EMBODIED LEARNING

References and sources

Macrine, S.L. and Fugate, J.M.B. (eds.) – Movement Matters: *How Embodied Cognition Informs Teaching and Learning* (MIT Press, 2022, Open Access). To date, this is most comprehensive empirical anthology on the subject to date – edited by two female professors from the University of Massachusetts Dartmouth and Kansas City University.
Contributors from the fields of neuroscience, cognitive psychology and educational research present the current state of research in specific areas of learning: vocabulary acquisition through physical activation (Glenberg and Gómez), handwriting and letter perception (Karin James), embodied geometry through collaborative gestures (Schenck and C. Nathan) and the educational potential of enactive approaches (Daniel Hutto). Macrine and Fugate develop the model of *Translational Learning Sciences Research for Embodied Cognition* – a systematic bridge between laboratory research and classroom practice. Their key finding: cognition arises through body-mind-environment interaction. Conventional teaching – sitting passively, receiving information – must be fundamentally rethought. Freely accessible at: direct.mit.edu/books/oa-edited-volume/5306

Guy Claxton and Emily Poel: **Bodies of Learning: How Embodiment Science Transforms Education** (Routledge, 2026). The seminal new standard work. Claxton –
a cognitive scientist and Emeritus Professor of Learning Sciences at the University of Winchester – and Poel – a Berlin-based embodiment practitioner and trainer with a background in somatic practices and contemporary dance – present a systematic scientific argument: learning is not primarily cognitive, but deeply embodied, emotional and relational. The book identifies the 4E model of Embodied Cognition as scientific framework and provides practical strategies for education and organisations. Mary Helen Immordino-Yang (USC) comments: 'Claxton and Poel convincingly demonstrate how the new knowledge on embodied cognition offers a radical, scientifically grounded approach to understanding human learning.'

Antonio Damasio – Somatic Marker Hypothesis: The neuroscientist demonstrates that decision-making is not guided by pure reason, but by emotional signals stored in the body. Somatic markers – bodily sensations linked to past experiences – act as rapid heuristic guidelines that evaluate courses of action preconsciously. This is neurobiological evidence for what is cultivated in embodied learning as 'gut feeling'. Key work: **Descartes' Error** (1994).

Francisco Varela, Evan Thompson and Eleanor Rosch – *The Embodied Mind*: one of the most influential works in cognitive science (MIT Press, 1991, reprinted 2016). The authors set out the case *for enactivism*: cognition does not arise in a brain that processes information, but in the course of embodied life – through action, perception and the ceaseless dialogue between organism and world. Thompson further developed this approach in **Mind in Life** (2007) and **Waking Dreaming Being** (2014) – including in relation to consciousness and contemplative practice.

Karl Friston – Active Inference / Free Energy Principle: Friston's model describes living systems as bodies that continuously generate predictions about their environment. Here, learning is always a bodily process of minimising discrepancies between expected and actually experienced sensations – a fundamental contribution to understanding why embodied practice makes learning accessible in a different way to purely cognitive inputs.

Shaun Gallagher – 4E Cognition: In **Enactivist Interventions** (2017), Gallagher integrates the current state of research into a theory of cognition that understands learning as *embodied, embedded, enacted and extended*. Thinking does not take place in the mind alone, but in the body, in space, in relationships and through tools. This opens up fundamental implications for the design of learning and leadership.

Simona Ginsburg and Eva Jablonka: Their definition of learning as an experience-dependent behavioural change – consisting of a change in sensory state, embodiment of memory through reinforcement and an altered response threshold – makes it clear that learning is physical from the very outset.

Ellen Langer – *The Mindful Body* (2023): Through decades of research, the Harvard psychologist demonstrates that the way in which we sensations has measurable physiological effects. Mindfulness of the body is not just a 'nice-to-have' – it is a variable of relevance to both medicine and learning theory. The HeartMath Institute supplements this with cardiological evidence: heart rhythm coherence, as a measurable state of integrated body-heart-mind function, demonstrably improves perceptual acuity and the quality of decision-making.

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