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Move Over, Descartes! Neuroscience Says You're Wrong

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Abstract: Recent developments in neuroscience, cognitive science, psychology, and philosophy of mind contradict Descartes's rejection of the body's role in thinking. This presentation describes implications for adult learning.

Keywords: neuroscience and adult learning; embodied learning; emotions and learning; learning and metaphor.

Introduction

Researchers and theoreticians in such varied fields as cognitive science, neuroscience, psychology, and philosophy of mind have over the last two decades explored new perspectives on the brain and implications for learning and knowing. As adult educators for 35-plus years, we have actively followed these evolutions looking for potential applications to practice. Given our positions outside these disciplines, we noticed similarities across their emerging views of the underlying processes of learning. By foregrounding several overlapping findings that appear most relevant to the field of adult learning, we hope to prompt practitioner-based research that may substantiate and guide new approaches to best practices in the field of adult education.

The Mind-Body Question Redux

For over 400 years, Western thought about what constitutes *knowing* has been overshadowed by Descartes' mind-body dualism, expressed in his oft-quoted maxim: "I think, therefore I am." As he saw it, thinking (cognition) should be free of the distracting and potentially deceptive cues the senses (the body) might provide.

Less well known is how fully Descartes embraced this premise. As reported by McGilchrist (2010), Descartes went so far as to question why his body's sensations of hunger should be connected to his mind's desire to eat, why a feeling of pain should lead to mental distress, or whether he even had a body. From Descartes' *Meditation IV*:

I can make probable conjecture that the body exists. But this is only a probability; and despite a careful and comprehensive investigation, I do not yet see how the distinct idea of corporeal nature which I find in my imagination can provide any basis for a necessary inference that some body exists. (McGilchrist, 2010, p. 333)

Given how widely accepted Descartes' pronouncements have been, most people fail to notice that they continue to inform how we commonly think about *cognition*. Though a few dictionary definitions of "the mental process of knowing" include the senses and experience (usually in secondary definitions), most focus primarily or exclusively on awareness, judgment, thought, understanding—that is, conscious mental activities.

In reality, neuroscience shows that what we call *thought* is the caboose of a long train of meaning that begins with the body's responses to external and *internal* environments. Memory that can be articulated and reason that can be explained emerge at the end of complex, non-conscious embodied processes that involve associating current and prior memory traces and body states. Only then are these consciously recollected (literally, re-collected) (Damasio, 2010). And because people become aware of the fruits of their embodied cognition only after the invisible work is done, they are left with the subjective impression that mind can be separate from body.

Though Descartes' perspective continues to profoundly affect Western thought, especially in terms of what people believe about knowledge, thinking, and reasoning, new research on how the brain learns foregrounds the role of emotions (Immordino-Yang, 2007)—and emotions are, in fact, specifically an expression of what is happening in the body.

Emotions and Feelings

Neuroscientists, though generally not social scientists, currently distinguish between emotions and feelings. According to Damasio (2000), *emotions* describe the brain's internal-to-body responses to environmental stimuli (that is, "body state"); *feelings* are conscious and subjective perceptions of those changes in body state. As an example, a typical driver who has to swerve sharply to avoid an accident is likely to feel the adrenaline, increased heart-rate, and other body-state reactions as fear and/or fury. By contrast, a professional race-car driver in the identical situation may well ascribe feelings of exhilaration and satisfaction to those same emotions or body-state. Even so, memory traces of any experience always include the associated body-state and these ancient reservoirs of emotional reaction continue to invisibly affect our responses in the present.

Two parts of the brain most involved in anxiety-related emotions, the hippocampus and the amygdala, are also essential to memory formation (Phelps, 2006). This underscores the fact that in attending to what are considered the cognitive aspects of adult learning, educators must remain alert to adults' emotions, as well. "In one form or another, emotional issues never seem very far from the surface in an adult learning context," and attending appropriately to this reality is among "the most important and challenging tasks for the educator" (Dirkx, 2008, p. 9).

Furthermore, emotion is also the hidden source of motivation to think and to learn, as these are essential to accomplish the brain's prime objective of insuring survival and advancing well-being (Meyer, 2006). Without emotional input, the brain may be able to solve discrete problems (such as during laboratory tests of cognitive function), but it cannot make evaluative decisions leading to appropriate action (Damasio, 1994). The organism's most basic survival decision—what to move toward and what to move away from—is hopelessly compromised in the absence of emotion. Without such body-based cues, social decision-making is fatally flawed. Siegel (1999) explains: "generated by the value systems of the brain, these emotional activations pervade all mental functions and literally create meaning in life. In this way, we can say that emotion and meaning are created by the same processes" (p. 158).

David Gelernter (1994), a leading figure in artificial intelligence, also points critically to the preponderance of claims that conflate rationality, logical thought, and problem-solving:

Emotions are fundamental to thought; but the body, inconveniently enough, is fundamental to emotions [It therefore] becomes inescapable that you don't think just with your brain; you think with your body too Emotions are not [merely] a form of thought, not an additional way to think, not a special cognitive bonus, but are *fundamental* to thought. (pp. 46-47)

Unfortunately, the emphasis on learning and thinking primarily as rational, cognitive activities effectively diminishes the powerful potential of intentionally learning with and through the body—which is, ironically, the only way the brain can ever learn.

Learning and Embodiment

Learning is the final step in a process that takes place throughout the body before we can discover that we "know" something. Most people think about the brain in terms of conscious, reflective, self-aware, decision-making activities, but "the biological mind is, first and foremost, an organ for controlling the biological body Minds are *not* disembodied logical reasoning devices" (Clark, 1997, p. 1). The brain is not just inside the skull like a walnut in a shell. It is functionally a *body-brain*, connected with and responsive to every part of the body. And every part of the body contributes to all the functions of brain.

Though the term *cognitive* focuses on knowing through perception and awareness as well as reason, hardly acknowledged—except in the “seat of cognition” sense—is how the brain achieves those outcomes. Missing is the piece that Descartes discarded, the body. Antonio Damasio (1994) described the essence of *Descartes’ Error*:

[T]he abyssal separation between body and mind . . . the suggestion that reason, and moral judgment, and the suffering that comes from physical pain or emotional upheaval might exist separately from the body. Specifically: the separation of the most refined operations of mind from the structure and operation of a biological organism. (pp. 249-250)

In contrast to Descartes, current research finds that “we feel, therefore we learn” (Immordino-Yang & Damasio, 2007). Between *perception* and *knowing* is the embodied brain busily constructing what we eventually recognize as meaning that we are aware of and can attempt to articulate: Learning is a whole-body experience. “Cognition is embodied,” Kahneman (2011) states unequivocally, “you think with your body, not only your brain” (p. 51).

Learning activities that focus almost entirely on reading, writing, and speaking ignore aspects of somatic, tacit knowing that precede awareness. As Polanyi noted, “We know more than we can say” (Polanyi & Grene, 1969, p. 113). The rational, critical approach largely ignores the fact that “the source of cognition is not just the naked brain, but the brain in concert with the sensing, acting body . . . [as it] intervenes with the environment” (Clark, 1997, p. x).

Patterns and Metaphors

According to the *Stanford Encyclopedia of Philosophy*, embodied cognitive science is premised on the idea that cognition requires the entire body, not just the brain: “[It] is a dynamic sensorimotor activity, and the world that is given and experienced is not only conditioned by the neural activity of the subject, but is essentially enacted in that it emerges through the bodily activities of the organism” (Wilson & Foglia, 2017, n.p.).

Embodiment is relevant in two ways. First, the portal between brain and world is the body’s sensory apparatus; second, making sense of those sensations is a function of how we experience our body in relation to them—through analogy and metaphor. This process begins at birth. In the newborn infant, “even the simplest act of recognition of an object can be understood only in terms of her own activity. Out of this she must construct the entire edifice of the phenomenological world . . .” by comparing each new experience (stimulus) to the “pregiven” world—that is, as it has already been experienced (Varela, Thompson, & Rosch, 1991, p. 176).

Though adults have more, and more varied, experiential material to draw on, the fundamental process of learning at any age is based on creating and elaborating networks of neural associations. Once a stimulus has passed the threshold of attention, the brain immediately categorizes it by comparing the unknown to the known. It seeks similarities between this experience and previous experiences in order to connect it to existing patterns. Edelman (2006) explains, “Brains operate . . . not by logic but rather by pattern recognition It is likely that early human thought proceeded by metaphor . . . which continues to be a major source of imagination and creativity in adult life” (p. 85).

Though our subjective experience of thinking is something we can articulate, all thought originates in the embodied brain’s activity of non-verbal analogical association. If the brain could speak, it would ask itself: *how do traces of earlier experiences, now part of countless neural networks, relate to this new stimulus?*

Even abstract thinking depends on metaphor. “Our deepest and most abiding concepts—time, events, causation, morality, and mind itself—are understood and reasoned about via multiple metaphors” (Lakoff & Johnson, 2003, p. 245). Because these analogical associations are the brain’s primary references, everything we come to know and understand, including the most abstract concepts, originated with embodiment.

Embodiment Directs Cognition

Empirical research also demonstrates how the body-brain connection affects presumably objective interpretations of “reality.” In one case, research participants were asked to evaluate a psychological case study. Shortly before being handed a profile, they were casually asked to briefly hold either a warm or cold beverage. Those who had held the warm beverage determined the person in the case study had the attributes of a “warm” person (e.g., approachable, caring) and those who had held the cold cup found the same case described the attributes of a “cool” person (e.g., distant, aloof) (Williams & Bargh, 2008).

In another study, participants playing a computer game didn’t know that the game was rigged to induce feelings of minor rejection and isolation, based on short-changing the number of turns they were allowed. When the game was over, those who had been left out of full participation perceived the temperature in the room as cooler than it was. In effect, as the researchers explicitly noted, the embodied metaphor of *cold and lonely* affected their experience of the physical world around them (Zhong & Leonardelli, 2008).

Move Over, Descartes!

Given the power of Descartes' dictum over the Western imagination, people have increasingly come to believe in rationality and logic. Note the irony: we *believe* in logic. In fact, in the brain metaphor precedes logic. First the brain uses symbols and images; only then does it begin to construct words and a logical story. Body and emotions—experience and a felt sense—rather than logical thinking are the first responders in any learning experience (Kasl & Yorks, 2016).

Laboring under the misapprehensions of Descartes, the field of education has largely failed to take into account that embodied experience is *always* the basis of cognition. Focusing primarily on cognitive and verbal approaches tends to ignore aspects of learning related to the senses, the emotions, and the body. Activities such as role-play, simulations, and other explicitly embodied experiences usually appear as ancillary to the main work of explicit, verbal (i.e., “cognitive”) learning. (Verbal approaches that focus on metaphor, irony, and symbolism, such as poetry, drama, and story, avoid many of these limitations.)

Learning focused primarily on cognitive abilities—typically meaning “higher” mental activities of reasoning and problem-solving—also privileges what gets to be considered legitimate learning. It emphasizes linearity rather than a more complex and relational way of anchoring learning. This marginalizes cultures that do not fit the dominant Western cognitive mold and individuals who learn in ways that explicitly use their senses and bodies (Lawrence, 2005).

Rather than Descartes' *cogito ergo sum* (I think, therefore I am), Marton and Booth (1997) posit *cognosco ergo sum* (I experience, therefore I am), because learning “is an ongoing exploration of the world as experienced” (p. 156). Neuroscience has only recently articulated the implications of affective and social neuroscience on educational theory: “the relation between learning, emotion, and body state runs much deeper than many educators realize and is interwoven with the notion of learning itself” (Immordino-Yang & Damasio, 2007, p. 3).

Cartesian dualism has finally been laid to rest. In reality, *we feel, therefore we learn*. Though Descartes questioned the utility of the body, educators must now acknowledge the essential role the “embodied brain” plays in construction of knowledge.

References

Clark, A. (1997). *Being there: Putting brain, body, and world together again*. Cambridge, MA: MIT Press.

Damasio, A. (1994). *Descartes' error: Emotion, reason, and the human brain*. New York, NY: Penguin.

- Damasio, A. (2000). *The feeling of what happens: Body and emotion in the making of consciousness*. New York, NY: Harcourt.
- Dirkx, J.M. (2008). The meaning and role of emotions in adult learning. In J.M. Dirkx (Ed.), *Adult learning and the emotional self*. 120, 7-18. doi: 10.1002/ace.311
- Edelman, G.M. (2006). *Second nature: Brain science and human knowledge*. New Haven, CT: Yale University Press.
- Gelertner, D. (1994). *The muse in the machine*. New York, NY: Free Press
- Immordino-Yang, M.H (2011). Implications of affective and social neuroscience for educational theory. *Educational Philosophy and Theory*, 43 (1), 98-103
- Immordino-Yang, M.H., & Damasio, A.R. (2007). We feel, therefore we learn: The relevance of affective and social neuroscience to education. *Mind, Brain and Education*, 1 (1), 3–10.
- Lakoff, G., & Johnson, M. (1980/2003). *Metaphors we live by*. Chicago, IL: University of Chicago Press.
- Lawrence, R.L. (2005). Knowledge construction as contested terrain: Adult learning through artistic expression. *New Directions For Adult And Continuing Education*, No. 107, Fall. San Francisco: Jossey-Bass.
- Kahneman, D. (2011). *Thinking fast and slow*. New York, NY: Farrar, Straus, and Giroux.
- Kasl, E., & Yorks, L. (2016). Do I really know you? Do you really know me? Empathy amid diversity in differing learning contexts. *Adult Education Quarterly*, 66(1), 3-20.
- Marton, F., & Booth, S.A. (1997). *Learning and awareness*. Mahwah, NJ: Erlbaum.
- McGilchrist, I. (2010). *The master and his emissary: The divided brain and the making of the Western world*. New Haven, CT: Yale University Press.
- Meyer, D.K., & Turner, J.C. (2006) Re-conceptualizing emotion and motivation to learn in classroom contexts. *Educational Psychology Review*, 18(4), 377-390
- Phelps, E.A. (2006). Emotion and cognition: Insights from studies of the human amygdala. *Annual Review of Psychology*, 57:27 -53
- Polanyi, M. & Grene, M. (Eds.) (1969). *Knowing and being: essays*. Chicago, IL: University of Chicago Press.
- Ratey, J. J. (2002). *A user's guide to the brain*. New York: Vintage Books
- Taylor, K. & Marienau, C. (2016). *Facilitating learning with the adult brain in mind: A conceptual and practical guide*. San Francisco, CA: Jossey-Bass.
- Siegel, D.J. (1999). *The developing mind: How relationships and the brain interact to shape who we are*. New York, NY: Guilford Press.
- Varela, F.J., Thompson, E. & Rosch, E. (1991). *The embodied mind: Cognitive science and human experience*. Cambridge, MA: MIT Press.

Williams, L.E. & Bargh, J.A. (2008). Experiencing physical warmth promotes interpersonal warmth. *Science*, 322(5901), 606-607. doi: 10.1126/science.1162548.

Wilson, R.A., & Foglia, L., "Embodied Cognition", *The Stanford Encyclopedia of Philosophy* (Spring 2017 Edition), Edward N. Zalta (ed.), URL = [<https://plato.stanford.edu/archives/spr2017/entries/embodied-cognition/>](https://plato.stanford.edu/archives/spr2017/entries/embodied-cognition/).

Zhong, C., & Leonardelli, G.J. (2008). Cold and lovely: Does social exclusion literally feel cold? *Psychological Science*, 19(9), 838-842. doi: 10.1111/j.1467-9280.2008.02165.x