Embodied Learning

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Definition

Within transdisciplinary education and beyond, educators are increasingly incorporating embodied learning as part of an expanded understanding of intelligence and cognition. Embodied learning is grounded in the recognition that experience, perception, and knowledge are shaped through the activity of our body in relation to the world and also shape the world (Dewey 1997; Goldin-Meadow 2009; Lakoff and Johnson 2020; Lindgren and Johnson-Glenberg 2013). The term embodied learning is etymologically based in the Old High German *botah*, meaning "body". In recognizing that "the human mind is a relational and embodied process that regulates flows of energy and information" (Siegel 2010, 52), embodied learning offers an educational approach that integrates physical and sensory learning alongside "the work occurring between the ears" (Henriksen et al. 2015, 8). This is not to suggest that simply engaging the body in physical activity within education constitutes embodied learning. Rather, embodied learning occurs when "the meaning of what is learned is grounded specifically in body movement and perception" (Nathan 2021, 81). In this chapter, embodied learning is applied as an umbrella term to encompass the various ways learning is discussed and realized across different fields, where there is an emphasis on learning that "joins body and mind in physical and mental acts of knowledge construction" (Nguyen and Larson 2015, 332). Embodied learning moves beyond mind–body dualism to embrace learning as a holistic, integrated, and felt act. For this reason, it can be seen as a crucial component of transdisciplinary learning in that it supports "attentive [ness] to the body and its experiences as a way of knowing" (Freiler 2008, 40).

In transdisciplinary education, embodied learning supports students from different disciplinary backgrounds to move across disciplinary boundaries and make sense of complex real-world challenges through explicit engagement of their bodies and sensory systems, including reflexivity, creativity, and complexity through attentiveness to body–mind–environment interactions. It also enables students to develop core transdisciplinary competencies in integrating and imple-

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menting diverse perspectives, wisdom, and knowledge. Keeping mind–body–environment relations central to education provides opportunities for students to develop meaningful views of themselves as competent learners within a "community of experience" (Nguyen and Larson 2015, 339). It also encourages students to move back and forth between the background, histories, beliefs, choices, experiences, and expressions that influence their own and others' actions (Satina and Hultgren 2001) to support reflexive transdisciplinary ways of being and knowing.

Background

As an approach for transdisciplinary learning, embodied learning has the potential to effectively support students to integrate their felt and emotional experiences, connect knowledge with action and make sense of complex real-world challenges. The 20th century has brought increased interest from academics across disciplines in the role of the body in education, including transdisciplinary learning.

Embodied learning has established itself as a significant field of research and practice in recent decades (Lindgren and Johnson-Glenberg 2013) as scholars adopt an expanded understanding of cognition and acknowledge the limitations of traditional education models. The body has historically been dismissed in education due to its subjective nature and perceived irrelevance in processes of knowledge construction (Dewey 1997; Henriksen et al. 2015; Johnson 1987). Yet at the turn of the 20th century expanded notions of cognition and intelligence emerged. Most notably, embodied cognition is informed by the work of contemporary philosophers such as John Dewey (1997), Martin Heidegger (1975), and Maurice Merleau-Ponty (1962, 1964). Embodied cognition acknowledges that "the brain is not disconnected from the rest of the body and solely responsible for cognition, but an organ occupied with processing perceptions experienced in the body" (Branscombe 2019, 3). Embodied learning offers a holistic approach to education in which the learner's physical, emotional, mental, and spiritual development is supported, and assumptions about the nature of knowledge are challenged (Forgasz and McDonough 2017). As the body is put back inside the mind (Johnson 1987, 7), learners are supported to engage their felt and bodily experiences as a means to make sense of knowledge and the world in new ways.

Embodied learning has a natural affinity with the goals of transdisciplinary education in striving for an "equilibrium between analytic intelligence, feelings, and the body" (Nicolescu 2012, 15). Both embodied learning and transdisciplinary education have emerged in response to postmodern views around the nature of knowledge that recognize it as not static or rational but complex, indeterminate, interpersonal, and contested. To grapple with and develop complex knowledge, learners require higher-level skills, competencies, and diverse approaches to obser-

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ving and making sense of complex knowledge and social problems (Murray 2009). Mishra et al. (2011, 25) argue that *embodied thinking* is one of seven transdisciplinary skills that support individuals in facing challenging situations through engagement with empathy and by integrating the "physical, mental and the emotional aspects of how we think and experience the world". Within transdisciplinary education, embodied learning is both an approach to learning and a transdisciplinary competency that should be developed. Despite increasing interest and recognition of the value of holistic, integrative education – such as transdisciplinary education and embodied learning – there are still challenges around bridging the gap between these domains and theory and practice, as the next section highlights.

Debate and criticism

The 20th century has seen great theoretical advancement in the domain of embodied learning, yet further empirical research is required to better understand how embodied learning is applied within educational contexts, including that of transdisciplinary higher education. There is still a stigma around embodiment, which presents challenges, as articulated by Gregory (2006, 316): "students of my generation were taught to view embodiment as a circus sideshow, a vulgar distraction like the fat man and the bearded lady who, we assumed, had nothing in common with the glittering flights of mind exhibited by the intellectual trapeze artists soaring high above the centre ring of the educational circus tent".

Table 1. Overview of debate, criticism and limitations of embodied learning research

Debate, criticism, and limitations	Details	References
Criticism and resistance by learners, practitioners, and the institution.	Embodied learning challenges our understanding of what it means to teach and learn. Students and educators have been socialized to see learning as the act of knowledge transfer (involving sitting, thinking, and repeating back information). As such, embodied learning can be seen as alternative, unnatural, unintellectual, and uncomfortable.	Gregory 2006; Gustafson 1999; Monk et al. 2015; Nguyen and Larson 2015

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Debate, criticism, and limitations	Details	References
Limited scholarship addressing embodied learning in transdisciplinary higher education.	Research connecting the domains of embodied learning and transdisciplinary higher education is limited. Existing scholarship is currently focused on the application of embodied learning within Kindergarten to Year 12 in contrast to higher education, and when discussed in relation to higher education, the focus is typically discipline-specific rather than transdisciplinary in focus.	Henriksen et al. 2015; Monk et al. 2015
Embodied learning requires time, resources, training and support, which can be challenging in resource-constrained environments.	Students and practitioners must be supported to develop an understanding of the value of embodied learning. There must also be careful consideration of body politics within the classroom and the role of gender, power, culture, trauma, and emotion within embodied learning. If embodied learning is to be supported in academia, education cultures and structures need to change, not just the educators themselves. Institutions must also recognize and support the labor-intensive nature of embodied approaches.	Fugate et al. 2019; Lipson Lawrence 2012; Macintyre Latta and Buck 2008; Nguyen and Larson 2015; Wagner and Shahjahan 2015
Debates around what constitutes embodied learning and when it is appropriate.	It is easy to assume that bodily engagement is always necessary and effective in learning. Yet scholars seek to dispel this assumption, recognizing that embodied learning does not claim that all movement and bodily engagement supports learning. There should be careful consideration of how and when embodied learning can support meaning-making.	Nathan 2021; Skulmowski and Rey 2018

Current forms of implementation in higher education

There are various ways in which embodied learning is implemented within transdisciplinary higher education. However, the emergent nature of both domains means limited scholarship and few case studies explicitly discuss implementation. Therefore, the following discussion does not offer an exhaustive list but instead highlights the various ways embodied learning is currently being implemented within transdisciplinary higher education around the globe, and the need for institutions and practitioners to make these applications more explicit. Given the emphasis on collaborative, real-world, and integrative learning, transdisciplinary edu-

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cation naturally leans towards and draws on embodied learning. Movement and physical activity are often integrated into the classroom as students work collaboratively and in hands-on ways with one another as part of transdisciplinary teams and engage in real-world contexts where students interact with stakeholders to understand and respond to complex challenges. Furthermore, bodily sensations, feelings, and emotions are required to make sense of and integrate different ways of knowing. As a result, higher education institutions and practitioners may unconsciously engage students in embodied learning when designing and delivering transdisciplinary learning. However, the following examples highlight how embodied learning can be engaged intentionally within transdisciplinary higher education, both as an embedded curricula approach and through specific activities.

Within the undergraduate degree of the Bachelor of Creative Intelligence and Innovation at the University of Technology Sydney, embodied learning forms a core approach to transdisciplinary teaching and learning. The course was launched in 2014 as a combined degree that enables students from 25 different "core degrees" from faculties across the university to undertake transdisciplinary learning alongside another undergraduate degree (e.g. design, science, business, communications, and engineering). Within the Bachelor of Creative Intelligence and Innovation, embodied learning is used to foster engagement with complexity, reflexivity, and creativity to support students from different disciplinary backgrounds to work collaboratively on complex real-world challenges with different people (Allen et al. 2021). For example, in a complexity-focused subject, students respond to an assessment brief asking them to enact a complex system in which their challenge occurs. Students use systems thinking and complexity frameworks, such as Dave Snowden's Cynefin framework (Kurtz and Snowden 2003) and Donella Meadows' (2009) leverage points, to intervene in a system and explore extreme challenges facing humanity today, such as out-of-control bushfires, drought, unsustainable farming practices, and overconsumption. These frameworks are introduced alongside different creative embodied practices, such as role-play, improvisation, and "Complex Systems Tableau" (Allen et al. 2021), drawing on systems thinking and theatre-based practices, such as the drama convention of tableau, in which participants make a frozen scene using their bodies, striking different poses and facial gestures. As a result, students design various embodied enactments of complex systems, from games in which the rest of the cohort participates to poetic imaginings of the system from more-than-human perspectives. This embodied experience contributes to students' capacity to question their assumptions and develop a situated, collective, and relational understanding of the system they are engaging with, including an empathetic sensibility to different stakeholders' values and perspectives. Empathy towards other actors in the system and understanding of our complicity in propagating problems was much harder to grasp for students in the past when more analytical approaches to systems thinking and complexity were adopted.

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In other cases, embodied learning is applied within specific subjects as part of a broader course to enhance creativity and support transdisciplinary learning in higher education. At the University of Vermont in the USA, students studying the environmental sciences can participate in subjects that draw on an approach called Kitchen-based Learning (O'Neil 2015), developed by environmental sciences instructor Joy Kcenia O'Neil. Within the subject "Environmental cooking", students are invited to learn about the interdisciplinary field of sustainability through experience and interactions in the kitchen "ecosystem". Creativity is enhanced through the coming together of seemingly disparate domains – sustainability and cooking – and by engaging students' sensory systems and embodied emotional states, feelings, and moods. For example, students take part in sensory-based activities such as "Palate solving", where they describe and reflect on the texture, taste, and smell of their dish to "deeply experience their food by connecting to their senses and what memories might be elicited or insights gained" (O'Neil 2016, 326). In this activity, students use their bodies to access hidden wisdom and understanding, which leads to collective and unanticipated learning, trust, and relationships that create the conditions for deep, enriched learning. O'Neil (2016, 328) also describes the broad range of emotions that are "all over the place", and interactions, both human and non-human, that take place within the kitchen as "students go back and forth from the refrigerator, stove, cupboards, talking to one another, with clanking sounds of chopping and cooking … laughing, silence and focus". Transdisciplinary embodied experiences, such as kitchen-based learning, value and amplify the emotional and energetic states that inform cognition, perception, and creativity (Cherukunnath and Singh 2022) and play a crucial role in transdisciplinary higher education.

Transdisciplinary embodied learning can also be implemented via specific learning activities rather than a specific curricular approach within a subject or course. The Swiss Academies of Arts and Sciences emphasizes studies in the sustainable sciences and society and focuses on strengthening the exchange across scientific disciplines (SCNAT 2023). Scholars and educators within the academy have developed a range of activities that utilize embodied learning approaches to support transdisciplinary learning. For example, the Actor Constellation is an activity developed by Christian Pohl that draws on role-play and physical mapping to unpack different perspectives and interactions relating to a central challenge question. Participants are invited to represent different scientific and societal actors, positioning themselves physically and spatially in relation to the challenge question and other actors to question and demonstrate their relevance to the challenge (Pohl 2020). Embodied activities such as the Actor Constellation support learners in moving beyond current perceptions and biases they may hold in relation to the challenge and to stakeholders. Furthermore, it supports the integration of different perspectives and ways of thinking. Pohl (2020, 1) argues that "the actor

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constellation helps to bridge thought styles by making the underlying assumptions of the person that positions the actors explicit. The assumptions become known and open for deliberation and discussion". This is an "embodied reflexivity", generating insights that only become accessible through critical engagement with embodied action (Midgelow 2017, 130) that can "disrupt assumptions, passive learning, and mind/body division" (Nguyen and Larson 2015, 341). This activity has also been successfully adapted and applied within the Bachelor of Creative Intelligence and Innovation to support students from different disciplines to notice (and make sense of) the world with their bodies in reflexive ways (Allen 2021).

In conclusion, embodied learning in transdisciplinary higher education supports learners to engage with reflexivity, creativity, and complexity as they tackle real-world social challenges together. Embodied learning fosters core transdisciplinary competencies around knowledge integration, enabling learners to develop as transdisciplinary practitioners. Although there are challenges in engaging embodied learning within transdisciplinary higher education, it offers a valuable teaching and learning approach that supports a more holistic and integrative educational experience. Embodied learning is often implicitly applied within transdisciplinary higher education contexts; however, it can be integrated with intention and awareness to enhance transdisciplinary learning. Scholars, educators, and institutions are advised to focus on developing and sharing understanding and practice around the critical application of embodied learning within transdisciplinary higher education. This requires recognizing that embodied learning is relational and contextual and that there is no one approach or formula for how embodied learning is best engaged within transdisciplinary learning contexts.

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