



OPEN ACCESS

EDITED BY

Eunice Nyamupangedengu,
University of the Witwatersrand, South
Africa

REVIEWED BY

Roberto Lagos-Hernández,
Autonomous University of Chile, Chile
Nicolas Terré,
Institut de Formation en Education
Physique et en Sport d'Angers, France

*CORRESPONDENCE

Roland Messmer
✉ roland.messmer@fhnw.ch

RECEIVED 29 May 2026

REVISED 06 July 2026

ACCEPTED 29 July 2026

PUBLISHED 26 August 2026

CITATION

Messmer R and Schönfeld K (2026)
Teaching embodied knowledge through
narratives.
Front. Educ. 11:1894619.
doi: 10.3389/feduc.2026.1894619

COPYRIGHT

© 2026 Messmer and Schönfeld. This is
an open-access article distributed under
the terms of the [Creative Commons
Attribution License \(CC BY\)](#). The use,
distribution or reproduction in other
forums is permitted, provided the
original author(s) and the copyright
owner(s) are credited and that the
original publication in this journal is
cited, in accordance with accepted
academic practice. No use, distribution
or reproduction is permitted which does
not comply with these terms.

Teaching embodied knowledge through narratives

Roland Messmer^{1,2*} and Katja Schönfeld^{1,2}

¹Institute for Secondary Education, FHNW School of Education, Murttenz, Switzerland, ²Institute for
Educational Sciences, University of Basel, Murttenz, Switzerland

Introduction: This paper examines how embodied knowledge can be understood and taught across school subjects by dissolving the enduring body–mind dualism rooted in classical philosophy. Drawing on Dewey's critique of this dualism and his concept of a body–mind continuum, the authors situate physical education (PE) as a paradigmatic case for exploring embodied knowledge in teaching and learning. Historically, schooling privileged cognition, treating the body instrumentally and marginalizing bodily experience in curricula. Although PE eventually became institutionalized, its epistemic foundation remained conceptually split between bodily practice and abstract reflection. This paper addresses three key issues: (1) the historical and conceptual persistence of the body–mind divide in schooling, illustrated through the evolution of PE; (2) how embodied knowledge serves as a dynamic connector between body and mind, informed by pragmatism, phenomenology, and competence-oriented approaches; (3) the role of narratives and metaphors in articulating and transmitting embodied understanding.

Methods: This study combines discourse analysis and narrative inquiry to analyze the historical and cultural context of PE and sports. The research focuses on the concept of body–mind dualism in PE, utilizing data from two studies conducted in Swiss middle schools. The analysis explores how different individuals operate under varying rules within the body–mind dualism, examining embodied knowledge through narratives and thick descriptions.

Results and Discussion: A class practice vignette—the *sea star* example of a student learning the high jump—shows how learners draw on metaphors to express bodily insights that may not align with teachers' technical language, highlighting both the presence of embodied knowledge and the communicative gap hindering its pedagogical use. This paper concludes that narratives and metaphors function as a shared language for embodied knowledge, enabling dialogue between teachers and learners. Rather than abandoning technique-based teaching, embodied narratives can complement it, fostering reflective, democratic learning across subjects. Ultimately, dissolving the body–mind dualism requires integrating embodied knowledge not only in PE but in all educational practices.

KEYWORDS

class practice, embodied knowledge, learning, narrative inquiry, physical education, teaching

Introduction

Classic philosophy was conceived in wonder, born in leisure and bred in consummatory contemplation. Hence it noted the distinction between objects consummatory or final in the fine arts and instrumental and operative in the industrial. It then employed the distinction to interpret nature in terms of a dialectical physics (Dewey, 2008a, p. 101)

For John Dewey, these roots of classic philosophy serve as the foundation for numerous dualisms. While they may not be particularly useful for philosophical discourse, they offer practical guidance. Dewey mentions other dualisms, including those “between sensuous appetite and rational thought, between the particular and universal, between the mechanical and the telic, between experience and science, between matter and mind” (Dewey, 2008a, p. 102). Furthermore, he specifically criticizes the body–mind dualism (Dewey, 1928), whose roots he identifies in Aristotle’s distinction between culture and nature.

Today, it is challenging to discern the precise nature of the problems inherent in dualism. For example, in physics, there is the dualism of wave and particle. However, we must respect the fact that, like many of his contemporaries, Dewey considered the dualisms of mind and body and of experience and nature to be the products of an undemocratic hierarchical social order that could not be accepted. He believed these dualisms to be a source of error and confusion; therefore, he wanted to dissolve them. Dewey argues for retaining distinctions that have proven useful. However, he critiques the body–mind dualism, which has persisted, particularly in the practice of teaching and learning, since its Aristotelian origins and which continues to influence contemporary approaches.

Therefore, Dewey proposes a circular or continuum approach when discussing various dualisms, particularly the body–mind dualism (Krüger, 2019, p. 52). Nevertheless, it is unlikely that the fixed mind, originating in classical philosophy, can be completely eliminated. This mindset is deeply engraved in our society and exerts a lasting influence on educational subjects:

Consequently, there is no “mind–body problem” in the traditional sense, because everything we attribute to mind (or refer to as mental) is the result of at least a partially functioning brain, operating within an at least partially functioning body that is engaging its worldly surroundings in an ongoing fashion (Johnson, 2017, p. 226)

Building upon Dewey’s concept of a continuum between body and mind in teaching and learning, we explore the application of this thinking across various subject areas, particularly physical education (PE). PE emphasizes the body as its central subject, and its learning and objectives revolve around reflection. Therefore, it provides the clearest example. We will adopt one of Dewey’s central proposals regarding the body–mind dualism as a concept encapsulated within situations involving communication and participation. A scoping review of embodied learning approaches reveals a substantial potential for learning through bodily experiences, particularly in the context of school education and PE (Faella et al., 2025).

In different school subjects, the body plays a significant role. In theater, individuals express their meanings through their bodies. In chemistry or physics, the body is utilized in the learning process in terms of the practical skills required by natural sciences. For example, safety management in the laboratory cannot be resolved only through abstract reflection. Furthermore, if we consider Bruner et al.’s (1966, p. 12) emphasis on enactive learning, all subject areas are confronted with the body–mind continuum. Dewey (2008a) states as follows:

Body–mind simply designates what actually takes place when a living body is implicated in situations of discourse, communication, and participation. In the hyphenated phrase body–mind, “body” designates the continued and conserved, the registered and cumulative operation of factors continuous with the rest of nature, inanimate as well as animate; while “mind” designates the characters and consequences which are differential, indicative of features which emerge when “body” is engaged in a wider, more complex and interdependent situation. (p. 217)

Building on this continuum between body and mind, we address three fundamental issues in the following analysis, taking Dewey’s approach as our starting point:

1. What are the historical and conceptual underpinnings of the body–mind dualism in schooling in Europe, and why is it always present? We illustrate this by using PE as an example.
2. What can fill the gap in the continuum or assist the circle work? We delve into the interplay between the theory of embodied mind and body, whereby they dynamically influence one another in practical scenarios.
3. What is the role of narrative and metaphor in conveying physical understanding?

This chapter employs a vignette from a high jump lesson in which a student metaphorically describes her movement as a sea star to illustrate two fundamental challenges: first, the existence of embodied knowledge that students possess but encounter difficulty in articulating verbally; second, the disparity between students’ bodily experiences and the technical language employed by teachers.

This inquiry concludes with implications for fostering and teaching embodied knowledge across diverse teaching subjects, particularly in the context of PE. As previously mentioned, PE is only an example of learning and teaching in relation to the continuum of body and mind. PE emphasizes what other disciplines also require: practice with the body. For instance, in science, one needs knowledge to resolve problems in the laboratory. This knowledge is not reflective; it is a knowledge in the body that helps one avoid dangerous situations involving hazardous substances. Therefore, in science and other school subjects, embodied knowledge may not form the core of the discipline’s knowledge. However, this type of knowledge must be of the utmost importance for teaching and learning.

Two methods combined

The methodological approach to this study combines two research methods. First, there is the discourse analysis founded by Foucault (2018). Second the narrative inquiry established by Clandinin and Connelly (2000).

Although Foucault never said that he had established a research methodology, the discourse analysis is used in the humanities and beyond other disciplines (Keller, 2024; Kendall and Wickham, 1999). Foucault didn't create a method; instead, through his theoretical reflections, he laid the foundation for a novel way of thinking—an explicitly positivist research program that has been applied and analyzed in literary studies, sociology, and, increasingly, in history.

Kendall and Wickham (1999) have established four steps; they are essentially in the method:

1. How those statements are formed,
2. what can be said (written), and what cannot,
3. how spaces for new statements are created, and
4. how these practices become both material and discursive simultaneously.

First, the topic or issue to be analyzed is identified. The social context (discourse) in which this topic is discussed is established. It is crucial to demonstrate and explain the culture and historical context of the topic and the material.

Second, the topic is assigned to a specific level of discourse (e.g., political debate, media coverage, academic discourse). Here, it should clarify which rules and norms govern how the topic is discussed at this level.

The third and fourth steps in our guide to using the Foucaultian notion of discourse — the identification of rules that delimit the sayable (which are never rules of closure) and the identification of rules that create the spaces in which new statements can be made (Kendall and Wickham, 1999, p. 99)

So this method is predestined to analyze the historical and cultural context of PE and sports. However, there is a non-linguistic aspect to this analysis in PE, as the subject matter encompasses not only verbal content. Consequently, we supplement the analysis with non-verbal subjects, as Fairclough (2009) describes as a “semiotic point of entry” (p. 171). In accordance with this approach, we utilize not only textual material for our analysis but also semiotic artifacts such as images or narratives.

In our analysis, we considered the origins of PE in Middle Western Europe during the 18th and 19th centuries. These historical roots provide a foundation for understanding the development of PE within the school environment. While it is true that other influences have shaped PE in the 21st century across various countries, the modern school system's origins can also be traced back to the early 19th century in Middle Western Europe. Our initial proposal for the investigation is the concept of body–mind dualism in PE. Therefore, it is unnecessary to

explore all the geographical origins of this body–mind dualism in schools.

Keller (2020) combines discourse analysis with narrative analysis, so the data sources are stories and told stories in different societies. The following tools from the field of narrative inquiry are to be employed in the analysis of the stories under consideration (Craig et al., 2024). As the data is analyzed from a variety of sources, serial interpretation is employed (Craig et al., 2024). The present study employed serial interpretation in order to elucidate the manner in which research ideas materialized within/across two different perspectives of class practices (Craig et al., 2024).

According to Schwab, serial interpretation adds intellectual heft to research investigations, increasing the explanatory power of findings from studies that can be linked together. By using serial interpretation to drive our meta-level narrative inquiry, we can show what our two research teams found on our fishing lines when we skimmed the surface and plunged the depths of our two data pools (Craig et al., 2024, p. 4)

In our study, we utilized two data sources. The first is a study conducted by Messmer (2011), which involved the video recording of five school classes. Each teacher was interviewed multiple times in stimulated interviews. The second study, conducted by Schönfeld (2021), also involved the video recording of five school classes and employed a similar design, conducting numerous stimulated interviews with different students. Both studies employed distinct video perspectives to document multiple classes within the selected classes. Several students and undoubtedly the teacher utilized subjective cameras, such as body cameras. This methodological approach facilitated the documentation of the participants' subjective perspectives, whilst also ensuring the accurate transcription of their verbal contributions. It is important to note that ambient noise in PE classes has the potential to significantly interfere with speech perception. To illustrate this point, consider the sound of multiple basketballs being dribbled at the same time.

All classes were located in middle schools in different regions of Switzerland. While Schönfeld's study focused on the students' perspectives, Messmer's study examined the teachers' viewpoints. Thus, we could plunge the depths of our two data pools to explore both sides of the topic in our new study. Overall, we believe it was crucial for our issues to be explored through this serial interpretation, examining how different individuals operate under varying rules within the body–mind dualism. We were able to identify numerous critical incidents and narratives that centered around the central topic of the inquiry: embodied knowledge. Subsequently, we condensed these stories into thick descriptions as the basis for our serial interpretation and the basis for our analysis. One of these stories is used to show the results of our analysis.

The roots of the body–mind dualism in schooling

The human body and movement are undoubtedly integral to the school curriculum. However, in the middle of the 19th century, the core of the curriculum was the mind. The body was merely a means to an end, and that end was to acquire abstract knowledge. In the very beginning of primary schools in Europe that were independent of churches and monasteries, the book *Gymnastik für die Jugend* (Gymnastics for the youth) was explicitly written by GutsMuths (1793) to improve fitness. Consequently, this gymnastics was not part of a school subject; instead, it was conducted outside of the school. As a result, the teachers were not trained teachers but coaches from local gymnastics clubs.

A clear objective was set of enhancing the wellbeing of students, enabling them to attain greater fitness and achieve superior outcomes in legitimate institutionalized subjects, such as mathematics, science, and literature. This objective persisted throughout the growth of schools in the 19th century. Although this form of activity received a name (physical education; *Turnen* in German), it remained an extracurricular activity, and in other school subjects, the body was explicitly excluded from the curriculum. This is likely one of the reasons why progressive education initially criticized the school system as book schools. In essence, the body–mind dualism was deeply ingrained in the foundation of schools and became an integral part of the school system.

In the 20th century, PE gradually became a regular school subject, with trained PE teachers and mandated curricula. However, the conceptual gap between the body and the mind remained unaddressed. Instead of integrating the mind into PE, the mind was relegated to other school subjects. This shift contradicted the goals of progressive education, as the explicitly body-connected school subjects retained a mind-oriented perspective. However, there was optimism that PE could contribute to broader educational objectives, including the development of personality traits such as courage and bravery, as well as fostering social and cooperative learning. Some of these objectives continue to be relevant, as evidenced by the work of Dyson and Casey (2016). Throughout this transition, the original goals of improving health and personality remained within the scope of PE. In contrast to other school subjects that emphasize cognitive development, the educational aims of PE focus on growth and development rather than knowledge and skills. Unlike other subjects, PE abilities cannot be taught or assessed.

If a distinction is made between educating and teaching, it may be that there is less teaching in PE than in other school subjects. As shown above, education is defined in a vague manner as the development and formation of other people's strengths, including not only courage and bravery but also cooperative learning, etc. That is why education is expressed more in a rhetorical form and less in terms of concrete goals. In contrast, teaching is defined solely in terms of its purposes (e.g., Nussbaum 2011), which are primarily the promotion of enlightenment and the transfer of knowledge. Consequently, teaching is determined by certain tasks and requirements on a

case-by-case basis. This distinction between educating and teaching can be attributed to Dewey, who posits in *Democracy and Education* (2008b) that educational objectives should be articulated only when there is a reasonable expectation of attaining them. From this perspective, teaching necessitates a clear endpoint and concrete objectives: Retaining Dewey's metaphor, you should really sell your subject matter.

The word *objective* suggests that something is planned and organized. It means that a process is carried out in a step-by-step way. If we think of an activity that is carried out over time and gets bigger the longer it goes on, then having an aim means we are thinking about what might happen at the end of it.

It is therefore unsurprising that the educational aims of PE lack evidence, as demonstrated by Ronkainen et al. (2021). It is possible for these goals to be achieved or for a link between goals and effects to be established. As Coakley (2011, p. 318) states, "there is no *a priori* reason that such a link [between goals and effects] is not possible or would not be helpful in producing positive developmental outcomes for individuals and communities." However, the ability to control the link between goals and effects varies depending on the context. This is true both in popular sport and in PE.

To develop PE as a school subject, its proponents advocate an approach with a stronger focus on learning in the curriculum. The 20th century witnessed the emergence of sports within society, giving rise to a parallel evolution of learning techniques, tactics, and aesthetic competences to accommodate these novel sporting forms (Messmer, 2018). In this sense, PE can be understood as a school subject like any other, in which not only physical fitness but also knowledge must be acquired and enhanced. In accordance with Dewey's perspective (2008b), the process of learning and teaching must be based on empirical evidence and practical relevance in a public or school setting that adheres to democratic principles. It is not sufficient for these processes to be based solely on rhetorical aims. It is essential that the central focus of the school subject is encompassed by a framework.

These differing goals of PE have led to different practices and approaches in different countries and curricula. However, the underlying objective of these curricula and pedagogical approaches should be to facilitate the acquisition of sports-related knowledge and skills rather than merely to discuss the subject. PE is a subject that exhibits diverse orientations globally, with sports being only one of its areas of influence. However, regardless of its variations, physical movement remains an integral component of the subject matter in PE (Messmer, 2018).

Irrespective of one's position on the subject matter of PE, a fundamental assertion remains constant: the pivotal role of the *human body*. Whether the focus is on mastering competences or the subject is perceived merely as a complementary subject to the so-called cognitive subjects (e.g., mathematics and physics), the body is invariably the foundation of the subject matter. Even if we follow an educational endeavor, it is inherently concerned with acquiring knowledge. This fundamental principle of education, which encompasses both ends of the pedagogical spectrum, is termed *embodied knowledge* in different disciplines. The term *embodied* encapsulates the involvement of the body in all aspects of the subject matter, while *knowledge* underscores the indispensable connection between education and individual

growth in a democratic society. The PE curriculum encompasses a dualistic construct of embodied knowledge. On the one hand, the curriculum and learning experiences cover knowledge of how to execute physical actions. On the other hand, they encompass comprehension of the theoretical aspects of those physical actions. However, the embodied knowledge approach does not preclude the inclusion of reflexive cognitive knowledge, as evidenced by Dewey's use of the term "secondary experience" (Dewey, 2008a, p. 16). The convergence of body and mind is evidenced by the integration of embodied actions, such as movement, strategy, and performance, into the curriculum and learning experiences (Heck and Scheuer, 2021; Messmer, 2018).

Furthermore, educators possess embodied knowledge that is expressed and enacted within the classroom through their teaching practices (Craig et al., 2018). Moreover, Craig et al. (2018) highlight how teachers' embodied knowledge is captured through narratives in their work:

From this first case, readers learn that embodied knowledge narratively surfaces in luminal moments in personal, professional, and social settings, and that the relationship of embodied knowledge to cognitive knowing often astounds those who experience and identify the physical body as both a lived phenomenon and a somatic object. (p. 336)

In this interpretation of embodied knowledge, a teacher's body has the explicit power involved in the teaching performance, especially in PE. This performance is not simply used to demonstrate something, such as a technique; it is also a somatic presence in the classroom or the gym.

In summary, we can capture how—for both students and teachers—embodied knowledge is a powerful concept with regard to the subject matter of PE. Shusterman (2018), who highlights this somatic aspect of the body–mind connection as a central aspect, uses *somatic* and *body conscious* as other terms for embodied knowledge. Shusterman distinguishes various levels of body consciousness. When we are asleep and not conscious, we still have a basic awareness of our body, for example, by unconsciously rolling to the middle of the bed when we get too close to falling off the edge. Ordinary waking consciousness, which is much clearer, involves both perceptions of objects in the world and perceptions of our feelings in reaction to those objects (Shusterman, 2018, p. 11). In this *ordinary* body consciousness, the concept of embodied knowledge can be discussed. This knowledge is formed through the perception of objects in the world, as in the case of other school subjects, and through bodily sensations when in contact with those objects in the world. The term *embodied knowledge* encapsulates two distinct aspects of learning and teaching. The first aspect refers to what it is to have a body (in German, *Körperhaben*). The discipline of PE is predicated on the notion that the body is a vehicle through which to learn how to move and how to act with this physical *object* in the world. The second aspect concerns the notion of what it is to be a body (*Leibsein*). This concept of the living body is based on the idea that individuals consciously or unconsciously reflect on their own body's presence and interaction with the world.

Embodied knowledge connecting body and mind

In American pragmatism, a significant focus has been placed on avoiding the Aristotelian and Platonic dualism prevalent in continental philosophy and analytical philosophy well into the 20th century (Rorty, 2009). Dewey, in particular, repeatedly emphasizes that the body–mind relationship should be understood as a continuum or a circuit (Bernstein, 2010, p. 145; Krüger, 2019, p. 52). Consequently, body and mind are to be understood as a single coherent construct that cannot be dissolved or differentiated. Therefore, the subject of PE should be taught in schools as a discrete entity that explicitly addresses the two-way relationship between body and mind. The term *embodied knowledge* encapsulates the multifaceted demands placed upon the subject, encompassing, on the one hand, sports and fitness training, physiological health, and the compensation required for seated subjects and, on the other, the acquisition of individual meaning, knowledge of sport, and the development of ability.

The body–mind dualism demonstrates that PE encompasses more than learning sports techniques. While sports techniques can serve as a means of learning movements and understanding the body (Stolz and Kirk, 2015, p. 79), it is crucial to recognize that teaching and learning involve activating embodied knowledge. Regardless of whether educators exclusively teach sports techniques, an approach that engages both teachers and students with their embodied knowledge is needed.

Merleau-Ponty (2002) posits that embodied knowledge should not be isolated from cognitive learning. Rather, the holistic concept of embodied knowledge offers a means of comprehending the interrelationship between the body and the world in a way that avoids unduly prioritizing the roles of abstraction and cognition (concepts and rules). Instead of being constrained by the reason–emotion and mind–body dichotomies, this view yields a concept of lived space in which the experience of embodied knowledge is referenced through movement and language.

Although Merleau-Ponty does not reference Dewey, this author's dissolution of dichotomies aligns with the continuum between mind and body described in detail by Dewey in *Experience and Nature* (Dewey, 2008a, p. 191–225). In the context of PE, this continuum can be observed as a competence model in the work of Messmer (2018). It is assumed that in the school curriculum, the concepts of body and mind cannot be separated in a Cartesian sense. Furthermore, this continuum aligns with a fundamental tenet of PE, namely, the practice of action. The alternative to a teleological interpretation of action, with its inherited dependence on Cartesian dualism, is to conceive of perception and cognition not as preceding actions but rather as a phase of action in which action is directed and redirected in its situational contexts (Joas, 1996, p. 158).

In conclusion, the concept of embodied knowledge is inherently linked to the discourse on Cartesian dualism, which involves the disjunction between body and mind. However, embodied knowledge offers a solution to this dualism. For educators, the concept of the *lived body*, as described by You and Craig (2013), highlights the need to embody knowledge in teaching situations. Shilling (2022, p. 5) draws on Dewey's and Bentley's (1949) distinction between anoetic stimuli and noetic

understanding, which can be understood as analogous to primary and secondary experience (Lehmann-Rommel, 2005). Shilling (2022) advocates for the exploration of the manner in which physically engaged encounters remain linked to their originating contexts. He posits that to clarify this relationship, it is essential to cultivate creativity: “Having emphasised the cultural potential of responding creatively to challenging transactions, it is worth exploring how these physically saturated engagements can remain entangled with the properties of the milieu they emerged from” (Shilling, 2022, p. 13). To address this research gap, he suggests examining the relationship between individual competences and the influence of social and cultural environments. This relationship, which is also embodied in narratives and influences teaching and learning, is examined in more detail below.

Embodied knowledge behind narratives in teaching and learning

If physical learning is understood as a learning opportunity not only by which physical fitness is to be improved but also through which students should actively engage with the subject matter, then narratives are important in emphasizing the body–mind circle. This is noted by Thorburn and Stolz (2017) with reference to phenomenology, which interprets the world not in an explanatory mode but rather in an attempt to understand it:

This can lead to first person accounts that are informed by rich narrative description and reflections which enable links between experiences and knowledge to become increasingly refined when making considered and verifiable judgements, for example, on the importance of human agency for the realization of whole school aims. (p. 722)

It is therefore recommended that students be instructed not only in engaging in intensive physical activity (e.g., during PE classes) but also in developing an understanding of the rationales behind their actions and the purposes of sports.

Beyond this discourse, there are two distinct levels of narratives in learning and teaching: (1) learning by students and (2) teaching by teachers. Each level employs distinct approaches to narratives in conjunction with either embodied knowledge or scientific knowledge. To illustrate this concept on two levels, we refer to a specific situation from a PE lesson. This vignette called *sea Star* originates in a larger study conducted by Schönfeld (2021). In this vignette, a student’s use of a metaphor is the starting point for a conversation between the teacher and student. The vignette shows how metaphors (and narratives more broadly) can function as a medium through which students can express their lived experiences, and what this means for teachers when conveying embodied knowledge.

The vignette *sea star*

In this particular class, the students practice different high jump techniques, such as the straddle. After Vanessa attempts

the straddle and touches the elastic string, she turns to the teacher. Vanessa asks the teacher whether it makes sense to look like a sea star while performing the execution.

Teacher: “Are you doing a sea star?”

Vanessa: “Yes, I jump over it like a sea star.”

Teacher: “So you feel like a sea star?”

Vanessa: “Yes.”

Teacher: “Show me then; do the sea star.”

Another student who is standing right next to Vanessa: “Can you show it to me too?”

Vanessa demonstrates her straddle once again, after which the teacher comments: “Well that didn’t really look like a sea star.”

Vanessa stands firm on her claim: “No, I do look like a sea star.”

Teacher: “No, that was a straddle pretty much.”

Teacher to Vanessa: “You touched the string, right?”

Vanessa: “What?”

Teacher: “You know, you would have clipped the bar; that’s what it looked like.”

Vanessa: “Yes, like a sea star.”

Teacher: “Because with the trailing leg, that is the jumping leg, you were a little bit too passive.”

Vanessa’s metaphor of a sea star highlights four crucial aspects regarding her learning. First, the fact that she describes her own jumping execution as a sea star indicates that she really knows how she jumped over the elastic string. She has a *language* for her knowledge. However, this knowledge is not verbal. She uses the metaphor of a sea star to capture how she represents the physical movement. In using this metaphor to name her action, Vanessa knows certain aspects about the movement that make the metaphor relevant to capturing the knowledge required to execute the movement.

This leads to a second point. Vanessa knows that her current technical execution does not look as it should. When the teacher states, “You know, you would have clipped the bar; that’s what it looked like,” she replies by saying, “Yes, like a sea star.” Thus, Vanessa has knowledge of the intended straddle technique, even if she cannot yet execute it. Third, it becomes clear here that Vanessa and the teacher are speaking different languages. The teacher picks up the metaphor, but in explaining the technique, he remains in an artificial language, as he does not see the helpfulness or relevance of the metaphor. Therefore, he cannot communicate with Vanessa in such a way that she

understands his instructions. Finally, the metaphor represents Vanessa's feeling during her (wrong) execution of the straddle—not her emotional feeling, but her physical feeling. This becomes apparent in the conversation with the teacher when she provides confirmation (“Yes”) to the teacher when he asks, “So you feel like a sea star?”

The story—or better, the vignette—reveals two problems in PE instruction. There is a knowledge of managing the movements. For Vanessa, her metaphor clearly communicates what her wrong execution looks like. The problem is that her metaphor is not a concept with accompanying details and directions (Vanessa clearly knows what she is doing and insists that a sea star captures that knowledge). Another problem is that the language for this knowledge is not verbal, as the teacher's technical instruction shows.

What can be learned from this example for teaching embodied knowledge? To answer this question, we first take the perspective of learning to then deduce the role that narratives and metaphors play in conveying embodied knowledge.

Narratives describing embodied knowledge in learning

The objective of teaching an educational subject is not merely to keep students moving. Those who engage in reflective practice regarding the significance of their actions are not only enmeshed in narratives but also, in a sense, situated at the same level as the subject matter external to the body. Nevertheless, [Thorburn and Stolz \(2017\)](#) demonstrate that movement learning is always also learning by the body without consciousness, yet it must nevertheless be described as cognitive. Thus, if the experience of embodied knowledge is referenced through movement and language, there is a need to describe the language used. In accordance with Dewey's theories, the corporeality of the human being must be integrated into the theory of consciousness, which approaches narrative: “An oft-told tale repeated without change fails to engage perception; it liberates us for attention to another story where development of meanings is as yet incomplete and indeterminate, possessed of suspense and uncertainty” ([Dewey, 2008a](#), p. 233).

This concept of the often-told tale can be easily compared to repetitive training in sports and language learning. While performing 12 repetitions of the bench press in weight training may enhance strength, it is not an optimal method for learning about weight training. Similarly, in language training, simply repeating vocabulary when learning a foreign language does not help students apply their learning in real-world situations. This is analogous to declarative knowledge that we have attempted to replace with knowledge that supports the capability of the students.

If the goal is to learn a movement within the context of technique, tactics, or performance, it is also crucial to consider the role of uncertainty. Narrative is reflected in both the learning of movements and the acquisition of cognitive competences (and vice versa). It is essential to learn how to apply words (and more) in a foreign language in uncertain, unfamiliar situations.

In accordance with [Dewey's philosophy \(2008a\)](#), uncertainty, which does not have to be painful uncertainty, serves as a

crucial gateway to learning. By contrast, in the absence of uncertainty, individuals are not compelled to engage in learning. This premise also allows for the acquisition of cognitive competences without conscious awareness, provided that the role of the body in learning processes is acknowledged. By examining Vanessa's learning process, it becomes evident that she identifies an erroneous approach to mastering the high jump technique through the metaphor of the sea star.

Thus, the mind is not bodiless, and the body is not mindless. In this sense, embodied knowledge describes the interdependence between the mind and the body, regardless of whether one is learning a foreign language or the execution of a high bar routine.

The interconnection between embodied knowledge and narratives is evident. According to [Storr \(2020\)](#), the primary function of storytellers is to provide an account of what has happened: “They create moments of unexpected change that seize the attention of their protagonist and, by extension, their readers and viewers” (p. 13). Storr also quotes Scott: “Almost all perception is based on the detection of change... Our perceptual systems basically don't work unless there are changes to detect” (review comment made by Professor Sophie Scott, 2018, cited in [Storr, 2020](#), p. 11). It can be argued that the relationship—or indeed the close connection—between narratives and embodied knowledge is supported by neuroscience. As [Gallese and Lakoff \(2005\)](#) emphasized earlier, the motor cortex is located near the motivation and narrative “cortex”. Thus, the relation is evident and must be noted.

Dewey's theory, which is represented in the story above, can also be applied to movements and to tactical and performance-related activities. During the initial stages of learning a movement, the focus is not on the repetitive and automated execution of the movement but rather on the exploration of novel and unexpected scenarios. This is surprising for both the mind and the body, as embodied knowledge can react to challenges in a learned way. In this sense, the metaphor of a sea star that is used is like the “stopped-action frames in a narrative” ([Bruner, 1996](#), p. 158), capturing this uncertainty in a moving picture. It transforms the active representation of the experience into an iconic one. Following Bruner, this picture serves as a prototype of a category, which we can initially capture through metaphor.

Implications for teaching embodied knowledge

This interdependence between narration and learning is also of significance to the teaching process. The fact that verbal language does not always exist for embodied knowledge poses a challenge for teachers not only in terms of how they convey this embodied knowledge to their students but also in terms of how they understand their knowledge. The connection between embodied knowledge and teacher action is exemplified by the work of [Dewey \(2008a\)](#) and [Craig \(2018\)](#). In everyday life, according to Dewey, people are not always aware of the decisions they make and the actions they perform: “We are not aware of the qualities of many or most of these acts; we do not objectively distinguish and identify them” ([Dewey, 2008a](#),

p. 227). Although Dewey does not explicitly refer to teacher actions, this concept is fundamental to the concept of teacher professionalism: “In a thoroughly normal organism, these ‘feelings’ have an efficiency of operation which it is impossible for thought to match” (Dewey, 2008a, p. 227). This operational efficiency, however, is indicative of the professionalism of teachers, which contrasts with that of other professions, such as lawyers, therapists, and doctors, for whom immediate action in a situation is not as crucial. Of course, medical professionals may also be under pressure to make decisions in emergency situations. However, in general, such professionals can apply their knowledge reflexively and *a posteriori*, for example, in therapy. Nevertheless, even *a priori* knowledge is of limited use to teachers: “To treat consciousness as a power accomplishing the change, is but another instance of the common philosophic fallacy of converting an eventual function into an antecedent force or cause” (Dewey, 2008a, p. 233).

As a result of the limited usefulness of *a priori* knowledge, Schön’s (1983) discussion of the *reflective practitioner* is often misinterpreted. Schön has consistently maintained that there is a form of knowing that is not dependent on consciousness, which he terms “knowing-in-action” (p. 49). This form of knowing is intrinsic to the professional identity of teachers and differs from everyday knowledge. Schön (1985, p. 74) refers to this justification of knowledge as “reflection-on-action,” but he sees a connection to narrative in “knowing-in-action,” especially for teachers:

The use of story to name the normative conceptual structure that underlies a manifest story of practice—underlying story rather than assumptions or framework—suggests a loosening of the bond between concept and reality. Story keeps the storyteller in the picture, suggesting that different narrators might make very different things out of the ‘same’ reality (Schön, 1994, p. 347)

Conclusion

Embodied knowledge may represent the most significant link between students and teachers in relation to their teaching–learning processes. As Kirk (2012) finds, there is a notable disparity between teachers and learners: “It might be argued that the teacher-centred multi-activity, sport-technique-based form of PE cannot easily facilitate the development of these key psychological characteristics in young people” (p. 6). A focus on the embodied knowledge of both participants in learning situations may make it possible to address this gap through the use of narratives. This is not to suggest that “multi-activity, sport-technique-based” teaching should be abandoned; rather, it should be complemented by other approaches that afford learners the opportunities to gain insights into their own experiences and learning processes. Narratives—in the form of images, metaphors, or stories—can be used to find a common language for embodied knowledge in the teaching–learning process. In the *sea star* vignette, it becomes evident that the primary objective of PE is not merely to acquire the correct

technique; rather, it is to develop a competence—in this specific instance, the ability to jump high. In this learning process, the metaphor of the sea star can be either beneficial or detrimental. While it may aid Vanessa in achieving a higher jump, it may not be as effective in teaching a specific technique. Consequently, sports coaches generally refrain from using metaphors, as their intention is to impart a narrow, specialized skill.

This metaphor indicates a connection between the subject matter and the learning process that highlights the aesthetic aspect of embodied knowledge. As others demonstrate (Maivorsdotter and Lundvall, 2009; Shusterman, 2008), there is an aesthetic element to every movement. In this aesthetic view regarding the relationship between learning and teaching, we can follow the philosophical concept of aisthesis: “As is well known, aisthesis has a double meaning. On the one hand, aisthesis means perception, on the other hand, sensation” (Welsch, 1997, p. 62). This analogy with the aesthetic school matters, helping us understand that the media and the subject matter of instruction are often the same: the body. With the body, we perform a move, a skill, or a presentation. But we also talk with the body to tell something to others (Schwender et al., 2025). However, in giving instructions, we cannot demonstrate what we want to say only with the body. Above the aesthetic potential of talking with the body, there remains a lack of a language for communicating together, as the vignette with the sea star has shown.

Nyberg and Larsson (2014) reiterate the necessity of a novel language in teaching and learning that prioritizes the acquisition of essential knowledge, as opposed to superficial health-related or physical skill information. Embodied knowledge may serve as a potential foundation for such a language of teaching and learning, which is built on the idea of knowing how:

There is an imminent need to systematically develop a language for learning in PE where what to learn, the specific knowings that PE is supposed to nurture and educe, is paramount, and where this “what” is not reduced to superficial knowledge about health issues or physical skills (Nyberg and Larsson, 2014, p. 132–133)

Moreover, as the analysis shows, there is a language for this embodied knowledge: narratives. However, as the *sea star* story shows, we also understand metaphors as narratives; perhaps they are the smallest form of narrative that exists. Following Blumenberg and Savage (2010), metaphors are a substitute for language when there is no term to express something. In this context, metaphors allow us to express embodied knowledge in words, albeit not in a technical manner: “But metaphors can also—hypothetically, for the time being—be foundational elements of philosophical language, ‘translations’ that resist being converted back into authenticity and logicity” (Blumenberg and Savage, 2010, p. 3). Similar to philosophical language, it is usually impossible to translate embodied knowledge into a logical (or paradigmatic) mode of thought (Bruner, 1985). However, it is specifically the role of embodied knowledge to facilitate the transition to authentic situations.

In our opinion, metaphors are a form of narrative when the context of the participants and the context of the action are taken into consideration. However, metaphors also form a narrative in their own right. Metaphors are resistant to terminological claims and cannot be reduced to concepts. However, one metaphor can be replaced, represented, or corrected by another, perhaps more precise, one:

They have a history in a more radical sense than concepts, for the historical transformation of a metaphor brings to light the metakinetics of the historical horizons of meaning and ways of seeing within which concepts undergo their modifications (Blumenberg and Savage, 2010, p. 5)

Metaphors and their stories would also address the missing link between body and mind. The metaphor of a sea star used by Vanessa helps her resolve the moving problem and perform her performance. But this metaphor is connected with her own story involving a sea star. We cannot simply transfer her story to other students. Therefore, in the relationship between learners and teachers, discussion about such metaphors is necessary. And now that we have the language, we need communication about the embodied knowledge. The teacher in the vignette missed this opportunity. Instead of responding with technical language, the teacher could have asked Vanessa about her metaphor and offered her an alternative metaphor (e.g., “Jump like a grasshopper!”).

Furthermore, the teacher could utilize Vanessa’s metaphor of a sea star to develop her movements and actions, akin to a metamorphosis. In essence, the transformation of the metaphor would serve as a reflection or encouragement for a transformation in the student’s actions, perceptions, intentions, and overall demeanor within the given situation. Consequently, teaching would entail assisting the student in incorporating their metaphor into a narrative where the initial metaphor can undergo transformation. In this instance, the missing link between the body and mind transcends mere metaphor; it serves as a non-verbal instructional method for imparting and acquiring movements.

Following Lakoff and Johnson (1980), this metamorphosis remains a reversible transformation from word, metaphor, story to movement, and vice versa. The authors reference Piaget and Inhelder (1948) and they speak from a “sensory-motor activity sense” (p. 526). Sensory-motor refers to activities that involve only perception and movement. Sensory-motor intelligence is the ability to solve practical problems through such activities before the development of language. Therefore, to teach effectively, we must create a space to emphasize this reversible metamorphosis: from movement to metaphors, as young children learn the world, and back from metaphors to movement. This is not a young child’s learning method, as Piaget consistently emphasized. Learning processes are a lifelong aspect of human development.

In examining Vanessa’s vignette and Messmer’s study (2011), this serial interpretation highlights a significant aspect of learning and teaching. As the vignette demonstrates, teaching is not solely a communication challenge; it is more about the place (Clandinin and Connelly, 2000) where this metamorphosis can occur.

If we return to the formulated body–mind continuum in so far as it is evidenced in the mandated curricula, we find the same dualism. Reflexivity is absent from curricula, which focus

exclusively on the acquisition of technical skills in the absence of anoetic stimuli. Conversely, proponents of this perspective view the curriculum solely through the lens of noetic understanding. The proponents of each extreme fail to recognize the necessity of integrating these two poles to facilitate learning in the context of the body. In this practical context, embodied knowledge, as told through narratives, represents a crucial connecting point between the knowledge of both the body and the mind. Furthermore, narratives involving embodied knowledge form a common *language* between teaching and learning and thus between teachers and students.

Embodied knowledge is practical knowledge or skills that we can capture with narratives. But there is an important difference in the direction of learning. According to Bruner (1996), “skill is a way of dealing with things, not a derivation from theory” (p. 152). His example is similar to the learning in high jump:

Doubtless, skill can be improved with the aid of theory, as when we learn about the inside and outside edges of our skis, but our skiing doesn’t improve until we get that knowledge back into the skill of skiing. Knowledge helps only when it descends into habits (Bruner, 1996, p. 152)

From this perspective, metaphors serve as the crucial link between paradigmatic and narrative modes of thought. They facilitate the translation of technical language (provided by the teacher) into a practical language (acquired by the student; i.e., Vanessa). This language enables us to attain the goals formulated by Nussbaum (2011) and Sen (2009), as outlined in their concept of *capability*. To accomplish these goals, we must identify a language that facilitates the negotiation and application of theory in practice. This language holds significance for various school subjects, not only for PE as exemplified by the case of Vanessa.

In other school subjects, we encounter similar problems. For instance, to explain the geometric principle of Pythagoras, we can trace its historical origins. Every year, when the Nile River overflowed, farmers had to painstakingly remeasure the boundaries of their fields. During his travels in ancient Egypt (approximately 525 B.C.), Pythagoras developed the formula we now refer to as the Pythagorean theorem to solve this geometric problem. While we can demonstrate the rule on the blackboard, we can also take students outside to experience land surveying using this method, just as they did 2,500 years ago. Through this embodied teaching and learning approach, students develop a deeper understanding of the rule. As we are all aware, this narrative mode of thought helps preserve the memory of the rule for future reference. Learning, whatever the discipline, would then necessarily involve a transaction between a teacher who embodies knowledge and students who learn to connect their experiences with the teacher’s narrative.

Finally, we can identify one last similarity to the aesthetic sciences, especially by Shusterman, who gives this phenomenon a special name, somaesthetics:

Somaesthetics, then, can be defined as the critical study and meliorative cultivation of the body as the site not only of experienced subjectivity and sensory appreciation (aesthesia) that guides our action and performance but also of our

creative self-fashioning through the ways we use, groom, and adorn our physical bodies to express our values and stylize ourselves (Shusterman, 2019, p. 15)

As Shusterman mentions here, the body is not only a vehicle for PE; it is also a language with which to communicate with other people (referred to as *Leibsein*). To achieve the goals of PE, it is not only necessary to train the body; you also have to communicate with it by using metaphors or narratives which can also support learning through movement in other subjects (Klimpki et al., 2026).

This comparison with the aesthetic sciences leads us to other subject matter and to Dewey's opening quote. In a 21st century school, there is no distinction between objects that are consummatory in the fine arts and those that are operative in the industrial. In democratic circumstances, it is impossible to allow slaves to perform the operative work, as was the case in ancient Greece in which the fine arts were exclusive to the ruling class. Following Shusterman (2019), there has also been a shift in the subject matter of aesthetics and consciousness, which are becoming increasingly embodied. Therefore, the body–mind dualism is ultimately only a conceptual construct that needs to be transcended in the practice of all school subjects.

Data availability statement

The data analyzed in this study is subject to the following licenses/restrictions: the datasets presented in this article are not readily available because of ethical and data protection considerations. Requests to access these datasets should be directed to RM, roland.messmer@fhnw.ch.

Ethics statement

The studies involving humans were approved by Ethikkommission der Pädagogischen Hochschule FHNW, Schweiz. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin. Written informed consent was obtained from the minor(s)' legal guardian/next of kin for the publication of any potentially identifiable images or data included in this article.

Author contributions

RM: Validation, Data curation, Conceptualization, Project administration, Formal analysis, Writing – review & editing,

Methodology, Writing – original draft. KS: Project administration, Formal analysis, Methodology, Validation, Writing – original draft, Data curation, Conceptualization.

Funding

The author(s) declared that financial support was received for this work and/or its publication. This work is supported by the Swiss National Science Foundation (grant number 219790) and by the Federal Office of Sport (grant number VM-100908). Open Access supported by Fachhochschule Nordwestschweiz FHNW.

Acknowledgments

The authors thank all participants for their openness, time, and valuable insights, without which this study would not have been possible.

Conflict of interest

The author(s) declared that this work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declared that generative AI was not used in the creation of this manuscript.

Any alternative text (alt text) provided alongside figures in this article has been generated by Frontiers with the support of artificial intelligence and reasonable efforts have been made to ensure accuracy, including review by the authors wherever possible. If you identify any issues, please contact us.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

References

- Bernstein, R. J. (2010). *The Pragmatic Turn*. Cambridge: Polity Press.
- Blumenberg, H., and Savage, R. (2010). *Paradigms for a Metaphorology*. Ithaca, NY: Cornell University Press and Cornell University Library.
- Bruner, J. S. (1985). "Narrative and paradigmatic modes of thought," in *Learning and Teaching the Ways of Knowing*, ed. E. Eisner (Chicago: University of Chicago Press), 97–115.
- Bruner, J. S. (1996). *The Culture of Education*. Cambridge, MA: Harvard University Press.
- Bruner, J. S., Olver, R. R., and Greenfield, P. M. (1966). *Studies in Cognitive Growth: A Collaboration at the Center for Cognitive Studies*. New York: Wiley.
- Clandinin, D. J., and Connelly, F. M. (2000). *Narrative Inquiry: Experience and Story in Qualitative Research*. San Francisco: Jossey-Bass Publishers.

- Cockley, J. (2011). Youth sports: what counts as “positive development?”. *J. Sport Soc. Issues* 35 (3), 306–324. doi: 10.1177/0193723511417311
- Craig, C. J. (2018). Metaphors of knowing, doing and being: capturing experience in teaching and teacher education. *Teach. Teach. Educ.* 69, 300–311. doi: 10.1016/j.tate.2017.09.011
- Craig, C. J., You, J., Zou, Y., Verma, R., Stokes, D., Evans, P., et al. (2018). The embodied nature of narrative knowledge: a cross-study analysis of embodied knowledge in teaching, learning, and life. *Teach. Teach. Educ.* 71, 329–340. doi: 10.1016/j.tate.2018.01.014
- Craig, C. J., You, J., Zou, Y., Curtis, G. A., and Poinbeauf, R. (2024). Fishing for topics in teaching and teacher education: finding publishable research in large data pools. *Int. J. Qual. Methods* 23, 1–15. doi: 10.1177/16094069241281638
- Dewey, J. (1928). Body and mind. *Bull. N. Y. Acad. Med.* 4 (1), 3–19.
- Dewey, J. (2008a). *The Later Works, 1925–1953. Vol. 1, 1925: Experience and Nature*. Carbondale, IL: Southern Illinois University Press.
- Dewey, J. (2008b). *The Middle Works, 1899–1924. Vol. 9, 1916: Democracy and Education*. Carbondale, IL: Southern Illinois University Press.
- Dewey, J., and Bentley, A. F. (1949). *Knowing and the Known*. Boston: Beacon Press.
- Dyson, B., and Casey, A. (2016). *Cooperative Learning in Physical Education and Physical Activity: A Practical introduction*. London: Routledge.
- Faella, P., Digennaro, S., and Iannaccone, A. (2025). Educational practices in motion: a scoping review of embodied learning approaches in school. *Front. Educ.* 10, 1568744. doi: 10.3389/feduc.2025.1568744
- Fairclough, N. (2009). “A dialectical-relation approach to critical discourse analysis in social research,” in *Methods of Critical Discourse Analysis*, 2nd ed. eds. R. Wodak, and M. Meyer (London: SAGE Publications Ltd.), 162–186.
- Foucault, M. (2018). *The Order of Things*. London: Routledge, an imprint of Taylor and Francis. doi: 10.4324/9780203996645 (Original work published 1966)
- Gallese, V., and Lakoff, G. (2005). The brain’s concepts: the role of the sensory-motor system in conceptual knowledge. *Cogn. Neuropsychol.* 22 (3/4), 455–479. doi: 10.1080/02643290442000310
- GutsMuths, J. C. F. (1793). *Gymnastik für die Jugend enthaltend eine praktische Anweisung zu Leibesübungen ein Beytrag zur nöthigsten Verbesserung der körperlichen Erziehung [Gymnastics for Young People, Containing Practical Instructions for Physical Exercises, a Contribution to the Most Necessary Improvements in Physical Education]*. Schnepfenthal: Buchhandlung der Erziehungsanstalt. Available online at: <https://archive.org/details/gymnastikfurdiej00guts/page/82/mode/2up> (Accessed July 7, 2025).
- Heck, S., and Scheuer, C. (2021). “Competence-orientation in teaching physical education,” in *Encyclopedia of Teacher Education*, ed. M. A. Peters (Singapore: Springer), 1–5. doi: 10.1007/978-981-13-1179-6_415-1
- Joas, H. (1996). *The Creativity of Action*. Cambridge: Polity Press.
- Johnson, M. (2017). *Embodied Mind, Meaning, and Reason: How our Bodies Give Rise to Understanding*. Chicago: University of Chicago Press. doi: 10.7208/chicago/9780226500393.001.0001
- Keller, R. (2020). “Narrative, discourse, and sociology of knowledge,” in *Routledge Handbook of Counter-Narratives*, eds. K. Lueg, and M. W. Lundholt (London: Routledge), 98–109.
- Keller, R. (2024). *The Sociology of Knowledge Approach to Discourse: Foundations, Concepts and Tools for a Research Programme*. Cham: Springer International Publishing. doi: 10.1007/978-3-031-55114-7
- Kendall, G., and Wickham, G. (1999). *Using Foucault’s Methods*. London: SAGE Publications Ltd. doi: 10.4135/9780857020239
- Kirk, D. (2012). Physical education futures: can we reform physical education in the early twenty-first century? *eJRIEPS* 27, 1–10. doi: 10.4000/ejrieps.3222
- Klimpki, T., Krieger, C., and Steinvord, K. (2026). Implementing physically active learning in secondary schools from teachers’ perspectives: benefits, concerns, and conditions for success. *Front. Educ.* 11, 1805646. doi: 10.3389/feduc.2026.1805646
- Krüger, H.-P. (2019). How is the human life-form of mind really possible in nature? Parallels between John Dewey and Helmuth Plessner. *Hum. Stud.* 42, 47–64. doi: 10.1007/s10746-017-9429-5
- Lakoff, G., and Johnson, M. (1980). Conceptual metaphor in everyday language. *J. Philos.* 77 (8), 453–486. doi: 10.2307/2025464
- Lehmann-Rommel, R. (2005). “The concept of activity and effectiveness in dewey’s aesthetic,” in *Pragmatism and Education*, eds. D. Tröhler, and J. Oelkers (Rotterdam: Sense Publishers), 53–68.
- Maivorsdotter, N., and Lundvall, S. (2009). Aesthetic experience as an aspect of embodied learning: stories from physical education student teachers. *Sport. Educ. Soc.* 14 (3), 265–279. doi: 10.1080/13573320903037622
- Merleau-Ponty, M. (2002). *Phenomenology of Perception*. London: Routledge. Original work published 1945.
- Messmer, R. (2011). *Ordnungen der Alltagserfahrung: Neue Ansätze zum Theorie-Praxisbezug und zur Fallarbeit in der Lehrerbildung*. Wiesbaden: VS Verlag für Sozialwissenschaften.
- Messmer, R. (2018). What is the subject matter of physical education? *Ger. J. Exerc. Sport Res.* 48, 508–515. doi: 10.1007/s12662-018-0531-2
- Nussbaum, M. C. (2011). *Creating Capabilities: The Human Development Approach*. Cambridge, MA: Belknap Press of Harvard University Press. doi: 10.2307/j.ctt2jbt31
- Nyberg, G., and Larsson, H. (2014). Exploring ‘what’ to learn in physical education. *Phys. Educ. Sport. Pedagogy* 19 (2), 123–135. doi: 10.1080/17408989.2012.726982
- Piaget, J., and Inhelder, B. (1948). *La représentation de l’espace chez l’enfant*. Paris: Presses Universitaires de France.
- Ronkainen, N. J., Aggerholm, K., Ryba, T. V., and Allen-Collinson, J. (2021). Learning in sport: from life skills to existential learning. *Sport. Educ. Soc.* 26 (2), 214–227. doi: 10.1080/13573322.2020.1712655
- Rorty, R. (2009). *Philosophy and the Mirror of Nature, 30th-anniversary ed.* Princeton, NJ: Princeton University Press.
- Schön, D. A. (1983). *The Reflective Practitioner: How Professionals Think in Action*. New York: Basic Books.
- Schön, D. A. (1985). *The Design Studio: An Exploration of its Traditions and Potentials*. London: RIBA Publications.
- Schön, D. A. (1994). *The Reflective Turn: Case Studies in and on Educational Practice, 2nd Print*. New York: Teachers College Press.
- Schönfeld, K. (2021). *Kognitive Aktivität im Sportunterricht: Eine empirische Untersuchung zu den Denkprozessen von Schüler*innen der Sekundarstufe I beim Lösen von Aufgaben [Cognitive Activity in Physical Education: An Empirical Study on the Thought Processes of Secondary School Students When Solving Tasks]*. Wiesbaden: Springer. doi: 10.1007/978-3-658-35944-7
- Schwender, T. M., Rudi, H., and Stortz, S. (2025). Creating, framing, reflecting—dance as embodied reflective practice in professional development for physical education teachers. *Front. Educ.* 10, 1542371. doi: 10.3389/feduc.2025.1542371
- Sen, A. (2009). *The Idea of Justice*. Cambridge, MA: Harvard University Press. doi: 10.2307/j.ctvjnr7n
- Shilling, C. (2022). Body pedagogics, transactionalism and vélo identities: becoming a cyclist in motorised societies. *Sociol. Rev.* 70 (1), 3–20. doi: 10.1177/00380261211049037
- Shusterman, R. (2008). *Body Consciousness: A Philosophy of Mindfulness and Somaesthetics*. Cambridge: Cambridge University Press.
- Shusterman, R. (2018). Body consciousness and the excentric self: between Plessner and somaesthetics. *Pragmat. Today* 9 (1), 10–20. Available online at: https://www.pragmatismtoday.eu/summer2018/Pragmatism_Today_Volume9_Issue1_Summer2018.pdf#page=10 (Accessed July 7, 2025).
- Shusterman, R. (2019). “Bodies in the streets: the soma, the city, and the art of living,” in *Bodies in the Streets: The Somaesthetics of City Life*, ed. R. Shusterman (Leiden: Brill), 13–37.
- Stolz, S. A., and Kirk, D. (2015). David Kirk on physical education and sport pedagogy: in dialogue with Steven Stolz (part 1). *Asia-Pac. J. Health Sport Phys. Educ.* 6 (1), 77–91. doi: 10.1080/18377122.2014.997862
- Storr, W. (2020). *The Science of Storytelling*. London: William Collins.
- Thorburn, M., and Stolz, S. (2017). Embodied learning and school-based physical culture: implications for professionalism and practice in physical education. *Sport. Educ. Soc.* 22 (6), 721–731. doi: 10.1080/13573322.2015.1063993
- Welsch, W. (1997). *Undoing Aesthetics*. London: SAGE Publications.
- You, J., and Craig, C. J. (2013). Narrative accounts of U.S. teachers’ collaborative curriculum making in a physical education department. *Sport. Educ. Soc.* 20 (4), 501–526. doi: 10.1080/13573322.2013.774271