpret pedagogical situations, exercise professional judgement, and

shape practice in ways that are responsive to contextual demands and educational values (Armour, 2010; van de Pol et al., 2010).

As pedagogical support shifts from external guidance to internal regulation, teachers increasingly engage in self-scaffolding processes, drawing on reflective practices, professional knowledge, and experiential understanding to guide their actions (Schön, 1987). This transition from supported participation to professional self-regulation resonates with sociocultural accounts of learning as a process of progressive participation in practice, whereby individuals move from reliance on external mediation toward more autonomous and informed engagement (Lave & Wenger, 1991). Such progression is central to the sustainability of pedagogical change, as innovations grounded in teachers' professional judgement are more likely to endure than those dependent on continuous external support.

In PE, where pedagogical innovation often involves adopting student-centered pedagogical models, scaffolding is particularly salient. These approaches place substantial cognitive, relational, and organizational demands on teachers, especially when they challenge established pedagogical traditions (Casey & Kirk, 2020; Silva et al., 2021). Without sustained pedagogical mediation, there is a risk that models are adopted in a technical or superficial manner. Scaffolding helps mitigate this risk by supporting teachers in interpreting pedagogical principles, adapting them to local conditions, and integrating them coherently into their practice rather than replicating models uncritically.

These insights carry important implications for both initial and continuing teacher education. When teacher education is conceptualized as a scaffolded and situated process – rather than as the transmission of predefined best practices – it is better positioned to support meaningful and sustainable pedagogical development (Armour, 2010). In this sense, scaffolding functions as a connective pedagogical mechanism linking teachers' learning, pedagogical mediation, and broader educational orientations such as PL. By supporting teachers in progressively assuming responsibility for complex pedagogical work, scaffolding strengthens the capacity to sustain practices that foster holistic and meaningful learning experiences over time. Taken together, these processes invite a reframing of PL as a cumulative educational achievement shaped by situated pedagogical mediation rather than by isolated instructional practices.

Integrative synthesis: pedagogical processes in the development of PL

PL as an outcome of situated educational processes

The literature examined in this review converges on a shared understanding of PL as an educational achievement that emerges through sustained and situated processes, rather than as a discrete outcome that can be directly delivered or prescribed (Cairney et al., 2019; Whitehead, 2010). Its development is shaped by the interaction of social contexts, pedagogical mediation, and professional practice, which together influence how learners experience, interpret, and engage with movement over time (Dudley et al., 2022; Farias et al., 2020).

Educational communities provide the social and cultural conditions within which pedagogical practices are legitimized, interpreted, and sustained (Parker et al., 2012; Wenger, 1998). Professional relationships, shared norms, and opportunities for participation influence how teaching is enacted and how educational intentions are translated into practice. Within these contexts, PE teachers' professional learning operates as a mediating force, shaping pedagogical decision-making and the quality of learning environments experienced by students (Armour, 2010; MacPhail, 2011).

Pedagogy, understood as the orchestration of tasks, interactions, and learning conditions, plays a central role in translating educational orientations into lived experiences (Casey & MacPhail, 2018). Through pedagogical mediation, learning becomes meaningful, inclusive, and developmentally coherent. From this perspective, PL is best understood as the cumulative result of coherent educational trajectories, in which learners progressively develop motivation, confidence, competence, and understanding through repeated engagement in supportive learning environments (Cairney et al., 2019; Goodyear & Dudley, 2015).

Reframing PL through processes, practices, and mediation

By foregrounding pedagogical and professional processes, this review reframes PL beyond definitional debates and outcome-oriented interpretations (Carl et al., 2022; Edwards et al., 2017). Rather than positioning PL primarily as a conceptual construct or assessment framework, the literature points toward its emergence through practice, interaction, and mediation within everyday educational settings.

Situated learning perspectives highlight that learning is inseparable from context and participation (Lave & Wenger, 1991), while research on teachers' professional learning underscores the interpretive and adaptive nature of pedagogical flexibility (Teixeira et al., 2025). Together, these perspectives draw attention to the relational foundations of PL, emphasizing how learning is shaped through social interaction, shared practices, and the organization of educational experiences.

Student-centered pedagogical models and instructional frameworks are shown to function not as guarantees of educational quality, but as pedagogical resources whose impact depends on how they are enacted and sustained in practice (Casey & Kirk, 2020). Within this process-oriented view, scaffolding emerges as a critical mediating mechanism, enabling both teachers and learners to navigate complexity, develop autonomy, and engage meaningfully with learning tasks (van de Pol et al., 2010). Through responsive and contingent mediation, scaffolding aligns pedagogical intent with lived experience, supporting progression while preserving agency and meaning.

Implications for pedagogical practice and educational research

Understanding PL as the outcome of situated pedagogical processes carries important implications for both practice and research in PE. Pedagogical approaches that prioritize participation, agency, and meaningful engagement require supportive professional environments and ongoing mediation (Armour & Yelling, 2007; Goodyear et al., 2014). Innovation in teaching is unlikely to be sustained without attention to the relational and contextual conditions that shape pedagogical practice.

From a research perspective, this synthesis points to the value of examining how pedagogical orientations are enacted, adapted, and sustained over time, rather than focusing exclusively on intended outcomes. Greater attention to PE teachers' professional learning, pedagogical mediation, and contextual responsiveness can provide deeper insight into the conditions that support meaningful learning experiences aligned with PL. By centering pedagogy and context, this integrative synthesis positions PL as an educational project grounded in practice. From this perspective, the development of PL depends on how pedagogical processes are

enacted to support holistic, inclusive, and sustained engagement with movement across PE and broader physical activity contexts.

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Theoretical Essay

Physical literacy within physical education: A holistic and student-centered approach

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Resumo

A Educação Física (EF) tem vindo, nas últimas décadas, a aprofundar a reflexão sobre os seus fundamentos conceptuais e pedagógicos, procurando afirmar a sua identidade disciplinar e relevância educativa. Este ensaio teórico centra-se no papel da literacia física (LF) enquanto referencial educativo sólido e integrador, congruente com o desenvolvimento integral do aluno e com as finalidades formativas e humanizantes da EF. A primeira secção situa os fundamentos filosóficos da LF – enraizados no monismo, na fenomenologia e no existencialismo – evidenciando como estes alicerces sustentam uma conceção do movimento enquanto vivência significativa e expressão da agência pessoal. A segunda secção analisa diferentes estruturas de referência internacionais para a operacionalização da LF, problematizando os seus pressupostos, lógicas avaliativas e utilidade pedagógica. A terceira secção discute o valor das abordagens de ensino centradas no aluno como vias privilegiadas para promover o desenvolvimento da LF, fomentando competências nos domínios físico, cognitivo, social e psicológico. O ensaio evidencia a importância da LF no currículo da EF e analisa o contributo de três modelos de ensino centrados no aluno, nomeadamente a Aprendizagem Cooperativa, o Modelo de Educação Desportiva e as Abordagens Baseadas no Jogo, enquanto vias pedagógicas coerentes com os princípios de agência, relação e experiência significativa que sustentam o seu desenvolvimento.

Palavras-chave: Literacia Física; Educação Física; Modelos de Ensino Centrados no Aluno; Desenvolvimento Holístico

Abstract

Over the past decades, physical education (PE) has progressively deepened its reflection on its conceptual and pedagogical foundations, seeking to affirm its disciplinary identity and educational relevance. This theoretical essay focuses on the role of physical literacy (PL) as a coherent and integrative educational framework, aligned with the holistic development of students and with the formative and humanizing purposes of PE. The first section outlines the philosophical foundations of PL – rooted in monism, phenomenology, and existentialism – highlighting how these perspectives support an understanding of movement as a

meaningful lived experience and an expression of personal agency. The second section examines various international frameworks for the operationalization of PL, questioning their assumptions, assessment logics, and pedagogical usefulness. The third section discusses the value of student-centered approaches as privileged pathways for promoting PL development, fostering competencies across the physical, cognitive, social, and psychological domains. The essay highlights the relevance of PL within the PE curriculum and analyses the contribution of three student-centered pedagogical models, namely the Cooperative Learning, Sport Education, and Game-Based Approaches, as pedagogical pathways aligned with the principles of agency, relational engagement, and meaningful experience that underpin its development.

Keywords: epistemological beliefs; initial teacher education; professional socialization; student-centered curriculum

1. Introduction

Despite its long-standing inclusion in school curricula worldwide, physical education (PE) continues to grapple with conceptual ambiguity about its educational purpose and a lack of coherence in its pedagogical orientation (Hardman, 2008; Whitehead, 2010). Frequently shifting its emphasis among sport performance, physical fitness, and recreational activity, PE has struggled to establish a unified rationale that connects its practices to the broader educational goals expected of schools in contemporary society. As modern societies redefine the competencies and dispositions required of citizens in the 21st century (e.g., critical thinking, collaboration, well-being, and social responsibility), PE's contribution to these holistic educational outcomes remains underexplored and often undervalued in both policy and practice (Hardman & Green, 2011).

In contemporary educational discourse, PE is increasingly recognized not merely as a vehicle for physical fitness or motor learning, but as a vital component of the integral development of the human being. Its presence in school curricula responds to the need to educate the body alongside the mind, nurturing physical competence, social responsibility, emotional well-being, and cognitive engagement (Bailey et al., 2006; UNESCO, 2015). Despite this educational potential, debates

persist regarding the purpose and effectiveness of PE in achieving holistic educational outcomes.

To support these educational aspirations, PE programs are expected to foster learning across multiple, interrelated domains – including motor, cognitive, social, and affective dimensions (Dudley et al., 2022). However, how these domains are addressed, nurtured, and made visible in teaching and learning processes varies considerably across educational systems. In many curricula, the physical–motor domain remains central, as expected in a subject grounded in movement. However, when PE is taught in a reductive, normative manner – through a “one-size-fits-all” approach in which all students are expected to achieve the same outcomes, dominated by skills-drills and teacher-centered instruction with little room for learner decision-making, its educational potential becomes significantly constrained. Such traditional approaches limit the interdependent development of physical, cognitive, and affective learning, and fail to realize the holistic educational potential of PE (Casey & Kirk, 2021; Hardman & Green, 2011). Research over the past two decades has demonstrated that PE can have substantial positive effects on student outcomes, from improved motor skills and physical health to enhanced self-esteem, social cohesion, and academic achievement (Bailey et al., 2006; Dudley et al., 2022; Hardman, 2008). Yet such outcomes are not guaranteed; they depend on the quality of teachers’ pedagogical practice, curricular coherence, and the perceived relevance of learning experiences for students.

As societies confront new and pressing challenges (e.g., physical inactivity, mental health concerns, and environmental sustainability), PE must evolve to meet the educational priorities of the 21st century. This requires moving beyond reductionist or technocratic paradigms and embracing frameworks that connect movement to personal meaning, agency, and lifelong engagement – principles at the heart of physical literacy (PL), here understood as a holistic capacity to move with competence, intention, and meaning across the lifecourse (Farias et al., 2024; Whitehead, 2010). Given its universal reach and continuity throughout compulsory education, PE is positioned to foster PL in a sustained and equitable manner. Unlike community sport-based programs, school-based PE ensures access for all learners, making it a strategic setting for long-term development across the multiple domains of PL. Accordingly, PL can be understood not merely as an addition to PE but as a

potential paradigm through which the subject's purpose and pedagogical orientation may be re-envisioned within the broader educational landscape. This essay examines the theoretical underpinnings of PL, proposing its value as a guiding orientation for the educational purposes of PE and highlighting student-centered approaches (SCAs) as a pedagogically coherent and impactful avenue for its holistic development.

2. Physical literacy philosophical foundations

The conceptualization of PL is situated within a tripartite philosophical foundation: monism, phenomenology, and existentialism (Whitehead, 2001). These three facets offer a conceptual lens through which movement is understood as a meaningful, embodied, and self-directed human experience. Firstly, monism challenges the traditional dualistic separation of mind and body, proposing a unified view of the human being. This ontological stance supports the idea that physical development is inherently connected to identity, agency, and relational awareness (Whitehead, 2010). Secondly, phenomenology, when applied to PL, draws attention to the significance of lived experience. Here, the body is viewed not as a mechanical tool, but as the primary site of perception, expression, and meaning-making (Fletcher & Ní Chróinín; Whitehead, 2010). This suggests pedagogical practices that invite emotional engagement, interpretation, and reflection – where students are encouraged to relate to their bodies and to personalize movement experiences. Thirdly, existentialism emphasizes the concepts of freedom, responsibility, and authenticity (Merleau-Ponty, 1962; Whitehead, 2010). From this perspective, PL unfolds through active engagement, choice, and commitment to movement experiences that are personally meaningful and self-determined, reflecting the individual's capacity to act with intentionality and awareness within the lived world.

Building on this philosophical grounding, Whitehead (2010) proposed a set of qualitative attributes that characterize the physically literate individual. These include: the motivation and confidence to realize one's innate movement potential; the ability to move with poise, efficiency, and creativity, while intelligently reading and responding to the environment; a well-established sense of self as embodied in the world; a reflective awareness of one's bodily capacities and an empathetic orientation toward others; and the capacity to articulate the essential elements of

effective movement performance. Together, these attributes offer a developmental articulation of Whitehead's philosophical vision, framing movement not simply as physical execution but as a domain of self-knowledge, imagination, and ethical interaction. In this vein, they serve as guiding principles for pedagogical thinking in PE, encouraging educators to move beyond instrumental conceptions of skill and instead cultivate a person-centered, meaningful, and reflective engagement with movement. This orientation is particularly relevant in inclusive educational contexts, where students bring diverse embodied histories, capacities, and motivations, and where valuing individuality is central to equitable learning. These qualitative attributes reflect not only the philosophical underpinnings of PL – particularly embodiment, agency, and lived experience – but also provide a conceptual bridge toward its pedagogical operationalization. Indeed, each of these attributes aligns closely with the developmental domains later articulated by educational organizations in the PL frameworks they developed (e.g., Sport Australia, 2019). In this sense, these frameworks can be understood as educational expressions of Whitehead's philosophical vision, translating existential, monistic, and phenomenological insights into developmentally grounded pedagogical practice.

As noted in prior research (e.g., Santos et al., 2022), promoting PL in schools means not only providing access to movement opportunities but cultivating a learning culture where every student feels empowered to explore, adapt, and grow. Such transformative potential rests on a philosophical foundation that supports a holistic, person-centered approach to PE. Yet, these foundations are often underrepresented in contemporary PE practices. While sport- and games-based activities, which predominate in PE, play an important role in developing skills, motivation, and social engagement, curriculum traditions shaped by high-level performance and elitism can inadvertently narrow the educational scope of PE and neglect students who do not display outstanding ability (Fernández-Rio & Iglesias, 2024; Whitehead, 2010). Fully realizing the ethos of PL requires integrating the strengths of traditional, teacher-centered models – valued for their clarity, structure, and technical precision – into broader pedagogical practices that are reflective, dialogic, and inclusive. Achieving this balance is crucial for PL to function as a practical framework for educational renewal in PE.

Responding to this challenge requires pedagogical models that are not only effective in promoting multiple learning outcomes but also philosophically aligned with the principles of PL, by conceiving movement as a lived, meaningful, and person-centered experience. If movement is to be lived meaningfully, integrated within the self, and chosen freely, then educational approaches must embody these values in practice. In this essay, we argue that SCAs offer pedagogical means through which the philosophical foundations of PL can be enacted in practice. By emphasizing autonomy, dialogue, exploration, and reflection, SCAs create spaces where students are not merely instructed but actively engaged as meaning-makers through movement (Dudley et al., 2022). They therefore provide the pedagogical conditions for movement to become expressive, contextualized, and personally meaningful – advancing the holistic vision of PL in practice.

We focus on three widely researched pedagogical models: Cooperative Learning (CL), Sport Education (SE), and Game-Based Approaches (GBAs). These were selected because they (i) operationalize the principles of embodiment, agency, and lived experience; (ii) demonstrate consistent positive impacts across multiple PL domains in empirical research; and (iii) are adaptable to diverse educational contexts (Hastie & Mesquita, 2016). Rather than offering prescriptive solutions, these pedagogical models illustrate different pedagogical pathways through which aspects of PL can be fostered. CL nurtures social interdependence and shared responsibility, fostering empathy and collaboration (Dyson & Casey, 2016); SE strengthens motivation, belonging, and authentic participation through sustained team affiliation and role rotation (Hastie & Mesquita, 2016); and GBAs enhance tactical understanding, decision-making, and cognitive engagement in contextualized play (Mitchell et al., 2020).

3. The educational relevance of physical literacy in physical education

PL is increasingly recognized not as an additional curricular objective, but as a conceptual orientation that unifies the learning domains established in PE. Rather than displacing aims related to skill, fitness, or sport participation, PL situates them within a broader educational purpose grounded in meaningful and lifelong engagement in physical activity. Whitehead's (2010) seminal definition of PL describes it as “the motivation, confidence, physical competence, knowledge, and

understanding to value and take responsibility for engaging in physical activities for life” (pp. 11–12). This definition shifts the focus of PE from outcome-based assessment to process-oriented growth, highlighting how students experience, interpret, and respond to movement in relation to themselves, others, and the world around them (Cairney et al., 2019).

The widespread inclusion of PE as a compulsory subject in school curricula provides a valuable opportunity to embed PL as a guiding framework, although its meaningful realization depends on the quality and relevance of students’ learning experiences. These experiences should be meaningful and developmentally appropriate, nurturing agency, belonging, and a positive relationship with movement (Fletcher & Ní Chróinín, 2022). Promoting PL in schools therefore means not only ensuring access to physical activity but cultivating environments where students find purpose, joy, and identity through movement. In this light, PL represents a transformative educational perspective through which PE can respond to diverse learner needs and foster lifelong well-being (Farias et al., 2020; Gil-Arias et al., 2021).

Such a transformative vision also resonates with the principles embedded in the Portuguese national curriculum for PE, which, although not explicitly referencing PL, implicitly reflects its holistic orientation. Policy documents², such as the *Profile of Students at the End of Compulsory Schooling* and the *Essential Learning Outcomes for Physical Education* emphasize goals including autonomy, critical thinking, collaboration, lifelong learning, inclusion, and respect for human dignity. Within PE, these aspirations are articulated through curricular goals that integrate technical and tactical development with broader competencies aligned with PL’s domains. Students are encouraged to interpret and analyze their own practice, to recognize the cultural and social value of sport, and to maintain physical fitness autonomously in their daily lives. Collectively, these aims position PE as a privileged context for fostering students’ PL.

Nevertheless, the adoption of PL as a central framework in PE is not without challenges. In many educational systems, traditional views of PE as a space primarily devoted to motor performance, behavioral control, or physical conditioning

² Objectives defined in the Profile of Students at the End of Compulsory Schooling and in the Essential Learning Outcomes of the national Physical Education curriculum. Available at: <https://www.dge.mec.pt/>

continue to influence curricula and teaching practices (Casey & Kirk, 2021). In addition, some physical education teacher education programs continue to prepare future teachers primarily for the delivery of teacher-centered, technique-driven practices – often organized around isolated skill-drill progressions with limited attention, or the broader notion of environmental interaction (e.g., tactical understanding) advocated by Whitehead (2010). While such traditional approaches to teaching PE may play an important role in developing physical competence and foundational motor skills, they offer limited opportunities for exploration, dialogue, and shared decision-making, thereby narrowing the broader educational potential of PE (Hardman et al., 2013). Moreover, institutional pressures – including time constraints, assessment demands, and social expectations surrounding sport – can further restrict opportunities for pedagogical diversification. These factors underscore the need for systemic support that enables PE to balance technical proficiency with more reflective, inclusive, and meaning-oriented forms of practice, thereby creating conditions through which PL can be meaningfully fostered.

4. International perspectives of physical literacy

As PL gained international attention, countries have approached its development through diverse lenses. Some have prioritized health-oriented monitoring, whereas others have pursued a more holistic educational agenda through broader curriculum frameworks (Cairney et al., 2019). One of the earliest and most philosophically grounded initiatives came from the United Kingdom through the International Physical Literacy Association (IPLA), which developed the Charting Progress tool – a reflective guide to support educators in observing and nurturing learners' development in PL over time. Rooted in Whitehead's (2010) definition of PL, it emphasizes qualitative progression across motivation, confidence, physical competence, and knowledge and understanding, without relying on standardized testing. Encouraging dialogue, self-reflection, and co-construction of learning, it offers pedagogical guidance aligned with inclusive and learner-centered practice (IPLA, 2017).

In Canada, the Canadian Assessment of Physical Literacy (CAPL) was developed to measure PL across four domains: daily behavior, physical competence, motivation and confidence, and knowledge and understanding

(Longmuir et al., 2015). The CAPL integrates physical performance tests, self-reports, and pedometer-based data to generate a comprehensive profile of children's PL, typically targeting ages eight to twelve. Although implemented in school settings, the CAPL is primarily used within research and public health monitoring rather than as part of teachers' routine assessment practices, drawing on a national database to support population-level benchmarking (Tremblay et al., 2018). While its multidomain structure moves beyond motor competence, the CAPL has been critiqued for retaining a predominantly biomedical orientation (Cairney et al., 2019). From an educational standpoint, this focus on measurement and population monitoring overlooks the subjective, experiential, and developmental dimensions that define PL as a holistic construct (Dudley, 2015; Whitehead, 2010). While well suited to research and surveillance, its norm-referenced design offers limited pedagogical utility, as it does not inherently guide instruction or formative learning in school contexts. Moreover, its focus on quantifiable outcomes can inadvertently reinforce performance hierarchies and discourage less proficient students, potentially undermining the motivational aims of PL. Thus, while valuable for system-level insight, the CAPL should be complemented by more formative and context-sensitive tools.

In contrast, Australia has developed the Australian Physical Literacy Framework (APLF), which offers a more educational and holistic vision of PL (Keegan et al., 2019; Sport Australia, 2019). The framework conceptualizes PL as a lifelong, holistic learning process enacted through movement and physical activity, with the explicit aim of enabling individuals to lead active, healthy, and meaningful lives. The APLF outlines progression across four interconnected domains: (i) physical (includes motor competence, movement efficiency, and the ability to perform actions safely and with control); (ii) cognitive (includes understanding of movement concepts, strategies, and decision-making); (iii) social (encompasses collaboration, empathy, and ethical engagement) and (iv) psychological (captures motivation, confidence, resilience, and emotional regulation). Each domain contributes to an individual's ability to engage meaningfully in physical activity.

What distinguishes the APLF is its developmental and pedagogical orientation. Rather than focusing narrowly on performance indicators predominantly tied to physical outputs, the framework adopts a broader perspective that considers

PL as an evolving, lifelong process shaped by experience, environment, and educational practice. Thus, the APLF proposes five sequential stages of development – Pre-Foundation, Foundation, Accumulation & Acquisition, Consolidation & Mastery, and Transfer & Empowerment – which describe how individuals may progress across each domain over time. Each stage is defined by a set of behavioral indicators and dispositions, enabling educators to interpret and support learning holistically rather than through isolated physical benchmarks. Importantly, these stages are not fixed levels of achievement; learners may progress differently across domains, reflecting the dynamic and individualized nature of learning in PE. This flexibility aligns closely with a student-centered philosophy, acknowledging individual pathways and the diverse rhythms through which PL develops.

In the *Pre-Foundation* stage, learners begin to explore movement in safe, playful ways, developing initial confidence, curiosity, and basic understanding of physical activity. The *Foundation* stage involves broader participation, emotional engagement, and increasing awareness of self and others in physical contexts. During the *Accumulation & Acquisition* stage, learners demonstrate growing autonomy, refinement of motor and cognitive skills, and emotional regulation within structured tasks. At more advanced stages, such as *Consolidation & Mastery*, individuals apply knowledge and competencies across varied contexts with increasing adaptability and collaboration. Finally, the *Transfer & Empowerment* stage reflects sustained, self-directed engagement with movement, marked by critical reflection and the ability to transfer learning across life domains.

These stages operate as guiding trajectories, non-linear, dynamic, and sensitive to the individuality of each learner (Sport Australia, 2019). They provide a structure that supports formative, developmental pedagogy, allowing teachers to tailor learning opportunities to diverse needs and to recognize progress in multiple forms, not only through physical execution but through affective, social, and cognitive growth. Importantly, the APLF provides guidance on what should be developed across the domains of PL, but leaves open the question of how best to foster such development in practice. Its value lies in providing a coherent developmental reference while allowing educators the flexibility to adopt pedagogical approaches suited to their context, resources, and learners. Among these, student-centered and inquiry-based

models (Casey & Kirk, 2021) represent one possible avenue for aligning pedagogy with the holistic and person-centered principles that underpin PL, yet their effective integration remains contingent on context and professional judgment. These characteristics make the APLF particularly relevant in contexts aiming toward more inclusive, student-centered, and humanizing practices, shifting away from performance-driven and elitist curriculum traditions that have historically marginalized students without exceptional ability. The APLF thus avoids the pitfalls of normative assessment and promotes equity, inclusion, and learner agency in the cultivation of PL, aligning with broader educational goals such as well-being and lifelong learning.

Importantly, the conceptual groundwork for this progressive, domain-based approach was laid by Dudley (2015), whose seminal model of observed PL provided a clear structure for identifying and developing PL through observable, educationally relevant behaviors. Dudley's model was one of the first to operationalize PL across the physical, cognitive, social and psychological, domains, explicitly aligning outcomes and teaching methods with the realities of school-based PE. This framework significantly influenced subsequent national efforts (i.e., APLF) by reinforcing the need for measurable, holistic, and context-sensitive progression in PL. This lineage illustrates how foundational conceptual work can inform large-scale educational policy. The APLF, therefore, not only builds upon but also extends Dudley's vision through its integration into curriculum frameworks and pedagogical planning tools.

However, despite the efforts of academics and governmental institutions, the APLF still requires further clarification regarding its applicability and interpretation within educational settings (Cairney et al., 2019; Keegan et al., 2019). Such clarification is essential to understand how it can guide students' learning trajectories and contribute to the development of their PL. To date, empirical research has primarily focused on exploring how Australian health and physical education teachers interpret and engage with the concept of PL. For example, in a recent study, Essiet et al. (2024) found that while teachers generally recognized the potential importance and applicability of PL, many expressed skepticisms regarding its practical implementation. Interviews revealed that their understanding of the concept remained narrow and often limited to physical competencies. Regarding its

integration in schools, participating teachers emphasized the need for clearer curriculum alignment and more explicit guidance to support their practice.

In Portugal, where PE is compulsory from ages six to eighteen, the APLF has informed academic and professional reflection rather than serving as a prescriptive model (Mota et al., 2021). Its holistic and developmental orientation has offered valuable insights for rethinking how curriculum, pedagogy, and assessment might better support the educational purposes already embedded within Portuguese PE. This influence has been particularly visible within Physical Education Teacher Education programs, where course curricula increasingly integrate SCAs and holistic frameworks for learning. Moreover, continuing professional development initiatives and research projects have drawn on the APLF's multidimensional perspective to guide teacher reflection and pedagogical innovation (e.g., Farias et al., 2020; Silva et al., 2024). While the national curriculum and associated policy documents do not explicitly refer to PL, they implicitly endorse many of its foundational principles – such as the integral development of students across domains, and the promotion of values like autonomy, inclusion, and lifelong engagement with physical activity. Tools currently used in Portuguese schools, such as *FITescola* (Direção-Geral da Educação [DGE], n.d.), primarily focus on physical indicators, including endurance and strength. However, the conceptual lens provided by the APLF invites a broader understanding of development that integrates the physical, cognitive, social, and psychological domains. Crucially, it reinforces the idea that all students, regardless of ability, can progress toward becoming physically literate through supportive, meaningful, and reflective educational experiences.

In recent years, Portuguese research has begun to engage with this multidimensional view of PL, notably through the development of the Portuguese Physical Literacy Assessment (PPLA) (Mota et al., 2021). While not a direct translation of the APLF, the PPLA reflects a growing commitment to capturing the full scope of learning experiences that contribute to PL. The instrument assesses the cognitive, social, and psychological domains through Likert-scale and multiple-choice items focused on knowledge of physical activity, health behaviors, and lifestyle habits. Yet, the physical domain continues to be evaluated mainly through teacher observation and informal judgments rooted in traditional sport-based

contexts. This raises concerns regarding subjectivity, consistency, and alignment with broader developmental goals (Cobo, 2013; Dede, 2010). The absence of standardized and longitudinal criteria may also limit comparability and reduce the instrument's potential to inform pedagogical innovation. While *FITescola* provides valuable fitness-related indicators, it tends to overlook the interpretive and reflective dimensions that are essential for cultivating lifelong engagement. Positioning Portuguese PE within a holistic framework inspired by, but not dependent on, frameworks like the APLF may help strengthen its implicit commitment to developing students' PL, a commitment already embedded in the values and aims of national educational policy.

5. Student-centered approaches as pathways for physical literacy development

A growing body of research has shown that SCAs are particularly conducive to the development of PL in PE contexts (Dudley et al., 2022; Hodges-Kulinna et al., 2024). Their relevance lies in their alignment with the holistic, embodied, and meaning-oriented nature of PL, as they foreground student agency, interpersonal engagement, and reflective learning. By offering inclusive and authentic movement experiences, SCAs create conditions for integrated growth across all four PL domains – physical, cognitive, social, and psychological – echoing the philosophical foundations of monism, phenomenology, and existentialism (Whitehead, 2010). Recent evidence from Dudley et al. (2022) further reinforces this connection, showing that models-based pedagogies situated within autonomy-supportive learning environments consistently promote motivation, engagement, and multidomain learning. In this sense, SCAs can be understood as pedagogical pathways operating within a broader autonomy-supportive framework that nurtures the holistic development of PL.

Among the landscape of SCAs, CL, SE, and GBAs are examined here as representative cases. This selection reflects not only the extensive empirical literature supporting these pedagogical models but also their capacity to foster development across multiple PL domains and their adaptability to diverse school settings (Fernández-Río & Iglesias, 2024; Hastie & Wallhead, 2015; Harvey & Jarrett, 2014; Dudley et al., 2022).

CL is structured around five key principles: positive interdependence, individual accountability, promotive interaction, group processing, and the development of social skills (Johnson & Johnson, 1998). These features make CL particularly effective in nurturing the social and psychological domains of PL. Empirical findings show that CL environments support the development of empathy, cooperation, and respectful communication, while also promoting intrinsic motivation, self-esteem, and emotional security, especially among students with lower self-confidence or perceived competence (Dyson, 2001; Dyson & Casey, 2016; Fernández-Río & Iglesias, 2024; Gil-Arias et al., 2021). The model's inclusive and non-threatening structure allows all learners to contribute meaningfully, reducing performance anxiety and promoting equitable participation. Collaborative structures such as peer tutoring, group tasks, and shared decision-making also stimulate the cognitive domain, fostering metacognition, critical thinking, and co-construction of knowledge (Dyson, 2002). Though less often foregrounded, the physical domain is also engaged as learners participate actively and repetitively in movement-based tasks designed to promote cooperative success. As such, CL operationalizes PL by integrating interpersonal growth with embodied experience and meaningful, reflective engagement.

Designed by Siedentop (1994), SE reproduces the culture of sport in educational settings through seasons, stable teams, role rotations, and culminating events. These elements strongly support the affective and social domains of PL by cultivating motivation, team affiliation, and democratic participation (Gil-Arias et al., 2021; Hastie et al., 2011; Hastie & Wallhead, 2015). Multiple studies have demonstrated the effectiveness of SE in fostering responsibility, persistence, and enjoyment – particularly among disengaged or low-skilled students – by immersing them in roles that extend beyond the performer, such as coach or referee (Wallhead et al., 2014; Farias et al., 2020). The physical domain is addressed through repeated, contextualized practice in game situations, leading to measurable improvements in motor competence, tactical understanding, and decision-making (Hastie et al., 2013; Mesquita et al., 2012). Moreover, SE promotes the cognitive domain by involving students in strategic planning, peer instruction, and analytical tasks that deepen their understanding of performance. Its structure offers both autonomy and scaffolding, enabling learners to reflect on their embodied

experiences in meaningful ways – thus exemplifying how a pedagogical model can sustain multidimensional PL development over time.

GBAs, rooted in the foundational *Teaching Games for Understanding* model, place tactical understanding, decision-making, and problem-solving at the core of the learning process, embedding these within authentic game situations. These approaches have consistently demonstrated impact in the cognitive domain, particularly by enhancing players' ability to read the game, make informed decisions, and transfer knowledge across related game forms (Harvey & Jarrett, 2014; Mesquita et al., 2012; Mitchell et al., 2020). The physical domain is activated through representative learning tasks that require technical execution in dynamic, unpredictable environments. Such practice has been shown to enhance skill retention and transfer (Farias et al., 2022). At the psychological level, GBAs are associated with increased enjoyment, self-efficacy, and intrinsic motivation, especially when combined with guided questioning and player autonomy (Gil-Arias et al., 2021; Dudley et al., 2022). The social domain is also addressed through team-based play, collaborative rule negotiation, and emphasis on fair play and communication. Because GBAs embed learning in engaging, authentic experiences, they are well positioned to foster meaningful and sustained engagement with movement, a central goal of PL.

In this way, GBAs, alongside CL and SE, illustrate how different pedagogical approaches can support aspects of PL's holistic and person-centered vision. These models exemplify how certain pedagogical designs can resonate with, and help bring to life, the philosophical foundations of PL in educational practice. Each offers a distinct but interconnected contribution: CL emphasizes social interdependence and emotional growth, SE cultivates belonging, motivation, and authentic participation, and GBAs promote tactical understanding and decision-making in contextualized play. Together, these models illustrate the multidimensional character of PL, showing that no single approach can capture its full scope, but that each contributes unique pathways toward holistic, student-centered learning (Dudley et al., 2022; Fernández-Río & Iglesias, 2024; Hastie & Mesquita, 2016; Harvey & Jarrett, 2014).

While each model holds distinct strengths, research has shown that their effects can be complementary. Combining or sequencing SCAs – such as

integrating SE to build inclusive team culture and GBAs to develop tactical cognition – has been shown to lead to deeper, more balanced learning across domains (Araújo et al., 2016; Farias et al., 2022). Hybrid approaches have demonstrated success in enhancing physical performance, strategic thinking, and inclusive participation and social cohesion. For instance, in a volleyball unit, the sequential use of SE and the Step-Game Approach improved both motor and cognitive outcomes while maintaining student motivation and collaboration (Farias et al., 2022). These findings underscore the value of pedagogical pluralism in PE – where the intentional blending of models allows teachers to respond to learner diversity, developmental readiness, and contextual realities more effectively. Through such hybridity, SCAs can guide students' PL journeys in ways that are both responsive to context and equitable in educational opportunity (Casey & Kirk, 2021).

Despite robust evidence, the implementation of SCAs is often hindered by systemic and cultural barriers. Teachers may face difficulties transitioning from directive teaching to models that require shared authority, flexible planning, and facilitation of student-led inquiry. A lack of sustained professional development is a recurring barrier to meaningful curricular and pedagogical change in PE, particularly in contexts where teacher education continues to prioritize technique-based paradigms (Casey & Kirk, 2021). Additional constraints include large class sizes, time limitations, and curricular rigidity – all of which can discourage innovation. Moreover, in many school cultures, competitive sport remains the dominant lens through which PE is understood, posing ideological resistance to pedagogical shifts. Addressing these constraints requires coordinated efforts: rethinking teacher preparation, investing in school-level support, and fostering a broader understanding of PL as an inclusive, developmental aim of PE. When thoughtfully planned and institutionally supported, SCAs do more than deliver physical competence – they offer educationally rich experiences that cultivate the whole learner. Their alignment with the philosophical and pedagogical dimensions of PL makes them not only viable, but essential, within a renewed vision of PE for lifelong human development.

Final considerations

This essay has argued that PL can be understood not merely as one of several goals in PE, but as a promising conceptual orientation for rethinking its educational purpose. Grounded in a robust philosophical foundation – drawing on monism, phenomenology, and existentialism – PL offers a way to reframe the role of movement in education as a medium for personal meaning, agency, and lifelong development. It aligns PE with broader aims such as well-being, autonomy, social responsibility, and equity. International frameworks like Canada’s CAPL and Australia’s APLF have demonstrated how PL can be operationalized in both evaluative and pedagogical terms. While the CAPL provides valuable metrics for public health monitoring and youth development, the APLF offers a developmentally rich and pedagogically grounded approach that integrates the four domains of PL: physical, cognitive, social, and psychological. The recent emergence of the PPLA (Mota et al., 2021) also represents a promising step toward national alignment. Nevertheless, empirical research reflecting the application of these frameworks and tools to the actual development of students’ PL within educational PE contexts remains scarce. A particularly evident gap concerns the lack of longitudinal research capable of tracing how PL develops and is sustained over time. Existing studies are largely cross-sectional or short-term in nature, with only a few exceptions demonstrating lasting impact, such as the transformative outcomes reported by Farias et al. (2020). While this essay offers a theoretical and pedagogical rationale for PL, further empirical research is required to examine its sustained implementation across diverse educational realities.

The discussion has also shown that SCAs – namely CL, SE, and GBAs – may provide pedagogically coherent pathways for fostering PL. When thoughtfully implemented, these models offer students authentic, inclusive, and meaningful learning experiences in which movement is lived, interpreted, and owned. They enable the co-development of motor competence, strategic thinking, collaboration, self-confidence, and critical reflection – making them not only compatible with PL but central to its realization in school settings. Yet, despite this pedagogical promise, real-world implementation of PL and SCAs remains constrained by structural, cultural, and curricular factors. Overcoming these challenges requires a collective shift that reimagines PE not as a technical discipline but as an educational space that cultivates holistic and equitable learning for all students.

Future curriculum reforms and teacher education programs must explicitly integrate PL as a guiding framework, ensuring coherent pedagogical strategies from early schooling to graduation. As this essay has outlined, placing PL at the heart of PE is not only theoretically justified but urgently necessary. Such questions should continue to guide how we reimagine PE – not merely as instruction in movement, but as an evolving educational journey toward meaningful, inclusive, and lifelong engagement in physical activity.

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Chapter III – Empirical Articles

Empirical Article 1

Cooperating teachers as facilitators of preservice teachers' immersion in the educational community: A physical education teacher education case study

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Abstract

In physical education teacher education (PETE), supporting preservice teachers' (PSTs') immersion into school communities is critical to fostering their professional learning. However, this socially situated process, where PSTs must gain legitimacy, engage with institutional practices, and navigate professional identities, remains underexplored in the PETE literature. Drawing on social learning theories, this representative case study investigated how experienced cooperating teachers (CTs) enacted facilitation strategies to mediate PSTs' immersion into the educational community. The study was framed by the concepts of legitimate peripheral participation, landscapes of practice, and the developmental stages of communities of practice (CoPs), including the PSTs-CT CoP and other CoPs within the broader school landscape. Participants included 15 PSTs placed in five schools, five CTs, one university supervisor, and one participant-observer. Data were collected over a full academic year through focus group interviews, the university supervisor's yearlong log, and field notes from the participant-observer. Findings suggest that CTs employed a phased and intentional approach to facilitation, aligned with the evolution of CoPs. Key strategies included (i) presenting the landscape, (ii) legitimising participation and creating perceived value, (iii) gradually expanding leadership roles, and (iv) supporting contributions that 'give back' to the school community. This study highlights how CTs' facilitation supported not only immersion but also the development of PSTs' knowledgeability (i.e. their capacity to be recognised across multiple professional contexts), thus reinforcing the CoP's role and visibility within the educational community.

Keywords: Physical education teacher education, preservice teachers, cooperating teachers, professional learning, communities of practice

Introduction

In initial teacher training, it is essential to recognise that professional learning³ – learning to be (and become) a teacher – is an eminently social learning process

³ We use the term *professional learning* to describe PSTs' integration into the educational community. As MacPhail et al. (2014, p. 41) define, "professional learning constitutes the learning undertaken on a daily basis, embedded within the remit of fulfilling the role of a teacher or teacher candidate". This learning is often more powerful when it occurs within a community.

(Lave and Wenger, 1991). Learning the craft of teaching Physical Education (PE), particularly the “technical” aspect, such as the pedagogies to be applied in lessons, is an important component (Calderón and Tannehill, 2021; Silva et al., 2021). However, this is not the sole facet of what being a teacher is (Alves et al., 2019). Becoming a teacher also involves active engagement with the professional community in which one is embedded. Preservice Teachers (PSTs) must internalise the norms of that community, immerse themselves in its culture, and gradually secure their membership. This professional integration process is tied to identity development through legitimate peripheral participation (Lave & Wenger, 1991), with PSTs evolving from newcomers to contributing members of the school community (Azevedo et al., 2023). The legitimacy of multiple trajectories and levels of involvement is continuously negotiated among community members, influencing PSTs’ transition toward more central participation and professional membership (e.g. by leading the organisation of events significant to the community).

Physical Education Teacher Education (PETE) programmes are essential for preparing PSTs to navigate the complexities of the educational system and integrate effectively into their assigned school communities. Thus, PETE courses must align with best practices in teacher education by adopting innovative strategies that effectively immerse PSTs into school communities and foster their professional learning (MacPhail et al., 2014). Learning to be a teacher involves adopting a social role and navigating a specific culture, a process that can be realised through PSTs’ participation in Communities of Practice (CoPs) (MacPhail and Tannehill, 2012; Parker et al., 2012). CoPs are groups of individuals who share a concern or passion for a domain and improve through sustained mutual engagement (Wenger et al., 2002). A CoP has three core dimensions: (1) a *domain* of knowledge that unites the group's focus; (2) a *community* whose members care about the domain; and (3) a shared *practice* they are developing. In the context of this study, the *domain* refers to PSTs’ developmental journey during school placement, as they seek recognition as legitimate members of the teaching profession – a process shaped by their engagement with and adaptation to the school’s various communities. The *community* includes the PSTs themselves, who strive for meaningful learning experiences and positive evaluations, with school-based mentors playing a pivotal role in guiding and supporting this process. The *practice* involves PSTs negotiating

relationships with influential members of the school community, which directly impacts their access to learning resources and their progression toward full participation in the domain.

In PETE, CoPs can be found in school placements, where PSTs – often placed into groups of three to four – collaboratively develop their teaching through shared experiences. However, PSTs’ engagement in CoPs during school placements is not automatic and often requires active facilitation. As a critical bridge between university-based learning and real-world teaching (McEntyre et al., 2018), the school placement is typically composed of a triad of University Supervisors (USs), Cooperating Teachers (CTs), and PSTs. CTs play a particularly important role, mediating theory and practice, fostering inclusion, and helping PSTs navigate the realities of school life (Alves et al., 2019). Identifying PETE strategies that support social integration and community immersion is therefore key to enhancing PSTs’ professional learning.

Recent work by Hordvik and Beni (2024) categorised PETE pedagogies into: (a) (auto)biographical pedagogies, where PSTs reflect on personal experiences; (b) experiential pedagogies, rooted in practice-based learning; and (c) professional learning pedagogies, which promote collaboration and peer learning. While these signature pedagogies contribute to the understanding and continuous evolution of PETE practices, they often underexplore the social learning mechanisms central to CoPs. Studies show that CoPs foster professional growth through dialogue, shared challenges, and collaborative reflection (Calderón & Tannehill, 2021; Parker et al., 2012). Chambers et al. (2011), for instance, found that PSTs engaged in a CoP became more proactive, autonomous, and resilient. However, such communities rarely emerge organically and often require intentional facilitation (Gonçalves et al., 2022). CTs are central to this process, balancing support and leadership to guide PSTs’ development within the CoP (Valério et al., 2024).

Landscapes of Practice and the stages of development within Communities of Practice

This study uses the CoP social learning theoretical lens (Lave & Wenger, 1991; Wenger et al., 2002; Wenger-Trayner & Wenger-Trayner, 2015) to capture and

understand the integration and immersion processes of PSTs when they join the educational community to become PE teachers. While a CoP represents a specific community (e.g. a PE department), Landscapes of Practice (LoPs) encompass the broader professional field and its collective knowledge base (Culver et al., 2019). LoPs are complex systems of CoPs and the boundaries between them (e.g. the CoP formed by the group of PSTs cohabits with the PE-group CoP), providing a broad social perspective on professional learning (Wenger-Trayner & Wenger-Trayner, 2015). During the professional school placement, PSTs navigate a diverse array of CoPs when they first enter the educational community: school management, operational staff, PE department, and the broader teaching community, each playing a role in their inclusion and learning. CTs, as established members of this wider community, can help PSTs navigate across institutional boundaries with these CoPs.

Learning within a LoP involves developing both competence and *knowledgeability* – the ability to engage effectively and be recognised across multiple CoPs and contexts within the educational landscape (Farnsworth et al., 2016). Formal and informal learning experiences shape PSTs' professional identities (Gonçalves et al., 2022), however, navigating across CoPs can evoke feelings of inclusion or marginalisation, influencing their sense of belonging. Wenger-Trayner and Wenger-Trayner (2015) outlined three modes of identification that position individuals within their LoP, linking broader social contexts to specific CoPs. In our study, these concepts help illuminate how experienced CTs facilitate PSTs' integration into the school community, particularly within the CoP formed between PSTs and CTs (PSTs/CT-CoP). The analysis draws on the CoP's developmental trajectory to explore how CTs' facilitation strategies support PSTs in navigating this landscape. Specifically, we apply the following modes of identification: (a) Alignment – understanding and adapting to the school's competence regimes, values and practices (e.g., interactions with school boards and other professional groups); (b) Engagement – active participation across CoPs (e.g., with PE teachers or parents); and (c) Imagination – constructing professional identity through daily interactions (e.g., with colleagues, staff, students, and CTs).

Moreover, during the school placement year, across the various cooperating schools, the PSTs/CT-CoP provides a milieu where PSTs can openly share common

struggles and challenges related to their integration while engaging with other CoPs. Its evolution can be seen as a consolidation process in which the CoP gains legitimacy, accesses resources, and its members become increasingly recognised as teachers within the broader educational landscape (Wenger et al., 2002). This development unfolds through five stages – potential, coalescence, maturing, stewardship, and transformation (see Table 1) – which reflect the CoP's growing cohesion around shared knowledge, pedagogical alignment, and mutual support. Such joint evolution strengthens newcomers' engagement (i.e. PSTs) with the wider professional community and supports the development of teaching competencies.

In line with Wenger et al. (2002), CTs play a central role in supporting the development of CoPs, particularly in the early stages of formation. Within the PSTs/CT-CoP, CTs facilitate this process by helping define shared interests, clarify roles, and establish initial relationships. As the community evolves, they adapt their support strategies – combining structured guidance, informal mentoring, and brokering across institutional boundaries. This study examines how CTs enact and adjust their facilitation practices across different stages of CoP development within a well-established PETE programme.

Table 1. *Community of Practice stages of development, description and core functions at each stage.*

Stages	Description	Core functions
Potential	Group of people who share the same issues and can benefit from group sharing	Share knowledge and experiences; Interactions are sporadic and the focus is on identifying common interests
Coalescing	Community members recognize each other's strengths	Members begin to explore their areas of interest more deeply and define common goals
Maturing	Sharing is exponential and members are actively involved in their professional development	Common practices and norms begin to emerge, and the CoP begins to have a significant impact on the professional development of its members
Stewardship	The community becomes more stable and organized, which can impact the organization	The influence of the CoP is expanded and gains external recognition, and can impact other communities or organizations; The dissemination of successful practices broadens the reach and relevance of the CoP
Transformation	By achieving the initial objectives, the community can be divided into subgroups	Redefining goals and strategies to adapt to new circumstances and challenges

Note. Community of practice (CoP)

The multidimensional (and overlooked) role of Cooperating Teachers in Physical Education Teacher Education

CTs play a central role in supporting PSTs during school placement, serving as their first professional role models and exemplifying the standards of PE teaching (Meegan et al., 2013; McEntyre et al., 2018). Their practical expertise and familiarity with school culture enable them to mediate PSTs' integration into the educational community, particularly in the early stages of adaptation to a complex environment shaped by established norms and values. Conceptually, CTs act as facilitators who guide PSTs in identifying key pedagogical issues, refining their practice, and, as Wenger et al. (2002, p. 80) puts it, "informally linking community members, crossing boundaries between organisational units and brokering knowledge assets.". Existing research highlights this facilitative role across different contexts. Studies have primarily focused on CTs' mentoring identity (Amaral da Cunha et al., 2018; Young & MacPhail, 2015) and their support in implementing specific pedagogical approaches (Silva et al., 2021). In Ireland's COPET programme, CTs are seen as instrumental in shaping PSTs' competence, identity, and pedagogy (Meegan et al., 2013), while in Norway, they are responsible for overseeing school-based practice, complementing university supervisors' theoretical input (Moen & Standal, 2016).

To date, few studies have applied the CoP evolution framework to examine PSTs' professional learning as community immersion (MacPhail & Tannehill, 2012; Parker et al., 2012), leaving the CTs' role as CoP facilitators largely unexplored. The means and strategies specifically employed by institutional facilitators to foster the flourishing of CoPs have been only superficially addressed in the literature (Wenger et al., 2002). Accordingly, within a PETE setting, the present study aims to examine how experienced CTs enact facilitation strategies to support PSTs' immersion into the educational community, as shaped by the dynamics of an evolving CoP.

Methods

Study design

The study followed a representative case study approach (Bryman, 2012) to capture the specific circumstances and conditions of a typical situation within a PETE programme. It explores the role of CTs in facilitating PSTs' immersion into school

communities by identifying the key facilitative processes they employ. The PETE programme under study is developed by a well-established sports faculty in northern Portugal, recognised internationally for its contributions to teacher education research and innovation (Azevedo et al., 2023; Farias et al., 2018, 2023; Valério et al., 2024). This design was selected because (i) it shares structural and pedagogical features with other PETE programmes and provides a suitable context in which broader questions of CT involvement can be explored; (ii) it integrates CTs as core teacher education agents through clearly defined roles; and (iii) it supports a research-informed, reflective approach to PETE, aligning with the objectives of this study.

Context and Participants

The study was conducted during the professional school placement year of a two-year PETE programme (see Supplement 1). In the first year, PSTs engaged in experiential learning through micro-teaching, peer teaching, and teaching in local schools, supported by course units focused on pedagogy, identity development, and participation in educational communities. The second year involved a year-long school placement in cooperating schools, where PSTs were placed in groups of three and assigned to a resident class⁴ under the joint guidance of a CT and a university supervisor. PSTs were responsible for planning, teaching, and assessing PE activities, as well as teaching units in primary schools. Their development was assessed through three key domains defined in the official placement regulations of the PETE programme⁵: (1) organisation and management of teaching and learning; (2) school participation, immersion, and community work; and (3) professional development. The school year was divided into three terms: September–December (Term 1), January–April (Term 2), and April–June (Term 3) – providing a consistent structure for data collection and analysis.

Participants included 15 PSTs (8 males, 7 females; $M = 24 \pm 1.8$ years), five CTs (3 males, 2 females; $M = 51$ years; M experience = 22 years), and one US, an experienced faculty member in sports pedagogy. The first author, a PhD candidate,

⁴ In the specific nomenclature of this PETE programme, the resident class refers to the class assigned to each PST for the entire school year. Additionally, the PSTs who form the group of practicum also share the teaching of another class, referred to as the shared class.

⁵ Retrieved December 10, 2024, from https://sigarra.up.pt/fadeup/pt/ucurr_geral.ficha_uc_view?pv_ocorrencia_id=357210.

also participated as a participant-observer. Participants were selected using purposive and convenience sampling. PSTs had to be placed at one of the five cooperating schools and have completed at least 90% of their first-year coursework. CTs were chosen for their recognised expertise in mentoring and school-based teacher education. All participants provided informed consent, and the study received ethical approval from the host institution [CEFADE 27_2024].

The research team included the PhD student (first author), who conducted all fieldwork and observations, and two academic supervisors. Although not involved in data collection, the supervisors contributed to methodological planning, development of interview protocols, and continuous reflection throughout the research process.

Cooperating teachers and university supervisor

CTs played a central role in guiding PSTs throughout the school placement. They supervised day-to-day teaching, supported PSTs' integration into the school context, and mentored them through pedagogical and institutional challenges. Their in-depth understanding of the placement's goals and structure, along with extensive prior experience in supervising placements, enabled them to foster PSTs' development as reflective and competent professionals (see Table 2 for a breakdown of CTs' teaching and mentoring experience).

The university supervisor coordinated the overall supervision process and collaborated closely with CTs to align expectations and feedback. In addition to conducting lesson observations, the US led monthly sessions with both PSTs and CTs to support reflective practice and pedagogical refinement (see Supplement 2).

Table 2. Demographic and professional background of the Cooperating Teachers, including gender, age, job position, coaching and teaching experience, and training institution.

CT	Gender	Age	Job position	Years as sports coach	Years teaching PE	Years as CT	Training institution
CT 1	Female	47	Full time permanent	12 / Volleyball	24	20	Faculty of Sport, University of Porto
CT 2	Female	55	Full time permanent	20 / Gymnastics	34	25	Faculty of Sport, University of Porto
CT 3	Male	43	Full time permanent	7 / Football	19	17	Faculty of Sport, University of Porto
CT 4	Male	51	Full time permanent	9 / Football	30	22	Universidade de Trás os Montes e Alto Douro, Vila Real
CT 5	Male	59	Full time permanent	18 / Handball	38	26	Faculty of Sport, University of Porto

Note. Cooperating Teacher (CT); Physical Education (PE)

Data Collection

The study utilized Focus Group (FG) interviews with CTs and PSTs, a reflexive log of the US, and field notes from the first author's participant observations to provide a realistic view of PSTs' daily interactions with the educational community, enabling comparisons across school contexts and CTs' facilitative actions.

Focus Group Interviews

Twelve FG interviews were conducted with CTs and PSTs at three points during the school year: at the start (September) to understand CTs' initial strategies and gather PSTs' perceptions; mid-year (February) to assess the evolution of CTs' approaches and PSTs' school roles; and at the end (June) to evaluate the CTs' strategies that most aided PSTs' integration into the educational community and their acquired status. Three 90-minute FG interviews were conducted with all five CTs. Nine 60-minute FG interviews were held with PSTs, divided into three groups of five (each group included one PST from each of the five cooperating schools) and interviewed once per school term. The FG interviews were conducted by the first author and another research team member. Before each session, the first author explained the study's purpose. Interviews followed themes aligned with the study's objective but remained open to emerging topics. Sample questions for CTs included: "How do you mediate PSTs' initial welcome in the school and introduce them to its various bodies?". For PSTs, sample question were: "How did you experience your arrival at the school in terms of interpersonal interactions? Did CTs use any strategies to support your integration, or did this happen informally?". Interviews were conducted

separately to encourage openness and avoid inhibiting critical or sensitive input. All interviews were audio-recorded and transcribed verbatim for analysis.

University Supervisor Log

Throughout the year, the US collected reflective notes on their supervision and shared them with the research team for analysis. These notes focused primarily on PSTs' lesson observations during the school placement, with occasional reflections on their school immersion, professional practice, and CTs' facilitative actions. This documentation supported the triangulation of data on PSTs' evolving engagement within the school communities and the mentoring strategies employed by CTs.

Participant-Observer Field Notes and Reflective Diary

During the professional school placement, the first author conducted 30 field observations, equally distributed across the five cooperating schools (six observations per school throughout the school year). Each visit lasted a full school day, during which PSTs' teaching was observed and the author participated in formal settings such as meetings, collaborative sessions between PSTs and CTs, and reflective discussions with PSTs, CTs, and the US. Informal moments, like breaks and casual conversations, were also engaged in to capture subtleties of daily life and interactions among CTs, PSTs, and other school community members. These interactions were occasionally complemented by informal questioning (e.g. "Why is your practicum group organising this activity?"), which helped explore the reasoning behind PSTs' actions. Handwritten field notes were taken during all observations to capture immediate impressions, contextual details, and key interactions. These notes were later revisited and expanded in a reflective diary to support more analytical and systematic data treatment (Farias et al., 2018). The first author also attended all 18 work meetings and nine workshops (see Supplement 2) led by the US at the host institution, recording only events and interactions relevant to the study.

Data analysis

All FG interviews and audio recordings were transcribed verbatim, and data analysis followed a mixed inductive–deductive thematic approach (Braun & Clarke, 2006).

This method enabled the identification of patterned meanings related to how CTs facilitated PSTs' engagement in school-based professional learning, considering both relational dynamics and structural aspects of each educational setting.

The analysis unfolded in three interconnected stages: The first phase involved data familiarisation and coding, during which the research team immersed themselves in the data through repeated readings of the transcripts. Each transcript was reviewed line by line, and initial codes were generated inductively, capturing meaningful actions and recurring patterns. Codes focused on facilitative practices such as introducing PSTs to socialisation routines or creating networking opportunities. These early codes reflected practical strategies used by CTs to support PSTs' entry into the professional community.

The second phase corresponded to category formation and theme development. The initial codes were collaboratively reviewed and grouped into broader categories, using cross-case comparison to identify commonalities, tensions, and contrasts. For example, some categories reflected efforts to increase PSTs' responsibilities (e.g., *Extended Responsibility*, which included actions like delegating leadership tasks: "I had the opportunity to organise an orienteering course during a field trip to Porto"). These categories were further refined into preliminary themes that captured both relational and structural mediators of professional learning, such as *Evolving Participation and Responsibility in the School Community*.

In the third phase, the categories and themes were examined through a deductive, theory-informed lens, drawing on the frameworks of LoPs and CoPs. This theoretical framing supported the analytical depth of the findings by situating participant experiences within broader constructs such as participation trajectories and community integration. For instance, the theme described above evolved into *Scaling Leadership in Community Participation*. The dialogue between the data and the CoP theoretical lens revealed an alignment between CTs' facilitative action and four stages of CoP development (Wenger et al., 2002): (a) *Potential*, (b) *Coalescence*, (c) *Maturing*, and (d) *Stewardship*. The final stage, *Transformation*, was excluded from the analysis, as it refers to long-term structural changes within the CoP and its relationship to the broader organisation. In this study, such

developments were not observed, since PSTs' formal participation concluded at the end of the school year.

The four final themes were developed through iterative discussions within the research team and represent a nuanced understanding of CTs' facilitative strategies across diverse school contexts. These themes were: Laying the groundwork for participation, Earning a place in the school community, Scaling the leadership in community participation, and Giving back to the community

Trustworthiness

Several trustworthiness criteria ensured research quality: prolonged engagement, data triangulation, respondent validation, and peer-checking analysis. The first author's prolonged engagement enhanced the study's credibility and internal validity (Bryman, 2012). It built trust with participants, allowing access to formal and informal settings and deeper insight into PSTs' experiences and CTs' actions. It also ensured observed behaviours matched theoretical interpretations, grounding findings in real school dynamics. Data triangulation captured different accounts of the social reality to describe the phenomenon from different participant perspectives. Respondent validation involved sharing results with CTs to ensure alignment between interpretations and real-life experiences (credibility). Finally, to avoid potential data contamination, the second and third authors – who were not involved in data collection – independently analysed the transcripts during the initial phase of coding. In a second phase, peer debriefing sessions were held within the research team to resolve discrepancies through discussion and, where necessary, refine category labels and theme definitions.

Results

The data collected throughout the school year revealed a dynamic progression in the PSTs-CT CoPs, as CTs enacted a range of facilitation strategies to support PSTs' engagement within the broader school landscape and their trajectories of immersion and participation in the life of the school communities.

Throughout the analysis, four broad phases in the development of the PSTs-CT CoPs were identified. Across all phases, community interactions were grasped through the three modes of identification within the LoP. These modes were

navigated in response to context-specific demands, relational dynamics, and emerging opportunities that shaped PSTs' participation. The CTs' facilitation of PSTs' immersion into school communities were considered with reference to three dimensions: (i) for mal interactions with the school board, other specific groups of school teachers, and PE facility staff (alignment); (ii) active participation in the PE teachers' group, the wider student community, and students' legal guardians (engagement); and (iii) the internal dynamics of the PSTs-CT CoPs, together with interactions with PE students (imagination). Table 3 outlines the boundary interactions encountered during PSTs' navigation of the LoPs, while Figure 1 provides a complementary overview of how CTs' facilitation strategies evolved over the school year, illustrating the progression of PSTs' immersion through different stages of CoP development and across multiple layers of the educational LoP. The categories in each subtheme are embedded in the narrative and denoted in italics.

Table 3. *Communities of practice within the school organisation: examples of interactions between the main CoP (PSTs/CT) and other communities, illustrating different levels of community identification (imagination, alignment, and engagement).*

Communities of Practice within the School Organisation	
Boundaries (Levels of community identification)	Communities
Imagination	<i>Main CoP: The group of PSTs and their respective CT (PSTs/CT-CoP)</i> Main CoP ⇌ staff responsible for PE facilities Main CoP ⇌ PE students
Alignment	Main CoP ⇌ head of school and members of the school board Main CoP ⇌ teachers from other curriculum subjects Main CoP ⇌ overall school staff
Engagement	Main CoP ⇌ the group of PE teachers Main CoP ⇌ the overall student community Main CoP ⇌ PE students' legal guardians

Note. Community of Practice (CoP); Pre-service Teachers (PSTs); Cooperating Teacher (CT); Physical Education (PE)

Laying the groundwork for participation

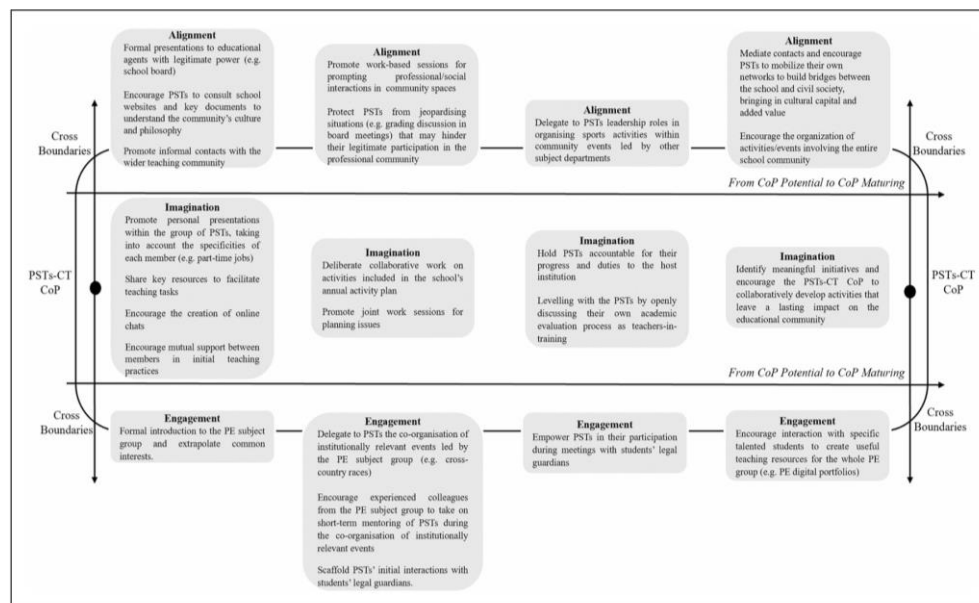
At the outset of the school placement, CTs took deliberate steps to support PSTs' immersion, ranging from formal introductions to fostering early familiarity with schools' routines and values. Some strategies centred on visibility and recognition within the institution, while others nurtured belonging through peer interaction and

informal engagement. Three subthemes were generated through the analytic process: Formalised presentation, Cultural and social induction, and CoP 'activation'.

Formalised presentation. In welcoming the PSTs, all CTs expressed their intention to become acquainted with the PSTs' personal circumstances, to encourage them to present themselves, and to facilitate communication channels with other relevant stakeholders. An initial strategy shared by all CTs was the facilitation of formal presentations aimed at ensuring that PSTs were immediately recognised as members of the community:

I always escort them and formally introduce them to the head of school. Also, to the operational staff in the printing office, and to the staff managing the PE facilities. These people will greatly facilitate PSTs' work. (CT4; 1st FG)

Figure 1. CTs' facilitation strategies to support PSTs' immersion into school communities, mapped across the evolving dynamics of the PSTs-CT CoP and the three modes of identification.



The formal presentation was extended to the CoP of PE teachers: 'In the initial meetings of the PE group and other departments, the CT placed us centre-stage; we had to formally introduce our selves to the other teachers' (PST2; 1st FG). Three of the CTs were concerned with understanding the PSTs' personal

circumstances in order to better tailor the demands placed upon them (e.g. the volume of activities in which PSTs were expected to participate) to the expectations of the school and other teachers regarding the work to be undertaken by the PSTs:

The CT sent us an email asking us to prepare a brief presentation about our personal attributes, sports experience, teaching curriculum vitae, and professional duties outside the school. (PST1; 1st FG)

By experience, I know some of the PSTs accumulate school placement duties with external part-time jobs. I like to articulate this information right away and distribute their workload to ensure that all PSTs will be available to meet all the professional school placement's demands. (CT2; 1st FG)

The intention was to create a flexible work plan that simultaneously clarified professional ethics and expectations regarding the PSTs' work, established a minimal baseline with which they had to comply, and mitigated potential conflicts with the expectations of those who might demand more from them.

Cultural and social induction. Facilitating PSTs' rapid appropriation of each school's specific culture was an early concern frequently noted by the CTs. Four CTs deliberately asked the PSTs to access information on the schools' websites and organisation guidelines:

The CT suggested we visit the website and research the school's patron to "absorb" cultural and philosophical aspects. I have been here all my life and didn't know this. (PST2; 1st FG)

All CTs undertook deliberate initiatives to liaise between the PSTs and other school communities (PE teachers and those from other departments). One strategy consisted of integrating the PSTs into existing social routines (e.g. informal social events within the broader teaching community):

The 'cake day' initiative contributed to a quicker integration, as we started to meet with teachers from all departments (the teachers brought a cake each week on a rotating basis for teatime). Some of the PE group teachers still talk about the chocolate cake I brought. (PST4; 1st FG)

Regarding the pedagogical work of the PSTs within the PSTs-CT CoPs, the CTs established a link with the legacy left by PSTs from previous years, 'showing them concrete examples of the work they were expected to produce' (CT1; 1st FG):

Our CT supported us with lots of pedagogical resources from previous years: teaching units, lesson plans, and assessment sheets. This allowed us to analyse and understand what was expected from us. (PST6; 1st FG)

CoP "activation". Within the PST-CT CoP level, the CTs sought to foster the building of a group identity in different ways, with the CoP logo being exemplary:

Despite coming from the same faculty's course, several PSTs don't know each other. I always ask them to create a logo for their group that is different from the logos of past PST groups. All resources (unit plans, etc.) will have their "stamp". (CT5; 1st FG)

Three CTs took deliberate actions to diminish the potential hierarchical power relations between mentors and mentees, encouraging open communication channels from the outset: 'A WhatsApp group is immediately created [with PSTs and their CTs as members]' (CT5; 1st FG); 'I want PSTs to know that although they are still in training, for me they are like the other teachers. I give them my personal phone number and they can call me at any time' (CT4; 1st FG). Another strategy used by all CTs during PSTs' teaching practice in the first school term was the structuring of lesson delivery through collaborative dynamics among the PSTs:

Our CT asked us to attend each other's classes and to step in to help our peers [fellow PSTs] if needed whether by giving feedback to a student or helping

set up activities. Everyone felt more confident knowing we could count on each other's support. (PST3; 1st FG)

They realise that everyone needs help, they accept criticism more readily, and they become more open to relationships with their fellow PSTs. (CT3; 1st FG)

Overall, data from the early stages of the school placement pointed to CTs' efforts to build familiarity, foster communication, and support the initial integration of PSTs into the school setting, where newcomers began to access shared and social practices within the community.

Earning a place in the school community

As the school placement progressed, CTs adopted new strategies aimed at reinforcing PSTs' involvement across the school community. This facilitation included efforts to increase PSTs' visibility, build trust, and expand their interactions with other members of staff. Three subthemes were identified: Legitimising newcomers' place in the community, Recruiting mentoring teams, and Balancing protection and professional exposure.

Legitimizing newcomers' place in the community. A common concern among CTs was to positively shape the impressions that other school teachers would form about the newcomers. CT4, in particular, promoted work sessions in community spaces, aiming to publicly highlight the PSTs' work ethic and professionalism to the broader teaching community. In the university supervisor's words:

In the school visit, the CT and PSTs were working in the teachers' common lounge. The CT later told me he was strengthening the PE status in the school. A message was sent to the teacher community that the PSTs' PE lessons were soundly planned beforehand. (University supervisor's log)

A strategy also common to CTs was the 'use' of the schools' annual activity plans to strengthen the skills and institutional position of PSTs in the community: 'During the cross-country athletics event, we felt like real teachers because we were

involved in the event organisation. As the other PE teachers placed their trust, the students saw us as leaders too' (PST5; 2nd FG). There was a clear and deliberate intention to position PSTs as active contributors within the PE department:

Involving PSTs in events organisation led by the PE group allows them to interact with various educational agents (students, parents, other teachers), enhancing their sense of belonging to the school. (CT3; 2nd FG)

Recruiting mentoring teams. Two CTs reported that they created opportunities for other social agents to take on responsibility for PSTs' immersion into the school community:

In the mega athletics event organisation, Alice, an experienced teacher of the PE group was in charge. She monitored the PSTs' input in the event and was very impressed; they helped in students' recruitment phase and in taking records.

(Participant-observer FN/D)

In keeping with another formal procedure in the school placement duties (teaching PE in primary classes), the PSTs also had the opportunity to teach in other partner schools. In these cases, CTs reached out to their senior PE colleagues from partner schools, inviting them to share in the mentoring of PSTs as part of a collaborative approach to their training experience. CT4 (2nd FG) reported the benefits of these cross-community interactions:

They [PSTs] have the chance to get advice from another senior teacher. They get to see different teaching styles and pick up what they think will be useful for their future teaching.

An important recognition within the community at this stage of the school placement, highlighted by two groups of PSTs, was the emergence of closer professional relationships with other senior PE teachers, especially those involved in their temporary co-mentoring:

Two 5th-grade teachers from the partner school asked us for some examples of the QR-code resources we used, as well as the content sequence we followed in handball. (PST10; 3rd FG)

Balancing protection and professional exposure. All CTs took protective measures to shield PSTs from situations that could potentially compromise their position within the school community, particularly in their interactions with key stakeholders (e.g. students' legal guardians). Two CTs also assumed responsibility for potentially sensitive aspects of PSTs' teaching roles, such as student assessment and grading. Several PSTs valued the CTs' active role in addressing these issues and, in particular, in providing the necessary justification during formal end-of-term grading meetings, where teachers from different subject areas collectively evaluated students' performance – a demanding responsibility that PSTs did not yet feel prepared to fully assume:

It was mainly for protection. We also think the CT may feel we are not yet fully prepared to lead the assessment process. Student assessment is a sensitive matter that can easily create tensions with parents and other class teachers. (PST8; 2nd FG)

In the first school-term assessment with the group of class teachers, the CT did all the talking; we were encouraged to take notes for subsequent group debate. (PST11; 3rd FG)

Channeling PSTs' use of digital platforms available in schools to mediate communication with students and their legal guardians served as a means of assigning them some responsibility in managing critical professional elements, while simultaneously maintaining a cautious distance a kind of protective shield– from tasks involving very high responsibility and impact on the school community (CT3; 2nd FG).

PSTs can interact indirectly with students and their parents through the Google Classroom. They upload resources, videos, and pedagogical feedback;

the students know in advance what the next lesson's content will be. (CT4; 2nd FG)

By balancing protection, guidance, and the transfer of responsibility, CTs enabled PSTs to contribute more fully to teachers' tasks, fostering more reciprocal relationships within the school community.

Responsibility transfer and leadership readiness

As the school year progressed, PSTs were gradually entrusted with responsibilities of greater institutional weight, particularly tasks that implied leading roles within the institutional practices of the school community. The CTs shifted to a less directive supervision style that allowed PSTs to carry out their roles with greater autonomy. Two subthemes were analytically constructed: Delegating extended responsibility, and Managing responsibility and expectations.

Delegating extended responsibility. Particularly from the second school term onwards, there was a widespread tendency for CTs to delegate to PSTs the responsibility of leading the organisation of school events. In two schools, this delegation also extended to cross-institutional interactions, with CTs mediating PSTs' engagement with external partners: 'We had the opportunity to organise an orienteering workshop during a field trip to Porto' (PST4; 3rd FG). A PST in another group added: 'We were guided [by the CT] on how to establish institutional contacts with the city council to request sponsorships; we had no idea of the level of formality involved' (PST6; 3rd FG).

With regard to PSTs' teaching practice, a notable step forward was their more active participation in the assessment of PE students, including face-to-face interactions with legal guardians during formal parent-teacher meetings:

In the second school term, although we didn't do the main talking, the CT asked us to handle a part of the presentation of the students' grades to their parents. We took full charge in the third term. (PST11; 3rd FG)

In contrast, in one school, PST12 (3rd FG) reported 'having little or no involvement in class board meetings for student assessment', a situation the respective CT5 explained as 'the way I usually do things; as a rule, I only let PSTs speak in the meetings later in the school year' (3rd FG).

Managing responsibility and expectations. As CTs delegated greater responsibility to PSTs, they simultaneously tightened accountability, keeping PSTs in a 'state of full readiness' (CT1; 3rd FG). One mechanism of accountability, mentioned by all CTs, was the routine monitoring of PSTs' professional portfolios— a mandatory resource documenting all teaching activities – which ensured compliance with the formal obligations required by school placement regulations:

Midway through the process, I start going through their professional portfolio with them, pointing out underdeveloped items and areas for improvement, making sure it conveys some kind of professional identity – who the PST is as a teacher, a description of the school, what lesson plans and activities they're applying, and their reflective diary. (CT1; 3rd FG)

The beginning of the third school term brought unexpected tensions within the PSTs-CT CoPs, which CTs could not directly control. Through continued contact with their peer networks of PSTs placed in other schools, some PSTs reported imbalances in the demands placed by different CTs and school management. As one PST explained:

We often chat with colleagues in other placements, so we know the load of activities we're asked to take on at my school is huge compared to theirs; we just hope all this effort will eventually make a difference in our grading. (PST8; 3rd FG)

In response, three CTs expressed the need to address the issue of PSTs' grading. Their concern was that, without open discussion and clear management of expectations about a fair workload reward balance, this risked breaking the momentum of PSTs' professional contribution to the school community:

The PSTs are students themselves, so halfway through the third term we started to discuss their school placement grading. They had to make an honest self- and peer-assessment, were encouraged to justify their appraisals, and I added my own observations. To prevent tensions over who was graded higher and whether this was fair, the meeting was held before it could become an issue. I made it clear that, right up to the end of the placement, they still had the chance to improve their grade. (CT4; 3rd FG)

As the school placement drew to a close, and with the PSTs-CT CoPs functioning as a continually productive community, PSTs reached a more mature stage of belonging and contributing more fully to the school community. At this stage, CTs began to take steps to ensure that the PSTs' contribution would leave a lasting mark on the school.

Returning value to the community

The final school term was marked by several self-initiated initiatives by PSTs aimed at adding value to their school communities. Two subthemes were generated: Preserving legacies and Enriching the school community.

Preserving legacies. One CT encouraged her PSTs to find ways of leaving an indelible mark on the community, suggesting the creation of tangible pedagogical resources as a potential way to do so. Building on this general guideline, the PSTs created multimedia portfolios with sequences of technical actions and learning progressions in roller skating and handball for use by the PE department and by future cohorts of PSTs in the following school year:

It's a tribute to this PSTs' group. They contribute to the teaching resources available to the PE department while leaving a legacy for future cohorts of PSTs.

All teachers will know who built these portfolios. (CT1; 3rd FG)

Enriching the school community. Extending PSTs' interactions with communities beyond the school represented a significant step in caring for the community's interests. In one school:

We organized a health-related activity by partnering with a local pharmacy and creating promotional videos about healthy eating and physical activity habits. A nurse also came in, to screen for diabetes and hyper tension. (PST9; 3rd FG)

In addition, one of the PSTs in another school tapped into his personal social network to bring in local council resources for future projects at his school:

It was a huge achievement; the county's sports senator himself came to the school to give a talk to our students. PST7 told me he was his brother-in-law and had almost "forced" him to involve the council in organising the school seminar.

(Participant-observer FN/D)

Overall, not all PSTs reported engaging in boundary-crossing initiatives, but the examples above illustrate the potential for broader community impact when PSTs acted under facilitative conditions (i.e. their CTs' mediation).

Discussion

This study examined how CTs facilitated PSTs' immersion in the educational community during a year-long PETE school placement. Specifically, it explored how CTs' mediation unfolded through the evolving dynamics of the PSTs-CT CoPs and the facilitation of PSTs' boundary-crossing within their LoPs as they became immersed in the school communities.

The study revealed a complex web of facilitation processes. CTs mediated PSTs' access to professional experiences (e.g. collaborative learning with fellow PSTs during PE lessons or engagement with key stakeholders such as students' legal guardians), enabling their progression towards more central roles, such as leading institutional events (Lave and Wenger, 1991). This encompassed both the internal evolution of the PSTs-CT CoPs and interactions with other CoPs across the LoPs. This dual focus aligns with Wenger's (1998) view of CoPs as inward-looking, developing practices and identities, and outward-facing, requiring boundary-crossing to engage with other communities and legitimise newcomers' participation (Wenger-Trayner et al., 2015). Although professional learning was not the direct

focus, immersion was considered an enabler of learning, and the processes observed implicitly created favourable conditions for PSTs' development. For instance, mentoring teams worked to legitimise PSTs as members of the pre-existing school communities, while also exposing them to alternative professional practices that could be adopted, adapted, or rejected—interactions known to contribute to novice teachers' pedagogical development (Silva et al., 2021).

In addition, CTs enacted versatile and differentiated mediation processes. These included: (i) facilitating initial legitimacy through tasks such as engaging with school policy, regulations, and professional routines (Parker et al., 2012; Wenger et al., 2002); (ii) protecting PSTs from prematurely assuming full responsibility in sensitive functions such as student assessment, with CTs temporarily retaining those tasks before gradually transferring responsibilities such as liaising with guardians or external institutions (Clarke et al., 2014; Valério et al., 2024; Wenger et al., 2002); and (iii) managing expectations about balancing PSTs' professional investment in school life with their final placement grading (Armour and Yelling, 2007).

PETE research has consistently documented the 'reality shock' PSTs face at the outset of school placement. Beyond technical challenges, this shock is often triggered by uncertainty regarding institutional expectations (Alves et al., 2019; MacPhail and Tannehill, 2012). In this study, CTs mitigated that initial impact by laying the groundwork for legitimate participation through formal introductions, integration into existing professional routines, and consideration of PSTs' personal circumstances beyond the work setting. Such immersion processes are critical to ensuring that assigned responsibilities (and PSTs' levels of active participation) are realistically aligned with their capacity to meet professional expectations (Alves et al., 2019; Armour and Yelling, 2007). Efforts to soften hierarchies were also key, as resident PE teachers sometimes claimed superior status, hindering PSTs' acceptance as full members of the school community (MacPhail and Tannehill, 2012; Parker et al., 2012). Hierarchical levelling can be pivotal, as it opens communication channels between newcomers and senior members, fosters a collective sense of purpose (domain), supports the development of shared repertoires and mutual engagement (Wenger et al., 2002; Wenger-Trayner et al., 2015), and enhances PSTs' professional identity development, possibly shaping

their immersion and sense of belonging within the school community (Valério et al., 2024).

Ensuring that PSTs secured a place within the school community became the next focus of CTs' facilitation. PSTs were included in annual activity plans, initially with tasks of lower responsibility (e.g. sporting events). This provided visibility to their contributions and strengthened their identity as community members (Lave and Wenger, 1991; Wenger et al., 2002). CTs also facilitated liaison with senior teachers, engaging them in the mentoring of PSTs through partnerships with other schools or by providing them direct supervision during events (e.g. inter-school athletics meetings). By acting as community brokers, CTs mediated cross-boundary interactions, expanding PSTs' learning networks and opening access to broader repertoires of practice (Clarke et al., 2014; Wenger et al., 2002; Wenger-Trayner et al., 2015; Young and MacPhail, 2015). A broker connects CoPs by translating and transferring meanings across boundaries, enabling the circulation of knowledge and practice (Wenger et al., 2002). Such mediation expanded PSTs' agency, offering multiple ways of acting and being within shared community norms, and helping them balance collective belonging with individual identity (Valério et al., 2024).

Another central component of CTs' facilitation concerned the dynamic interplay between gradually transferring professional responsibilities to PSTs (e.g. growing leadership of institutionally significant activities) and scaffolding these interventions by balancing professional exposure with protective measures. This dynamic was particularly evident in sensitive institutional tasks involving cross-boundary interactions with other educational stakeholders, such as student assessment or communication with students' legal guardians (Vinson et al., 2021). Rather than excluding PSTs from sensitive responsibilities, CTs channelled their participation into safer and temporarily peripheral roles. Multimedia platforms mediated this process, allowing PSTs to remain engaged in tasks that might otherwise have been beyond their reach (Farias et al., 2023). Likewise, balancing scaffolding with increased accountability through portfolio monitoring and structured peer/self-assessment of PSTs' performance aimed to ease tensions within the PSTs-CT CoPs, enabling them to mature further. This dual role positioned CTs as both facilitators of immersion and gate keepers of certification, as in this PETE context the grades they awarded to PSTs contributed significantly to the overall

evaluation determining their eligibility to teach (Valério et al., 2024). Thus, CTs' scaffolding not only supported PSTs' progression but also preserved trust and cohesion, ensuring the CoP was functional as a safe site of professional learning. Such facilitation is critical to sustaining community wellbeing and fostering members' mutual engagement, aimed both at professional learning within the CoP and at meaningful contributions to the life of the wider community (Wenger et al., 2002).

Returning value to the community became evident towards the end of the school placement, as CTs' intervention grew less directive and PSTs exercised greater agency and initiative. As PSTs appeared to gain wider recognition as contributing members (e.g. senior teachers adopted the professional resources they created), some began to act as community caretakers— what Wenger et al. (2002) describe as stewards of the domain— reflecting emerging professional worth and identity. Creating digital portfolios with pedagogical resources was one way they signalled a willingness to support future cohorts. Another case involved a PST drawing on his personal network to bring external resources into the school, showing how social capital may be mobilised in service of the community (Vinson et al., 2021; Wenger-Trayner et al., 2015). From a LoP perspective, such initiatives suggest that boundary-crossing can generate added value (Wenger-Trayner et al., 2015). Dialogical learning (i.e. through coordination, reflection, and mutual recognition) seemed to underpin these processes, supporting both PSTs' legitimacy and the community's capacity to engage across boundaries. While modest in scope, these instances show how PSTs may enrich their CoP and its positioning in the wider school landscape.

Final considerations

This study uncovered the intricate web of mediation processes enacted by CTs to facilitate PSTs' immersion in educational communities during school placements in a PETE programme. It highlighted how immersion was shaped by the interplay between the internal development of the PSTs-CT CoPs and their boundary-crossing interactions with other agents and CoPs within the LoP.

As a case study, our aim was to foreground effective facilitation practices that may inform teacher educators and researchers. However, we did not fully examine the power dynamics that often shape PSTs' professional learning, including

hierarchical tensions, resistance from established members, or the uneven acceptance of PSTs as legitimate participants. Such factors could have offered deeper insight into how community belonging contributes to the development of the professional competencies required for competent teaching. Future studies could extend this work by examining these challenges and their implications for PSTs' learning in greater depth.

Future research would benefit from prolonged and immersive qualitative fieldwork, such as ethnographic approaches. With their sustained presence in daily school life, ethnographers are well placed to capture the dynamic and often inconsistent nature of professional learning, while also offering a proximal understanding of the relationships, interactions, and emotions through which PSTs and school members negotiate belonging and participation. Such depth could generate richer insight into the interplay of facilitation, power, and identity across CoPs. At the same time, the facilitation strategies identified here offer a practical basis for mentor training within PETE programmes. Strengthening university–school collaboration, alongside investment in the professional development of teacher educators, university supervisors, and CTs, remains essential: effective mediation depends on these actors working in concert, aligning academic preparation with the lived realities of school practice. Such coherence can enhance the consistency, depth, and sustainability of PSTs' immersion and professional growth across placement settings.

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Supplemental material

Supplemental material for this article is available online.

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Empirical Article 2

Scaffolding preservice teachers' use of models-based practice in physical education: A participatory action research

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Abstract

Purpose: This study examined how two facilitators – a cooperating teacher (CT) and a participant observer – scaffolded the implementation of models-based practice by four preservice teachers (PSTs) throughout a full school year during a shared school placement, focusing on problem-solving scaffolding and PSTs' teaching practices. **Methods:** A participatory action research design was adopted, incorporating lesson observations, pre-/post-lesson reflections, informal interviews, reflective diaries, and focus groups interviews, analyzed abductively. **Results:** Initially, the facilitators guided problem identification and solution development to help PSTs overcome emerging challenges from practice but gradually empowered them to diagnose issues and devise pedagogical solutions independently. By the end of the placement, PSTs showed fuller ownership of their professional learning, linking past experiences to current teaching, sharing knowledge, and collaborating on solutions – demonstrating enhanced professional learning self-regulation. **Conclusion:** PSTs are more likely to adopt models-based practice when CTs embrace and model these pedagogies, receive on-the-spot scaffolding, or when strong collaboration exists between university educators and school-based facilitators.

Keywords: Physical Education Teacher Education; Professional learning; Pedagogical models; Sport Education; Cooperative Learning; Games-based approaches.

Introduction

As educational curricula worldwide strive to remain relevant and effective amid a rapidly shifting society (MacPhail et al., 2013), the most essential skills for 21st-century learners involve the development of adaptable cognitive and lifelong learning ability, autonomy, critical thinking and decision-making, creativity, innovation, communication skills, openness to diversity and social empathy (Cobo, 2013). School physical education (PE) and physical education teacher education (PETE) increasingly aim to contribute to K-12 PE students' holistic development (psychomotor, cognitive, social, and affective domains). This is often pursued through the adoption of constructivist-oriented learning perspectives (Chen et al., 2000) and, in some cases,

the implementation of PE curricula grounded in models-based practice⁶ (Casey & Kirk, 2020; Lutrell & Chambers, 2013). The constructivist-oriented perspective envisions learning as arising from students' involvement with the content as active learners (students construct their learning experiences), social learners (knowledge develops through positive social interactions), and creative learners (learning becomes personally meaningful through understanding and experimentation with the subject-matter) (e.g., Perkins, 1999). Further, models-based practice aligns the design and implementation of instructional activities (lesson organization, student grouping and peer interactions, content development) with the constructivist-oriented nature of learning in PE, facilitating students' achievement of multiple learning goals (Hodges-Kulinna et al., 2022).

In PE, the pedagogical principles underpinning models-based practice align closely with Dyson et al.'s (2004) unifying framework for student-centered instruction, which includes: (a) the teacher acting as a facilitator of student learning; (b) students working and learning in small groups; (c) games and learning activities being adapted to students' characteristics and learning needs; (d) learning activities being both engaging and challenging; (e) students taking responsibility for their own learning process; and (f) contributing to the learning of their peers. This facilitative role of the teacher resonates with the broader shift in educational discourse from the "sage on the stage" to the "guide on the side" (Goodyear & Dudley, 2015). In this perspective, the teacher's primary function is not solely to transmit knowledge, but to support students in constructing their own understanding of the subject-matter through meaningful engagement and peer interaction activities. This perspective emphasizes the PE teacher's role in shaping environments where learners gradually assume greater ownership of the learning process.

Models-based practice in PE (Casey & Kirk, 2020; Dyson et al., 2004; Lutrell & Chambers, 2013), through implementation of pedagogical models such as Cooperative Learning (e.g., Dyson, 2001), Sport Education (Siedentop et al., 2019), and Game-Based Approaches (Pill et al., 2023), has led curricular innovation by translating student-centered pedagogical principles into practice. These models

⁶Models-based practice in physical education refers to the deliberate and coherent use of one or more pedagogical models (e.g., Sport Education, Cooperative Learning, Teaching Games for Understanding) to structure curriculum, instruction, and assessment. Rather than relying on a single, one-size-fits-all approach, models-based practice encourages teachers to select, combine, and implement models purposefully, based on the learning goals, context, and needs of students (Casey & Kirk, 2020).

operationalize such principles by aligning planning, implementation, and assessment within PE teaching. Research suggests that the long-term (Farias et al., 2019), complementary (Gil-Arias et al., 2023), and flexible use of these pedagogical models (Hattie, 2012) can better address the diverse learning needs of students (Hodges-Kulinna et al., 2024). For example, in Sport Education, there is abundant evidence that adopting managerial roles (e.g., coach, referee) increases students' subject-matter understanding (Hastie & Wallhead, 2016). Persistent learning teams and cooperative activities within this model enhance students' communication, leadership, and interpersonal skills (Farias et al., 2018). Additionally, decision-making improves when students take instructional responsibility, such as in reciprocal teaching and task design (Mesquita et al., 2015). Discovery-based learning, games-based problem-solving, and task modifications have been shown to foster more equitable participation and learning opportunities for many students (Pill et al., 2023).

Despite these promising results, much of the research has focused on experienced teachers (Silva et al., 2021), suggesting that effective implementation of models-based practice often benefits from teacher expertise and confidence. However, some studies also indicate that well-prepared preservice teachers (PSTs) from PETE programs associated with sound teacher education practices can implement these approaches effectively, even early in their careers (Farias et al., 2018; MacPhail et al., 2013). While PETE programs are a crucial component of PSTs' professional learning, playing a central role in preparing them to implement effective PE curricula, the higher education institutions that host these programs often provide continuing professional development opportunities for in-service teachers, thereby contributing more broadly to curriculum development in PE (MacPhail et al., 2013). However, even in PETE programs that include school placement training and deliberately prepare PSTs for implementing a PE curriculum grounded in models-based practice (Farias et al., 2023), the findings remain highly inconsistent (Silva et al., 2021). Most PSTs tend to recognize the value of models-based practice and attempt to implement it during their school placement. For example, they may promote team affiliation and managerial roles (as in Sport Education), foster group interdependence and shared responsibility (as in Cooperative Learning), or use tactical problem-solving through modified games (as in Game-Based Approaches) (Curtner-Smith & Sofo, 2004).

Noteworthy, both experienced teachers ‘experimenting’ with pedagogical models (e.g., Sport Education) (e.g., Gil-Arias et al., 2022) and PSTs often struggle with implementing the more complex dimensions of models-based practice, that is, critical elements that demand a higher level of instructional intentionality, responsiveness, and conceptual understanding. While some educators may initially adopt more surface-level structural elements (e.g., team organization, role assignments, or inclusion of modified games), they often encounter challenges when attempting to enact deeper pedagogical practices. These include, for example, transferring instructional responsibility to students, supporting peer-teaching dynamics, and designing differentiated learning tasks that respond to students’ evolving needs (Stran et al., 2012). Such practices require not only procedural knowledge but also a refined ability to adapt instruction to learners’ needs and foster active, student-driven engagement in learning. However, when faced with challenges such as classroom management issues, institutional constraints, or unfamiliar pedagogical approaches, teachers may struggle to sustain these student-centered strategies. This tendency is not exclusive to PSTs, though it can be particularly pronounced in their case due to limited experience and confidence in enacting models-based instruction (Richards & Templin, 2012; Wang & Ha, 2013). Moreover, in many placement contexts, this regression is reinforced when cooperating teachers (CTs)⁷ do not espouse student-centered pedagogies, and instead steer PSTs – implicitly or explicitly – toward more directive, familiar practices. In contrast, more supportive environments, where facilitators actively model and scaffold the use of models-based practice, may help PSTs remain committed to these approaches, even when confronted with practical challenges.

Importantly, the on-the-spot mediation (or its absence) provided by CTs during critical moments of PSTs’ teaching can significantly influence their continued use of models-based practice in PE. However, as highlighted by both Keay (2009) and Farias et al. (2023), this influence is embedded within a broader set of contextual conditions, including school culture, prevailing pedagogical norms, and induction dynamics, that collectively shape PSTs’ ability to sustain innovative pedagogical practices over time. Nonetheless, there is still a marked gap in research regarding how CTs scaffold PSTs’

⁷ In this PETE program, the cooperating teacher is a school-based educator who hosts preservice teachers during their placement and serves as a pedagogical mentor throughout the school year. In collaboration with the university, the CT provides ongoing guidance, feedback, and support for preservice teachers’ teaching practices.

professional learning as they attempt to overcome shortcomings in their models-based practice during school placement training in real-life teaching in PE. Namely, (i) studies rely heavily on participants' self-reports without actual field observations of their teaching practice (both PSTs and CTs), (ii) research is mostly exploratory and often lacks real-time pedagogical interventions aimed at improving PSTs' teaching practice (i.e., CTs or facilitators are either not present during critical moments, adopt a more passive supervisory stance, or are unfamiliar with student-centered pedagogies), and (iii) the short duration of research protocols and/or PETE placements (two to four months) prevents the identification of significant transformations in PSTs' teaching practice (e.g., Silva et al., 2021).

In agreement, over the course of a year-long school placement, the present study conducted an in-depth analysis of a participatory action research (PAR) intervention aimed at supporting a group of four PSTs in implementing a PE curriculum grounded in models-based practice, with the full agreement of the school's PE department and leadership. The study was conducted in a rural area of northern Portugal, at a public elementary and secondary school (covering grades 5–9 in the elementary level and grades 10–12 in the secondary level). Each PST was responsible for teaching one class from either grade 10 or 11, with students aged between 14 and 18. Notably, the CT involved in the study had a well-established history of teaching PE using student-centered pedagogical models. To this end, the main objective of the study was to (a) uncover the scaffolding processes progressively and responsively employed by two facilitators – one CT and one participant observer (PO) – in supporting the PSTs' implementation of models-based practice. A complementary objective was to (b) map the specific pedagogical models and pedagogical strategies implemented by the PSTs throughout the placement.

Theoretical framework: problem-solving scaffolding for professional learning

Professional learning in teacher education is a dynamic, evolving, and ill-structured problem-solving process (MacPhail et al., 2013). PSTs learn (how and what to teach) by identifying and addressing emerging professional challenges (e.g., student disengagement) while they endeavor to continuously refine their teaching practices to achieve specific curriculum and professional goals (e.g., implementing pedagogical models in PE). Putting in place a structured framework to support PSTs in addressing critical emerging challenges in their teaching practice is even more

essential when implementing models-based practice. Approaches such as the effective transfer of responsibility to students or modifying games to accommodate different skill levels place additional instructional demands on PSTs compared to more directive teaching approaches. These instructional demands often intersect with broader contextual and systemic influences – such as prevailing school culture, institutional expectations, curriculum constraints, limited preparation time, and the degree of supervisory support – that can significantly shape what pedagogies PSTs feel able, or unable, to enact (Farias et al., 2023; Keay, 2009).

In agreement, problem-solving scaffolding (Xun & Land, 2004) was used as the theoretical lens in this study to amplify the analytical power of the inquiry to the teacher education processes. Wood et al. (1976, p. 90) defined the scaffolding metaphor, as an intervention “that enables a child or novice to solve a problem, carry out a task or achieve a goal which would be beyond one’s unassisted efforts”. While originally applied to adult-child interactions in schools, scaffolding is widely used in teacher education (Legrain et al., 2019). The scaffolding metaphor can be represented by temporary pedagogical structures provided by a more knowledgeable other (e.g., a CT) to help learners (i.e., PSTs) “to perform a task they cannot complete by themselves and that is intended to bring them gradually to a state of competence in which they can complete a similar task or process independently” (Smit et al., 2013, p. 817). This approach thus assumes that each learner, including adult learners such as PSTs, has their own zone of proximal development (Vygotsky, 1978), that is, a range of tasks they cannot yet perform independently but can accomplish with appropriate support. Scaffolding allows PSTs to tackle ongoing, on-the-spot teaching challenges beyond their current knowledge and ability. In this study, two PETE facilitators – a CT and a PO – employed an iterative problem-solving intervention focused on (i) problem identification, (ii) solution development, and (iii) pedagogical reasoning and argumentation (Xun & Land, 2004).

In PSTs’ professional learning, problem identification involves pinpointing the most pressing issues that constrain their teaching practice, defining the core of the problem, and clarifying instructional goals within the problem representation process (Loughran, 2006). Effective scaffolding requires facilitators to guide PSTs in recognizing discrepancies between their intended learning outcomes (e.g., promoting effective peer-teaching) and students’ actual responses (e.g., lack of pedagogical feedback among peers). Once such challenges are identified, facilitators help PSTs

develop a repertoire of strategies (e.g., designing targeted learning activities), anticipate constraints to their implementation, evaluate outcomes, and iterate toward more effective teaching–learning processes (Xun & Land, 2004). For PSTs to reach self-initiated and independent identification of such constraints – and devise appropriate responses – they must engage in reflective practice and develop a strong sense of pedagogical purpose and reasoning (Loughran, 2006). Scaffolding may therefore include prompting PSTs to justify their choices, connect strategies to past experience, and engage in peer dialogue to refine decision-making (Fletcher et al., 2020). While PETE coursework may introduce such reflective practices, real-time teaching presents complex and emergent challenges that require situated scaffolding. In this regard, the support of facilitators during placement can offer ongoing opportunities for PSTs to articulate their intentions, refine their strategies, and assume ownership of their professional development (Richards & Templin, 2012).

Scaffolding can also serve direction maintenance and cognitive structuring intentions (van de Pol et al., 2010), steering PSTs' pursuit of specific teaching objectives (e.g., modeling critical elements of Sport Education as a lesson structure) or providing explanatory and belief structures that organize learning and justify the teaching practices PSTs are expected to adopt ("Applying no-pressure game modifications will help your students be more successful") (van de Pol et al., 2010). Scaffolding intentions can be enacted through multiple means, responsively adapting to PSTs' current knowledge and awareness (or lack thereof) of critical aspects of the problems or solutions presented in their planning and teaching practice (Wibowo & Dyson, 2021). The scaffolding means may vary based on the complexity of the teaching-learning process under discussion (e.g., it may be easier for PSTs to assign students to persistent teams than to promote collaborative learning among them) and students' progress (if students are missing important learning opportunities, the CT may need to step in to compensate for momentary limitations in the PSTs' teaching). Ranging from more explicit guidance (e.g., modeling, direct instruction: "you should teach a 3v2 task") to discovery-based approaches (e.g., hints, questioning: "is the peer-teaching task working? how can you successfully support it?"), PSTs can be involved at different cognitive levels and degrees of responsibility for independent improvement of their teaching (Xun & Land, 2004). The lower the explicitness of the information provided to PSTs, the higher their cognitive engagement and responsibility

for filling in missing information (e.g., by transferring past knowledge to current situations).

Methods

Study Design

This study followed a PAR design, an approach rooted in collaboration and shared decision-making among participants working toward common goals (Kemmis & McTaggart, 2005). PAR is conducted by individuals embedded in social contexts and seeks to enhance the rationality and fairness of educational and social practices while deepening participants' understanding of these practices and their surrounding contexts (Kemmis & McTaggart, 2005). PAR was particularly well-suited to respond to the aims of this study, for the on-the-spot, collective, and self-reflective nature of PAR interventions allowed participants to address concrete professional challenges while generating actionable insights and knowledge relevant to their practice.

The research spanned four PAR cycles, conducted throughout an entire school year. Following an initial reconnaissance stage, three intervention cycles were structured around the iterative processes of diagnosing, planning, acting, monitoring, reflecting, and fact-finding. Throughout these cycles, PSTs actively engaged in their own learning and professional development, with their reflections and fact-finding (aligned with the study's research objectives) informing the planning of subsequent cycles. The results section provides a detailed account of the specific focus and intervention strategies employed within the PAR design.

Context and participants

The research was conducted within a PETE master's program at a faculty of sport sciences in northern Portugal, specifically during the year-long professional school placement that takes place in the second year of the program. This particular PETE program aimed to prepare PSTs for the implementation of a PE curriculum grounded in models-based practice, enacted through pedagogical models such as Sport Education, Cooperative Learning, and Games-Based Approaches (e.g., Valério et al., 2024).

In the first year, the participants attended 300 hours of training in several course units (curriculum development, sport-based teaching methods). In the sport-based

teaching methods, the PSTs were trained to teach specific sports content⁸ using a designated pedagogical model. The Sport Education model was used as the organizational framework for learning how to teach athletics, Cooperative Learning was applied in dance, and Game-Based Approaches (such as the Step-Game Approach; Mesquita, 2006 and Tactical Games; Pill et al., 2023) were addressed in volleyball, basketball, and handball. Importantly, the use of pedagogical models was not pursued as an end in itself, but, instead, as pedagogical resources to fulfill the aims of the national PE curriculum, particularly the holistic development of students across physical-motor, cognitive, and socio-affective domains. Additionally, during micro-teaching (teaching small groups of children in the faculty's gym or in schools) and peer-teaching (groups of PSTs teaching their peers), the PSTs taught the specific sports content using the respective pedagogical model.

The second year comprised a yearlong professional school placement. Four PSTs placed at the same school participated in this study, with each PST being assigned a resident PE class (see Table 2). The PSTs were selected through purposive sampling, given the study's focus on a specific school setting with an experienced CT who had demonstrated consistent implementation of models-based practice (Farias et al., 2022). In alignment with the PETE program's pedagogical orientation, PSTs were encouraged to apply critical elements of student-centered pedagogical models in a flexible and context-responsive manner, selecting and adapting those elements most relevant to the ongoing ability level and educational needs of their students (Casey & Kirk, 2020). All four PSTs had previously completed a bachelor's degree in sport sciences (initial teacher education) and, at the time of the study, had no prior experience in teaching or coaching. Admission to this master's course in teaching PE only considers candidates whose initial teacher education meets the academic and professional requirements (i.e., course units' content) necessary for enrolment in this PETE program. Based on their placement preferences, this group of PSTs was formally assigned to the school by the PETE program.

The PSTs' school placement training was supported by two facilitators. The CT ('Frank'), aged 51 years old, with approximately 20 years of mentoring experience as a CT. The main researcher ('John'), in the PO role, was also a facilitator. John was 27

⁸In the Portuguese PE curriculum, "sports content" includes both team and individual sports, as well as other physical activity domains such as dance or gymnastics.

years old, held a master's degree in PE teaching for elementary and secondary education, and was a PhD student at the host institution. Having previously completed the same PETE program and taught PE using models-based practice, he brought both practical experience and published research on the topic (Farias et al., 2022).

All participants provided informed consent prior to the study and were informed of its scope, voluntary nature, and their right to withdraw at any time. PSTs were clearly informed, both orally and in writing, that participation in the research component was entirely voluntary and would have no impact on their academic evaluation. Ethical approval was granted by the university's ethics committee [CEFADE 27_2024], and participant anonymity was ensured using pseudonyms. Given the PO's dual role as both researcher and facilitator, measures were taken to minimize potential role conflict and undue influence. These included maintaining clear role boundaries, fostering open communication, and using a reflexive diary to document interactions with participants throughout the placement.

The facilitators' scaffolding intervention

Throughout the school year, the facilitators implemented a range of scaffolding interventions – both planned and spontaneous – to support the PSTs' evolving professional learning needs. These interventions took place across various contexts, including lesson observations, informal pre-/post-lesson reflections, and collaborative planning sessions. This section outlines the sites of intervention, the types of scaffolding interactions, and the critical elements of models-based practice addressed in these interactions, while more detailed information regarding their nature, frequency, and documentation is provided in the following section (see page 13).

Sites of scaffolding intervention

(i) Pre-lesson meetings – meetings to plan and review full unit and lesson planning, and guide PSTs' subsequent teaching; (ii) in-lesson interventions – delivering immediate feedback to address emerging challenges in the lesson; (iii) post-lesson reflections – meetings for reflection on the lesson events and plan future courses of action; (iv) workshops at the host university – delivery of theoretical inputs on student-centered pedagogical models.

The problem-solving scaffolding of preservice teachers' professional learning

The problem-based scaffolding framework by Xun and Land (2004) guided the facilitators' scaffolding intervention, which included a focus on, (i) Problem identification – identifying the most pressing challenges in PSTs' teaching practices (e.g., identification of students' game-play problems); (ii) Solution development – PSTs' engagement in generating potential solutions, and evaluating their effectiveness, drawing on reflection, prior knowledge and experiences, and (iii) pedagogical reasoning and argumentation – PSTs were to articulate the rationale and justifications behind their teaching.

Models-based curriculum implementation

Throughout the school year, the facilitators supported PSTs in implementing a curriculum grounded in models-based practice. This process was tailored and dynamic, with specific pedagogical knowledge and strategies related to pedagogical models introduced progressively to refine PSTs' teaching. The intervention emphasized the implementation of critical elements from three established pedagogical models: (i) Sport Education (e.g., persistent affiliation, keeping records, role-playing, and formal competition); (ii) Cooperative Learning, focusing on positive interdependence, individual accountability, and face-to-face interaction; and (iii) Game-Based Approaches, highlighting components such as game-based tasks, tactical complexity, development of game problem content, and game modifications. To support pedagogical coherence and shared understanding of the models' critical elements, most PST-led lessons were observed in person by both the CT and the PO, who provided ongoing feedback and dialogic guidance aligned with the educational intentions of each model. Additionally, selected lessons were video-recorded and later reviewed collaboratively during structured reflection sessions with the PSTs. These joint discussions served as key opportunities to deepen critical thinking, consolidate pedagogical intentions, and strengthen alignment with the critical elements underpinning models-based practice.

The teaching units taught by the preservice teachers

Throughout the placement, each of the four PSTs taught their assigned class a specific set of sports content. As the school year progressed, the PSTs also demonstrated a developmental trajectory in implementing pedagogical strategies associated with models-based practice, which were continuously supported by the PO

and the CT. Table 1, in the results section, presents an overview of the sports content taught in each of the four classes across the three school terms, along with the key pedagogical models' critical elements introduced at each stage. Each teaching unit lasted approximately five weeks, with duration varying depending on the annual plan previously established by the school's PE department coordinator and the level of proficiency demonstrated by students throughout each unit. As the specific models-based practice developed by the PSTs could not be determined in advance – in line with PAR's emphasis on responding to participants' evolving professional needs and lived experiences – these practices emerged progressively throughout the placement. Although all PSTs followed formal lesson planning procedures, the instructional strategies they adopted within the models-based framework are described in the Results section to align with one of the study's main aims: to document how models-based practice evolved over time.

Data collection

Data for this study were gathered from lesson observations and field notes, pre/post-lesson reflections, informal interviews with the CT and focus group (FG) interviews.

Lesson observations and field notes

The PO conducted a total of 152 lesson observations throughout the school year, observing one lesson per week for each PST, amounting to 38 lesson observations per class. The primary objective of these observations was to analyze PSTs' teaching practices, with a particular focus on their ability to implement pedagogical models consistent with models-based practice in PE, their instructional effectiveness (e.g., "How engaged were the students?"), and the challenges encountered in their practice (e.g., on-the-spot identification of instructional gaps). The PO systematically recorded detailed field notes during or immediately after each lesson. Although no fixed observation template was used, the notes were guided by key themes aligned with the study's focus, including the use of models-based practice, instructional effectiveness, and challenges faced by PSTs during instruction.

In parallel with these observations, the PO maintained a reflective diary (PO-RD) composed of 207 entries, totaling 110 pages and 36,128 words. These entries systematically documented observed events during lessons as well as other relevant

naturalistic interactions – both explicit and implicit – among research participants. This ongoing systematization allowed the PO to continuously identify areas for intervention with PSTs and ensure alignment with other research procedures (e.g., topics to be addressed in FG interviews). Entries were organized chronologically to capture the progression of lessons, joint reflections, workshops at the host institution, and both formal and informal interactions containing potentially valuable insights for the research. The diary's content was shaped by an iterative process in which PSTs refined their models-based practice with ongoing support from the PO and CT. These facilitators played an active role in interpreting challenges, gaps, and areas for improvement in PSTs' practices (e.g., shifts in beliefs toward models-based practice, effective selection of instructional strategies). Beyond systematically recording events, the diary also included analytical notes that integrated relevant theoretical perspectives. These notes served to interpret observations in light of the study's conceptual framework, guiding the identification of meaningful patterns and supporting the triangulation of data sources – thus contributing to a more comprehensive approach to data analysis.

Pre/post-lesson reflections

Before PSTs' teaching, regular briefings were held to review lesson plans and the instructional strategies they intended to implement. Similarly, immediately after many lessons, reflective sessions took place in the PE teachers' workroom with the entire group of PSTs, facilitated by the PO, the CT, or both. In total, 45 pre-lesson briefings and 92 post-lesson reflections were conducted throughout the school year. These sessions focused on PSTs' emerging teaching practices and students' responses. Discussions often began with prompt questions such as, "Do you think the lesson went well?" or "What might you have done differently in the 2v2 task?" In this informal yet collaborative setting, the PO audio-recorded the discussions, which were later transcribed for analysis.

Informal interviews with the CT

Throughout the school year, the researcher conducted systematic informal interviews with the CT in a naturalistic and reflective manner, focusing on the daily occurrences in PSTs' teaching practices. These conversations typically took place after lessons or during free periods when the PO and CT shared the same workspace.

In total, 20 informal interviews were conducted, all of which were audio-recorded for ensuing analysis.

Focus group interviews

The PO conducted four FG interviews with the PSTs, each lasting approximately 70 minutes. The first interview, held at the beginning of the school year, aimed to capture PSTs' initial impressions, expectations, and goals regarding their teaching practices and how they intended to align them with PE objectives. Three additional FG interviews were conducted at the end of each school term, informed by critical incidents, that is, meaningful or problematic events during PSTs' teaching practice that revealed tensions, professional learning opportunities, or significant pedagogical shifts. Key events served as prompts to encourage PSTs to interpret and reflect on their experiences, assessing the impact of their instructional decisions on student learning. These discussions also provided PSTs with an opportunity to voice concerns and challenges related to their teaching practices. The interview protocol remained open-ended, fostering the exploration of emerging insights and facilitating meaningful dialogue aligned with the research focus. All FG interviews were audio-recorded and transcribed verbatim for subsequent analysis.

Data Analysis

To capture the inherently spontaneous, iterative, and cyclical nature of PAR, data collection and analysis were integrated through a collaborative and continuous process involving multiple qualitative data sources. The analysis followed an abductive approach, blending inductive and deductive reasoning through constant interplay between empirical observations and theoretical interpretation (Rinehart, 2021). In this study, the problem-based scaffolding framework by Xun and Land (2004) served a dual purpose: it guided the facilitators' scaffolding interventions and also functioned as an analytical lens for deeper interpretation of the data.

The analysis began with an inductive thematic approach (Charmaz, 2014). The first author engaged deeply with the data, systematically reading transcripts line by line to identify key segments that reflected core ideas, teaching patterns, and emergent themes. In the second stage, initial codes were manually assigned to prominent data excerpts, forming the foundation for categories and sub-themes. At this stage, the analysis also incorporated a deductive dimension, as the study's

objectives aligned with the problem-solving scaffolding model (Xun & Land, 2004). The framework's three key categories – *problem identification*, *solution development*, and *reasoning and argumentation* – were used to systematically map PSTs' professional learning and interpret how the PO and CT's interventions supported the adoption of student-centered practices.

This structured, theory-informed approach helped reveal meaningful patterns, test relationships between codes, and build coherent sub-themes and overarching themes. For example, data excerpts such as *"they misinterpreted the teacher's role in Sport Education," "did not provide pedagogical feedback to students,"* and *"relied mainly on organizational elements like formal competition"* were initially coded under categories such as *"misalignment with pedagogical intentions"* and *"partial uptake of student-centered strategies"*. These were then synthesized into the broader *theme "Modeling preservice teachers' foundational models-based instructional practices"*. This theme captured how PSTs initially replicated surface-level critical elements modeled by the facilitators (e.g., team structures, modified games), yet struggled to enact deeper pedagogical responsibilities such as providing instructional feedback or fostering peer learning. The deductive use of Xun and Land's (2004) categories helped track how the facilitators' interventions evolved in response to these gaps – from explicit modeling to reflective questioning and joint planning.

In addition, aligning data from multiple sources enabled a chronological perspective on PSTs' pedagogical shifts, illustrating how their teaching evolved across the four PAR cycles in response to facilitators' interventions. This process also supported triangulation and cross-referencing between data sources, strengthening the analytical robustness of the findings. Themes were developed iteratively and comparatively across all data sources, ensuring that each theme reflected insights triangulated from at least two types of data. Throughout this iterative process, inductive and deductive reasoning were continuously interwoven, moving between empirical material and theoretical constructs to refine explanations of the observed phenomena.

In the final stage, the authors collaboratively refined and (re)labeled the identified themes to ensure they accurately reflected the evolving epistemology of PAR. Each theme was analyzed in relation to its development across the four intervention cycles. A detailed account of these final themes is provided in the Results section. Table 1 summarizes the alignment between the main themes, critical elements

of models-based practice, and scaffolding processes throughout the PSTs' professional learning.

Trustworthiness

The PO conducted the data analysis. To ensure the trustworthiness of this research, several rigorous criteria were applied. First, the PO maintained deep engagement with the social context of the cooperating school by being regularly present on-site throughout the school year, observing lessons, engaging in informal conversations with the PSTs and the CT, and participating in staff meetings and school-based activities. This prolonged involvement fostered sustained interactions and enhanced the alignment between observed events and the theoretical constructs developed (Bryman, 2012). Data triangulation across multiple sources (e.g., lesson observations and field notes, pre- and post-lesson reflections, FG interviews) ensured a comprehensive analysis, integrating diverse perspectives and interpretations of the phenomena under investigation. Stakeholders' data verification included the corroboration by PSTs and the CT of the researcher's interpretations reflected in the findings, ensuring alignment with their actual perspectives and experiences. Additionally, an auditing approach was conducted by two qualitative researchers not involved in this study, who assessed whether proper procedures had been followed and verified the accuracy between the excerpts and the assigned categories. Finally, regular peer debriefings and collaborative data analysis between the first author and two senior critical friends served to validate interpretations, refine analytical insights, and mitigate potential researcher bias (Bryman, 2012).

Results

The narrative presentation of the results is complemented by the information in Table 2 (scaffolding process) and Table 1 (critical elements of models-based practice implemented by the PSTs).

Reconnaissance: diagnosing preservice teachers' initial teaching conceptions and practices

The first four weeks of the school placement were dedicated to exploring the PSTs' current teaching practices (and the underlying conceptions upholding such teaching). Overall, the PSTs expressed a narrow perspective of what the learning

goals of PE should be: “PE in the school curriculum should be about promoting physical activity. Keep students healthy and moving” (Sophia-FG, September).

The predominant implementation of teacher-centered practices by the PSTs confined students to a passive role, reducing their learning to knowledge reproduction: “(in volleyball) when introducing passing, forearm pass, and underhand serve, James set a series of isolated skill drills detached from the game, while students merely reproduced the skills as told”. (PO-RD, September). There was a lack of student autonomy and engagement, as “Even when PSTs moved on to introducing the 2v2 handball games. Games are supposed to be fun, yet students didn’t engage, playing the game just because they were told to”. (PO-RD, September)

Table 1. Mapping of the sports content taught by preservice teachers in the four classes throughout the school year and the critical elements of models-based practice implemented.

Preservice Teacher (Class)	1st term		2nd term		3rd term	
	<i>Sports content taught</i>	<i>Instructional models explored</i>	<i>Sports content taught</i>	<i>Instructional models explored</i>	<i>Sports content taught</i>	<i>Instructional models explored</i>
<i>James (10th A)</i>	Volleyball Basketball		Futsal Dance Gymnastics		Badminton Swimming	
<i>Sophia (10th B)</i>	Volleyball Basketball	Teacher-centered instruction (isolated skill drills; teacher reproduction)	Futsal Dance Gymnastics	Sport Education (persistent affiliation; formal competition; record-keeping; role-playing)	Badminton Swimming	Sport Education (persistent affiliation; formal competition; record-keeping; role-playing)
<i>Ava (11th A)</i>	Handball Gymnastics Swimming	Sport Education (persistent affiliation; formal competition; record-keeping; role-playing)	Volleyball Badminton	Game-based approaches (game-based tasks; tactical complexity; game problem content development; game modifications)	Dance Basketball	Game-based approaches (game-based tasks; tactical complexity; game problem content development; game modifications)
<i>Peter (11th B)</i>	Handball Gymnastics Swimming		Volleyball Badminton		Dance Basketball	Cooperative Learning (positive interdependence; individual accountability; face-to-face interaction)

Table 2. Summary of the main themes in alignment with models-based practice and scaffolding processes throughout the PSTs' professional learning.

AR-Cycle	Theme	Models-based teaching practices	Responsibility in leading Professional learning process	Professional learning Problem-solving Scaffolding	
				Problem-solving processes	Intentions, settings and means
1	<i>Reconnaissance: diagnosing preservice teachers' initial teaching conceptions and practices</i>	PSTs apply teacher-centered teaching	Diagnosis of PSTs' predominant teaching conception and practices	PSTs showing a narrow and teacher-centered perspective on PE learning goals (oriented towards health, physical activity, and motor-learning outcomes).	Observation and systematization of PSTs' teaching practice gaps and professional learning needs.
2	<i>Modeling preservice teachers' foundational models-based instructional practices"</i>	Sport Education critical elements (persistent affiliation; formal competition)	Facilitators-led Problem Identification and modeling the solution development process	Keeping PSTs on track toward models-based strategies; Establishing connections between student-centered theoretical concepts and emerging classroom challenges (i.e., practical applications); Supporting PSTs in identifying critical aspects of their teaching.	Modelling specific models-based practice: (a) Theoretical input on Sport Education, Game-based approaches and Cooperative Learning (workshops); (b) field observation of expert teaching using Sport Education critical elements (professional role modeling); Pre-/post-lesson debate and reflection, along with devising action plans: (a) check PSTs' understanding of task content and structure; (b) model instructional interventions through questioning to help PSTs refine their teaching.
3	<i>Collaborative problem-identification and solution development for enhancing preservice teachers' awareness of critical elements in their teaching</i>	Game-Based Approaches (game modifications; game-based tasks; tactical complexity) Sport Education (role-playing)	Facilitators-PSTs Collaborative Problem Identification and Solution Development	Guiding PSTs in recognizing and understanding their students' lack of success and their ineffective task design (aligning student learning needs with tailored teaching practices); Exploring the alignment between different task modifications and the intended learning outcomes.	Guided observation: video-based scaffolding – analysis and identification of students' learning needs (gameplay problems); Pre-lesson guided task design sessions: hands-on experimentation with task design and reflection on the implications of chosen task solutions.
4	<i>Scaffolding reasoning, argumentation skills and knowledge transfer toward preservice teachers' pedagogical ownership</i>	Sport Education (formal competition; role-playing; keeping records) Cooperative Learning (individual accountability; positive interdependence; face-to-face interaction)	Self-initiated PSTs-led Problem Identification and collaborative Peer-Construction of Solutions	Encouraging PSTs to connect their current teaching experiences with past ones to enhance the transfer of previously learned and applied critical elements of models-based practice; Promoting PSTs' reasoning and argumentation on the suitability of their proposed teaching solutions; Prompt the extension of co-constructed teaching solutions among PSTs.	Reflective group discussions (facilitators as guides-on-the-side): (a) prompting PSTs to articulate their pedagogical reasoning and decision-making, and (b) highlighting advanced critical elements of models-based practice implemented by other PSTs to foster knowledge exchange (peer modeling).

Note. Action-Research (AR); Preservice Teachers (PSTs); Physical Education (PE)

Modeling preservice teachers' foundational models-based instructional practices

The first intervention cycle was conducted over the remaining eight weeks of the first school-term. The facilitators' scaffolding of PSTs' professional learning aimed to *keep the PSTs on target* in their pursuit of the intended professional learning goals (i.e., implementing student-centered pedagogical models). The *degrees of freedom* in PSTs' actions were narrowed as the facilitators tried to *model* and encourage the application of particular critical elements of models-based practice.

The PO's intervention included two workshops led by the PO at the university. Based on his own teaching experiences during his school placement as a PST three years earlier, the PO sought to model the PSTs' subsequent teaching practices on his personal and practical experience in successfully implementing models-based practice. These workshops were developed in response to the pedagogical challenges identified during the initial weeks of the school placement:

I shared multiple resources from my own lessons as a preservice teacher to demonstrate the practical application and feasibility of student-centered pedagogical models. The contents included key critical elements of the SE model, such as team affiliation, formal competition, record-keeping, and the concepts of progressive competition and the event model. I focused on designing game-based tasks, developing game problems, and making game modifications. I also showed how to plan student-centered lessons, design modified game forms, and use record sheets for peer assessment and accountability, along with task cards to support peer-teaching activities. (PO-RD, September)

This intervention was reinforced in the school placement, with *follow-up field support* provided by the CT, as a *professional role model*:

While teaching handball, the CT created a task card and record sheet to support peer-teaching, scoring students' commitment and engagement. After the lesson, PSTs were encouraged to recognize the positive impact of the CT's strategies on student motivation and engagement. (PO-RD, October)

During the remainder of the school term, the PSTs showed self-initiative in regularly implementing some of the Sport Education critical elements modeled by the facilitators, "mainly those related with class organization (e.g., persistent affiliation, formal competition), they are trying to create a more engaging learning environment for students" (PO-RD, October). As a major gap in PSTs' teaching, they frequently "misinterpreted the teacher's role in Sport Education and did not provide pedagogical feedback to students, even when they failed to meet the task goals." (PO-RD, November). As a result, the facilitators felt compelled to identify these emerging issues and bring them to the PSTs' attention. They also prescribed them teaching solutions:

CT: The lesson plan is strong. The circuit's idea was good, and the task cards very clear. How well do you think the students learned the rolls and mini-trampoline jump?

Ava: I think most of them performed the skills correctly.

(The PO supports the point with evidence)

PO: I registered many trials, and less than half of the students performed the core skills criteria.

(The CT tries to ascertain the PSTs' level of awareness regarding the limitations in their teaching)

CT: I agree. Why do you think this happened? What may be missing in your instruction and feedback?

Sophia: They were supposed to learn, especially because the organization was good, and the skill cards were crystal-clear.

(While highlighting the strengths of the PSTs' choices, the facilitators point out remaining deficits and outline specific solutions for the situations at hand)

CT: Students are engaged in their workstations, but you need to step in, assess their performance, and provide them feedback, especially when a student struggles with a motor skill. That's our job as teachers.

PO: You can model the movements through demonstration, showing the correct execution and linking the skill card criteria to the errors students are making.

(Post-lesson reflection, December)

Collaborative problem-identification and solution development for enhancing preservice teachers' awareness of critical elements in their teaching

The second school-term saw a scaffolding intervention aimed at increasing PSTs' ability to "discover (and understand) the critical elements hindering their teaching" (problem identification) and devise appropriate "solutions to these problems" in collaboration with the facilitators (CT-informal interview, January). This problem-solving process began to be focused on content development issues, for which the implementation of games-based approaches seemed appropriate. The PSTs were already using games-based tasks in their lessons but were unable to identify the critical tactical problems hindering the success of their students during game-play:

There's a lot of crowding around the ball, poor ball possession and lack of mobility. The PSTs are still unable to identify the critical game problems that are hindering their students' success, nor to design appropriate tasks. The games need to be properly modified to meet students' current ability level. (PO-RD, December).

Consequently, the facilitators sought to enhance PSTs' understanding of the tactical complexity of games. The PSTs were guided to uncover and understand the relationship between their students' lack of success (teaching problem) and their ineffective design (or modification) of game-based learning tasks (teaching solutions). *Guided observation (video-based scaffolding)* was used to channel the "PSTs'

attention to a particular frame of teaching-learning problems, more realistically aligned with their current level of content-specific tactical knowledge” (PO-RD, February), thereby optimizing their ability to discover and become aware of particular critical elements in their teaching practice:

During video analysis of volleyball games, the PST is steered to identify the critical elements constraining task goals achievement...

PO: So, what strikes you the most when watching the videos of your students' game-play? What is happening in the game?

Ava: I think the reception to the serves is disrupting the play rallies.

(Ava spots the big picture and is steered to align her conclusion with the task goals...)

PO: Think about the game's foundational principles. What do you want from this task? What do you expect from students, and what is actually happening?

Ava: Wait, they are not... I also need to clarify the roles of receiver and setter. Students get confused, and the non-receiving player doesn't move closer to the net. I'm focused on building the attack, so the serve is redundant.

(As Ava identifies the key critical elements of the problem, she is encouraged to design tailor-made task-solutions...)

PO: So, how can you adjust the serve to ensure continuous reception-setter plays?

Ava: Something that makes it easier for the other team to set up the attack...

PO: Good insight. Like what?

Ava: Hmm...

(When Ava struggles to find solution, the PO fills-in in her current knowledge gap by suggesting a specific game modification)

PO: Perhaps, a facilitative rule? Two consecutive points, swap to throw-in serve.

(Ava is encouraged to understand the reasons why this solution is appropriate)

CT: Why is this important?

Ava: The less-skilled students will more successfully receive the ball, this will facilitate their attack setup, which is the point here.

(Post-lesson reflection, March)

As the second school-term progressed and the PSTs demonstrated an increasing ability to identify key learning issues in their students' learning associated with eventual teaching gaps, the PSTs were encouraged to design their own learning activities aligned with the most pressing learning needs of their students. *Pre-lesson guided task design* sessions were a central intervention. In collaboration with the PO and CT, the PSTs were prompted to engage in hands-on experimentation with task design and reflect on the implications of their chosen task solutions. A focus was placed on exploring the alignment between different task modifications (i.e., the proposed solutions) and the learning content students were expected to learn (e.g., moving for attacking space against):

PO: So, you want students to learn how to attack open space in futsal?

Numerically advantaged drills could be a good alternative. Let's try a 2v1 situation...

Peter (After trial): This won't work, it will constrain the on-the-ball actions. If the defender positions well, the attackers might struggle with decision-making.

(The CT encourages the PST to select the most effective solution path by raising alternative structures to the initial task design)

CT: Would a 3v2 setup be a better solution?

Peter: Wouldn't that make it more difficult?

PO: Let's give it a try...

(The PSTs engage in a 3v2 practice trying to displace the two defenders)

Peter: It worked better! There's an extra passing lane now, defense won't anticipate the move.

(The CT redirects the discussion to potential shortcomings in the generated solution)

CT: What if the on-the-ball defender opts to cover?

Peter: hmm... it's best, then, if I limit the space where the defense can tackle.

PO: Right, let's try it and see.

(The guided task design moves on steering the discussion toward refining the learning task)

(Pre-lesson reflection, March)

An important benchmark in informing subsequent scaffolding processes was recognizing that PSTs could transfer strategies developed in previous units to new situations. More importantly, they began to personalize and implement more sophisticated strategies than those used previously. The following example demonstrates the increasing efficiency of the support PSTs were providing to their students for supporting team leadership roles:

In addition to skill cards, Sophie introduced ‘corner meetings’ during task transitions to better support students’ independent work. This became standard practice for all PSTs, who briefed team leaders on goals and feedback before introducing new tasks. (PO-RD, April)

By the end of this intervention cycle, the facilitators realized the PSTs were better prepared to take primary control over their own learning and teaching practices. The CT didn’t want PSTs to “merely implement student-centered models... I feel they’re ready to take fuller ownership of shaping their own student-centered teaching approach while students will still learn what they must learn”. (CT-informal interview, April)

Scaffolding reasoning, argumentation skills, and knowledge transfer towards preservice teachers’ pedagogical ownership

In the final intervention cycle, the facilitators encouraged the PSTs to “build their own student-centered teaching practice” and take “fuller ownership of their teaching development and that of their fellow PSTs” (PO-RD, April).

The following excerpts illustrate the growing ability of the PSTs to independently identify key pedagogical priorities and how they were challenged to *bring their planning and teaching practices to the fore*. As the predominant scaffolding element, the facilitators ‘filtered’ the decisions presented by the PSTs, asking them to justify their choices in alignment with student needs and intended learning goals. Additionally, it highlights the facilitators’ crucial role in linking past experiences to new contexts (e.g., the transition from teaching team sports to individual sports), ensuring that PSTs remained in pursuit of a student-centered PE, while preventing them from backtracking or relinquishing essential elements they had previously implemented. By taking a more *guide-on-the-side role*, the fundamental purpose of the facilitators’ scaffolding was to

both “help the PSTs stabilize their student-centered practices and to extend them through collaborative learning with their peers” (PO-RD, April):

(A PST is prompted to explain their pedagogical intention)

CT: What is the plan for the badminton lesson?

Sophia: Badminton is an individual sport; I’m trying to figure out how to adapt my previous lesson plans, which were based on team-sport dynamics.

CT: What are you thinking?

Sophia: The game is 1v1, but I want to keep them in teams while including formal competition and role-playing.

(CT tries to activate prior knowledge by mapping the previous solution onto the existing problem schema)

CT: Haven’t you set up a round-robin tournament before, the 2x2 futsal matches (second school-term). Is it really that different now?

Sophia: I see...if I set up teams of six, with two 1v1 courts, I’ll have two players rotating as referees and peer-coaches.

CT: Any records?

Sophia: I was just thinking about that! I’ll set up a scoreboard to record their performance.

(Pre-lesson planning, May)

Peer-modeling scaffolding was another key intervention. The facilitators channeled PSTs’ attention to “advanced student-centered teaching practices” implemented by some PSTs to “inspire their peers toward expanding their teaching” (PO-RD, May). The following excerpts discuss Cooperative Learning strategies related to helping the PSTs’ students self-regulate their learning, expanding peer-teaching dynamics, and self- and peer-assessment:

PO: I really liked how you structured the choreography over the 6 lessons.

Ava: In each class, I introduce a new concept, like movement fluidity, but the teams have to integrate that into their own choreography.

(PO asks Ava to explain the reasoning behind her decisions and to back them up with arguments)

PO: Why set up the unit like this?

Ava: I make sure they include the content that will be assessed in their choreographies while also making them responsible for figuring out the right role for each team member.

(PO guides the consideration of alternatives that could complement the proposed solution by prompting the other PSTs to share their knowledge)

PO: James, I remember your dance unit had some interesting elements, like the assessment...

James: Well, one could make sure they take responsibility for their progress.

PO: Sophia, didn't your students record themselves dancing (using their phones)?

(the peers provide procedural guidance)

Peter: You could have them film the choreography they've done so far. Then, they could watch the videos and check if they're performing the moves correctly.

Ava: Great! the lesson is short, though!

(PO keeps the focus on the alignment between learning and assessment)

PO: Hmmm, integrating peer assessment into the lesson while still practicing enough to learn. Thoughts?

Peter: Maybe have them record their performances, upload them to Google Classroom, and then analyze them as homework.

Ava: If I cut down on the content, they will need less time (to practice), and each group can assess each other. I'll prepare a criteria checklist.

(Post-lesson reflection, May)

By the end of the school year, after overcoming countless challenges, by transferring past student-centered practices to teaching units, and sharing knowledge and best practices with their mates, the PSTs conveyed an embodied understanding of the educational value of student-centered learning experiences in PE:

Sport Education boosted student motivation and engagement. Our lessons improved, it made them more cooperative and dynamic. The GBAs prompted our ability to adapt tasks and significantly improved their game-play. The planning is more meticulous, hard-labor, but the overwhelming impact on students makes it all worthwhile. (Peter, FG June)

Discussion

This study examined a yearlong PAR intervention focused on the scaffolding processes employed by two facilitators (CT and PO) to support a group of PSTs in implementing models-based practice throughout their school placement training. Specifically, it aimed to uncover how the facilitators progressively and responsively employed scaffolding strategies, while also mapping the instructional practices associated with models-based teaching adopted by the PSTs. The facilitators' scaffolding intervention revealed a non-linear process, a complex web of scaffolding intentions (direction maintenance), settings (pre-lesson guided task design), and means (modeling through direct instruction, questioning for discovery-learning). Initially, the facilitators took a more directive role, but by the end of the placement, they shifted to a 'guide-on-the-side' approach, using questioning to help PSTs discover key pedagogical elements. Although all PSTs had previously been introduced to models-based practice during coursework, their practical understanding was limited. As a result, early supervisory interactions were aligned with directive approaches (Glickman et al., 2013), gradually transitioning to more collaborative guidance as PSTs developed confidence and competence in applying the pedagogical models.

In sum, the teacher educators-as-facilitators' role was, essentially, a teacher educators-as-activators' role (Hattie, 2012). The scaffolding was responsive to PSTs' actions, providing explicit support when they struggled and shifting to implicit guidance as their understanding grew. It was noted an implicit strong interdependence between the yearlong scaffolding process, structured as an iterative problem-solving approach to address emerging teaching challenges, and PSTs' progressive adoption of increasingly complex student-centered pedagogies that fostered deeper student engagement in meaningful learning experiences.

Initial teaching conceptions and practices

The initial diagnostic phase indicated that PSTs held a narrow conception of PE, primarily focused on physical activity and motor skill acquisition while overlooking student autonomy, social development, and decision-making. In their first month, PSTs predominantly employed teacher-centered practices, relying on isolated skill-drill tasks or superficial game-based activities that lacked key contextual elements (e.g., student accountability, formalized competition) (Stran et al., 2012), leading to disengagement. This pedagogical step-back is well-documented in PETE research

(Curtner-Smith & Sofo, 2004), as PSTs often revert to teacher-directed approaches when faced with real-world challenges, seeking greater control over classroom management and student interactions (Wang & Ha, 2013).

Modeling preservice teachers' use of models-based practice

In the first intervention cycle, keeping (or regearing) the PSTs 'on target' (direction maintenance: pursuing a PE curriculum grounded in student-centered pedagogical principles) (Dyson et al., 2004) was a predominant intention embedded in the facilitators' scaffolding (van de Pol et al., 2010). The scaffolding involved workshops on teaching PE via Sport Education and Game-Based Approaches, alongside field observations of the CT implementing the Sport Education model. The facilitators identified key issues in PSTs' teaching (e.g., disengaged students) and explicitly modeled particular critical elements of models-based practice (Wang & Ha, 2013). While prescriptive teacher education approaches are often criticized for limiting PSTs' pedagogical autonomy (Fletcher et al., 2020), in this study, initial modeling had a rapid and lasting impact. Throughout the first term, the PSTs effectively embedded several Sport Education strategies – such as persistent affiliation, role-playing, and record-keeping – into their instructional routines (Curtner-Smith & Sofo, 2004). This was facilitated by the contingent approach (Wibowo & Dyson, 2021) to the scaffolding applied by the facilitators. Namely, the facilitators' scaffolding strategies varied in their degree of explicitness and directiveness, and were adapted responsively to the PSTs' pedagogical needs (e.g., their level of awareness of the impact of teaching practices on students' learning). More explicit support was provided when PSTs struggled to master content and concepts, while alternative forms of scaffolding – such as reflective questioning or subtle pedagogical cues – were used contingently, in response to facilitators' reading of their answers and their perceived mastery of different pedagogical aspects (Xun and Land, 2004).

More importantly, the PSTs' practice was not simply externally modelled or 'imposed' by the facilitators but rather supported and sustained through multiple complementary processes. Professional role modeling ('I do as I ask you to do') was a means of legitimizing the pedagogical solutions proposed to the PSTs. The facilitators also scaffolded PSTs' understanding of the appropriateness of the solutions developed through cognitive structuring. They provided explanatory and belief structures that organized and justified the relevance of these professional learnings to

the specific challenges PSTs were facing (i.e., improvements in underdeveloped teaching practices) (Xun & Land, 2004). Previous research suggests that teacher education practices relying heavily on theoretical inputs (pedagogical and content-specific knowledge) may not effectively transform PSTs' teaching practices (Ward & Ayvazo, 2016). In contrast, this study found that specialized on-the-spot scaffolding (van de Pol et al., 2010) played a crucial role in helping PSTs adopt models-based practice as their primary pedagogy (Farias et al., 2023). The facilitators' ongoing and tailored mediation allowed for solutions that directly addressed PSTs' emerging classroom challenges. Such personalized professional learning support helps teachers internalize instructional practices, making them more meaningful and sustainable over time (Fletcher et al., 2020; MacPhail et al., 2013). However, by the end of the first term, PSTs still struggled with diagnosing game-related problems and modifying tasks effectively. Beyond understanding pedagogical models conceptually, they needed the ability to apply them in specific teaching contexts (Ward & Ayvazo, 2016). Their limited sport-specific content knowledge (e.g., tactical awareness) hindered the effective implementation of student-centered pedagogical models, making this the focus of the next intervention (Farias et al., 2019).

Collaborative problem identification and solution

The second intervention cycle showed a more collaborative and interactive scaffolding process of the PSTs' professional learning, with greater engagement of the PSTs in identifying critical problems in their practice and in the subsequent development of solutions. The facilitators identified the core teaching challenges in the PSTs' practice that they were either unaware of or lacked knowledge about (e.g., task design, game modifications). Within this range of problems, space for discovery was given to the PSTs. Firstly, the facilitators employed video-based analysis, asking PSTs to identify mismatches between task goals and students' game-play. This helped to focus the PSTs' attention on specific tactical issues in students' game-play that were temporarily beyond their awareness (Stran et al., 2012). Secondly, through discovery-learning questioning conducted in the gym during pre-lesson guided task design sessions, the facilitators encouraged the PSTs to devise and test pedagogical solutions by anticipating potential constraints and exploring various courses of action to better align their teaching with students' needs. PSTs' hands-on participation in iterative trial-and-error cycles (e.g., designing modified futsal tasks) demonstrated

their growing autonomy in creating purposeful learning experiences. During the second school-term, PSTs improved their ability to design tasks increasingly aligned with their students' learning needs and understood the connection between goals, skills, and task modifications. They regularly transferred modeled practices to new situations, independently refining strategies and adding a 'personal touch' (e.g., developing peer-leadership strategies). The ecological alignment between learning goals and appropriate teaching design, promoting student-centered interactions, is a trait of skilled teachers (Ward & Ayvazo, 2016). In this sense, particular scaffolding interactions – such as guiding PSTs' identification of students' game-play patterns and using question prompts to foster their pedagogical reasoning (e.g., "Why do I teach the way I teach?") – were critical for improved teaching practices. Research suggests that when PSTs grasp the pedagogical logic underlying a teaching strategy, they are more likely to internalize it, elaborate on it, and adapt it autonomously to new contexts (MacPhail et al., 2013), thereby enhancing their content knowledge and improving the design of learning tasks (Farias et al., 2023).

Developing pedagogical ownership

The last intervention cycle evidenced a close interplay between the fading of the explicitness embedded in the facilitators' scaffolding and the PSTs' growing responsibility for identifying the key topics in the development of their teaching practice. PSTs were encouraged to bring their pedagogical suggestions to the discussion with the main intention of refining their instructional decision-making. Implicit was, therefore, that the scaffolding was now drawing 'on top of' the planning independently done by the PSTs, and, inherently, on top of their identification of the most relevant learning needs of their students. By inference, they were also working on their most needed teaching needs (Wang & Ha, 2013). The scaffolding encouraged the PSTs to articulate their pedagogical intentions, predict the probable effects of their strategies, and support their practices with evidence from past experiences. This aligns with a deep learning approach, as it cognitively engages PSTs in the building of their professional identity and taking ownership of their teaching practices. In addition, PSTs were encouraged to apply knowledge from previous pedagogical experiences to new teaching contexts, such as transferring models-based practice between team and individual sports. For example, group discussions helped PSTs adapt futsal competition strategies to badminton, prompting critical reflection on

teaching challenges and alternative solutions. Finally, the facilitators promoted a collaborative learning environment, where PSTs shared knowledge and experiences, leading to deeper cognitive processing and new understandings (Xun & Land, 2004). Notably, the gradual accumulation of teaching experience during the school placement contributed substantially to PSTs' professional learning, as they increasingly demonstrated more confident, autonomous, and context-sensitive pedagogical decision-making and practices. By the end of the cycle, PSTs had developed a broader understanding of student-centered pedagogy, applying a range of strategies drawn from models-based practice in a responsive and contextually appropriate manner, rooted in collaborative social learning.

Implications for practice and research

This study reinforces the idea that teachers working in collaborative environments are more effective in implementing curricular innovations (Yoon et al., 2023), highlighting the role of social learning in teacher education. PSTs developed professionally through connecting their practices with those of others and engaging in collaborative reflection. Their sustained participation in peer dialogue further fostered long-term pedagogical growth (Lave & Wenger, 1991; Yoon et al., 2023). However, a critical point in this study warrants further inquiry; specifically the impact of power dynamics among social agents with varying levels of authority within PETE programs (Young & MacPhail, 2015). While PSTs appeared to adopt models-based practice in a self-determined way, their pedagogical decisions were notably shaped by the scaffolding strategies employed by the facilitators. The professional practice of PSTs is formally evaluated at the end of the school placement by CTs and university supervisors, a process that may foster compliance, as PSTs can feel pressured to adopt the pedagogies advocated by their mentors in order to align with assessment expectations (Valério et al., 2024). Importantly, this study was conducted in a school where the CT was already familiar with student-centered pedagogical models, further emphasizing the importance of supportive CTs in fostering PSTs' adoption and development of such approaches.

This study acknowledges that the conditions of the researched school placement – namely, having an experienced CT and the continuous support from a PO – created a particularly favorable setting for PSTs' in-depth pedagogical engagement. While such conditions may not be present in every PETE program, the

pedagogical challenges and relational dynamics documented here reflect broader challenges commonly encountered during PSTs' professional learning. Thus, the findings generated rich, contextualized insights into how scaffolding strategies can support PSTs' professional learning in models-based practice (or other curriculum approaches). Ultimately, this work potentially illustrates good practices within a context-sensitive PETE framework, offering guiding principles for CTs' professional development and contributing to stronger university-school partnerships.

While the study spanned a full school year and documented encouraging developments in PSTs' adoption of models-based practice, this timeframe may not suffice to ensure deep and sustained transformation in professional practice. As Beni et al. (2022) note, meaningful pedagogical change is often non-linear and context-dependent, unfolding progressively through extended engagement. Similarly, Richards et al. (2025) emphasize the importance of ongoing cycles of reflection and practice to consolidate innovation in PE. These considerations highlight the value of future research that follows PSTs beyond the school placement, particularly into their early years as newly qualified teachers, when they assume greater autonomy over planning and instruction. Longitudinal follow-up studies could provide valuable insights into how scaffolding received during initial training contributes to the sustainability or adaptation of models-based practice across diverse school contexts. Furthermore, future studies could broaden the analysis by examining the entire PETE trajectory – from the beginning of teacher education to the school placement phase – thereby offering a more comprehensive view of how professional learning and pedagogical identity evolve over time (Valério et al., 2024). Building on these suggestions, ethnographic approaches embedded within PAR designs could offer deeper insight into how PSTs' beliefs, instructional decisions, and classroom practices evolve, while attending to the co-constructed nature of meaning-making in situated school contexts.

Final thoughts

The problem-solving scaffolding process enacted by the facilitators was essential in supporting PSTs' teaching practices, systematically guiding them through increasingly complex models-based pedagogies while addressing their evolving needs. Initially, the facilitators modeled student-centered strategies, offering concrete examples that PSTs could adopt and refine over time. As PSTs progressed, the scaffolding became more responsive and adaptive, shifting from explicit interventions

to an inquiry-based approach. The facilitators encouraged PSTs to analyze game-play patterns, anticipate challenges, and problem-solve independently while combining cognitive structuring (e.g., clarifying pedagogical rationales) with hands-on trial-and-error cycles. Through a collaborative learning environment, critical discussions were encouraged, allowing PSTs to share experiences, refine strategies, and transfer models-based instructional practices across different teaching contexts. By the final intervention cycle, as scaffolding gradually faded, PSTs were not only implementing student-centered strategies but also articulating pedagogical intentions, thus assuming greater responsibility for planning and instruction.

In sum, the study found that a responsive adjustment of scaffolding strategies employed by the facilitators helped PSTs develop pedagogical autonomy, self-regulate their decisions, and take ownership of their professional learning.

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Empirical Article 3

Enacting student-centered approaches for physical literacy development: A participatory action research study with preservice teachers

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Abstract

Physical literacy (PL) has been increasingly positioned as a central educational horizon of physical education (PE), yet its enactment in everyday school contexts remains challenging, particularly in lessons taught by preservice teachers (PSTs). This participatory action research (PAR) study examined how secondary school students' PL developed across one school year in PE lessons taught by PSTs using a curriculum informed by student-centered approaches (SCAs). Four PSTs and 54 students participated, with data generated through lesson observations, reflective diaries, and focus group interviews. Thematic analysis, structured across four PAR cycles, showed that students' learning did not progress linearly. Early engagement in game-like tasks coexisted with reliance on teacher guidance. As learning conditions evolved, students demonstrated improvements in tactical understanding, collaboration, confidence, and emotional regulation, alongside emerging engagement with physical activity beyond school. These findings indicate that SCAs can support PL development when learning tasks and responsibilities are deliberately scaffolded over time.

Keywords: Physical literacy; Student-centered approaches; Physical education teacher education; Preservice teachers; Participatory action research.

Introduction

Physical literacy (PL) has increasingly been positioned as a guiding educational orientation in physical education (PE), yet its meaningful enactment in everyday school settings remains a persistent challenge. Conceptualized as a multidimensional and dynamic capability, encompassing physical, cognitive, social, and psychological engagement in meaningful movement contexts, PL is commonly associated with motivation, confidence, competence, and understanding for lifelong participation in physical activity (Whitehead, 2010). Contemporary scholarship emphasizes PL as a situated and evolving capacity shaped through interactions between learners, pedagogical environments, and social contexts (Bailey, 2021; Cairney et al., 2019). Accordingly, the ways in which PE is taught are not pedagogically neutral, as instructional models directly shape which domains of PL

are afforded opportunities to develop, how they are integrated, and whether they are meaningfully enacted at all (Dudley et al., 2022).

Global policy initiatives, including UNESCO's quality PE guidelines (2015), alongside curriculum reforms in countries such as Australia, Canada, and Wales, have increasingly positioned PL as an overarching educational orientation within PE. Despite this growing international alignment, PL remains conceptually and operationally contested (Belton et al., 2019; Jurbala, 2015). These tensions are partly reinforced by performativity-oriented policy discourses that privilege learning outcomes that are more readily measurable, often emphasizing physical performance at the expense of other dimensions (cognitive, social, psychological) (Bailey, 2021; Casey & Goodyear, 2015). As a result, PL is at risk of being narrowed to a refined form of skill acquisition or fitness development, rather than understood as a holistic, relational, and context-dependent capability (Edwards et al., 2017).

These challenges are further compounded by the culturally situated nature of PL, as its enactment is shaped by distinct educational traditions, movement cultures, and policy contexts. Consequently, multiple formulations of PL have emerged internationally, each reflecting local curricular priorities and pedagogical values, which complicates efforts to establish a singular conceptual or operational consensus (Keegan et al., 2019; Martins et al., 2021; Whitehead, 2010).

These limitations are reflected in the empirical literature. In a systematic review of 48 PL interventions, Carl et al. (2022) reported substantial variability in how PL was conceptualized and operationalized, with most interventions focusing narrowly on physical competence and motivation, while giving limited attention to social and psychological dimensions or to the pedagogical conditions shaping learning. Many of the reviewed interventions were implemented over relatively short timeframes (e.g., single units or brief programs) and in conditions that differed markedly from everyday school practice, limiting their ecological validity. The review further highlighted weak coherence between stated PL intentions and the frameworks guiding intervention design, which were often conceptual or reference-based rather than pedagogical, offering limited guidance for how teaching-learning processes were enacted in practice. Within this fragmented landscape, frameworks such as the Australian Physical Literacy Framework (APLF) (Sport Australia, 2019) represent an important conceptual advance by explicitly articulating PL as a

multidimensional construct, defining physical, cognitive, social, and psychological domains and outlining developmental progression across learning stages. However, despite these conceptual refinements, existing research has rarely examined how such frameworks are enacted pedagogically in authentic school contexts, leaving critical questions about the teaching approaches that support multidimensional PL development largely unaddressed.

In response to these challenges, researchers have increasingly recommended student-centered approaches (SCAs) as pedagogical models grounded in learning theories that view PL as emerging through active participation, social interaction, and contextualized problem-solving (Dudley et al., 2022). From this perspective, SCAs that transfer responsibility to students and encourage their active engagement with decision-making processes (student-led activities), structure meaningful social interactions (collaborative task achievement), and situate learning within authentic movement contexts (PE lessons are fun, festive and connect to sport culture) support the development of multiple student competencies consistent with a holistic view of student development in PL (Hastie & Wallhead, 2016; Mesquita et al., 2012). Within this pedagogical landscape, SCAs such as Sport Education (SE), Cooperative Learning (CL), and Game-Based Approaches (GBAs) have shown consistent potential to support PL by creating learning conditions that activate the development of multiple PL dimensions (Casey & Goodyear, 2015; Dudley et al., 2022; Hodges-Kulinna et al., 2024). Specifically, SE promotes sustained engagement, motivation, and social development through persistent team membership, authentic competition, and meaningful roles, supporting students' confidence, relationships, and sense of responsibility (Siedentop et al., 2019). CL structures positive interdependence, individual accountability, and group processing, thereby fostering collaboration, shared regulation, and ethical participation (Dyson et al., 2010). GBAs emphasize learning through game-like problems, supporting perceptual awareness, tactical reasoning, and decision-making by linking movement execution to contextual understanding (Pill et al., 2023). Research in sport pedagogy further indicates that when these models are enacted responsively, they can support inclusive, dialogic, and tactically enriched learning environments in which cognitive, social, and psychological dimensions of PL are developed alongside physical engagement (Farias et al.,

2020; Silva et al., 2024). Increasingly, scholars argue that the pedagogical value of these models lies not in rigid implementation, but in their flexible and context-sensitive adaptation to learners' developmental needs (Casey & Kirk, 2020).

Despite the encouraging body of work realized on SCAs with potential benefits for PL, important limitations remain within research on SCAs. Many empirical studies examine individual models in isolation, rely on short intervention periods, or are implemented by highly experienced teachers under relatively controlled conditions (Dudley et al., 2022). Furthermore, while these studies demonstrate the pedagogical potential of SE, CL, and GBAs, they also reveal recurring challenges, including difficulties sustaining coherent enactment in dynamic classroom settings, limited attention to how tasks and roles evolve over time, and a lack of research examining how multiple pedagogical approaches can be responsively combined to address learners' changing needs (Silva et al., 2024). Consequently, despite the strong theoretical alignment between SCAs and multidimensional PL, far less is known about how these approaches operate across extended periods of authentic practice, particularly when enacted by preservice teachers (PSTs).

This gap is especially relevant in PE teacher education (PETE) given that PSTs are often positioned as agents of pedagogical renewal, yet typically enter school placement with limited experience in managing the complexity, uncertainty, and relational demands of PE lessons (Goodyear & Dudley, 2015; Silva et al., 2021). In the absence of structured opportunities to adapt and integrate pedagogical strategies in situ, PSTs frequently revert to more teacher-directed practices when faced with behavioral, organizational, or emotional pressures (Silva et al., 2021). Crucially, the pedagogical decisions PSTs make during placement directly shape students' opportunities to engage meaningfully, collaborate, develop confidence, and experience learning across multiple PL domains (Barnett et al., 2023). Examining PSTs' learning in relation to students' responses is therefore essential for understanding how PETE programs can prepare teachers capable of fostering holistic PL development in real-world contexts.

In agreement, the present study aimed to examine how secondary school students' PL developed across one school year in PE lessons taught by PSTs using a curriculum informed by SCAs. Rather than treating pedagogical models (i.e., SE,

CL, and GBAs) as prescriptive templates, the study focused on how key pedagogical features were flexibly blended and adapted over time in response to learners' needs as PSTs' practice evolved. Using a participatory action research (PAR) design, the study sought to generate an in-depth, process-oriented understanding of how the responsive use of SCAs can support multidimensional PL development in authentic school contexts.

Methodology

Research Design

This study adopted a PAR design (Kemmis et al., 2014) to examine how SCAs implemented by PSTs during their school placement shaped pupils' learning experiences and PL development in PE. PAR was selected for its capacity to simultaneously investigate pedagogical processes in authentic contexts and support PSTs' professional learning through cycles of reflection and adaptation.

The study was conducted across the three terms of the school year (1st term, September to December; 2nd term, January to April; and 3rd term, April to June) and comprised an initial reconnaissance phase followed by three iterative PAR cycles. Each cycle included diagnosing, planning, acting, monitoring, reflecting, and fact-finding, allowing pedagogical strategies to be implemented, reviewed, and refined over time. This cyclical structure enabled the analysis of how instructional conditions and student engagement evolved across successive phases of the intervention.

The first author acted as a participant–observer (PO) and facilitator throughout the process, working collaboratively with a cooperating teacher (CT) to support PSTs' lesson planning, enactment of SCAs, and structured reflection. Joint planning meetings and post-lesson reflections were used to examine students' responses, identify pedagogical challenges, and adapt subsequent instructional decisions. This collaborative inquiry process ensured methodological coherence while preserving pedagogical authenticity within the school setting.

Context and Participants

The study was conducted in a public school located in a rural area of northern Portugal, serving approximately 300 students across basic and secondary education. The school was characterized by adequate PE facilities and a culture of

pedagogical openness, including prior engagement with SCAs. The surrounding community reflected a medium socio-economic profile, with opportunities for youth sport participation through local clubs and associations.

Four PSTs (two female and two male; mean age 25 ± 1.2) who were enrolled in a local two-year PETE program participated in the study. During the first year, PSTs were introduced to SCAs, focusing on both conceptual understanding and practical application. This included experiencing SCAs as learners in practical classes, as well as enacting these pedagogies as teachers through peer-teaching and collaborative microteaching experiences with primary school pupils. The second year consisted of a full-year teaching school placement, supported by a supervisory team from both the university and the host school. During this placement, each PST assumed full responsibility for teaching one class, including lesson planning, implementation aligned with curricular guidelines, assessment, and ongoing reflection on professional development. Given the program's emphasis on SCAs in the first year, there were clear institutional expectations that PSTs would implement these pedagogical models during their school placement.

All PSTs held prior bachelor's degrees in sport sciences but had no formal teaching or coaching experience. The placement school was selected through purposive sampling due to the presence of an experienced CT and an institutional context supportive of SCAs (Farias et al., 2022). The PSTs were formally assigned to the school by the PETE program based on placement preferences. Throughout the school year, the PSTs were supported by two facilitators: the CT (Frank), a 51-year-old teacher with over 20 years of mentoring experience; and the first author (John), a 27-year-old PhD student from the host institution, who acted as PO. John held a master's degree in PE teaching for elementary and secondary education and had prior practical experience and publications related to student-centered pedagogies (Farias et al., 2023).

The study involved four classes (two 11th-grade and two 10th-grade groups), comprising 54 students (29 girls and 25 boys; aged 15–17 years). While most students participated regularly in PE, only a small number were engaged in extracurricular sport. The classes displayed diverse levels of motor competence, ranging from highly skilled to students experiencing persistent difficulties, with the

majority showing intermediate proficiency. PE lessons followed the school timetable, with two weekly sessions per class (one 90-minute and one 50-minute lesson).

Planning of SCAs for PL development

Throughout the school year, PSTs (supported by the PO and the CT), were progressively guided to implement a SCA curriculum as part of their professional learning within the PAR design. This curriculum was oriented toward the development of PL, which is increasingly recognized across international frameworks, curricular guidelines, and policy documents as a central educational aim of PE. Rather than being defined through a single prescriptive model, PL was understood as a holistic and multidimensional learning outcome encompassing physical, cognitive, social and psychological dimensions of participation in meaningful movement experiences.

PSTs entered the school placement having already completed, during the first year of their PETE program, a structured curriculum explicitly focused on SCAs. This preparation included both conceptual and practical engagement with SE, CL, and GBAs, providing an initial pedagogical repertoire aligned with contemporary views of PE as a learner-centered, participatory, and developmental process.

Importantly, these SCAs were not presented as fixed templates to be implemented uniformly, but as flexible pedagogical resources to be adapted responsively to learners' needs and contextual conditions. Accordingly, the student-centered curriculum was not imposed as a predefined program; rather, it emerged through shared pedagogical commitments between the school and the PETE program, both of which emphasize learner-centered teaching and maintain familiarity with models-based practice. The CT's extensive experience with these pedagogies and the PETE program's constructivist orientation supported conceptual and practical coherence across university and school contexts throughout the school year.

The enactment of SCAs by PSTs was further supported through a problem-solving scaffolding framework (see AUTHOR, 2025), which informed how facilitators mediated PSTs' instructional decision-making during the placement. Rather than functioning as a rigid structure, this framework guided real-time pedagogical support as challenges emerged. The PO and CT jointly scaffolded PSTs' practice by

supporting the identification of instructional problems, co-constructing and modelling pedagogical responses, and guiding pedagogical reasoning. This adaptive support enabled PSTs to progressively assume greater responsibility for planning, implementing, and justifying SCA's instructional decisions.

Across the three school terms, PSTs integrated SE, CL, and GBAs into lesson planning and teaching in increasingly sophisticated ways. Key features of SE included persistent team affiliation, role playing, record-keeping, and opportunities for student leadership. CL contributed structures for positive interdependence, individual accountability, group processing, and face-to-face interaction. GBAs were enacted through tactical questioning, problem-solving using game-like tasks, game modifications and progressive increases in task and game complexity. Together, these features supported learning environments that were participatory, dialogic, and increasingly responsive to pupils' needs and abilities.

Each PST taught a designated class and planned instructional units aligned with the national PE curriculum, adapting content and pedagogy through student-centered strategies in response to emergent teaching–learning issues identified within each PAR cycle. Although classes engaged with different physical activity areas (e.g., handball, volleyball, badminton, and gymnastics), unit design followed a shared pedagogical trajectory, moving from more teacher-led structures toward increasingly autonomous, collaborative, and reflective forms of participation. This approach ensured pedagogical coherence across classes while enabling meaningful analytic comparability.

Data Collection

Data were collected through lesson observations and reflective records, pre- and post-lesson reflections, and focus group (FG) interviews with PSTs and students.

Lesson observations and reflective records

The PO conducted 152 lesson observations over the school year – one per week for each PST (38 per class). These observations focused on how student-centered pedagogies were enacted in practice, attending to indicators such as students' engagement with tasks, the clarity and appropriateness of task structures, the alignment between instructional intentions and students' responses, and the emergence of real-time teaching challenges. Observations were recorded in

detailed field notes and in the PO reflective diary (PO-RD), resulting in 207 entries written during or shortly after lessons and meetings. The PO-RD also included analytical reflections linking practice to theory, helping trace evolving pedagogical approaches and student engagement.

Pre- and post-lesson reflections

Regular briefings preceded each lesson to review plans and intended instructional strategies. After each lesson, reflective sessions were held in the PE workroom, where the PO, CT, and PSTs discussed emerging teaching practices and student responses. Discussions were prompted by open questions (e.g., “*How did the group respond to the new activity?*”), fostering critical and collaborative reflection. All sessions were audio-recorded and later transcribed for analysis.

FG interviews

Four FG interviews were held with PSTs: one at the beginning of the school year (to capture initial expectations) and three at the end of each school term to explore shifts in practice, reflections on student learning, and challenges encountered. FG interviews were also conducted with students from all four classes. In each class, two heterogeneous groups of four students were formed, balanced by gender and levels of PE engagement (as identified by PSTs and the CT). In total, 24 students’ FG interviews were conducted (one per group per term) capturing diverse perspectives on the pedagogical processes and students’ evolving learning experiences across the four PL domains. All interviews were audio-recorded and transcribed verbatim.

Data Analysis

Data were analyzed using thematic analysis (Braun & Clarke, 2006), with the aim of examining how PSTs’ pedagogical enactment across a school year shaped students’ learning experiences. Although the study was organized around four iterative PAR cycles, the analysis did not apply predetermined categories derived from any single PL framework. Instead, the PAR cycles functioned as a temporal and pedagogical scaffold, enabling the analysis to trace changes in students’ participation, decision-making, interaction, and confidence as instructional conditions evolved.

The analytic process followed Braun and Clarke's six recursive phases: familiarization, initial coding, theme development, refinement, naming, and interpretation. The first author engaged in repeated reading of lesson observations, the reflective diary, PSTs' and students' focus group transcripts, and pre- and post-lesson reflections. Analytical memos were generated throughout this process to capture emerging patterns of engagement, recurring challenges, critical incidents, and pedagogical responses within and across cycles. Initial codes were generated inductively and focused on moments in which students demonstrated shifts in understanding, behavior, or interaction (e.g., hesitation during early game-like tasks, emerging tactical reasoning during modified games, or changes in peer interaction as roles became more prominent). Rather than organizing codes deductively into physical, cognitive, social, or psychological domains, the analytic focus centered on how these dimensions co-occurred within concrete pedagogical events. This approach foregrounded the situated and integrated nature of students' learning experiences.

As analysis progressed, codes were clustered and refined in relation to the developmental dynamics evident within each PAR cycle. Particular attention was given to how instructional features, task demands, and student responses combined to characterize different phases of the intervention. This cycle-oriented analytic structure preserved the narrative logic of the PAR process and supported examination of how pedagogical conditions and student engagement shifted over time.

The APLF informed interpretation at a conceptual level, functioning as a sensitizing lens rather than as an analytic or coding framework. Specifically, the APLF was used to support the interpretation and labeling of broad PL domains to which emergent learning elements could be meaningfully related (e.g., perceptual awareness, collaboration, emotional self-regulation), without constraining the analysis or requiring data to fit predefined categories. The specific expressions, properties, and trajectories of these learning elements were derived inductively from students' actions and accounts. Similarly, the SCAs underpinning the intervention informed interpretation through their enacted features in practice, rather than through deductive application of model-based categories.

In the final stage, analytic patterns were consolidated into cycle-based accounts that reflect how students' learning was enacted and transformed across the four PAR cycles. These analytic accounts preserved the developmental and temporal logic of the PAR process and provided the organizational basis for the Results.

Trustworthiness

Several strategies were employed to ensure the trustworthiness and credibility of the study. The first author maintained prolonged engagement in the cooperating school throughout the four PAR cycles, supporting PSTs, observing lessons, and collaborating closely with the CT. This sustained involvement strengthened the alignment between classroom events, participants' perspectives, and the evolving pedagogical intentions and contextual demands of the project (Bryman, 2012). Data triangulation was achieved through the integration of multiple sources, including lesson observations, FG interviews with PSTs and students, the researcher's reflective diary, and field notes, enabling a comprehensive understanding of students' experiences and pedagogical dynamics across cycles. Member checking was conducted with PSTs and the CT, who reviewed selected excerpts and confirmed the plausibility of emerging interpretations. To further enhance analytic transparency, two independent qualitative researchers audited portions of the coded dataset, thematic structure, and illustrative excerpts. Finally, regular peer debriefings supported reflexive engagement with the data, allowing the research team to challenge assumptions, refine interpretations, and consider the influence of researcher positionality throughout the analytic process.

Ethical Considerations

All participants provided informed consent prior to their involvement in the study. For students, consent was obtained from their legal guardians, and students were informed about the study's aims, the voluntary nature of participation, and their right to withdraw at any stage without consequence. PSTs and the CT received the same information and provided written consent. The study received ethical approval from the university's ethics committee [insert code], and all procedures adhered to established ethical guidelines for educational research. Confidentiality was ensured

through the use of pseudonyms, the removal of identifying details from transcripts and field notes, and the secure storage of all digital and physical data.

Results

The findings are presented narratively across four PAR cycles, each representing a distinct phase of the intervention characterized by the evolving enactment of SCAs by PSTs. Across the four classes involved in the study, these cycles reflect shifts in instructional emphases and recurring patterns of student participation as pedagogical responsibilities, task demands, and forms of engagement changed over time. Given the inclusion of students from different year groups and content areas, the analytic focus was not on comparing individual classes, but on identifying salient and recurrent patterns in how students' learning unfolded within similar pedagogical conditions.

Table 1 provides an overview of the four PAR cycles, outlining the timeframes, content areas, and key pedagogical features that framed each phase. The findings are reported cycle by cycle, foregrounding how students' learning was enacted in relation to the evolving pedagogical context. The APLF informed interpretation at a conceptual level, supporting the identification of broader PL domains to which emergent learning elements could be related, while allowing the specific expressions and developmental trajectories of learning to emerge from the data. Theme labels were designed to reflect the interaction between the SCA-informed pedagogical features enacted by PSTs and students' physical literacy responses over time. This approach captures students' learning as a dynamic, situated, and non-linear process, in which physical, cognitive, social, and psychological elements co-occurred and interacted within particular lesson structures and task demands.

Table 1. Overview of the four PAR cycles: timeframes, gradual and responsive use of SCAs, and dominant student learning patterns.

PAR cycle	Timeframe	PSTs' pedagogical focus and responsive use of SCAs features	Dominant student learning patterns
<i>Cycle 1 – Reconnaissance: early team-based engagement and constrained decision-making</i>	Sep–Oct	Introduction of game-like tasks; persistent team affiliation; limited instructional mediation during gameplay	High engagement and enjoyment; limited understanding of rules, positioning, and tactical decisions; frequent reliance on teacher guidance
<i>Cycle 2 – Emerging shared decision-making and collective problem-solving during gameplay</i>	Oct–Dec	Consolidation of team affiliation; explicit assignment of peer feedback; use of modified games; tactical prompts and structured group processing	Improved communication and coordination; emerging tactical reasoning; increased peer discussions during play; mixed emotional regulation in competitive situations
<i>Cycle 3 – Developing student agency under increased game demands</i>	Jan–Apr	Increased task complexity (e.g., introduction of tactical nuances); formalized student roleplaying (e.g., captains, referees); reduced direct teacher intervention; planned opportunities for team-based problem-solving	More intentional decision-making; effective enactment of student roles; peer leadership; shared regulation of participation; growing responsibility for team functioning
<i>Cycle 4 – Sustained student agency and transfer beyond PE</i>	Apr–Jun	Explicit delegation of task organization and participation management to students; student-led regulation of activities (e.g., rotations, substitutions); minimal teacher intervention; integrated use of SCA features across different content areas	Stabilized autonomy; shared responsibility for learning and participation; emotional self-regulation; emerging engagement with physical activity beyond PE

Note. Participatory Action Research (PAR); Preservice teachers (PSTs); Student-centered approaches (SCAs); Physical education (PE).

1st PAR cycle – Early team-based engagement, emerging game appreciation, and unregulated social interaction

During the first PAR cycle, PSTs organized lessons using a range of instructional strategies, including small-sided games, team-based activities, pair work, and station-based task organization. In handball, game-like tasks such as 10-pass drills served to initiate the development of handball gameplay skills within non-consequential situations that still embedded a competitive element. In gymnastics, learning was organized through small-group station work that required face-to-face interaction and initial collaboration to create acrobatic group sequences. In fitness-based lessons, students occasionally worked in pairs, while in swimming, students were split into groups that worked on different content (task complexity) according with their diagnosed swimming background.

However, PO lesson observations showed that these pedagogical features were often enacted with limited instructional mediation during students' task performance. In several lessons, PSTs adopted a predominantly observational role while activities were ongoing as *“feedback was scarce, and task instructions were*

rarely adjusted once activities were underway" (PO-RD, September). In swimming, dividing students across lanes constrained opportunities for differentiated explanation and feedback, as *"with students divided by lanes, it became difficult to explain specific content appropriate to different levels"* (PO-RD, September). In volleyball 2v2 gameplay, individual accountability and shared responsibility were not operationalized, as *"students played without opponent rotation or record-keeping"* (PO-RD, September), limiting variation in decision-making possibilities and contributing to monotonous patterns of participation.

Student engagement in game-based activities was identified early on as students *"played straight away, not just drills as usual"* (student A, girl; FG-December). However, students' participation during handball lessons revealed a lack of understanding of the rules of the game (restrictions on defensive interception), task constraints (not using safely zones), and appropriate positioning in the court (getting open). Several students described limitations in tactical interpretation when playing different game formats, particularly when the rules differed from those typically associated with formal versions of the game. Student B (girl; FG-December) described difficulties in *"understanding the new rules, different from the regular 7v7"*, while student C (boy; FG-December) noted that *"people intercepted the ball when not allowed, making a fault and breaking the game flow"*.

These challenges were also reflected in students' movement-related decisions during gameplay: PO observations documented *"limited spatial awareness, slow reactions, and inappropriate decisions when transitioning between attack and defense, moving back when they should move up-court and vice versa"* (PO-RD, September). In several lessons, students clustered around the ball, *"showing little mobility to create passing lines"* (PO-RD, September) as oftentimes, and, as per student D, *"I didn't know where I should stand on the court"* (girl; FG-December).

Social interaction was evident when students worked in teams, pairs, or small groups, fostering relationships within persistent groups. During gameplay, however, interaction patterns were characterized by unequal participation, particularly in competitive situations. In some instances, individual players dominated play, limiting opportunities for collaboration and collective involvement. One student described this experience: *"When it gets competitive, Richard just wants to win and doesn't*

pass us the ball... he does everything on his own because he thinks that's better for the team" (student E, girl; FG-December). In these moments, PSTs did not intervene to monitor participation patterns or to promote equitable involvement during competitive play. Students frequently expressed engagement and enjoyment, particularly when lessons involved immediate participation in game situations. In game-like tasks the *"competition between teams significantly increased students' willingness to participate"* (PO-RD, October).

2nd PAR cycle – Task-mediated collective engagement and facilitated shared decision-making

During the second PAR cycle, lessons increasingly incorporated modified games designed to make collective play demands explicit, particularly in game-based contexts. In invasion games, task modifications emphasized maintaining ball possession, and required teams to pause briefly to discuss and adjust their positioning or tactical choices following breakdowns in play. In several lessons, PSTs deliberately reduced direct intervention during gameplay, allowing students greater time to negotiate decisions, interpret play situations, and coordinate collective adjustments without immediate teacher direction. Instructional actions during this cycle included more frequent prompts aimed at decision-making in game situations, as well as brief interruptions to allow peer discussion about collective strategies, particularly in sports such as handball and volleyball, and to a lesser extent in individual or closed-skill activities. In fitness-based lessons (FITescola/athletics) and swimming, PSTs structured tasks to be completed in pairs, creating conditions for shared responsibility and peer mutual support.

Within these pedagogical conditions, students' engagement in handball showed changes in how they described and enacted decision-making. Lesson observations documented longer periods of sustained ball possession, with emerging peer-to-peer helping attitudes during play: *"ball possession lasted longer and students began correcting each other's positioning during the game; 'get open'; 'don't wait up, move before the ball'"* (PST-Peter; FG-November). Several accounts illustrated changes in perceptual awareness, tactical reasoning, and anticipatory decision-making, particularly in relation to timing and space during gameplay events. Students' conveyed increased awareness of both personal and collective

appropriate decision-making, as *“Now I can make the pass faster and keep my head up to see who is unmarked”* (student F, boy; FG-December), and *“I began to understand that if I moved a little earlier, the play opened up for us”* (student G, girl; FG-December).

In volleyball lessons, students engaged in brief discussions before performing attack plays, indicating moments of shared planning and strategy selection, as one PST noted, *“...they began discussing among themselves who would set and who would attack, as well as where to direct the ball”* (PST-Ava; FG-November). Social interaction during cycle 2 was characterized by increased communication and collaboration, particularly in game-based lessons. Students described these moments as opportunities to listen to peers’ ideas and jointly agree on alternative ways of acting. As student H explained, *“Sometimes we stop and say, ‘Let’s try it differently,’ we listen to what others suggest, decide together what to do, and it actually works”* (FG-December). Another account indicated reduced reliance on teacher guidance and greater use of peer interaction during gameplay, as one student noted, *“we’ve started talking more during the game, not waiting for the teacher to tell us what to change”* (student I, boy; FG-December). However, peer interaction was not always experienced uniformly. Some students reported discomfort when feedback was provided by peers outside their usual friendship groups, for example, *“it felt strange when someone I don’t usually work with told me what I should do”* (student J, girl; FG-December).

Students’ psychological responses during cycle 2 were particularly visible in competitive situations. While engagement and enjoyment remained high during game-based tasks, several students described frustration following mistakes, as *“when we lost the ball, I got annoyed and stopped thinking about the next play”* (student E, girl; FG-December). Lesson observations identified challenges related to emotional self-regulation, with temporary withdrawal from interaction or reduced involvement in subsequent plays from some students, as *“after consecutive errors, some students moved away from play and reduced communication with the team”* (PO-RD, December).

In different sports, additional patterns of interaction were observed. During fitness-based lessons, tasks were organized so that peers supported one another directly. Through lesson observations, it was noted that *“while one student*

completed the mile test, a peer counted laps, encouraged them, and recorded the time” (PO-RD, December). Similarly, in swimming lessons, students were observed accompanying less skilled peers throughout the lesson to ensure safe engagement and task completion. As explained, “I couldn’t take part in the practical lesson, but I stayed outside the pool supporting Lara the whole time so she would feel safe and know what to do” (student K, girl; FG-December).

3rd PAR cycle – Intentionally designed learning conditions and shared responsibility: adaptive game play and considerate peer leadership

During the third PAR cycle, PSTs introduced tasks of increased complexity and more deliberately manipulated task constraints, placing greater cognitive and decisional demands on students. In game-based contexts, they attempted to shape students’ perception–action coupling, for example through applying spatial constraints, rule adaptations, and differentiated task goals.

In badminton, PSTs manipulated court dimensions and target zones by dividing the court into three distinct areas (i.e., near the net, mid-court, and deep court) to prompt intentional variation in shot selection. As one student explained, *“we’ve started using different hitting techniques, shorter or longer, depending on what we wanted to achieve”* (student A, girl; FG-April). Another student described adjusting decision-making in response to opponents’ movements, linking what to do to how the opponent was positioned or moving, evidencing anticipatory reasoning during play: *“If I send the shuttlecock to the back of the court, the opponent has to move, and then I can use the net”* (student L, girl; FG-April).

In volleyball, modified games and drills were designed in reference to specific tactical principles, such as side-out situations. Students were observed to engage in collective organization during gameplay. These moments involved shared planning, reasoning, and collective decision-making in response to task demands, with the PO noting that *“After realizing that the opponents were targeting weaker receivers, students spontaneously gathered and reorganized the rotation based on who could handle the serve better”* (PO-RD, February). In addition, PSTs progressively reduced direct control during task enactment, allowing students greater space to organize, communicate, and collectively regulate their actions. This redistribution of responsibility was supported by the *“formalization of student roles,*

such as captains and referees, which became more explicitly integrated into the lesson flow” (PST-James; FG-April).

As game situations evolved, students demonstrated a growing ability to adjust movement execution in response to tactical demands. In badminton, this was reflected in how students adapted footwork and body positioning to prepare shots more effectively, as one student noted, *“I started paying more attention to where I was on the court and getting into position earlier, so I could hit the shuttle better”* (student A, girl; FG-April). Furthermore, rule adaptations such as allowing additional touches in volleyball, enabled less skilled students to maintain participation while engaging with the tactical structure of the task: *“once the teacher allowed us to use two touches to control the ball, I felt much more capable of playing, and as a result, the team’s performance also improved significantly”* (student M, girl; FG-April).

Social interaction during cycle 3 was marked by more explicit and enacted forms of peer leadership and shared responsibility. Students increasingly described themselves as learning resources for one another. In badminton, there were evidenced of peer instruction grounded in content knowledge and task understanding, as *“when others were struggling with the lob, I explained what they needed to do, specifically stepping forward with the racket-side leg when executing the shot”* (student N, girl; FG-April). Leadership roles emerged more tangibly through students taking responsibility for supporting and including others, as illustrated by one student’s explanation: *“Being captain means helping others, explaining the rules, and making sure everyone feels included”*. Peers also became collectively involved in managing emotional responses within the group during gameplay, supporting teammates who became nervous in order to sustain their participation. As student O noted, *“Sometimes teammates get nervous. We have to reassure them they’re safe and keep going”* (boy; FG-April).

Students’ accounts pointed to a progressive shift in confidence associated with increased responsibility in game contexts. As one student stated, *“at the beginning I was afraid to make mistakes, but now I even want to be captain”* (student E, girl; FG-April). At the same time, although students increasingly assumed responsibility for team organization and collective participation, observations indicated that this autonomy was not yet fully consolidated when task demands intensified: *“In game situations requiring adjustments during attack–defense*

transitions or responses to opponents' movements under time pressure, some students paused play and turned to the PSTs for guidance on where to move or how to proceed" (PO-RD, February).

4th PAR cycle – Sustained student agency and physical literacy transfer

During the fourth PAR cycle, PSTs deliberately redistributed pedagogical responsibility across wider groups of students in both 10th- and 11th-grade classes, rather than concentrating it solely in designated team captains, and further reduced direct intervention during lesson flow. Students were explicitly assigned responsibility for organizing and managing key lesson components. For example, in team sports such as badminton and basketball, students managed rotations, kept score, and resolved minor disputes, while in dance and fitness-based lessons they led warm-ups, coordinated group tasks, and monitored task completion.

In badminton lessons, learning activities increasingly reflected student-led organization: *"Students organized the warm-up autonomously by selecting and sequencing movement-based and racket-handling exercises aligned with the footwork patterns lesson focus, and managed time allocation without direct teacher intervention"* (PO-RD, May). Within this context, PSTs monitored task progression and group dynamics, intervening selectively when necessary. As one PST described, *"now we step back and let them take control, but we're always there if needed"* (Sophia; FG-June).

During this period, students' accounts reflected more stable tactical reasoning and collective planning. In basketball, one student described how play was intentionally adjusted during a typical offensive sequence: *"Now we don't rush the pass. We move the ball first, see how the defense reacts, and if they close one side, we change the play to the other to create space and get a better option"* (student F, boy; FG-June). Game-play planning increasingly extended beyond immediate decisions made during play. As one student explained, *"during tournaments we usually know beforehand who we're going to play next, so we talk about how they play and what they're good at. For example, if we know a team attacks a lot through the middle, we decide to close that space and force them wide"* (student O, boy; FG-June).

Patterns of participation during cycle 4 were characterized by shared responsibility and peer regulation during gameplay. During tournaments, *“students organized substitutions and ensured equitable participation among team members”* (PO-RD, May). Students also described resolving game-related issues autonomously, as one PST noted: *“when disagreements came up during play, like whether it was a foul or who had possession of the ball, students talked it through and resolved it themselves, without us having to step in”* (PST-Peter; FG-June).

Students’ accounts reflected a shared culture of support that extended beyond formally assigned roles, with supportive behaviors described as part of regular participation rather than limited to students with specific responsibilities (e.g., captains or referees). As student C noted, *“when a teammate is more tired, we know we have to support them”* (boy; FG-June). This broader sense of responsibility was also evident in how students described role enactment during competitive events, with one student explaining, *“being a referee or captain taught me to respect others more and to be fair”* (student N, girl; FG-June).

Within the psychological domain, students’ accounts reflected increased confidence in relation to participation. Rather than describing fear of making mistakes, students spoke about accepting errors as a normal part of their involvement in activities: *“At the beginning, I was afraid of failing, but now I know mistakes are part of learning”* (student I, boy; FG-June).

Clear indications of transfer beyond the PE setting emerged during the fourth cycle, as students described increased engagement with physical activity outside school in different forms. Some accounts reflected self-initiated or individually organized participation, as one student explained, *“I enjoyed PE this year and felt I needed more endurance, so I joined a local gym”* (student O, boy; FG-June). Others described exploring new activities beyond school in less formal contexts, *“the classes were more fun, which made me want to try a sport outside school”* (student A, girl; FG-June). In some cases, this engagement extended to more structured and institutionalized contexts, such as club sport participation: *“that’s how I ended up joining a local basketball team”* (student M, girl; FG-June).

Discussion

This study examined how secondary school students' PL developed across one school year in PE lessons taught by PSTs using a curriculum informed by SCAs. The findings indicate that students' learning did not progress linearly as a result of exposure to SCA-based lessons, but emerged gradually through evolving pedagogical conditions shaped by the responsive enactment of SCAs over time. Across the four PAR cycles, meaningful development was associated with the flexible design of tasks, the progressive redistribution of responsibility, and the stabilization of collective practices, which together supported students' engagement, decision-making, social interaction, and confidence. Taken together, these findings reinforce the potential of SCAs to support multidimensional PL development, while underscoring that how pedagogical features are enacted and adapted over time is central to when and how this potential is realized in authentic school contexts.

PSTs' enacting SCAs across a full school year

A central contribution of this study lies in illustrating what the sustained enactment of SCAs can look like when implemented across a full school year within a PETE context. The findings highlight how PSTs' teaching practices evolved through the flexible blending and adaptation of student-centered pedagogical features over time. Overall, the findings show that the enactment of SCAs by PSTs evolved from initial use of game-like tasks and team structures, toward increasingly deliberate pedagogical practices that foregrounded shared decision-making, role-playing, and student responsibility, culminating in more sustained forms of student agency across lessons. This process-oriented enactment contrasts with much of the PETE literature, which has shown that PSTs often struggle to sustain learner-centered practices beyond isolated units or controlled interventions, frequently reverting to more directive teaching under classroom pressures (Goodyear & Dudley, 2015; Silva et al., 2021).

Importantly, PSTs' capacity to enact SCAs in a sustained and responsive manner appeared closely linked to the systemic conditions of the PETE program in which this study was situated. Consistent with research emphasizing the multi-layered nature of pedagogical enactment in PETE, the year-long school placement, strong university-school partnerships, and continuous pedagogical dialogue among

PSTs, CTs, and the university supervisor created conditions that supported pedagogical continuity and experimentation (Farias et al., 2023). These structures enabled PSTs to refine their practice progressively, rather than abandoning student-centered intentions when confronted with classroom management demands, or uneven student responses.

The role of CT and the PO was particularly salient in scaffolding PSTs' engagement with SCAs. Rather than functioning solely as evaluators or technical advisors, they acted as pedagogical facilitators who legitimized PSTs' instructional choices, mediated access to the school community, and supported principled decision-making aligned with student-centered teaching (AUTHOR, 2025). This form of scaffolding has been identified as critical in enabling PSTs to develop adaptive expertise, tolerate ambiguity, and respond flexibly to the emergent demands of practice – capacities that are central to the enactment of SCAs in authentic school contexts (Goodyear & Dudley, 2015).

The PETE program's nature where the study took place also facilitated the development of communities of practice (Lave & Wenger, 1991) among PSTs and CTs, providing a social infrastructure that supported learning through participation over time. From a sociocultural perspective, prolonged immersion within these communities enabled PSTs to align theoretical understandings of SCAs with the practical realities of school-based teaching, strengthening the coherence between university coursework and classroom enactment (Farias et al., 2023). In contrast to PETE contexts characterized by fragmented supervision or limited school integration, such continuity appears to mitigate the tendency for student-centered pedagogies to be adopted superficially or abandoned under pressure (Silva et al., 2021).

These findings suggest that PSTs' sustained enactment of SCAs during school placement is less a function of individual competence and more a product of systemic PETE conditions that support pedagogical experimentation, reflective practice, and gradual redistribution of responsibility. Within such conditions, SCAs function not as prescriptive instructional templates, but as pedagogical resources whose potential is realized through ongoing mediation, scaffolding, and participation within supportive professional communities (AUTHOR, 2025; Goodyear & Dudley, 2015).

PL development as a situated and non-linear process

The findings from this study provide empirical support for conceptualizations of PL as a dynamic, situated, and non-linear process that unfolds over time through participation in meaningful movement contexts (Edwards et al., 2017; Whitehead, 2010). Rather than progressing uniformly across domains, students' learning trajectories reflected periods of emergence, consolidation, or fluctuation, with different elements of PL becoming salient at different moments across the school year. This temporal variability reinforces arguments that PL development cannot be captured through short-term interventions or static assessments, but requires sustained engagement within pedagogical environments that allow learning to evolve (Bailey, 2021; Cairney et al., 2019).

Using the APLF as a sensitizing lens enabled the interpretation of students' learning across physical, cognitive, social, and psychological domains without imposing predefined developmental pathways. Consistent with recent critiques of domain-based representations of PL, the findings illustrate how these elements were intertwined in practice rather than enacted discretely (Belton et al., 2019; Keegan et al., 2019). For example, gains in decision-making and perceptual awareness were frequently accompanied by changes in communication, shared responsibility, and confidence, highlighting the relational nature of PL development in game-based and collaborative contexts.

Across the four PAR cycles, evidence of PL development was observed both within and across stages, as described in the APLF, with students often consolidating particular elements within a given stage while simultaneously displaying emergent features typically associated with later stages in other domains. It reflected the APLF's assertion that development may advance, stall, or regress differently across elements depending on context and learning conditions. Early cycles were characterized by engagement and motivation that preceded stable tactical understanding or effective decision-making, aligning with research showing that affective engagement alone does not guarantee holistic PL development (Edwards et al., 2017). Subsequent cycles reflected more integrated forms of learning, in which students demonstrated increasing capacity to interpret game demands, coordinate actions with others, and regulate participation under more complex conditions. These patterns support the view that PL development is better

understood as iterative and context-sensitive rather than as movement through fixed stages (Durden-Myers et al., 2018; Sport Australia, 2019).

Importantly, the findings also suggest that different SCAs may create opportunities for development of distinct, yet interconnected, elements of PL. GBAs (game modifications) appeared to support cognitive and perceptual dimensions related to decision-making and tactical awareness, while SE features, such as persistent team affiliation and roleplaying, created conditions for social responsibility, collaboration, and ethical participation (Hastie & Wallhead, 2016). CL structures further supported communication, peer regulation, and attentiveness to others, aligning with research linking collaborative pedagogies to social and psychological aspects of PL (Dyson et al., 2010; Farias et al., 2020). Rather than attributing specific outcomes to a specific pedagogical model, the findings highlight how the responsive blending of pedagogical features shaped opportunities for multidimensional PL development.

Finally, evidence of student agency and selective transfer beyond PE observed in the later stages of the study aligns with conceptualizations of PL as a lifelong and individual journey rather than a set of predetermined outcomes (Keegan et al., 2019; Whitehead, 2010). Students' engagement with physical activity beyond school appeared contingent on the stabilization of autonomy, shared responsibility, and emotionally safe learning environments, supporting arguments that transfer is more closely linked to meaningful participation and ownership than to the acquisition of discrete skills (Durden-Myers et al., 2018; Pot et al., 2018). In this sense, the findings suggest that a sustained SCAs curriculum may contribute to the conditions under which PL-related dispositions extend beyond the immediate PE context, while also underscoring the uneven and non-linear nature of such transfer.

Conclusions

This study contributes to understandings of PL as a situated, relational, and non-linear process that unfolds through sustained participation in student-centered pedagogical environments. By examining students' learning across a full school year, the findings show that meaningful development did not result automatically from engagement in student-centered lesson formats, but emerged progressively through the responsive enactment of pedagogical features that supported shared

decision-making, role enactment, and student agency over time. At the same time, evidence of transfer beyond PE was selective and based on students' self-reports, and the pedagogical enactments observed reflect PSTs' practice within a specific PETE and school context. These considerations are consistent with the situated and developmental nature of PAR and do not detract from the study's conceptual contribution.

The findings also point to important implications for research and practice. Longitudinal, process-oriented designs appear particularly valuable for capturing the non-linear development of PL and for understanding how responsibility, task demands, and emotional support are scaffolded over time within SCAs. In PETE contexts, greater attention to how PSTs develop pedagogical decision-making to balance structure and autonomy may inform the design of supervision, mentoring, and school placement models. Finally, future research is needed to explore how experiences in PE interact with opportunities, constraints, and identities beyond school, and how conditions for transfer may be sustained across contexts.

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Empirical Article 4

Students' game-play performance as an expression of physical literacy: A yearlong study in student-centered physical education

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Abstract

Physical literacy (PL) has been increasingly positioned as a central educational aim of Physical Education (PE), yet its empirical examination in authentic school contexts remains challenging. Within sport- and game-based activities, game-play performance reflects the integrated coordination of perceptual, cognitive, and motor processes that are central to the situated expression of PL. This study examined changes in secondary school students' game-play performance across successive instructional cycles implemented through student-centered pedagogical approaches, with particular attention to gender-related patterns. Data were collected within a participatory action research project conducted over one academic year in PE. Fifty-one students (27 girls, 24 boys; aged 15–17 years) participated. Game-play performance was assessed at the beginning and near the end of instructional units using systematic video-based observation based on the Game Performance Assessment Instrument. Performance indicators included decision-making, skill-efficiency, skill-efficacy, adjustment, and overall game performance. Non-parametric analyses revealed significant pre- to post-test improvements across most performance indicators. However, these changes were not uniform across cycles. Substantial improvements were observed in the first cycle, followed by more limited changes in overall game performance in the second cycle despite improvements in specific components, and more consistent gains across all variables in the third cycle. When analyzed by sex, both boys and girls demonstrated overall positive patterns of development, with no statistically significant differences in the magnitude of change between groups. These findings suggest that game-play performance can provide ecologically valid indicators of learning processes related to the physical and cognitive dimensions of PL. At the same time, the results highlight the importance of considering the temporal and pedagogical context in which such learning unfolds.

Keywords: Physical education; Game-play performance; Student-centered pedagogies; Physical literacy

Resumen

La alfabetización física (PL) ha sido cada vez más posicionada como un objetivo educativo central de la Educación Física (EF), aunque su examen empírico en contextos escolares auténticos sigue siendo un desafío. En actividades deportivas y basadas en juegos, el rendimiento en el juego refleja la coordinación integrada de procesos perceptivos, cognitivos y motores que son fundamentales para la expresión situada de la PL. Este estudio examinó los cambios en el rendimiento en el juego de estudiantes de secundaria a lo largo de ciclos sucesivos de instrucción implementados mediante enfoques pedagógicos centrados en el alumnado, con especial atención a posibles patrones relacionados con el sexo. Los datos se recogieron en el marco de un proyecto de investigación-acción participativa desarrollado durante un año académico en EF. Participaron 51 estudiantes (27 chicas, 24 chicos; 15–17 años). El rendimiento en el juego se evaluó al inicio y al final de las unidades didácticas mediante observación sistemática basada en el Game Performance Assessment Instrument (GPAI). Los indicadores de rendimiento incluyeron toma de decisiones, eficiencia técnica, eficacia técnica, ajuste (participación sin balón) y rendimiento global en el juego. Los análisis no paramétricos revelaron mejoras significativas del pretest al posttest en la mayoría de los indicadores de rendimiento. No obstante, estos cambios no fueron uniformes a lo largo de los ciclos. Se observaron mejoras sustanciales en el primer ciclo, seguidas de cambios más limitados en el rendimiento global durante el segundo ciclo, a pesar de mejoras en componentes específicos, y de ganancias más consistentes en todas las variables en el tercer ciclo. Cuando se analizaron por sexo, tanto chicos como chicas mostraron patrones positivos de desarrollo, sin encontrarse diferencias estadísticamente significativas en la magnitud de los cambios entre ambos grupos. Estos hallazgos sugieren que el rendimiento en el juego puede proporcionar indicadores ecológicamente válidos de procesos de aprendizaje relacionados con las dimensiones física y cognitiva de la PL. Asimismo, los resultados destacan la importancia de considerar el contexto temporal y pedagógico en el que se desarrolla dicho aprendizaje.

Palabras Clave: Educación física; Rendimiento en el juego; Pedagogías centradas en el alumno; Alfabetización física

Introduction

Recent educational debates have increasingly emphasized the need for schooling to prepare students for rapidly changing social, economic, and technological contexts by fostering so-called “21st century skills”, such as critical thinking, problem-solving, creativity, collaboration, and adaptability (Cobo, 2013; UNESCO, 2015). Contemporary educational frameworks highlight the development of transferable competencies that enable learners not only to acquire knowledge but to apply it effectively in dynamic and socially situated environments. Within this broader perspective on human education, school curricula are expected to contribute to the formation of integrated, context-sensitive capabilities that extend beyond the specific subject-matter knowledge of each discipline. In physical education (PE), physical literacy (PL) has increasingly been advanced as a guiding educational framework capable of orienting curricular aims toward the holistic development of learners, reflecting a view in which physical, cognitive, social, and psychological dimensions are understood as interdependent and mutually constitutive across the lifespan (Dudley et al., 2015; Whitehead, 2010).

Building on Whitehead’s conceptualization, the attributes of PL are understood to dynamically influence one another, with development occurring through ongoing interactions between physical, cognitive, social, and psychological domains (Whitehead, 2010). Grounded in broader educational aims linked to human flourishing and meaningful participation in physical activity (Durden-Myers et al., 2018), PL emphasizes individual developmental journeys while acknowledging that these trajectories unfold within social contexts – such as PE lessons – that shape access to participation opportunities, learning experiences, and social recognition. From this perspective, learning in PE is not limited to the acquisition of isolated skills but involves context-sensitive engagement in meaningful participation. Accordingly, pedagogical approaches that structure participation, interaction, and responsibility

are likely to play a critical role in shaping students' learning experiences, game-play performance, and developmental trajectories (Dudley et al., 2022).

In school-based PE, learning frequently unfolds through sport- and game-based activities, which constitute a substantial component of the curriculum. Furthermore, game contexts are difficult to bypass when assessing PL or student development in PE, as they strongly shape how competence and learning are enacted in practice (Butler, 2006). These contexts are characterized by dynamic and unpredictable environments in which learners must continuously perceive relevant information, interpret evolving situations, and coordinate decision-making with motor execution. As such, game-play provides a meaningful context for examining learning, as it reflects the integration of multiple performance dimensions under ecological constraints. From this perspective, game-play performance can be understood as a situated expression of learning processes related to specific dimensions of PL, particularly the physical and cognitive domains, although it does not represent the construct in its entirety and should be interpreted as a contextually bounded indicator of specific learning processes. Albeit, different sport contexts may involve specific task demands, they share underlying perceptual–cognitive and motor processes (e.g., decision-making, spatial awareness, and coordination), which allows for the examination of game-play performance as a general indicator of learning across game-based activities.

From a research perspective, the multidimensional and context-dependent nature of PL poses significant challenges for its assessment in school contexts (Cairney et al., 2019; Corbin, 2016). Traditional approaches in PE have largely privileged the physical domain, with a predominant focus on measurable fitness components (e.g., cardiorespiratory endurance, muscular strength, agility) and discrete motor skill proficiency, typically assessed through standardized performance tests and composite batteries such as the FITNESSGRAM, Eurofit, or the Canadian Assessment of Physical Literacy (CAPL) (Barnett et al., 2023; Cairney et al., 2019). While these approaches provide valuable information about specific components of PL, they offer limited insight into how learning is enacted within the dominant game-based practices of PE. As a result, there is ongoing debate regarding how assessment approaches can more adequately capture learning as it unfolds in authentic participation contexts (Barnett et al., 2023). In contrast, sport-

and game-based contexts allow for the simultaneous observation of perception, decision-making, motor execution, and interpersonal coordination. Observable game-play behaviors may therefore provide ecologically grounded indicators of integrated motor–cognitive processes, even if they do not capture the full multidimensional scope of PL (IPLA, 2017; Renshaw et al., 2019).

Student-centered pedagogical approaches (SCAs), such as Sport Education (SE), Game-Based Approaches (GBAs), and Cooperative Learning (CL), have been proposed as particularly suitable for fostering learning processes aligned with PL. These approaches deliberately structure interaction, responsibility, and decision-making opportunities, thereby creating learning environments that support meaningful participation in game-play contexts.

In SE, features such as persistent team affiliation, role-playing, and formal competition provide extended opportunities for students to assume responsibility and engage meaningfully over time (Siedentop et al., 2019). GBAs emphasize learning through modified game forms, tactical problem-solving, and representative learning tasks, encouraging students to perceive game situations, make decisions, and adapt their actions in dynamic contexts (Pill et al., 2023). Similarly, CL structures learning around positive interdependence, individual accountability, and collaborative problem-solving, fostering social interaction and shared responsibility (Dyson et al., 2004). Collectively, SCAs can create conditions in which students are actively engaged in game-play situations that require the integration of decision-making, motor execution, and interpersonal coordination. Within such pedagogical conditions, game-play performance emerges as a particularly relevant context for examining how students' learning unfolds in PE. Substantial evidence supports the social and psychological contributions of these pedagogical models, with consistent findings pointing to enhanced engagement, sense of belonging, perceived competence, shared responsibility, and positive peer interaction (Gil-Arias et al., 2017; Harvey et al., 2016; Hastie et al., 2009).

Research has consistently identified gender-related differences in students' experiences and learning in PE, particularly across social and psychological dimensions such as participation, perceived competence, motivation, and engagement in game-based activities (Barnett et al., 2023; Cairney et al., 2019). In many school-based contexts, boys tend to report higher levels of confidence and

demonstrate greater involvement in competitive and game-oriented tasks, whereas girls may experience lower perceived competence or reduced opportunities for meaningful participation, particularly in invasion and team games. However, such differences are increasingly understood as socially and pedagogically mediated rather than fixed or biologically determined traits, shaped by curricular structures, instructional models, and learning environments (Dudley et al., 2022; Hodges-Kulinna et al., 2024). From this perspective, examining gender-related patterns of change requires explicit attention to the pedagogical conditions within which learning occurs, as these may influence how students engage in game-play and, consequently, how motor and cognitive competencies are developed and expressed.

Research grounded in game-based assessment and model-based practice further suggests that pedagogical design plays a central role in shaping gendered learning outcomes. While some studies have reported advantages for boys and higher-skilled students, particularly in competitive contexts and early phases of instruction (e.g., Alexander & Luckman, 2001; Brock et al., 2009), others have demonstrated more equitable or even advantageous outcomes for girls when instructional conditions emphasized task modification, shared responsibility, and inclusive participation structures (Mesquita et al., 2012). Evidence from studies employing systematic observation tools such as the Game Performance Assessment Instrument (GPAI) reinforces this perspective, indicating that instructional conditions shape students' opportunities for decision-making and effective participation in game-play contexts. For example, Araújo et al. (2017) reported gender- and skill-related differences in students' game-play performance in volleyball, showing how variations in instructional design influenced patterns of engagement and decision-making. However, much of this research has been conducted within single-season or short-term instructional units, with limited attention to how such pedagogical approaches operate over extended periods or across successive instructional cycles.

Despite growing interest in the relationship between PL and game-play performance, empirical research examining how students' performance evolves across extended instructional periods in authentic school contexts remains limited. In particular, relatively few studies have examined changes in game-play

performance across successive instructional cycles implemented through SCAs, especially within regular school-based PE and involving preservice teachers (PSTs).

Accordingly, the purpose of the present study was to examine changes in secondary school students' game-play performance across three instructional cycles implemented over one school year within student-centered PE contexts. A secondary aim was to explore whether these changes differed by gender, thereby contributing to ongoing discussions on pedagogy, equity, and learning in PE.

Methods

Research design

The present study reports data collected within a broader participatory action research (PAR) project conducted over one full school year in a basic and secondary school, following principles commonly associated with PAR in educational settings (Kemmis et al., 2014). Within this framework, the research unfolded through iterative cycles comprising diagnosing, planning, acting, monitoring, reflecting, and fact-finding, allowing pedagogical strategies to be implemented, reviewed, and progressively refined over time.

The study involved four intact PE classes, each taught by a different PST. Across these classes, three instructional units were analyzed per class – one in each school term – resulting in a total of 12 units conducted over the course of the school year (see Table 1). These units were organized into three successive instructional cycles corresponding to the three school terms, each cycle representing a distinct phase of pedagogical implementation and progressive refinement. The instructional units encompassed different game categories, including invasion and net/wall games (e.g., volleyball, basketball, handball, futsal, and badminton), allowing students to engage in varied game contexts throughout the school year.

Within each instructional unit, students' game-play performance was assessed at two time points: at the beginning (pre-test) and at the end (post-test) of the unit. This resulted in repeated observations of students' performance across multiple instructional cycles and varied game contexts over the course of the school year. Importantly, the PAR framework informed the pedagogical development of the

instructional units, as PSTs engaged in continuous reflection and adaptation of teaching strategies across cycles. As such, the instructional units analyzed in this study should be understood as part of an evolving pedagogical process rather than as fixed or standardized interventions.

This research complements previously reported qualitative findings derived from the same project (e.g., AUTHOR, 2025), which focused on pedagogical enactment processes and students' learning experiences. Accordingly, the present paper concentrates specifically on observable game-play performance outcomes, assessed through systematic video-based analysis.

Context and Participants

The study was conducted in a public basic and secondary school located in a rural area of northern Portugal. The school was characterized by adequate facilities for PE and an institutional openness to pedagogical innovation. Participants comprised 51 students (27 girls and 24 boys; aged 15-17 years) enrolled in four PE classes (two 10th-grade and two 11th-grade groups). Although 54 students were initially enrolled, complete data were available for 51 students and were therefore included in the analyses. Students displayed heterogeneous levels of motor competence, ranging from highly skilled to students experiencing persistent learning difficulties. While most students participated regularly in PE lessons, only a small proportion were involved in organized sport outside the school context. The four classes followed a common curricular structure across the school year, with comparable instructional units and equivalent lesson frequency per unit, allowing data to be aggregated for analytical purposes.

Instruction was delivered by four PSTs (two female and two male) during their full-year school placement as part of a local two-year Physical Education Teacher Education (PETE) program. During the first year of the program, PSTs were introduced to student-centered pedagogical approaches, with an emphasis on both conceptual understanding and practical application. This preparation included experiencing these pedagogies as learners in practical classes, as well as enacting them as teachers through peer-teaching and collaborative microteaching experiences. The second year of the PETE program consisted of a full-year school placement, supported by a supervisory team from both the university and the host

school. During this placement, each PST assumed responsibility for teaching one class, including lesson planning, implementation aligned with curricular guidelines, student assessment, and ongoing reflection on professional practice. Given the program's emphasis on student-centered pedagogies in the first course year, there were clear institutional expectations that PSTs would draw on these approaches during their school placement.

Implementation of student-centered pedagogies and PL orientation

Across the school year, PSTs implemented a PE curriculum informed by student-centered pedagogies and oriented toward fostering learning processes aligned with key dimensions of PL. Rather than adhering rigidly to a single pedagogical model or operationalizing predefined domain-specific outcomes, instruction drew flexibly on features associated with SE, GBAs), and CL. Pedagogical decisions emerged responsively in relation to learners' needs, contextual constraints, and ongoing reflective dialogue within the PAR design guiding the broader project.

To enhance methodological transparency, it is important to clarify how these pedagogical principles were operationalized in practice. The enactment of student-centered pedagogies evolved progressively across the three instructional PAR cycles.

In the first cycle, instruction remained predominantly teacher-led, with the initial integration of simple game-based tasks alongside isolated drills. Learning activities involved basic game-like situations, with limited use of questioning and reflection. Tasks were occasionally adapted through simple constraints (e.g., space or number of players), and early forms of team organization began to emerge, including initial implementation of persistent team affiliation and basic competitive structures. Students also started to assume simple roles within teams, reflecting early features associated with SE.

In the second cycle, there was a consolidation of student-centered pedagogies. Lessons were increasingly structured around modified and small-sided games designed to address specific tactical problems (e.g., maintaining possession or creating space). Instructional sequences involved engagement in game-play situations followed by guided reflection through questioning, and subsequent task modification to increase tactical complexity. Persistent teams were established,

roles became more formalized, and greater emphasis was placed on peer interaction and shared decision-making.

In the third cycle, instructional practices reflected a more integrated student-centered approach. Tasks were highly representative and systematically manipulated through constraints such as rules, space, and player numbers. Instructional sequences continued to follow a game-based learning approach, with reduced teacher direct instruction and a stronger emphasis on student autonomy, peer leadership, and cooperative structures. Students were expected to take greater responsibility for regulating play, solving tactical problems, and supporting team functioning.

Across cycles, student organization followed a similar progression, with increasing levels of responsibility and autonomy within persistent teams. Within this evolving instructional approach, emphasis was placed on creating learning environments that supported context-sensitive skill execution, tactical awareness, decision-making, and meaningful participation in authentic game contexts. Although psychological dimensions were not directly measured, the autonomy-supportive and collaborative climate was consistent with theoretical perspectives on PL.

The enactment of SCAs evolved gradually and responsively over the school year as PSTs developed increasing pedagogical fluency in integrating features of the different models. Instructional adaptations were not predetermined but emerged through iterative cycles of planning, action, observation, reflection, and refinement, consistent with the PAR framework.

As shown in Table 1, the instructional process was organized into three successive cycles corresponding to the three school terms. Each cycle reflects a distinct phase in the progressive enactment of student-centered pedagogies, while also situating the game-play performance data within the pedagogical conditions under which learning occurred. Only sports included in the game-play performance analysis using the Game Performance Assessment Instrument (GPAI) are presented.

Table 1. Pedagogical progression and instructional features across the three instructional cycles

PAR cycle (term)	Pedagogical orientation	Instructional features (operationalization)	Sports content analyzed (by class)
1st PAR cycle (1st term)	Initial transition toward student-centered approaches (early SE features)	Predominantly teacher-led instruction combined with early integration of game-based tasks. Use of isolated drills alongside simple game-like activities. Limited use of questioning and reflection. Emergent team structures and initial role-taking (e.g., basic responsibilities within teams).	Volleyball (10th A, 10th B); Handball (11th A, 11th B)
2nd PAR cycle (2nd term)	Consolidation of student-centered pedagogies (SE + GBAs)	Increased use of modified and small-sided games. Tasks designed around tactical problems (e.g., maintaining possession, creating space). Structured reflection moments through questioning. Persistent teams and formalized roles. Greater peer interaction and shared decision-making.	Futsal (10th A, 10th B); Badminton (11th A, 11th B)
3rd PAR cycle (3rd term)	Integrated student-centered approach (SE + GBAs + CL)	Systematic use of constraint manipulation (rules, space, player numbers). High task representativeness and tactical complexity. Strong emphasis on student autonomy, peer leadership, and cooperative structures (e.g., shared responsibilities, collective regulation of play). Reduced teacher direct instruction.	Badminton (10th A, 10th B); Basketball (11th A, 11th B)

Note. PAR (Participatory Action Research); Sport Education (SE); Game-Based Approaches (GBAs); Cooperative Learning (CL). Only sports included in the game-play performance analysis using the GPAI are presented.

To clarify the conceptual alignment between pedagogical emphasis and the dimensions of physical literacy most directly implicated in game-play performance, Table 2 summarizes how key instructional features were theoretically related to the performance variables examined in the present study.

Table 2. Alignment between pedagogical emphasis, physical literacy domains, and game-play performance variables.

PL domain	Pedagogical emphasis during instruction	Related game-play performance variable
<i>Physical</i>	Representative and modified game forms (GBAs); Adaptive skill execution (GBA/SE)	Skill-efficiency; Skill-efficacy
<i>Cognitive</i>	Tactical questioning (GBAs); game problem-solving (GBAs); decision-making under constraints (GBAs/SE)	Decision-making; Adjustment (off-the-ball involvement)
<i>Social</i>	Persistent team affiliation (SE); collaborative structures (CL); shared responsibility (SE/CL)	Implicitly embedded within the pedagogical climate and collaborative structure of game-play contexts when taught (not directly measured)
<i>Psychological</i>	Autonomy-supportive climate (CL/SE); meaningful participation (SE/GBAs)	

Note. The alignment presented reflects theoretical consistency between instructional emphasis and performance indicators, rather than a direct operationalization of physical literacy as a measurable construct; Physical Literacy (PL); Sport Education (SE); Cooperative Learning (CL); Game-based approaches (GBAs).

While the pedagogical processes and PSTs’ professional learning trajectories are examined in detail elsewhere (AUTHOR, 2025), the present study focuses specifically on students’ game-play performance as a quantitative and contextually situated expression of learning within these pedagogical conditions.

Data Collection

Quantitative game-play assessment

Game-play performance was assessed through video-recorded game-play sessions conducted at two time points: a pre-test implemented at the beginning of each instructional unit and a post-test implemented near the end of the unit. These assessment moments were selected to capture students’ initial and subsequent performance following sustained exposure to the instructional approaches. For each participant, performance scores were computed by aggregating coded actions across the different sports content included in the analysis. Accordingly, the values reported represent overall indicators of students’ game-play performance rather than sport-specific outcomes. To ensure comparability across participants and assessment moments, a standardized baseline of 8 minutes of game-play per

student was established for coding (Farias et al., 2015). Uninterrupted game sequences were selected whenever possible to guarantee equivalent observation time and to minimize the influence of contextual variability across games.

The coding instrument was based on the GPAI (Oslin et al., 1998), using operational definitions aligned with the game contexts analyzed. Game performance (GP) was assessed across four core components: decision-making (DM), skill-efficiency (SE), skill-efficacy (SEF), and adjustment (ADJ). Clear criteria for defining appropriate decisions, successful execution, and effective outcomes were established a priori and applied consistently across all coded segments.

For each participant, performance indices were calculated as proportions of appropriate or successful actions relative to the total number of observed actions. Specifically, the DM and ADJ indices were computed by dividing the number of appropriate decisions by the total number of appropriate and inappropriate decisions, whereas the SE and SEF indices were calculated by dividing the number of successful executions by the total number of successful and unsuccessful executions. To provide an overall indicator of students' performance in game-play contexts, a GP index was computed as the mean of the four GPAI component indices, according to the following formula: $GP = (DM \text{ index} + SE \text{ index} + SEF \text{ index} + ADJ \text{ index}) / 4$. All pre- and post-test game-play segments were coded by the lead researcher using a predefined coding manual, and the resulting composite scores were used in the statistical analyses to examine changes in students' game-play performance from pre- to post-test and to explore potential differences according to gender.

Observer training and reliability

All game-play segments were coded by the lead researcher using a predefined coding manual developed for the study. Prior to coding the full dataset, a structured training and calibration process was conducted to ensure consistency in the application of the coding criteria. Specifically, the lead researcher and an additional trained coder, who was not directly involved in the project, independently coded a separate sample of game-play footage. This process involved multiple joint training and calibration sessions, during which coding decisions were discussed and refined until a shared understanding of the operational definitions was achieved. Training

continued until a minimum agreement threshold of 0.90 was consistently reached across all performance components.

Following this calibration phase, the lead researcher proceeded to code all game-play sessions included in the study. To assess the reliability of the coding process, both intra-observer and inter-observer agreement were calculated using percentage agreement ($\text{agreements} / [\text{agreements} + \text{disagreements}] \times 100$; Van der Mars, 1989). To estimate inter-observer reliability, a subset of the data was independently coded by the second observer. Additionally, intra-observer reliability was assessed by re-coding a randomly selected subset of approximately 40% of the participants at both pre- and post-test moments, within a maximum interval of 21 days after the initial coding. This proportion exceeds the minimum recommendations for observational research (Hopkins, 2006).

Results indicated high levels of reliability. Intra-observer agreement averaged 0.95 across components (decision-making: 0.93; skill-efficiency: 0.95; skill-efficacy: 0.96; adjustment: 0.94), while inter-observer agreement averaged 0.91 (decision-making: 0.89; skill-efficiency: 0.91; skill-efficacy: 0.92; adjustment: 0.90).

Ethical Considerations

All participants provided informed consent prior to participation. For students, written consent was obtained from legal guardians. Participants were informed about the study's aims, the voluntary nature of participation, and their right to withdraw at any time without penalty. The study received ethical approval from the relevant institutional ethics committee [Code], ensuring compliance with the principles of the European Code of Conduct for Research Integrity (ALLEA, 2023). Confidentiality was ensured through the secure handling and storage of all data, including video-recorded game-play, and by anonymizing all participants' identities during data analysis and reporting.

Data Analysis

Data were analyzed using the IBM Statistical Package for the Social Sciences (SPSS), version 28. For the purposes of statistical analysis, aggregated game-play

performance indices were computed for each participant across the sports content included in each instructional cycle; accordingly, all analyses reflect overall performance indicators within each PAR cycle rather than sport-specific effects. Descriptive statistics were calculated to characterize the sample and summarize the game-play variables derived from the GPAI coding.

Pre- and post-test measures were obtained within each instructional unit corresponding to each cycle, resulting in repeated paired observations for each participant across the school year. Analyses were conducted separately for each PAR cycle (1, 2, and 3), allowing the examination of changes in game-play performance across successive pedagogical phases. Normality of the data was assessed using the Shapiro–Wilk test. For within-group comparisons, normality was evaluated based on difference scores (post–pre), with analyses conducted separately by sex. As the majority of variables did not meet the assumption of normality, and considering the relatively small sample sizes, non-parametric tests were applied.

Changes in the studied variables from pre- to post-intervention within each instructional cycle were analyzed using the Wilcoxon signed-rank test. These analyses were conducted for the overall sample and separately for boys and girls. To examine whether changes differed by sex, change scores (post–pre) were calculated for each variable and compared between boys and girls using the Mann–Whitney U test.

The effect size was estimated using the r statistic for non-parametric tests (Field, 2013), calculated as the standardized test statistic (Z) divided by the square root of the total number of observations (N). Effect size magnitude was interpreted as small ($r \approx 0.20$), moderate ($r \approx 0.50$), and large ($r \geq 0.80$) (Cohen, 1988). In cases where all ranks moved in the same direction, effect size values approached 1.00, reflecting a fully consistent pattern of change (Siegel & Castellan, 1988). The level of statistical significance was set at $p < 0.05$ for all analyses.

Results

Tables 3 to 8 present the descriptive statistics and inferential analyses for all game-play variables derived from the GPAI across the three instructional cycles. Tables

3, 4, and 5 report results for the overall sample, while Tables 6, 7, and 8 present sex-specific analyses. Overall, pre–post changes in game-play performance were observed across all instructional cycles, although the magnitude and consistency of these changes varied depending on the pedagogical phase. These patterns are explored in detail in the sections that follow.

1st PAR cycle

Table 3 presents the descriptive and inferential statistics for all game-play variables in the 1st PAR cycle. Overall, significant improvements were found in decision-making, skill-efficiency, adjustment, and overall game performance (all $p < .001$), with large effect sizes ($r = 0.80$ – 1.00). Conversely, no statistically significant differences were observed for skill-efficacy ($p = .080$), despite a slight decrease in mean values from pre- to post-test. These results indicate that the 1st PAR cycle was characterized by substantial improvements across most performance components, particularly in decision-making and overall game performance.

When analyzed separately by sex (see table 4), both boys and girls showed significant improvements from pre- to post-test in most variables. For boys, statistically significant improvements were observed in decision-making ($p < .001$; $r = 0.98$), skill-efficiency ($p < .001$; $r = 0.98$), adjustment ($p < .001$; $r = 1.00$), and game performance ($p = .004$; $r = 0.65$). No statistically significant differences were found for skill-efficacy ($p = .900$). For girls, statistically significant improvements were observed across all variables, including skill-efficacy ($p = .019$; $r = 0.51$), with moderate to large effect sizes.

Overall, both groups demonstrated positive patterns of change during Cycle 1, although improvements were more consistent across all variables among girls.

Table 3. Descriptive and inferential statistics for game-play performance variables in 1st PAR cycle.

PL domain	Variable	Pre-test		Post-test		p	r
		M (SD)	Md	M (SD)	Md		
Physical	<i>Skill-efficiency</i>	0.680 (0.290)	0.643	1.242 (0.586)	0.963	<.001	0.97
	<i>Skill-efficacy</i>	1.776 (1.389)	1.344	1.683 (0.970)	1.555	.080	0.28
Cognitive	<i>Decision-Making</i>	0.896 (0.454)	0.800	1.550 (0.829)	1.463	<.001	0.98
	<i>Adjustment</i>	0.745 (0.375)	0.682	1.117 (0.420)	0.923	<.001	1.00
Overall	<i>Game Performance</i>	1.024 (0.444)	0.912	1.398 (0.496)	1.376	<.001	0.80

Note. M (mean); SD (standard deviation); Md (Median); p (values derived from Wilcoxon signed-rank tests); r (effect size).

Table 4. Descriptive and inferential statistics for game-play variables by sex.

PL domain	Variable	Sex	Pre-test M (SD)	Post-test M (SD)	p	r
Physical	<i>Skill-efficiency</i>	Boys	0.681 (0.191)	1.124 (0.446)	< .001	0.98
		Girls	0.679 (0.360)	1.348 (0.679)	< .001	0.95
	<i>Skill-efficacy</i>	Boys	2.135 (1.746)	1.752 (0.958)	.900	—
		Girls	1.457 (0.888)	1.621 (0.995)	.019	0.51
Cognitive	<i>Decision-Making</i>	Boys	0.973 (0.485)	1.649 (0.771)	< .001	0.98
		Girls	0.828 (0.421)	1.462 (0.882)	< .001	0.98
	<i>Adjustment</i>	Boys	0.668 (0.372)	1.104 (0.427)	< .001	1.00
		Girls	0.813 (0.371)	1.129 (0.422)	< .001	1.00
Overall	<i>Game Performance</i>	Boys	1.114 (0.539)	1.407 (0.469)	.004	0.65
		Girls	0.944 (0.329)	1.390 (0.527)	< .001	0.95

Note. M (mean); SD (standard deviation); p (values derived from the within-group comparisons using Wilcoxon signed-rank tests); r (effect size); effect sizes are not reported for non-significant results.

2nd PAR cycle

Table 5 presents the descriptive and inferential statistics for 2nd PAR cycle. Significant improvements from pre- to post-test were observed in decision-making ($p = .033$), skill-efficiency ($p = .008$), skill-efficacy ($p = .002$), and adjustment ($p = .007$), with moderate to large effect sizes ($r = 0.48$ – 0.96). However, no statistically significant differences were found in overall game performance ($p = .814$). Although improvements were observed in specific components of performance, these were

not reflected in overall game performance. This pattern suggests that, although specific performance components improved, these gains were not sufficiently integrated to produce measurable changes in overall game performance during this cycle.

In the 2nd PAR cycle, boys did not show statistically significant pre–post differences in most variables, including decision-making ($p = .673$), skill-efficiency ($p = .500$), adjustment ($p = .250$), and game performance ($p = .641$). Skill-efficacy showed a tendency toward improvement ($p = .055$; $r = 0.78$), although it did not reach statistical significance (see table 6)

In contrast, girls showed statistically significant improvements in skill-efficiency ($p = .022$; $r = 1.00$), skill-efficacy ($p = .024$; $r = 0.57$), and adjustment ($p = .039$; $r = 0.83$). Decision-making showed a near-significant trend ($p = .051$), while no significant changes were observed in game performance ($p = .898$).

These findings may indicate that this cycle was characterized by improvements in specific performance components, particularly among girls, without corresponding gains in overall game performance in either group.

Table 5. Descriptive and inferential statistics for game-play performance variables in 2nd PAR cycle.

PL domain	Variable	Pre-test		Post-test		p	r
		M (SD)	Md	M (SD)	Md		
Physical	<i>Skill-efficiency</i>	0.539 (0.298)	0.571	0.762 (0.257)	0.833	.008	0.96
	<i>Skill-efficacy</i>	0.711 (0.208)	0.778	0.820 (0.113)	0.851	.002	0.64
Cognitive	<i>Decision-Making</i>	0.438 (0.217)	0.431	0.565 (0.383)	0.550	.033	0.48
	<i>Adjustment</i>	0.649 (0.204)	0.706	0.854 (0.040)	0.846	.007	0.88
Overall	<i>Game Performance</i>	0.575 (0.123)	0.579	0.568 (0.243)	0.483	.814	-0.05

Note. M (mean); SD (standard deviation); Md (Median); p (values derived from Wilcoxon signed-rank tests); r (effect size).

Table 6. Descriptive and inferential statistics for game-play variables by sex.

PL domain	Variable	Sex	Pre-test M (SD)	Post-test M (SD)	p	r
Physical	Skill-efficiency	Boys	0.487 (0.451)	0.856 (0.051)	.500	—
		Girls	0.558 (0.259)	0.727 (0.297)	.022	1.00
	Skill-efficacy	Boys	0.631 (0.286)	0.797 (0.139)	.055	0.78
		Girls	0.744 (0.166)	0.829 (0.103)	.024	0.57
Cognitive	Decision-Making	Boys	0.425 (0.258)	0.543 (0.291)	.673	—
		Girls	0.443 (0.205)	0.574 (0.421)	.051	—
	Adjustment	Boys	0.743 (0.173)	0.898 (0.016)	.250	—
		Girls	0.614 (0.213)	0.838 (0.032)	.039	0.83
Overall	Game Performance	Boys	0.540 (0.183)	0.558 (0.268)	.641	—
		Girls	0.589 (0.093)	0.572 (0.239)	.898	—

Note. M (mean); SD (standard deviation); p (values derived from the within-group comparisons using Wilcoxon signed-rank tests); r (effect size); effect sizes are not reported for non-significant results.

3rd PAR cycle

Table 7 presents the descriptive and inferential statistics for 3rd PAR cycle. Significant improvements from pre- to post-test were observed across all variables (all $p < .001$), with large effect sizes ($r = 0.61$ – 0.99), including decision-making, skill-efficiency, skill-efficacy, adjustment, and overall game performance. These findings indicate a consistent and generalized improvement in both specific performance components and overall game-play performance during PAR cycle 3.

In this cycle, both boys and girls showed statistically significant improvements from pre- to post-test across all variables (see table 8).

For boys, improvements were observed in decision-making ($p < .001$; $r = 1.00$), skill-efficiency ($p < .001$; $r = 0.82$), skill-efficacy ($p = .020$; $r = 0.55$), adjustment ($p < .001$; $r = 0.83$), and game performance ($p < .001$; $r = 1.00$). Similarly, girls showed significant improvements in decision-making ($p < .001$; $r = 0.87$), skill-efficiency ($p < .001$; $r = 0.97$), skill-efficacy ($p = .003$; $r = 0.66$), adjustment ($p = .003$; $r = 0.79$), and game performance ($p < .001$; $r = 0.96$).

These findings indicate a strong and consistent pattern of improvement for both groups during the final instructional cycle.

Table 7. Descriptive and inferential statistics for game-play performance variables in 3rd PAR cycle.

PL domain	Variable	Pre-test		Post-test		p	r
		M (SD)	Md	M (SD)	Md		
Physical	<i>Skill-efficiency</i>	0.659 (0.147)	0.650	0.802 (0.092)	0.800	<.001	0.90
	<i>Skill-efficacy</i>	0.770 (0.121)	0.786	0.830 (0.076)	0.821	<.001	0.61
Cognitive	<i>Decision-Making</i>	0.850 (0.361)	0.761	1.426 (0.705)	1.210	<.001	0.95
	<i>Adjustment</i>	0.556 (0.210)	0.524	0.728 (0.198)	0.778	<.001	0.82
Overall	<i>Game Performance</i>	0.755 (0.227)	0.731	1.035 (0.354)	0.918	<.001	0.99

Note. M (mean); SD (standard deviation); Md (Median); p (values derived from Wilcoxon signed-rank tests); r (effect size).

Table 8. Descriptive and inferential statistics for game-play variable by sex.

PL domain	Variable	Sex	Pre-test M (SD)	Post-test M (SD)	p	r
Physical	<i>Skill-efficiency</i>	Boys	0.679 (0.120)	0.779 (0.086)	< .001	0.82
		Girls	0.636 (0.175)	0.829 (0.095)	< .001	0.97
	<i>Skill-efficacy</i>	Boys	0.768 (0.134)	0.816 (0.071)	.020	0.55
		Girls	0.772 (0.112)	0.843 (0.080)	.003	0.66
Cognitive	<i>Decision-Making</i>	Boys	0.866 (0.402)	1.486 (0.647)	< .001	1.00
		Girls	0.836 (0.326)	1.370 (0.763)	< .001	0.87
	<i>Adjustment</i>	Boys	0.555 (0.220)	0.710 (0.220)	< .001	0.83
		Girls	0.558 (0.205)	0.749 (0.173)	.003	0.79
Overall	<i>Game Performance</i>	Boys	0.753 (0.239)	1.009 (0.325)	< .001	1.00
		Girls	0.756 (0.221)	1.059 (0.384)	< .001	0.96

Note. M (mean); SD (standard deviation); p (values derived from the within-group comparisons using Wilcoxon signed-rank tests); r (effect size); effect sizes are not reported for non-significant results.

Sex differences in change scores across instructional cycles

To examine whether changes in game-play performance differed by sex, Mann–Whitney U tests were conducted on change scores (post-pre) for each variable across the three instructional cycles (Table 9).

No statistically significant differences were found between boys and girls in any of the analyzed variables across all cycles ($p > .05$). Although some descriptive differences were observed, these did not reach statistical significance. In the 1st

PAR cycle, girls showed slightly greater improvements in skill-efficiency and overall game performance, whereas boys demonstrated greater gains in adjustment. In 2nd PAR cycle, changes were generally small and inconsistent for both groups. In PAR cycle 3, trends approaching significance were observed for decision-making ($p = .069$), with greater improvements in boys, and for skill-efficiency ($p = .080$), with greater improvements in girls.

Overall, these findings indicate that the magnitude of change in game-play performance was comparable between boys and girls across the intervention, providing no evidence of differential effects by sex.

Table 9. Sex differences in change scores (post–pre) across instructional cycles (Mann–Whitney U test)

PAR cycle	Variable	U	p	r
1	Skill-efficiency	275.00	.363	0.15
	Skill-efficacy	290.00	.530	0.10
	Decision-making	312.00	.830	-0.04
	Adjustment	252.00	.179	-0.22
	Game performance	274.00	.353	0.15
2	Skill-efficiency	9.00	.630	-0.25
	Skill-efficacy	74.00	.784	-0.08
	Decision-making	70.50	.647	0.12
	Adjustment	10.00	.776	0.17
	Game performance	76.00	.862	0.05
3	Skill-efficiency	112.00	.080	0.34
	Skill-efficacy	236.00	.295	0.18
	Decision-making	199.00	.069	-0.31
	Adjustment	147.00	.497	0.14
	Game performance	263.00	.623	-0.09

Note. Values represent Mann–Whitney U tests comparing change scores (post–pre) between boys and girls. Effect size (r) was calculated as $Z / \sqrt{N}$.

Summary of changes across cycles and sex

Across the three instructional cycles, both boys and girls demonstrated overall positive patterns of development in game-play performance. However, these patterns varied across cycles. Girls showed a more consistent pattern of improvement, particularly in the first cycle and in specific performance components during the second cycle. Boys, in contrast, displayed a more irregular trajectory, with no statistically significant changes observed in the second cycle but strong improvements in the first and third cycles.

In both groups, the second cycle was characterized by improvements in specific performance dimensions without corresponding gains in overall game performance, suggesting that improvements in individual components did not consistently translate into overall game-play performance.

Importantly, although these descriptive patterns suggest slightly different developmental trajectories, no statistically significant differences were found between boys and girls in the magnitude of change across any of the variables or cycles. This indicates that the overall impact of the intervention was comparable between sexes.

Discussion

The purpose of this study was to examine changes in students' game-play performance across successive instructional cycles implemented through SCAs, with particular attention to potential gender-related patterns. Drawing on systematic observation of game-play using the GPAI, the findings provide quantitative evidence of improvements in students' performance across multiple variables, including decision-making, skill-efficiency, skill-efficacy, adjustment, and overall game performance. Importantly, these improvements were not uniform across cycles, revealing differentiated patterns of development over time.

Across the three instructional cycles, a non-linear pattern of change was observed. The 1st PAR cycle was characterized by substantial improvements across most performance variables, particularly in decision-making, adjustment, and overall game performance. In contrast, PAR cycle 2 showed improvements in specific performance components (e.g., skill-efficiency, skill-efficacy, and

adjustment), but these were not reflected in overall game performance. Finally, cycle 3 revealed consistent and generalized improvements across all variables, including overall game performance. This pattern suggests that students' development may have occurred in phases, involving initial gains, a period of partial consolidation, and subsequent integration into more holistic game-play performance.

From a learning perspective, these findings reinforce the value of examining performance within authentic game contexts. The observed improvements in decision-making, skill-related indices, and adjustment reflect processes that require the coordination of perception, action, and interaction under dynamic constraints. Rather than capturing isolated motor proficiency, the GPAI-derived variables provide insight into how students interpret game situations, select appropriate responses, execute actions, and adapt to evolving contexts. As such, these indicators can be understood as contextually situated manifestations of learning related to the physical and cognitive dimensions of PL, rather than as direct measures of the construct in its entirety.

The differentiated pattern observed across cycles can be interpreted in relation to the evolving pedagogical conditions described in the study. The initial gains in the first PAR cycle may reflect students' responsiveness to relatively structured learning environments, in which key features of SCAs (e.g., persistent team affiliation, role playing, formal competition) were progressively introduced. These conditions may have supported initial engagement and facilitated improvements in decision-making and participation.

The more limited transfer observed in cycle 2 suggests that improvements in specific components of performance may not immediately translate into integrated game-play performance. This phase coincided with an increased emphasis on tactical complexity, game-based problem-solving, and greater learner autonomy, which may have introduced additional cognitive and contextual demands. As a result, students may have been in a transitional phase, where specific skills and decision-making capacities were developing but not yet fully coordinated within game-play situations.

The generalized improvements observed in Cycle 3 may indicate a greater degree of integration, whereby previously developed skills and decision-making capacities became more effectively applied in game-play contexts. This phase was

characterized by a more consolidated implementation of hybrid pedagogical features, including sustained game-based tasks, collaborative structures, and shared responsibility, which may have supported the alignment of individual and collective performance within authentic game situations.

These findings are consistent with previous research examining learning in game-based pedagogical contexts. Studies using the GPAI have reported improvements in decision-making, skill execution, and overall performance following sustained engagement in modified and representative game forms (Araújo et al., 2017; Mesquita et al., 2012; Farias et al., 2018). However, much of this work has been conducted within single instructional units or short-term interventions. The present study extends this literature by documenting how such changes may unfold across multiple instructional cycles over a full school year, highlighting the temporal and developmental dimension of learning in school-based PE.

The results can also be interpreted in light of the pedagogical approaches implemented. Student-centered pedagogies, such as SE, GBAs, and CL, are designed to structure participation, decision-making opportunities, and social interaction within learning tasks. Previous research has consistently associated these approaches with enhanced engagement, tactical understanding, and quality of participation in game contexts (Dyson et al., 2010; Gil-Arias et al., 2022; Harvey & Jarrett, 2014). In the present study, the observed improvements are consistent with the types of learning processes these pedagogies aim to support. However, given the absence of a comparison group, these findings should be interpreted as occurring within the specific pedagogical context studied, rather than as evidence of causal effects.

With respect to gender, both boys and girls demonstrated overall positive patterns of development across the instructional cycles. Although some variation in trajectories was observed, no statistically significant differences were found between sexes in the magnitude of change across any of the variables or cycles, suggesting that the observed differences in developmental trajectories may reflect variations in learning processes rather than differential outcomes. Girls showed a more consistent pattern of improvement across cycles, including gains across all variables in the first cycle and improvements in specific performance components during the second cycle. Boys, in contrast, displayed a more irregular trajectory, with

no statistically significant changes observed in the second cycle but substantial improvements in the first and third cycles. Despite these descriptive differences, the absence of statistically significant between-group differences suggests that both boys and girls experienced comparable gains in game-play performance throughout the intervention.

These results contribute to ongoing discussions regarding gender and learning in PE. While earlier research has often reported advantages for boys in game-based contexts, particularly in competitive environments (Alexander & Luckman, 2001; Brock et al., 2009), other studies have shown that pedagogical conditions emphasizing equitable participation, task modification, and shared responsibility can support more inclusive learning trajectories (Mesquita et al., 2012). The present findings align with this latter perspective, suggesting that the pedagogical context may play a central role in shaping how students engage and develop in game-play settings. Although some variation in developmental patterns was observed, the absence of statistically significant differences between boys and girls indicates that the intervention may have supported comparable learning opportunities across sexes. These findings therefore support the potential of SCAs to promote equitable development in game-based PE contexts.

From a PL perspective, the findings provide empirical support for the use of game-play performance as a contextually grounded indicator of learning processes related to its physical and cognitive domains. The coordinated improvements observed across decision-making, skill-related variables, and adjustment reflect dimensions that are theoretically aligned with the integrated nature of PL (Dudley et al., 2015). However, it is important to emphasize that these indicators represent partial and situated manifestations of learning, rather than comprehensive assessments of PL as a multidimensional construct. Psychological and social dimensions, although embedded within the pedagogical context, were not directly measured in the present study.

Limitations and future directions

Despite its contributions, this study is subject to several limitations that should be considered when interpreting the findings. First, the sample was relatively small and drawn from a specific school context, which may limit the generalizability of the

results. In addition, the absence of a comparison group precludes causal inferences regarding the effectiveness of the pedagogical approaches implemented.

Second, although data were collected across multiple instructional units over the course of a school year, the analysis focused on pre- and post-test comparisons within each instructional cycle. As such, the study does not allow conclusions regarding long-term retention or the transfer of learning beyond the immediate instructional context.

Third, the aggregation of performance scores across different sports content limits the ability to examine sport-specific patterns of learning. While this approach allowed for the analysis of general game-play performance, it may have masked variations associated with specific activity types or task demands.

Finally, although the study focused on observable game-play performance, it did not directly assess the social and psychological dimensions of learning associated with PL. Future research would benefit from integrating mixed-method approaches that combine performance-based indicators with measures of motivation, engagement, and social interaction. Longitudinal designs that track learning trajectories over extended periods, as well as studies incorporating comparison groups and larger samples, would further strengthen understanding of how pedagogical conditions influence students' development in PE.

Conclusions

The present study provides quantitative evidence that students' game-play performance can improve over time within a specific school-based PE context characterized by student-centered pedagogical approaches. Drawing on systematic observation of game-play across successive instructional cycles, the findings demonstrate meaningful changes in decision-making, skill-efficiency, skill-efficacy, adjustment, and overall game performance for both boys and girls. Importantly, these changes were not uniform across cycles, suggesting that students' development may occur in phases involving initial gains, partial consolidation, and subsequent integration into overall game-play performance.

By focusing on performance variables derived from game-play rather than isolated skill tests or self-reported measures, this study contributes to ongoing discussions regarding how learning processes associated with PL may be examined

in ecologically valid ways. Although the measures employed do not constitute a direct assessment of PL as a holistic construct, they provide insight into contextually situated expressions of learning aligned with its physical and cognitive dimensions.

With respect to gender, no statistically significant differences were found between boys and girls in the magnitude of change across any of the variables or instructional cycles. Although some variation in developmental patterns was observed, these findings indicate that both groups experienced comparable gains in game-play performance. This suggests that the pedagogical context implemented in this study may have supported equitable learning opportunities for boys and girls within game-based PE settings.

Taken together, the results reinforce the value of examining game-play performance as an indicator of learning in PE and highlight the importance of pedagogical designs that support meaningful participation in authentic contexts. At the same time, the absence of differential effects between sexes suggests that such pedagogical approaches may contribute to more equitable learning environments in game-based PE. Nevertheless, these findings should be interpreted within the specific context in which the study was conducted, and caution is warranted when extending them beyond similar educational settings.

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Chapter IV – Final Considerations

4.1. Synoptic discussion of the findings

Across the six studies included in this dissertation, a coherent research agenda was pursued to understand how PSTs learn to enact SCAs within school-based PE, and how such pedagogical practices create conditions through which dimensions associated with PL may emerge in students' learning experiences.

In line with the overall architecture of the thesis, the findings are best understood by foregrounding, first, PSTs' professional learning within PETE, then the role of CoPs and pedagogical scaffolding in supporting the enactment of SCAs, and only subsequently the ways in which students' learning may be interpreted through a PL lens.

The overarching aim of the research project was to examine how PSTs learn to teach through SCAs during school placement and how these pedagogical practices, once enacted in school-based PE, support meaningful and multidimensional learning among students. To address this aim, the empirical studies collectively explored: (a) how contextual and relational conditions within school placement settings, including participation in CoPs, shape PSTs' immersion in the educational community; (b) how pedagogical scaffolding and mediation support PSTs' attempts to enact SCAs during school placement; (c) how students' learning related to PL is expressed across multiple learning domains within student-centered PE lessons taught by PSTs; and (d) how selected observable indicators of students' game-play performance, as expressions of the physical and cognitive domains of PL, changed across successive instructional cycles, while also considering potential gender-related patterns.

Overall, in an overview, the findings show that preparing PSTs to teach through SCAs is not a matter of transmitting pedagogical models as fixed instructional scripts. Rather, it is a situated professional learning process that depends on the quality of the pedagogical environments in which PSTs are embedded. Participation in CoPs and access to pedagogical scaffolding emerged as central conditions enabling PSTs to interpret, negotiate, and progressively enact SCAs in practice. In this sense, the first two empirical studies constitute the core of the dissertation, as they illuminate the professional learning processes through which SCAs became possible in the first place.

Once enacted, these pedagogies created learning environments in which students were invited to participate more actively in decision-making, collaboration, role negotiation, and engagement with authentic learning challenges emerging throughout PE lessons. While the realization of motor outcomes remained paramount in PE, the findings from the third and fourth empirical studies suggest that these pedagogical conditions supported forms of learning that extend beyond strictly physical and motor skill-based domains. Students' learning was expressed across several dimensions associated with PL, including physical engagement in movement contexts, cognitive processes such as game understanding and decision-making, social interaction through collaboration and participation, and psychological dispositions such as confidence. These dimensions do not exhaust the full scope of PL as a holistic construct, but they do represent ecologically grounded dimensions that are particularly likely to emerge through curricula informed by SCAs.

Accordingly, the contribution of this research to PL should be understood as an incursion into the construct through pedagogical processes that may be put in place to aspire to PL development rather than as an attempt to capture or measure it in its entirety. Across the studies, PL did not appear as a predefined outcome attributable to a specific pedagogical model, but as a process-oriented and context-sensitive lens for interpreting how students engaged in meaningful movement experiences over time. From this perspective, the findings reinforce the idea that PL-oriented learning in PE is shaped not only by what is taught, but by how teaching is learned, mediated, and enacted in practice.

The following sections present a synoptic discussion organized around three interrelated themes that reflect the architecture of the dissertation: (i) PSTs' professional learning as a situated and social process, with particular attention to CoPs and scaffolding; (ii) the enactment of SCAs as a complex and adaptive pedagogical process; and (iii) the ways in which selected dimensions associated with PL emerged within student-centered PE lessons.

PSTs' professional learning as a situated and social process

The findings across the empirical studies highlight PSTs' professional learning as a situated and relational process, closely tied to participation in specific pedagogical and institutional contexts. In relation to the first objective of the dissertation, which examined how professional learning processes such as participation in CoPs and pedagogical mediation of professional learning shaped PSTs' engagement with SCAs during school placement, the first empirical study provided insight into how these contextual and relational conditions supported PSTs' immersion in the educational community.

Beyond developing pedagogical competence through the accumulation of discrete strategies, PSTs' learning unfolded through engagement with practice, interaction with more experienced others, and negotiation of meaning within school placement environments. This perspective aligns with sociocultural accounts of professional learning that conceptualize learning to teach as a process of becoming a participant in a CoP (Lave & Wenger, 1991; Wenger, 1998). In this sense, learning to teach involves progressively becoming a legitimate participant in the landscape of professional practices that constitute the school environment, which includes engaging in multiple CoPs, such as interactions with peers, CTs, USs, and participation in broader professional groups within the school, including the PE department or the wider educational community.

Within this framework, professional learning was mediated through multiple forms of scaffolding provided by CTs, USs, and, at times, peers. Rather than primarily taking the form of prescriptive guidance aimed at ensuring fidelity to pedagogical models, this mediation often involved dialogic and adaptive forms of support. Namely, it functioned as contingent support that enabled PSTs to engage with pedagogical complexity while gradually assuming greater responsibility for instructional decision-making. Dialogic feedback, collaborative planning, and opportunities for guided experimentation emerged as particularly salient mechanisms through which PSTs were supported in making sense of SCAs in practice (Goodyear & Dudley, 2015; van de Pol et al., 2010).

Importantly, the effectiveness of scaffolding appeared to be closely linked to the quality of relationships and the degree of pedagogical alignment between university-based (USs) and school-based agents (CTs). Where CTs shared pedagogical

values aligned with SCAs and created spaces for reflection and dialogue, PSTs were better positioned to experiment, reflect, and re-engage with learner-centered intentions. Conversely, misalignment between institutional expectations or limited opportunities for reflective dialogue constrained PSTs' capacity to sustain SCAs implementation in schools (e.g., CTs prioritizing traditional, teacher-centered practices over SCAs), reinforcing findings from previous research on the contextual nature of teacher learning (Silva et al., 2021).

Participation in school-based CoPs further shaped PSTs' professional learning trajectories. Engagement in collaborative routines, informal exchanges, and shared problem-solving supported PSTs' sense of legitimacy and belonging within the educational community. However, the findings also underscore that CoPs are not inherently educative. Their potential to support professional learning depended on how participation, authority, and pedagogical knowledge were organized within schools. In contexts where hierarchical relations or conservative pedagogical norms prevailed, opportunities for meaningful participation and pedagogical growth were more limited (MacPhail, 2011; Wenger, 1998).

Across the studies, professional learning was marked by non-linear trajectories characterized by fluctuating moments of confidence, uncertainty, consolidation, and disruption. Learning to enact SCAs required PSTs to tolerate ambiguity (e.g., when students' responses to tasks unfolded in unanticipated ways), question prior assumptions (e.g., reconsidering teacher-directed approaches to skill instruction), and develop trust in pedagogical processes that redistributed responsibility to students. These dispositions were cultivated through sustained engagement of PSTs with practice (i.e., planning, enacting, and progressively adapting SCA-informed learning tasks) and mediated support over time (i.e., dialogic feedback, joint reflection, and pedagogical guidance from CTs and USs). Such patterns reinforce the view of professional learning as an ongoing process of negotiation of and adaptation of, and less as a linear progression.

These findings suggest that PSTs' capacity to enact SCAs is deeply intertwined with the professional learning environments in which they are embedded. Scaffolding and participation in CoPs functioned as enabling conditions rather than guarantees of pedagogical change, highlighting the importance of coherent PETE

designs that deliberately structure opportunities for participation, reflection, and pedagogical risk-taking.

Enacting SCAs: complexity, adaptation, and pedagogical drift

In relation to the second objective of the dissertation, which examined how PSTs enact SCAs during school placement, the findings from the second empirical article show that the enactment of SCAs emerged as a complex and adaptive process aimed at supporting students' multidimensional learning across physical, cognitive, social, and psychological domains. Far from the rigid application of instructional models, enactment involved a responsive use of pedagogical principles in relation to the evolving demands of teaching situations. Although approaches such as SE, GBAs, and CL are frequently presented in the literature as coherent frameworks for supporting meaningful learning in PE, the findings from this research program reinforce the view that their educational potential is contingent on teachers' understanding and enactment of the pedagogical principles that underpin these approaches in specific contexts (Casey & Kirk, 2020; Farias et al., 2018; Gil-Arias et al., 2017).

Consistent with previous research in sport pedagogy, enactment was characterized by ongoing pedagogical decision-making in response to students' engagement, task demands, and contextual constraints. PSTs were required to continuously adapt learning tasks, modify rules and roles, and redefine instructional focus in order to sustain participation and manage heterogeneity within classes. These adaptations were not indicative of pedagogical inconsistency or lack of fidelity, but rather reflected the inherently contingent nature of teaching in dynamic and socially complex learning environments (Goodyear & Dudley, 2015; Pill et al., 2023).

Within this process, instances of pedagogical drift, where instructional practices temporarily shifted toward more directive or teacher-centered forms, were evident. Importantly, such shifts did not necessarily signal rejection of SCAs. Instead, they appeared to function as pragmatic responses to moments of uncertainty, classroom management pressures, or perceived risks to lesson flow and student engagement. This interpretation aligns with literature suggesting that pedagogical drift is a

common feature of early attempts to enact complex pedagogical approaches and may represent a transitional phase in teachers' professional learning rather than a failure of implementation (Casey, 2014; Silva et al., 2021).

The findings further suggest that enactment should be understood as a developmental process unfolding over time, in which PSTs gradually learned to tolerate ambiguity (e.g., when students' responses to tasks unfolded in unanticipated ways), redistribute responsibility to students (e.g., allowing learners to assume roles and make decisions during learning tasks), and trust pedagogical structures that foreground learner agency (i.e., learning environments where students actively regulate participation and problem-solving). Rather than progressing linearly toward increasingly refined enactment, this process involved cycles of experimentation and reflection. Such non-linear trajectories echo broader conceptions of teaching as adaptive expertise, where professional judgement is developed through situated engagement with practice, as PSTs continuously adjusted tasks, roles, and instructional decisions in response to emerging learning situations, rather than through adherence to prescriptive instructional scripts (Renshaw et al., 2018).

Crucially, PSTs' capacity to navigate pedagogical complexity was closely linked to the availability of professional support and mediation. Opportunities for reflection, dialogue, and guided experimentation supported engagement with challenges and re-alignment with student-centered intentions, whereas the absence of such support increased the likelihood that pedagogical drift would become entrenched. These patterns highlight that pedagogical enactment cannot be understood as an isolated instructional act, but rather as situated pedagogical work embedded within broader professional learning environments.

At the same time, the findings help clarify why the development of PL through SCAs is pedagogically meaningful. The value of SCAs lies not in the adoption of pedagogical models for their own sake, but in the learning environments they help create. By foregrounding student participation, collaboration, decision-making, and authentic engagement with movement tasks, SCAs create pedagogical conditions in which multidimensional learning may emerge in ways that resonate with PL-oriented perspectives.

Dimensions associated with PL within student-centered PE lessons

As established in the narrative review and the theoretical essay, PL is best understood as a dynamic, context-sensitive, and pedagogically mediated process (Cairney et al., 2019; Edwards et al., 2017; Whitehead, 2010). Building on this conceptual foundation, the third and fourth empirical articles addressed the remaining objectives of the dissertation by examining how students experienced learning within SCA-informed PE lessons and how selected observable indicators of game-play performance evolved across instructional units. From this perspective, learning in PE emerges through participation in carefully designed movement contexts that invite decision-making, collaboration, reflection, and adaptation, rather than through the accumulation of isolated skills or fitness attributes. Building on this theoretical foundation, the empirical findings across the studies support the idea that dimensions associated with PL may emerge through pedagogical process when students engage in PE lessons informed by SCAs.

Importantly, the present dissertation did not seek to examine all dimensions of PL in equal depth. Rather, the studies focused on those dimensions that were both pedagogically salient within SCA-informed curricula and methodologically accessible within authentic school-based PE contexts. In particular, the research examined students' participation, confidence, collaboration, game understanding, decision-making, and selected observable indicators of game-play performance. These dimensions were prioritized because they are especially likely to be developed and expressed in pedagogical environments where students are invited to take responsibility, interact with peers, solve tactical problems, and engage in meaningful movement experiences. It can be argued that the findings suggest a situated expression of PL linked to a particular way of conceptualizing teaching and learning in PE – namely, a student-centered perspective in which learning is actively co-constructed through students' participation. Pedagogical models commonly associated with SCAs, such as SE, GBAs, and CL, deliberately structure learning environments around these forms of participation, making these dimensions particularly visible and pedagogically meaningful within SCA-informed curricula.

From this perspective, PL development in school-based PE was characterized by variability, fluctuation, and non-linearity. Students' engagement, confidence, understanding, and participation did not progress in steady or predictable ways

across lessons or instructional units. Instead, moments of apparent advancement often coexisted with periods of hesitation or uneven participation, reflecting the influence of task design, social dynamics, prior experiences, and contextual constraints. These patterns challenge linear models of learning progression and resonate with perspectives that conceptualize learning as emergent and contingent on participation in practice (Renshaw et al., 2018; Silva et al., 2024).

In line with this perspective, qualitative evidence from students' accounts highlighted how learning experiences were shaped by opportunities to participate meaningfully, contribute to collective tasks, and develop a sense of competence and belonging within lessons. In the early stages of the instructional units, students' accounts often reflected tentative engagement and initial attempts to navigate the social and tactical demands of the activities, revealing emerging expressions of confidence, participation, and interaction aligned with the social and psychological domains of PL. As lessons progressed, students described learning not only in terms of improved performance, but also through increased confidence, willingness to engage, and growing awareness of others. These accounts suggest a gradual consolidation of participation and interaction initially expressed through the social and psychological domains, alongside a strengthening of decision-making and movement-related engagement associated with the cognitive and physical domains. These experiential dimensions echo previous research emphasizing the role of meaningful participation, autonomy, and social interaction in supporting PL-oriented learning (Choi et al., 2021; Farias et al., 2020; Gil-Arias et al., 2020).

Complementing these insights, quantitative analyses of game-play performance provided additional, albeit partial, perspectives on learning as it unfolded within authentic contexts. Changes observed in students' decision-making, skill efficacy, skill efficiency, and adjustment offered evidence of adaptation to game demands across successive instructional cycles. Importantly, these changes did not follow linear trajectories. Instead, a differentiated pattern emerged, characterized by substantial improvements in initial phases, more limited transfer of gains to overall performance during intermediate phases, and more consistent integration of performance dimensions in later stages. These patterns suggest that learning in game contexts may unfold through phases of development, involving initial gains, partial consolidation, and subsequent integration into more holistic game-play

performance. At the same time, when examined by sex, no statistically significant differences were found in the magnitude of change across cycles, indicating that these learning processes were broadly comparable for boys and girls within the pedagogical conditions studied.

Furthermore, these indicators were sensitive to task constraints and social configurations, reinforcing their context-dependent nature. As such, they are best understood as situated expressions of learning rather than as direct measures of PL, a distinction increasingly emphasized in international discussions on PL assessment (Barnett et al., 2023; Cairney et al., 2019). In sum, the integration of findings reinforces the conceptualization of PL as an emergent pedagogical process rather than an outcome to be achieved. At the same time, the dissertation makes clear that this is only an incursion into the construct. Not all dimensions of PL were addressed, nor could they be within the scope of a single process-oriented research program. This selective focus reflects both the pedagogical orientation of the study and the methodological commitment to examining learning as it unfolds within authentic practice, rather than attempting to capture all dimensions of PL simultaneously through predefined measurement frameworks. This limitation, however, reflects the complexity of studying PL in practice and underscores the value of future qualitative research examining other dimensions that may emerge within different pedagogical and relational contexts.

4.2. Reflections on studying PL in practice

This research adopted a methodological orientation aligned with the processual, situated, and non-linear nature of PL as conceptualized throughout the thesis. Studying PL in authentic school contexts required methodological approaches capable of capturing pedagogical enactment and learning as they unfolded over time, rather than reducing these phenomena to static or decontextualized indicators. The use of participatory action research as a research design, including qualitative methods such as participant observations, interviews, and reflective accounts, enabled close engagement with the lived realities of teaching and learning in PE.

At the same time, the inclusion of quantitative analyses of game-play performance offered complementary insights into observable expressions of

learning situated within authentic contexts. Importantly, these methods were not employed to measure PL as a unified construct, but to illuminate how learning processes may be expressed differently across pedagogical conditions and moments in time. The combination of methods therefore supported a richer, more nuanced understanding of learning while respecting the epistemological stance underpinning the research.

Nonetheless, studying PL in practice entails important methodological considerations. The situated nature of the data reflects the study's focus on understanding pedagogical processes within authentic contexts rather than seeking broad generalizations. Similarly, the close involvement of the researcher in the pedagogical process required ongoing reflexivity throughout the research. Rather than being viewed as limitations, these characteristics align with the study's purpose of contributing contextually grounded insights to the growing body of knowledge on PL, underscoring the value of methodological coherence when investigating complex educational practices.

Because this dissertation approached PL through selected dimensions that were most visible within SCA-informed pedagogical environments, future research would benefit from extending this work through qualitative studies that examine other dimensions of PL not addressed here in detail. Given the process-oriented nature of PL, it is neither feasible nor conceptually coherent to attempt to encompass all of its dimensions within a single study design. Additional qualitative inquiry may therefore be especially important in exploring how other dimensions unfold in diverse pedagogical and cultural contexts.

4.3. Contributions and implications of a process-oriented perspective on PL

The findings of this research contribute to PE scholarship by advancing a process-oriented understanding of PL grounded in pedagogical enactment and professional learning. By integrating theoretical perspectives on PL with empirical evidence generated in teacher education and school contexts, the study reinforces the view of PL as an emergent, context-sensitive capability shaped through participation in meaningful learning environments, rather than as a fixed outcome to

be achieved or measured. In this sense, the research contributes to ongoing international debates by repositioning PL as a pedagogical achievement that unfolds through teaching-learning interactions over time.

The research also offers important contributions to sport pedagogy by conceptualizing SCAs not as prescriptive instructional models, but as pedagogical frameworks whose educational value lies in how they are interpreted, adapted, and enacted in practice (Casey & Kirk, 2020). The findings demonstrate that the potential of such approaches to support the emergence of dimensions associated with PL is closely linked to teachers' professional judgement, their capacity to navigate pedagogical complexity, and the learning conditions in which enactment occurs. This perspective challenges implementation-oriented accounts of pedagogical models and foregrounds enactment as a central analytical lens for understanding teaching and learning in PE.

From a teacher education perspective, the findings underscore the importance of PETE program designs that deliberately support PSTs' engagement with pedagogical complexity. Structured opportunities for scaffolding, reflective dialogue, and participation in professional communities emerged as key conditions for enabling PSTs to sustain SCAs during school placement. These insights highlight the role of CTs and USs not only as evaluators of practice, but as mediators of professional learning who shape how pedagogical ideas are taken up, negotiated, and refined in context.

At the same time, the contributions of this research must be interpreted in light of its limitations. The focus on a specific PETE context and a relatively small number of participants constrains the transferability of the findings to other institutional and cultural settings. Moreover, the situated and temporal and process-oriented nature of the research privileges depth of understanding over breadth. Future research could build on this work by examining similar pedagogical processes across diverse teacher education programs, educational levels, and stages of teachers' careers. Longitudinal studies that follow teachers beyond initial training may further illuminate how PL-oriented pedagogies evolve, stabilize, or transform over time within the realities of professional practice.

4.4. Final thoughts

This dissertation examined how PSTs learn to enact SCAs in school-based PE and how these pedagogical practices create conditions through which dimensions associated with PL may emerge in students' learning experiences. By adopting a process-oriented and synoptic perspective, the research demonstrated that such learning environments depend fundamentally on how PSTs are prepared and supported during their professional learning.

Across the dissertation, the findings consistently highlighted the importance of CoPs and pedagogical scaffolding as enabling conditions for PSTs' engagement with pedagogical complexity. These professional learning conditions supported PSTs in learning to interpret, adapt, and sustain SCAs in practice. Once enacted, these pedagogies created opportunities for students to participate meaningfully, collaborate with others, engage in decision-making, and develop confidence and game understanding within authentic movement contexts.

In this sense, the dissertation argues that the importance of PL in PE can be meaningfully explored through SCAs because these pedagogies create the kinds of learning environments in which multidimensional and situated learning may emerge. At the same time, the research makes clear that this represents only an incursion into PL. Not all dimensions of the construct were examined, nor could they be within the scope of a single process-oriented research program.

Ultimately, the dissertation contributes to ongoing international efforts to position PE as a meaningful educational space for holistic learning. It suggests that learning aligned with PL depends not only on curricular aspirations, but on the pedagogical and professional conditions that enable teachers to enact SCAs over time. Continued qualitative and temporally extended research will therefore be essential to further examine other dimensions of PL and deepen understanding of how they emerge across diverse pedagogical contexts.

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