frontiers | Frontiers in Education

TYPE Conceptual Analysis
PUBLISHED 12 December 2024
DOI 10.3389/feduc.2024.1480690

OPEN ACCESS

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RECEIVED 14 August 2024
ACCEPTED 28 November 2024
PUBLISHED 12 December 2024

CITATION
Grecic D, Sprake A, Thomson A, Christodoulides E and Palmer C (2024) The epistemic judgement framework: a reflexive tool for physical education teachers' professional development to support Quality Physical Education.
Front. Educ. 9:1480690.
doi: 10.3389/feduc.2024.1480690

The epistemic judgement framework: a reflexive tool for physical education teachers' professional development to support Quality Physical Education

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The need for Quality Physical Education to provide the many benefits the subject offers is well established. Unfortunately, in too many areas ineffective teaching and learning practices are limiting the profession's response to children's developmental needs. Many teachers' professional development interventions are criticised as not enabling the required philosophical, and pedagogical shifts that are needed to improve practice and student outcomes. The paper presents a new integrated model, the *Epistemic Judgement Framework* to enhance this process. Epistemology offers an important lens by which to explore teacher beliefs and behaviors, however, existing research in this field is very specific in scope, which makes learning transfer difficult. To better explore this area a fuller appreciation of the bioecological environment in which teaching takes place as well as the Critical Realist view of the teaching world is introduced. The purpose of this article therefore is to propose a framework to guide teacher professional development to support the achievement of Quality Physical Education that merges environmental considerations and exploration of hidden influencers with epistemological research on teacher decision making and behavior. Practical applications for teacher professional learning utilizing the model and future directions are suggested.

KEYWORDS

epistemology, professional judgement, physical education, teachers, quality PE

Introduction

Proponents of Physical Education (PE) have asserted the subject's potential to foster holistic outcomes for children and young people (Bailey, 2006; Bailey et al., 2009; Weiss, 2011; Sprake and Walker, 2015). For this reason, PE is often co-opted to serve various political and organisational objectives and strategies. The myriad aims for PE—that is, for instance, the physical, cognitive, social, emotional aspects of learning, health promotion, school-wide academic achievement, competition, inclusion and so on – has resulted not only in a "political tug-of-war" (Sprake and Palmer, 2012, p. 74) but a sense of "ideological confusion" within the PE community (Sprake et al., 2021, p. 14). Indeed, with conceptions such as fundamental movement skills (Gallahue and Donnelly, 2003); physical literacy (Whitehead, 2010); models

based physical education (Metzler, 2011), meaningful physical education (Fletcher et al., 2021) to consider, PE teachers find themselves confused about the subject's role, purpose and appropriate terminology (Lynch et al., 2016). It leaves teachers struggling to align their own philosophies and practices alongside the demands of these innovations on top of embedding national curricula aims across the different national landscapes (Carl et al., 2023; UNESCO, 2024a). On top of this, there has also been the academicisation of PE to consider (Green, 2008; Casey and O'Donovan, 2013), and the more recent turn to neoliberalism (Evans, 2013; Evans and Davies, 2014; Macdonald, 2014) as private sector organisations join the ever-increasing list of stakeholders. In an ostensible effort to establish international consensus, UNESCO (2015) presented a clear aspiration and guide for all countries to deliver Quality Physical Education (QPE), outlined in their Guidelines for Policy Makers:

> QPE is the planned, progressive, inclusive learning experience that forms part of the curriculum in early years, primary, and secondary education. In this respect QPE acts as the foundation for a lifelong engagement in physical activity and sport. The learning experience offered to children and young people through physical education lessons should be developmentally appropriate to help them acquire the psychomotor skills, cognitive understanding and social and emotional skills they need to lead a physically active life (UNESCO, 2015, p.9).

Therefore, QPE does not reflect the standard traditional PE offer (see Kirk, 2011) but suggests a move from the *status quo* toward holistic conceptualisations and practices that promote the interaction of different learning domains in order to achieve diverse educational objectives (such as motor skills, wellbeing, health, social justice, active citizenship, literacy and oracy). This may require new approaches to, and ways of thinking about, PE practice around the world. Change in PE is not a new phenomenon. In the United Kingdom (UK) and across much of the Western world during the first part of the 20th century, PE practices had chronologically been linked with the military (Smith, 1974), health (McIntosh, 1968), aesthetic movement (Morison, 1969), and fitness (Kirk, 1992). Yet, from the 1950s, traditional PE-as-sport techniques has dominated much of the landscape. While there were huge technological advances in society, the strength of the traditional discourses saw little change in curricular content and delivery. It led to Kirk (2011) asserting that physical education in this dominant form was potentially heading for extinction and that radical change was necessary. UNESCO's attempt to generate a consensus of what change may look like may have been a response to this. Keen to assert how QPE is distinct from traditional PE, UNESCO (2024b) outline that:

> [QPE] is about peer-led learning and rounded skill development which can enhance educational and employability outcomes. It is also about whole body health which includes physical and psycho-social wellbeing. QPE supports students to develop the physical, social and emotional skills which define healthy, resilient and socially responsible citizens (UNESCO, 2024b).

QPE is also now a core component of UNESCO's *Fit for Life* programme (UNESCO, n.d. – Fit for Life Global Alliance) and, as a result, it is now recognised as an important driver of teaching practice. However, PE teachers and pupils co-exist in an environment that is subject to constant social and cultural flux. The volatile, uncertain, complex and ambiguous (VUCA) world in which we exist (Bennis and Nanus, 1985) has fostered global concerns about our population's health, climate and economy. It is crucial to reinvent education to address these challenges and safeguard humanity's future (Futures of Education Initiative, UNESCO, 2021). One of the foundational principles, as suggested, is strengthening education as a public endeavour and a common good, allowing societies and individuals to flourish together—in this case, the microcosmoses of PE teachers and pupils in school settings (UNESCO, 2021). Evidence appears to suggest that our teachers are ill-prepared for this new PE world (see Curtner-Smith, 2001; Richards et al., 2014; Richards, 2015), with many socialised into a modus operandum misaligned with pupil needs and wants. For instance, concerns about the number of pupils disengaging with PE (Hemingway et al., 2023), pupils who adopt "hiding techniques" to save face in PE (Lyngstad et al., 2016) and young people who demonstrate a lack of motivation to continue sport and physical activity beyond the school day (Sport England, 2023; Youth Sport Trust (YST), 2023). Of course, this data does not have global coverage, but this may well be due to the lack of national level data points rather than a situation that is much improved in other countries. A first step toward a clearer picture might involve all countries delivering a minimum level of provision which is not presently the case with only 9.1% of upper secondary schools, 16.3% of lower secondary and 42.7% of primary schools meeting the minimum criteria when audited by the United Nations in the *Global State of Play* Report (UNESCO, 2024a).

Why is a new professional development framework needed?

Despite national and cultural variations, there appear a number of common governmental objectives that direct curricula intentions: enhanced health, academic outcomes, employability, and social fabric outcomes. The post pandemic legacy in many countries has accentuated the pressing need to combat children's declining mental health and social connectedness. Within this *shadow pandemic* (McGorry, 2020), schools more broadly and PE teachers in particular have been identified as key change agents to deliver this agenda (Rockliffe et al., 2023). However, PE teachers are already presented with an array of expectations and pedagogical approaches to implement; health promotion, holistic development, competency-based approaches, critical and social justice pedagogies, models-based practice, meaningful PE, and trauma-aware pedagogy, and so on. Not only are practitioners encouraged to adopt these approaches, but they are pivotal in contributing to QPE targets and delivering a 'meaningful' PE pupil experience. It is highly questionable, however, whether these wide-ranging proposals for PE practice, emanating from the academy, have influenced PE practice *en masse*, if at all. One of the reasons for this opinion is the criticism of the teacher professional development offer and the lack of measurement of teaching on pupil outcomes. Indeed a recent UK survey found that only two fifths of teachers thought that the training they'd received was relevant, sufficient and of high quality, stating that much of it had lacked relevance and not allowed them to reflect on their practice (Gov.UK, 2023). Research has however offered guidance as to what effective features of professional

development (PD) for teachers should include. This includes that PD practice is sustained over time, is collaborative, involves the active engagement of teachers, is focused on subject-specific content, is practice based, and draws on external expertise (Darling-Hammond et al., 2017; Sims et al., 2021). Specifically, with regard to Physical Education, teachers' effective training needs to; be contemporary, focus on the learning process, bridge research/theory and practice in innovative ways, and support the long term development of the PE teachers (Armour et al., 2017). Interestingly, Kern and Graber (2018) identified that teaching beliefs lie at the heart of practice and drive teachers' instructional decision making, with Hargreaves and Fullan (2012) promoting that beliefs form the basis for nearly all instructional decisions including those related to curriculum adoption and delivery. However, with so many teaching priorities and orientations to consider, PE teachers are invariably required to make decisions and judgements on *what* practices to adopt, *how* to implement them and justify their *why*. This is, however, a highly complex process. If we are to establish a high-resolution understanding of PE teachers' motivations for, or reluctance to, implementing certain practices – that is, curricular intentions, pedagogical approaches, theories and activities – then we must situate their decision-making within an all-embracing framework. Many decision-making frameworks exist to guide and explain this process (e.g., Naturalistic Decision Making, Professional Judgement Decision Making, PDJM, Type 1 and Type 2 Decisions, Ecological Dynamics, and Systems Theory). For the purposes of this paper, however, we focus on a specific thread of the decision-making process, our *epistemology*, and how our personal beliefs and deeply-held teaching and learning philosophies can serve implicitly or explicitly as a guide-to-action. Our epistemology forms the architecture of our beliefs about knowledge and on what basis we can make knowledge claims. Therefore, we strongly advocate for epistemology as an essential consideration of research exploring this decision-making process – that is, from the granular details to the macro systems level – and aim to provide a comprehensive framework through which teachers can plan, facilitate, evaluate and refine their practice in meaningful ways. Within the sporting world, Grecic and Collins (2013) proposed an Epistemological Chain to guide this decision-making process. To date, however, the PE profession has faced criticism for failing to appropriately consider the belief systems of the teachers themselves (Tsangaridou, 2006) or to adopt reflexive approaches (Evans, 2017) to their praxis, especially when engrained teaching beliefs contribute so much to the profession's resistance to change (Parker et al., 2016). As Green (2000) commented that teachers tend to have a mishmash of views on physical education that are poorly thought-out, contradictory and overlap, their philosophies are rarely grounded in philosophical thinking and rely heavily on their world view. It means that they simply 'do' physical education (Green, 2003) as "philosophies" follow practice, rather than precede or shape them. We are therefore keen to encourage PE teachers to contemplate the cultural, social, political and ideological origins of their own perspectives, voice and practice within the broader milieu of education, and pursue a more self-appraised and critically-informed professional development journey. In doing so, we seek to advance previous work and present a revised framework which embeds the key elements of epistemic judgement as well as a wider appreciation of the seen and unseen environmental factors that can influence teacher behavior. Our new framework of *Epistemic Judgment Framework* (EJF) can provide a valuable reflexive opportunity to aid PE teachers' practice. We suggest that the new EJF model can be of significant value to teachers by presenting them with a multi-layered framework upon which to base their thinking about, and reflections on, the learning episodes they develop and methods they employ. In addition to this laudable aim the EJF may also present an opportunity for enacting change in PE, especially as we globally promote QPE's importance. The EJF may help facilitate change via those open and willing to change their practice directly or through its use by those who hope to instigate pedagogical change in others. Fullan argued that such change is exceedingly complex, affected by both individual and societal agents but that an understanding of teachers' beliefs was fundamental if such change was to be achieved (Hargreaves and Fullan, 2012).

Understanding teachers' beliefs and unpicking why PE teachers teach the way they do requires an appreciation of epistemology, because a teacher's epistemological worldview undoubtably affects their teacher identity and decision-making (van der Linden and McKenney, 2020). Therefore, we will first introduce the background to teaching's epistemic focus followed by describing two important concepts to support exploration of the teaching act, that is the bioecological model of human development and the research position of Critical Realism (CR). The paper will then explore how these models can be built upon the existing Epistemological Chain model (Grecic and Collins, 2013) to establish a new EJF to support teaching development. Finally, an exemplar of the framework's operation is provided and a discussion on how the model could be practically applied in a variety of school and educational contexts.

Knowledge and epistemic beliefs in teaching

Epistemology is the philosophical study of knowledge and justified beliefs (Hetherington, 2019). Concerned with the processes by which something can come to be known, and on what basis knowledge of truth or reality can be claimed (Kivunja and Kuyini, 2017; Cooksey and McDonald, 2019), matters of epistemology are centred on the complex relationship between the knower and the known (Holmes, 1986). It is of likely value that some clarification on the term knowledge is provided here. Knowledge always pertains to truth or reality, whereas beliefs occupy the continuum between unsubstantiated claims and justified true beliefs. Drawing on Plato's contention that knowledge adds value to true beliefs, Schmitt (1992, p. 1) suggests that knowledge is "indefeasibly justified true belief" in that, by acquiring knowledge in addition to true belief, the knower is able to ascertain the unassailable justification for their belief. One of the central epistemological problems, therefore, is to explore when individuals merely believe and when they know (Audi, 2010).

In the PE context, Tsangaridou (2006) discusses the challenge of defining knowledge, particularly in its importance in contributing to high quality physical education. Understanding knowledge has multiple meanings and may lead to differing conceptualisations of what physical educators require (McEvoy et al., 2015: Waring and Herold, 2019). To gain a degree of clarity, Rovegno et al. (2003) identified practical, personal, experiential and situational forms of knowledge in PE. This is useful in that it identifies not only what teachers need for their practice, but what they accrue through the processes of their teaching experiences. The most influential breakdown of knowledge typologies has been initiated by Shulman

(1987) and features extensively in physical education research (e.g., Gower and Capel, 2004; Tsangaridou, 2006; Capel et al., 2009; Herold and Waring, 2018; Backman and Barker, 2020). Stran and Curtner-Smith (2009) note that teachers' deeply held beliefs are established during their time at school and affect how they teach when they become a teacher themselves. There is much research that demonstrates these teacher beliefs preceding and predicting practice (Lumpe et al., 2012; Tsangaridou, 2006) forming the basis for nearly all instructional decisions (Hargreaves and Fullan, 2012; Kulinna et al., 2000), including those related to their teaching pedagogy (Kennedy, 2005). Beliefs are multifaceted, though at a personal level, epistemological beliefs are inextricably linked to an individual's beliefs about how we learn, how we acquire knowledge and how we identify and verify that knowledge (Perry, 1981). These beliefs relate to the apparent certainty of knowledge, the organisation of knowledge and the control individuals have over that knowledge (Schommer-Aikins, 2002). Schommer-Aikins and Easter (2009) identified five specific beliefs about knowledge dimensions that comprise an individual's epistemological beliefs: (i) Omniscient Authority – where knowledge comes from, (ii) Certain Knowledge –the reliability of knowledge, (iii) Simple Knowledge – beliefs about how simple or complex knowledge is, (iv) Quick Learning – how fast we can learn (v) Innate Ability – how good we are at learning. They also highlight the multidimensional nature of beliefs that grow and change over time (Schommer, 1994). In the context of PE and PE teaching, therefore, it would be rational to claim that teachers' epistemological beliefs will potentially evolve over time. For instance, from the lens of occupational socialisation theory, it could feasibly be argued that *organisational socialisation* – that is, the process whereby PE teachers entering the profession become accustomed to the norms, values and expectations of their particular school and are taught the knowledge and skills required of their role (Lawson, 1983a, 1983b; Templin et al., 2017) – may influence a teachers' epistemological beliefs, particularly if those norms, values and expectations are informed by their colleagues' own varying epistemological beliefs.

Hammer, Elby and colleagues proposed the *resources approach* to epistemology (Elby and Hammer, 2010; Hammer and Elby, 2002). This resources perspective stems from a "knowledge in pieces" approach where context specific knowledge is used and can help people understand the situation they are in Hammer and Elby (2002). More recently, researchers have investigated how we justify what we know (see Hofer, 2016; Lunn et al., 2015) and how we make judgments about knowledge claims (Briell et al., 2011) as this is more reflective of why we think something is true and how we decide what to believe. This may be based on what makes sense to us, what others tell us, or through considering different perspectives before selecting a course of teaching action (Greene et al., 2010). Chinn et al. (2011) and Chinn et al. (2014) have built upon this body of knowledge to develop the AIR model of epistemic cognition which focuses specifically on epistemic Aims, Ideals and Reliable processes to better understand and explain the nature of knowledge and processes of knowing (Chinn et al., 2014). This model offers three areas to reflect against: Aims and Values—the goals people have when they are learning something and why they want to learn about it; Ideals. -the standards or rules people use to judge if something is good or trustworthy knowledge; Reliable Epistemic Processes—the different ways people gather, create, and use e.g., via expert testimonies, observations, statistical analysis, argumentation processes, peer review etc. In summary the AIR model helps us see how people set goals for learning, judge what is good, reliable knowledge, and use different methods to learn and understand. It helps us understand how people think about knowledge and how they learn. Linked to physical education, it helps clarify teachers' aims and purpose and contributes to the factors they use to define it. This is essential as if teachers cannot appropriately identify their understanding of what physical education is, how will they know whether they are teaching it, or if and when their pupils are physically educated.

Epistemology for teaching and learning

Epistemological beliefs play a fundamental role in students' learning, and it is therefore unsurprising that epistemological development has been championed as an aim of education more broadly (Hofer, 2001). By incorporating epistemological developments into educational practice, teachers can create environments that foster intellectual growth, promote critical inquiry, and empower students to become lifelong learners. In particular, epistemology provides a lens by which teachers can appreciate how students learn and the different ways they acquire knowledge related to the environments and spaces that they inhabit. With this insight, teachers can tailor their approaches to better align with students' local and contextual learning preferences. Epistemology can also have a more direct influence on teachers' pedagogy by helping them reflect on their own epistemological assumptions in order to develop teaching strategies that foster critical thinking, inquiry, and metacognition among students. This may then directly link to more meaningful learning experiences for students as teachers design learning episodes that encourage students to actively participate in sense-making activities, collaborative inquiry, and problem-solving tasks.

Epistemology development also encourages students to question, evaluate, and critique knowledge claims. By engaging students in discussions about the nature of knowledge, truth, evidence, and justification, teachers can cultivate critical thinking skills and encourage deeper reflection on the content they encounter. This may also support a more effective transfer of learning as students start to appreciate how knowledge is interconnected and can be applied to different domains and disciplines. Research has also demonstrated how a more developed or 'sophisticated' epistemology is linked with higher order thinking skills, the use of advanced learning strategies, deeper understanding and cognitive processing, conceptual change, greater levels of motivation and engagement in learning, and the development of educated citizens (Hofer, 2001, 2020). Studies have also identified that students' specific beliefs about knowledge predict their self-regulation strategies and are also closely interrelated with their motivation levels (Bråten et al., 2014). Research has also confirmed a strong connection across teachers' beliefs, their classroom behaviors, the learning environment they create, and how the curriculum is directly implemented (e.g., Nespor, 1987; Hofer and Pintrich, 1997; Hofer, 2002; Tarmo, 2016; Soleimani, 2020). Furthering this work linking epistemology to behavior, Grecic and Collins (2013) developed the epistemological chain (EC) to provide an *articulated framework* that connects an individual's belief system with the actions that they choose to undertake. It is important to articulate that not every teacher is equipped to or able to access these choices. Choice

works at different levels, and this "freedom to do" may be limiting and controlling (Evans and Davies, 2014) meaning that it will be a hollow premise if choice is not accompanied by the freedoms necessary to make them. Indeed, in this context greater levels of teacher agency or choice may not actually be a choice at all when it comes to delivering practice.

The epistemological chain

This paper uses the EC as the base on which to layer further elements in order to create a more comprehensive framework to support teacher development. Whilst epistemology relates to an individual's beliefs about knowledge and learning, the EC provides a traceable link between an individual's philosophy, beliefs about knowledge and learning, and their resulting behavior (Grecic and Collins, 2013). From a teaching and learning perspective, therefore, where an EC is present, teachers' or students' epistemological beliefs will directly influence the educational *outputs* created. Put more formally, the EC has been described as, "the interrelated/connected decisions made that are derived from high-level personal beliefs about knowledge and learning" (Grecic and Collins, 2013. p.153). Specifically, within this framework one's epistemology is seen to directly impact preferences related to a range of areas: the learning environment; inter-personal relationships; goal setting processes; operational and delivery methods; evaluation metrics; and plans for future learning (Figure 1).

Criticism of the original EC have been considered at a variety of levels in order to establish a more reflexive and impactful Epistemological Judgement Framework (EJF). In particular, a recent teaching pilot study of the EC highlighted a number of challenges with its existing format and helped us recognise that the EC definition oversimplifies the complex nature of epistemological processes (Grecic, 2024). Epistemological beliefs are influenced by various factors, including cultural, social, and educational backgrounds, as well as personal experiences. This complexity is not captured in the original definition and model as key mechanisms that influence its operation are missing. The perceived linear nature of the EC was also a weakness. As noted above, in reality, individuals' epistemological beliefs and decisions are influenced by a variety of factors, including social context, personal experiences, cultural background, and cognitive processes, all of which interact as a dynamic system in non-linear ways. The linear representation of the original EC also overlooks the presence of feedback loops and recursive processes in knowledge acquisition and learning, limiting its reflective depth. Individuals' beliefs and decisions are often influenced by feedback from previous experiences and outcomes, leading to iterative cycles of reflection, adjustment, and reinterpretation. Epistemological development often involves complex cognitive processes such as metacognition, perspective-taking, and self-regulation, which extend beyond a simple sequence of decision-making steps.

The categories or links in the EC may be described as too simplistic for the true nature of teaching (or sports coaching as was the original focus of the EC research). For example, interpersonal dynamics, communication strategies, and feedback mechanisms could also affect decision making but are not explicitly labelled (although are often considered within the chain sections). We also accept that the EC may lack generalisability due to the significant epistemological belief variations between individuals and the extent to which they shape teaching and coaching practice may differ based on factors such as experience level, teaching philosophy and situational constraints. Although a potential limitation, this is also a strength when the EC has been applied in an individualised manner.

In summary, while the linear representation of the EC provides a simplified framework for understanding the relationship between beliefs and actions, it may overlook the complexity, feedback loops, reflective depth, and contextual variability inherent in knowledge acquisition and learning processes. Therefore, considering these limitations, we are striving to develop a more comprehensive understanding of epistemological dynamics in educational contexts.

Developing a new model of epistemic judgement: adding environmental context and digging beneath the surface

Responding to the need for environmental factor recognition in teacher professional development (Richards, 2015; Kern and Patton, 2024), we have integrated Bronfrenbrenner's bioecological model of development into our thinking and make explicit our own philosophical position that drives our work – that is, Critical Realism. We selected Bronfenbrenner's bio-ecological model of development to help us appreciate and consider how different environmental and contextual factors can impact upon our teachers' decision-making. Originally, Bronfenbrenner (1977) formulated a series of 5 systems; Exo, Macro, Meso, Micro, and Chrono, which he arranged in closeness to the individual according to their importance. His later Bio-ecological revision in 1994 emphasized the complex relationships between immediate and wider environments. Here he demonstrated how individuals interact with each of the 5 systems as they develop and how an individual's characteristics influence the environments they are exposed to, and vice versa. This increased dialectical perspective on human development aligns with our collective epistemological position. This revised model introduced the Process Person Context Time (PPCT) framework that detailed the different elements at play within the human developmental journey. Although a comprehensive description of the PPCT is beyond the scope of this paper, it does provide a valuable scaffold upon which we develop an understanding of teachers' own journeys. Figure 2 we present our PE teaching interpretation of Bronfenbrenner's bio-ecological systems that we ask those who will use the EJF to consider.

As Bronfenbrenner's model is now 30 years old, we have also considered additional, perhaps more granular, factors which impact upon teachers' development. For instance, at the individual level we now consider various aspects at play that include our personal traits, characteristics and intelligences. At the microsystem level, we need to sharpen our understanding of the contextual and cultural influences on the socialisation experiences of teachers. Research employing occupational socialisation theory has highlighted the powerful processes, however dialectical they may be, of acculturation, professional socialisation and organisational socialisation which impact upon PE teachers' beliefs and orientations (Lawson, 1983a,b; Templin and Schempp, 1989; Stroot and Williamson, 1993; Curtner-Smith, 2001; Richards et al., 2014; Templin et al., 2017; Pennington et al., 2022). From the bioecological

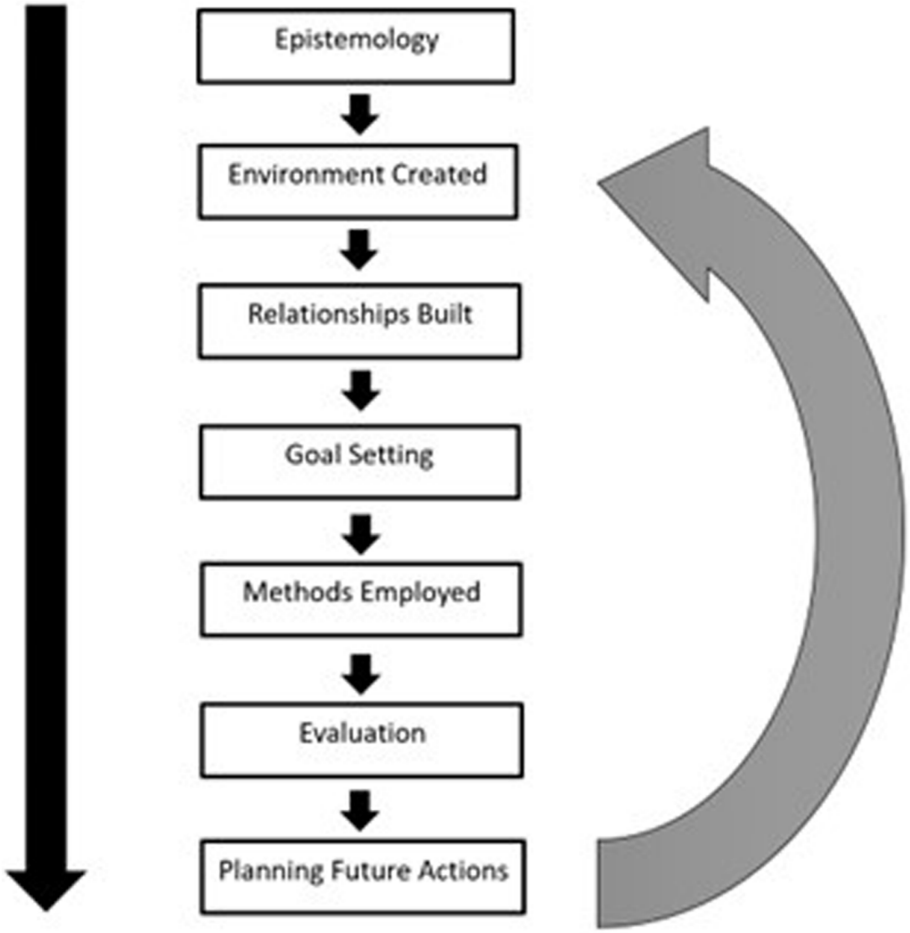

FIGURE 1
The epistemological chain (Grecic and Collins, 2013).

perspective, therefore, it seems vital to account for these highly influential processes at the microsystems level and their multidirectional relationship with the wider PE environment as part of the developmental journey. Additionally, increasingly digitised societies are impacting upon all aspects of individuals' lives, both generally and also in the context of teaching PE (Marín-Suelves et al., 2023). With these additions, the bioecological model helps us appreciate the influence of culture, time, context, and technology on teacher's decision-making at each level of the environment.

Here we also recognise teacher's beliefs and attitudes to change will be strongly affected by their perceived agency within their environment (Kern et al., 2021), this being subject to the multiple influences and elements of power exercised by the environment's stakeholders (Day et al., 2006). Indeed the often contextual subjectivities operating at macro and micro levels privilege certain interests and ideologies, while excluding others. This means that as the interests of the stakeholders with their varying degrees of power are never socially disinterested or neutral (McNamee, 2005), so that the school cultures that impact upon teacher decision-making processes are inherently political (Connolly, 2009; Richards et al., 2013). This invariably impacts teacher behavior and can lead to 'slippage' between the policies and practice (Ball, 2007) as teachers have to navigate between their beliefs and the realities and actualities of the teaching spaces and environment they inhabit.

Looking beneath the surface

Here we make a conscious effort to be explicit about the philosophical stance that has led to the reconsideration of our original model. We wholeheartedly promote the valuable lens of CR to help us think more deeply about what is happening in the teachers' environment to support future research and any practical interventions. CR is a branch of philosophy that distinguishes between the 'real' world and the 'observable' world in which we exist. Bhaskar (1975) is widely recognized as a founding proponent for CR. He promoted that the 'real' world cannot be observed and exists independent from fallible human perceptions, theories, and/or events that we experience or see. CR promotes our existence as stratified, consisting of three layers (see Figure 3) – that is, the *real*, the *actual* and the *empirical* that operate in an open system (Sayer, 1999; Archer, 2010; Bhaskar, 2010). It is the "real" but often hidden bio-psycho-social worlds and their complex interactions that promote or inhibit the "actual" actions, behaviors, events, and objects that we empirically witness or feel (Blaikie, 2007) and offer the capacity to best reveal how

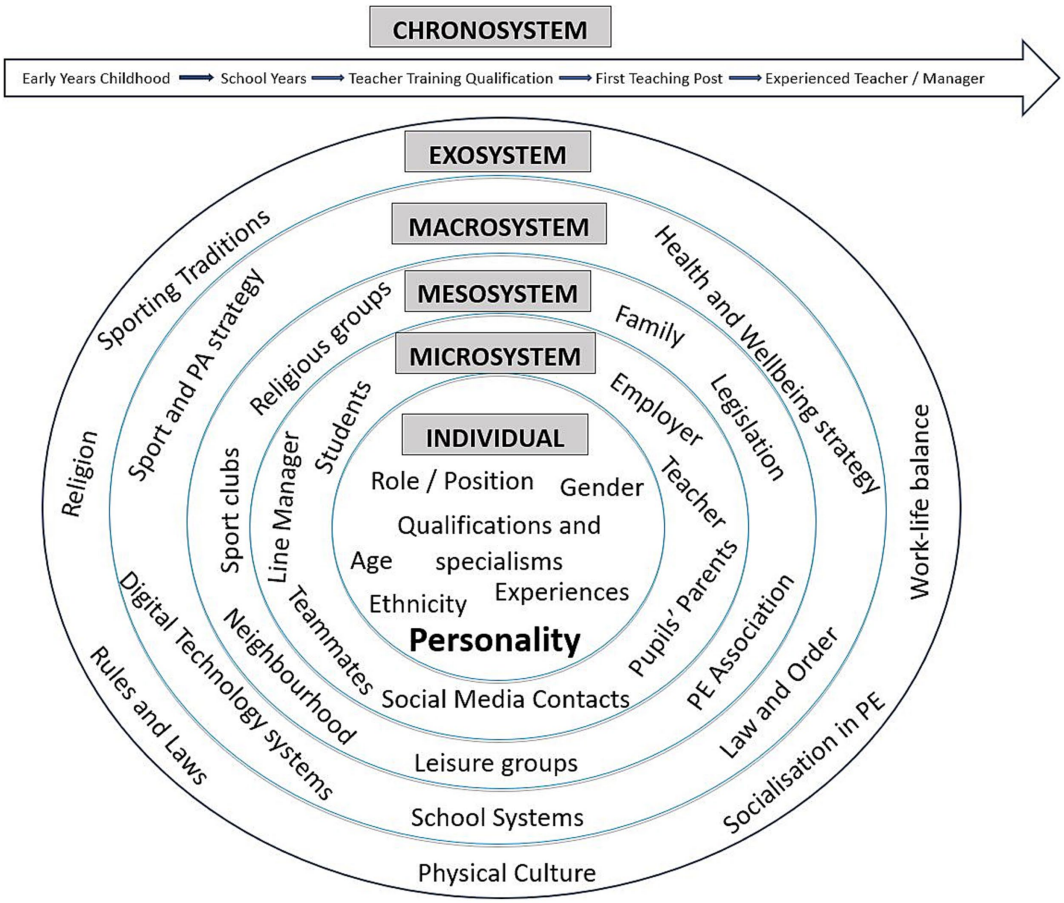

FIGURE 2
A PE teaching bioecological environment.

and why something occurs (Byers, 2013). From this viewpoint, any exploration of teacher behavior must first endeavour to fully understand the natural, social, and psychological structures that bear influence upon all the stakeholders within their world to uncover why current practices exist and why alternatives may or may not gain traction from those involved. In our PE teaching context, the domain of *real* may refer to how the PE curriculum is established, governed and inspected. Whilst the domain of *actual* events may refer to PE teachers' professional duties (e.g., lesson delivery, assessment, extra-curricular provision, professional development undertaken, and so on). Finally, the domain of *empirical* experiences may refer to the sociocultural influences on PE teachers' daily lives in school.

In part, the value of CR lies in its promotion of ontological plausibility, empirical adequacy, and practical utility (Ronkainen and Wiltshire, 2021). Such realist investigation offers ecologically valid descriptions of the bespoke situation, challenges, and enablers by which social actors' actions and experiences are shaped (Wiltshire and Ronkainen, 2021). By promoting CR, we encourage teachers to strive to provide accurate descriptions of the specific situation, challenges, and factors that shape their actions and experiences. We propose that this approach offers a more comprehensive understanding of the environment hidden influences on the teachers' bio-ecological development. Ultimately, therefore, it will help us develop more effective teaching interventions or strategies.

Toward the epistemic judgement framework

Reflecting the 'linear' perception and criticisms of the original EC described above, it is important for us to state that it was never the intention for practitioners (originally sports coaches) to work through each stage in turn. It was intended that coaches would reorganise the EC and consider each of the EC elements as distinct segments. This would allow coaches to 'jump in and out' of the cycle at any point, as well as being able to transpose the elements and re-link in whatever order made sense for that individual to create their own specific chain (think here of a stacking cup analogy). In response to our new EC iteration, the *Epistemic Judgement Framework* (EJF) still presents the key elements of the teaching process, but now encourages the user to place themselves at the centre of all considerations about the epistemic judgements that underpin their selections, decisions and associated behavior. This will in turn become grounded in a more comprehensive bioecological and critical realist understanding of the environmental influences at play. In this way we propose that teachers will engage in more meaningful planning, delivery and reflections on their teaching pedagogy, positively impacting quality and thus enhancing the students' experience of the learning episode.

The EJF does still include the previous EC components, however the EJF evolution places the individual's epistemic judgements at the

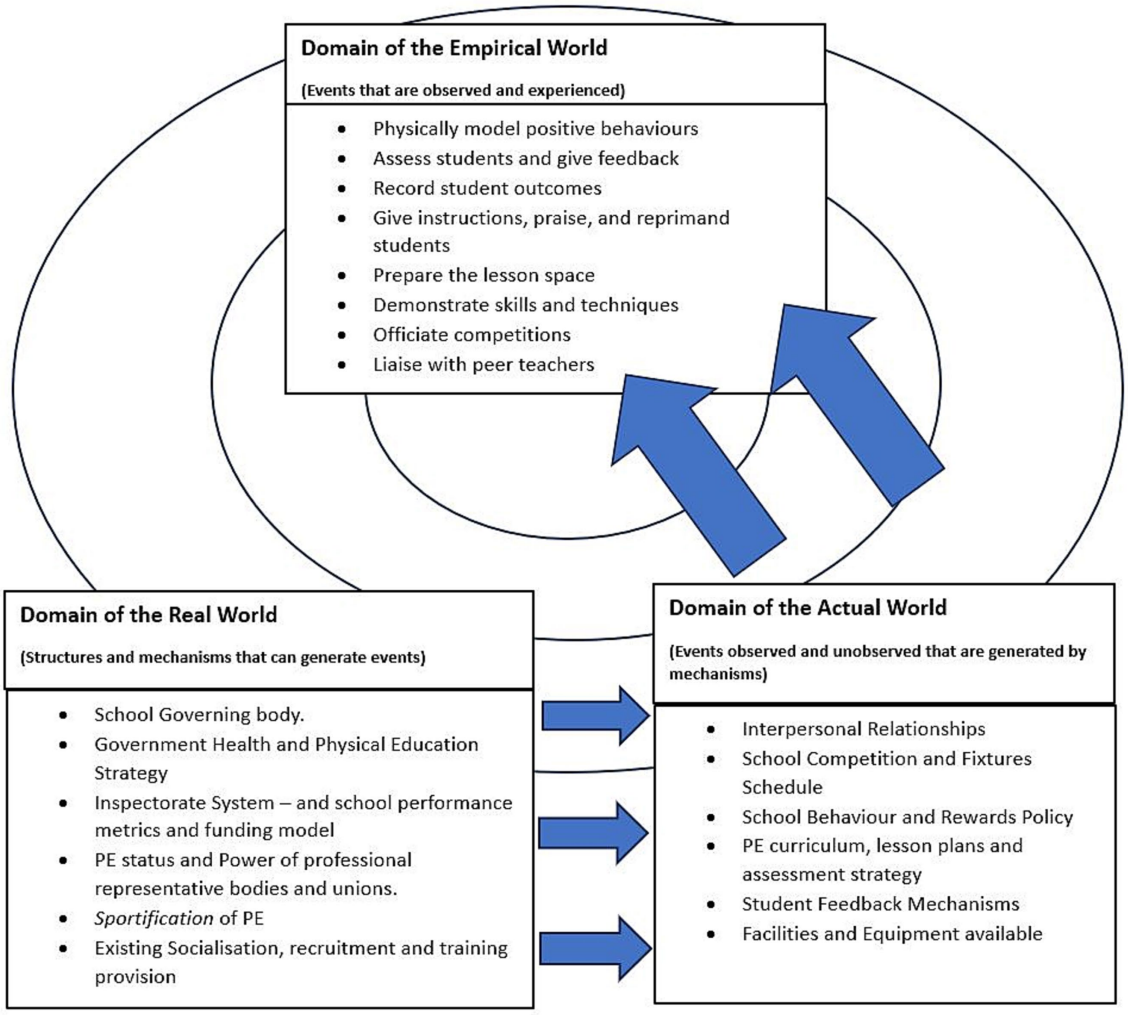

FIGURE 3
The three "worlds" of critical realism in physical education.

core running through the entire philosophy to behavior linkages. Here we embed the AIR framework (Chinn et al., 2014) as the lens by which we consider the judgements made about each section, which lead to the decisions made and thus subsequent actions. Of equal importance is that each element is considered by its environmental stressors, of which many will only become apparent following deep reflection on the open and hidden influencers on each factor. Despite this model depiction (Figure 4), as a linked hierarchy with philosophy initiating a top-down reflective process, we envisage the EJF components can also be utilised as transposable data units that can be rearranged in multiple formats, providing a self -initiated map to guide teachers' developmental journeys where desired.

Recognising the EJF's potential to be applied in a dynamical systems format we have found the 'Wayfinder' analogy, from contemporary sports coaching development research, has resonated greatly with us. Here coaches take a facilitative approach to help their players or fellow coaches navigate through the dynamic sporting environment in which they operate (Woods et al., 2020; 2023). We also see value in promoting this analogy for teacher development with the EJF offering our PE teachers a pathway to follow with forks in the road where decisions need to be made and routes both backwards and forwards between the EJF milestones, or points of interest, depending on the choices made. Here our Wayfinder PE teacher could utilise the EJF as they navigate their progress through their teaching practice. Here the EJF would encourage teachers to reflect on their personal philosophy of teaching and epistemology as well as the bio-ecological interactions and the hidden influencers at play in order to carefully decide on their direction of travel at each next stage.

As an example of how teachers would use this framework in either format, we suggest they consider the EJF elements as follows: Philosophy: This is the contemplation stage – Here teachers explore their deep held values and beliefs about human life and development. They then need to ask themselves where they would like to go as humans and as teachers, what do they want to do along the way, and why do they want to go there? Finally they consider the desired impact the journey have on themselves and others (students, peers etc.)? Epistemology: Here this is the planning stage – teachers need to consider what knowledge is and how learning happens. What are their base level assumptions that will guide future decisions? Environment: This is the starting out point of the journey, representing the context

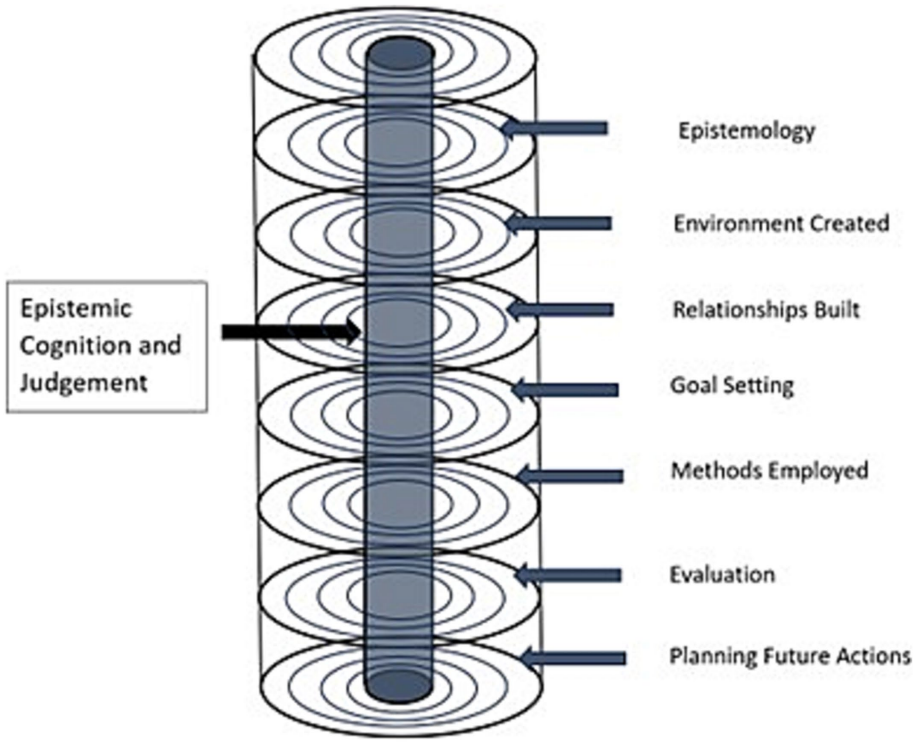

FIGURE 4
The epistemic judgement framework.

in which teaching occurs. It sets the stage for the entire journey as teachers consider what type of learning environment they want and need to establish for their teaching acts. Relationships: Along the journey, teachers encounter various stakeholders (Headteacher, Governors, Senior managers, peers, mentors, pupils, parents, counsellors, social workers, police etc.) and interact with them in different ways. These relationships shape their experiences and impact their decisions. Teachers need to reflect upon their preferred interactions and their personal interpersonal resources that they have available. Goals: as teachers embark on their journey, they set goals to guide their actions and aspirations. These goals serve as signposts along the pathway, providing direction and focus. These may be intentions or targets for self, pupils or how they will influence others. Methods: Teachers employ various pedagogical approaches and teaching methods as they navigate their journey. These methods represent the tools and techniques they use to achieve their goals and fulfil their responsibilities. Teachers need to consider whether these are in fact aligned or in conflict to their beliefs, and how this will impact upon their capability to undertake the journey. What tools, equipment do the teachers' have at their disposal? Where did they get them from, are they still up to date, do they need anything else to enable them to be successful? Evaluation: Periodically, teachers pause to evaluate their progress and reflect on their experiences. The evaluation process can serve as a refreshment area or viewpoint along the pathway, allowing teachers to rest, take stock of the distance travelled thus far, assess their effectiveness and make adjustments as needed. They need to assess the processes and products of their interactions and their progress in respect of their desired outcomes. Future Planning: Finally, teachers will use their reflections and evaluations to inform their future plans and actions. This process of planning represents the ongoing nature of the journey, as teachers continuously strive to improve and adapt their practice and plan the next stage of action.

By visualizing the epistemological chain as a journey map or pathway, we do feel we can better convey the dynamic and iterative nature of PE teaching, where teachers navigate through different elements, reflect on their experiences, and plan for the future. This analogy helps to illustrate the interconnectedness of the elements and the ongoing nature of professional development in teaching.

To summarise the EJF described above can be utilised in two alternative formats. Firstly, its linear representation aims to facilitate discussion and professional development by exposing teachers to a more critical and informed approach to consider their practice and the decisions they make. Secondly a more dynamical systems approach can be adopted whereby teachers choose their own starting and end points (different EJF elements) as well as the steps they take on the path along the way. This provides the teacher more autonomy and agency but does require a greater level of appreciation of the environmental systems at play. We envisage this format would be most valuable for more experienced teachers as they retrace their career footsteps and plan out their future journey in the profession.

EJF future applications

The EJF affects change via the teacher as the main locus of control. The ultimate aim is undoubtedly to enhance pupil learning,

improve children's experiences of PE in order to improve their motivation, confidence and competence to be active and healthy, and to develop life skills that they can utilise in later life. The EJF descriptions above provide insight and ideas of the EJF's direct benefits for teachers, but the intention is that there is direct correlation to improved pupil outcomes with project discussions already progressing with European PE Associations and the World Physical Education Alliance (WPEA). As key change agents (Hargreaves and Fullan, 2012) our teachers must be the target of effective professional development if they are to be able to facilitate a more meaningful experience and the establishment or advancement of QPE as the professions' most recent stated aim (UNESCO, 2015). Utilising and/or combining the different versions of the EJF outlined above we believe can greatly enhance the professional development on offer for practicing PE teachers. In addition to enhancing their reflexivity we believe there are a number of additional future applications that can lead to positive change, reflecting calls for PE teachers to move away from traditional performance outcome based PE to a more idealist perspective of what the subject and profession can enable (Bailey et al., 2009; Kirk, 2011; Fletcher et al., 2021) in order to enhance the students' experience in PE. Firstly the EJF offers Personalized Professional Development: Utilizing the EJF as a framework, teachers can engage in personalized professional development tailored to their beliefs, goals, and contextual needs. This approach allows teachers to reflect on their practice, identify areas for growth, and implement targeted strategies to enhance teaching and learning experiences. Secondly our framework offers a template for Curriculum Design: By considering the interconnected elements of the epistemological chain, curriculum designers can create more holistic and effective curricula for PE. This will support the teachers develop an understanding of the wider education landscape (neoliberalism), how the school fits within this, and how the PE curriculum fits within the wider curriculum framework of the school. This involves aligning philosophical beliefs with pedagogical methods, assessment practices, and environmental factors to promote meaningful learning experiences for students. The EJF can also support Data-Informed Decision Making: Teachers can use the epistemological chain to inform data collection and analysis processes, enabling data-informed decision-making in PE. By examining how philosophical beliefs, epistemological assumptions, and environmental factors influence teaching and learning outcomes, teachers can make evidence-based decisions to improve practice, especially where schools may have data driven outputs that are not at first apparent. In a wider context the EJF can be utilised for the Promotion of Critical Thinking and Reflection: Incorporating elements of critical realism and epistemic judgment into teaching practices can foster critical thinking and reflection skills among students. Teachers can design learning experiences that encourage students to question assumptions, analyze evidence, and reflect on their own learning processes in PE. The EJF may also be applied to enable the Cultivation of Holistic Learning Environments: By considering the bio-ecological model of development and the interplay between individual, social, and environmental factors, teachers can create holistic learning environments that support the physical, cognitive, social, and emotional development of students. This involves designing inclusive activities, fostering positive relationships, and promoting a supportive classroom culture in PE and therefore disrupting Western neoliberal policies that often drive PE practice.

Overall, the EJF's future application in teaching, learning, and physical education involves leveraging philosophical beliefs, epistemological assumptions, and environmental factors to enhance professional practice, curriculum design, decision-making processes, and student learning outcomes. By adopting a holistic and reflective approach grounded in epistemology, we truly believe that educators can create meaningful and transformative learning experiences for all students in PE and beyond. Despite our paper's unashamed aim being on improving pupils' experiences in PE we propose many additional applications for the EJF in education. Staying with the pupils and utilising the EJF with them, exploring their perceptions of the same EJF sections and the environment in which they and their teachers exist would not only provide valuable information for teachers, but would increase pupil awareness of the many confines and possibilities that their teachers must consider. This heightened awareness may also prompt student voice activities where pupils are encouraged to co-develop future plans and activities that are more in line with their own epistemologies and motivations. Often promoted this is rarely evident in PE. Looking beyond the classroom itself the EJF may also be of great use in recruitment and appraisal and may protect against simple reproduction of outdated practices (Flemons et al., 2024). By using the EJF elements to ask teaching candidates to articulate their teaching philosophy and pedagogical basis it would offer a valuable lens by which to inform potential alignment or conflict with the school's needs and culture. In the appraisal context the EJF may even be used to provide a gap analysis of where future support and training was desired or needed. Finally the EJF can also be used in teacher training courses to help prospective PE teachers with their own biographical mapping during HE studies, training themselves to apply it firsthand. This requires PD for HE instructors and early implementation in PE courses.

To summarise, this paper has presented a conceptual framework by which to consider how and why teachers make decisions that ultimately impact on pupil experiences in PE. We propose that our EJF offers a valuable reflexive tool for teachers to explore the rationale for their decisions and become more aware of their practice's wider context as well as the key influencers, facilitators, barriers and challenges that they are presented with. In this way we hope to enable teachers to become a more reflective, informed and better prepared practitioners who will be more aware of the rationale and basis of each judgement they make. This is the first time to our knowledge that the specific environmental factors and hidden influencers of the PE profession have been integrated into a professional development tool that targets teachers' deep held beliefs about Physical Education. In doing so we have responded to the call to consider the wider sociopolitical drivers at play (Kern and Patton, 2024) as well as the specific school context (Richards, 2015). In addition our framework offers an original approach to address teachers' beliefs, noted as one of the most difficult aspects of professional development to attend to when aiming to facilitate meaningful pedagogical change (Curtner-Smith, 2017). We have also presented a number of ways in which the EJF can be operated by teachers, schools and/or teacher trainers depending on the needs and resources available. Despite confronting criticisms of the original EC model we are also aware of potential

limitations of our revised proposal. Here in particular we highlight the role of facilitator/operator themselves. The deep and honest conversations that need to take place are predicated by a supportive, non-judgemental, inclusive approach. Any pre-conceived positions, self-presentations conscious or unconscious bias would negatively impact judgements, and ultimately the agency of the teacher who is self reflecting. This issue must be considered seriously and future work may focus on providing digital resources that remove this risk to the process. Nevertheless, we truly believe that the EJF offers a valuable tool that will enhance Physical Education teachers' knowledge, self-awareness and practice resulting in a more positive experience for both teachers and students in PE.

Author contributions

DG: Conceptualization, Writing – original draft, Writing – review & editing. AS: Writing – review & editing. AT: Writing – review & editing. EC: Writing – review & editing. CP: Writing – review & editing.

Funding

The author(s) declare that no financial support was received for the research, authorship, and/or publication of this article.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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