Finding Mind: A Defense of Embodied Cognition in the Classroom

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ABSTRACT

Recent empirical research offers compelling evidence in favor of incorporating principles of embodiment in the classroom. While engaging the body for the sake of learning has become more accepted for younger learners, embodiment is largely neglected for the teaching of more abstract concepts, including ones related to language acquisition — despite strong evidence that principles of embodiment can help adult learners with abstract ideas as well. This essay will define embodied cognition, contextualize the ways that the American school system has largely adopted "disembodied" and representationalist approaches to cognition, and provide a selection of empirical evidence in favor of adopting embodied principles in classrooms. The final sections of the essay will offer some strategies for adopting these principles in college-level humanities courses and provide some speculation in favor of the philosophical importance of doing so.

> Ah, if only mind could float free of its carnal entanglements, thinking pure thoughts of things certain, eternal, and good. *But that is a dysfunctional dream!* It is our organic flesh and blood, our structural bones, the ancient rhythms of our internal organs, and the pulsing flow of our emotions that give us whatever meaning we can find and that shape our very thinking.
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> — Mark Johnson, *The Meaning of the Body*

In 1988, the American alt-rock band the Pixies released their debut album, which included a song that would prove to be one of their biggest mainstream hits. The song, entitled "Where is My Mind?" repeats this titular question many times over. Black Francis's ethereal vocals belt out this refrain:

> Where is my mind?
> Where is my mind?
> Where is my mind?
> Way out in the water
> See it swimming

It is easy to interpret this well-known chorus as being about mental health struggles, especially since the song gained a second life after being featured at the end of David Fincher's film *Fight Club* (1998). [1] However, this song also raises a very interesting philosophical question. Where, indeed, is anyone's mind? What even is a mind?

It might seem intuitive enough to equate the mind with the brain. This has, in fact, long been the assumption in Western philosophy and science. The prevailing idea is that all cognitions — thoughts, ideas, emotions, and knowledge — are housed in three pounds of wetware between our ears, independent of our full bodies. This intuition is taken to its logical conclusion through influential philosophical thought experiments, such as the dreamworld posited by Descartes nearly three centuries ago, or the more modern brain-in-the-vat hypothesis (McKinsey 2018). Could it be the case that the world around us is a mere illusion, the by-product of a powerful manipulator? Perhaps our "true" selves are lone brains floating in jars — our sensations, bodies, and environments nothing more than illusions triggered by well-placed electrical impulses.[2] These thought experiments are meant to pump our epistemological intuitions about whether we can have true knowledge of our waking life, potentially motivating skepticism about the

1. Fincher's film explores themes of mental health conditions such as dissociative identity disorder.

2. A similar thought experiment was made famous for modern audiences in the sci-fi film *The Matrix* (1999), which imagines a scenario where our experience of reality is nothing more than an illusion being fed to us by robots that have our "true" bodies trapped in energy-capturing vats.

existence of the external world or even our very bodies. Epistemology aside, these thought experiments presume a high degree of localization behind human cognitions; they presume, in other words, that a mind can exist and function *without a body*.

These presumptions are heartily challenged by a rising school of thought called embodied cognition (EC). According to EC, our minds are not identical to our brains. Our minds are far more complicated and far-reaching than this. For the EC theorist, our minds — and all the cognitive accouterment — are extended and enacted via our bodies and our engagement with our environments. In this view, minds are not static entities, passively receiving sense-data from and creating representations of the external world. Instead, minds are *processes* that arise from complex interactions among brains, bodies, and environments. The line between such entities cannot be neatly drawn.

The rise of embodied cognition has repercussions for numerous and diverse realms of inquiry. This should be unsurprising considering how deeply the hypotheses of EC challenge our inherited intuitions about the nature of cognition. The ways in which EC bears on pedagogy is salient here. My goals are three-fold: first, I will discuss competing conceptions of EC to develop a working definition, which will involve a brief foray into the history and influence of disembodied views of cognition. I will then explore some of the empirical evidence for EC to establish credibility behind its central claims. After providing a working definition of and compelling evidence for EC, I will turn to its relevance in the classroom. This will involve a survey of how EC has been and is being used for educational purposes. This offers compelling reasons for adopting principles of EC in the classroom — from elementary school to graduate school and beyond. I will offer some concrete proposals for how to do this for college humanities courses (e.g., some suggestions for creating a syllabus and some ideas for specific lesson plans). Finally, I will close with some philosophical considerations regarding the benefits of recognizing our embodiment, fundamental continuity, and entanglement with our environments.

I. Defining Embodied Cognition

The central thesis of Mark Johnson's influential 2008 book *The Meaning of the Body: Aesthetics of Human Understanding* is that "what we call 'mind' and what we call 'body' are not two entities, but rather aspects of one organic process, so that all our meaning, thought, and language emerge from the aesthetic dimensions of this embodied activity" (p. 1). Johnson's framing of his central thesis captures the heart of embodied cognition. Ultimately, advocates of EC take as their theoretical starting point the idea that cognitive processes are deeply rooted in the body's interactions with the world.

While most EC theorists will accept this as a general characterization of embodied cognition, it fails to capture much of the ongoing debate around the details

of such a view. Golonka and Wilson (2013) write that EC offers the "most exciting hypothesis in cognitive science right now" but that "like all good ideas in cognitive science, [...] embodiment immediately came to mean six different things." There are, for instance, advocates of "strong" or "radical" EC and advocates of "weak" or "graded" EC (Farina, 2020). The latter position requires that cognition entails *some* dynamic engagement of the body's senses with the environment, what the EC theorists call "sensorimotor activation." The stronger versions of EC state that cognition cannot occur without sensorimotor activation — that is, embodied engagement with the environment is a necessary condition of cognition (Tirado et. al., 2018). There are many gradations between these two camps of EC.

The ontological status of any particular form (or strength) of EC is not relevant here. This is a largely empirical question, and there are many intriguing studies that help identify the nature and complexities of EC. EC can be taken seriously as a hypothesis, specifically regarding the human ability to think and learn. As Macrine and Fugate (2022) argue, the *only condition* for embodied cognition is that a "cognitive system can spread beyond the brain, incorporating parts of the world as well as the subject's body" (p. xvii). This use of "can" sets their view apart from the strongest formulations of EC, in that the incorporation of body and world are not necessary conditions for cognition. This more flexible position helps motivate the usefulness of embodied principles in the classroom.[3]

It is essential to understand EC as the position that cognition (including our capacity to learn) requires more than just the brain; it requires, to some degree, the activation of our bodies (via sensorimotor systems) and engagement with environments. Additionally, understanding how this view contrasts with more traditional views of cognition is essential since they are extraordinarily prevalent in schools and general attitudes about teaching. "Teaching pedagogy and curriculum continue to view learning as abstracted and separate from the body," writes Macrine and Fugate (2022). "As a result, classroom teaching continues to rely on presenting and learning disembodied concepts, without the engagement of the sensory motor systems or understanding how the body influences internalization of these concepts" (p. 3). While theories of embodied cognition continue to emerge, classrooms today have failed to keep pace.

II. Inherited Representationalist Views of Cognition

As mentioned, the human mind has long been considered the sole source of knowing, thinking, and teaching, with the body considered both separate and inferior.

3. It should be noted that, despite this more liberal and inclusive definition, my argument that embodied learning techniques are more effective and should be adopted in the classroom hinges on the fact that there is powerful evidence in favor of some degree of embodied cognition.

Since classical antiquity (and specifically since the influence of Plato in the 4th-century BCE), the body and mind have been seen as separate and hierarchical in nature. Plato posited an ideal realm divorced from the imperfections and vicissitudes of embodied existence (Kraut, 2004). Additionally, his student Aristotle believed that the mind rules over the body, and reason over the emotions (Barnes, 1995). Domination over the body and emotions was required to free the rational mind from its corporeal chains. Plato and Aristotle, of course, had a major impact on the intellectual trajectory of the Western world. These dichotomous assumptions informed René Descartes' notions of the mind/body split as well (Ryle, 1949). He contended that the mind must be cleared for the foundation of knowledge to be laid. Vestiges of these hugely influential thinkers and ideas can be found in most every modern intellectual tradition today.

In addition to the metaphysical musings of philosophers, certain religious traditions also codified humanity's dichotomous status, deepening people's sense of separateness. Students are exposed to many variations of this story, be it through intellectual or religious traditions, that act to reify an arguably common intuition that some element of human cognition is above, beyond, removed from, or more than nature itself — with minds that float free from the carnal entanglements of the body.

Thus, we have a story of influential philosophical and religious traditions as well as a powerful human intuition that together works to set mind and body apart from one another. Moreover, the body is seen as secondary — an impediment to the mind's expansion and capabilities, "an albatross levying a heavy drag on self-realization" (Macrine & Fugate, 2022, p. 13). In the wake of this, there arose a new and seemingly more empirically supported model of cognition that took these intuitions largely for granted: the computational model of cognition. This is an important perspective to confront due to its outsized and continuing influence.[4] In short, this is the idea that cognition acts analogously to computer algorithms. Very roughly, a computational process begins with an input of information, proceeds through instruction-guided operations based on this information, and concludes with some sort of output, which is the result of the operations on the input. The human mind, in this model, acts as a functioning hard drive: it passively receives information (via sense-data) that is converted to electrical signals, which in turn builds out a representation of the information. This is the dominant model of cognition and has been since the mid-20th century. Shapiro (2022) writes that "the *core commitment* of traditional cognitive science is that the various cognitive capacities—

4. Mark Johnson (2017) describes this contemporary movement as "the invasion of the body-snatchers," opening his discussion of this point with the tongue-in-cheek sentence, "When I was a graduate student in philosophy back in the mid-1970s, people did not have bodies" (p. 2).

perception, memory, language use, reasoning, and so on—can all be analyzed in terms of computational processes" (p. xiv, emphasis mine).

Again, this permeates the classroom and our broader understanding of how to best learn. These core commitments can be seen in curricula. Schools, whether conscious of it or not, still work hard to separate mind from body. Macrine & Fugate (2022) state it clearly:

> Cartesian dualism is still pervasive throughout school settings. The teacher is seen as a "talking head"—a disembodied and disempowered conduit for core curriculum. These disembodied threats come in the form of rote memorization, mindless drills, and skills in preparation for standardized testing. Even now, the ramifications of our epistemological heritage continue to have quite an effect on how we conceptualize knowing, learning, and teaching. (p. 15)

Such are the traditions and methods of learning that EC aims to challenge. Embodied learning in the classroom requires a profound rethinking of how we understand language, reason, memory, and learning, as well as reconceptualizing how we see ourselves relative to one another and our environments.

III. Empiricizing EC

There has been a great deal of empirical research related to EC, especially within the last two decades. Much of this empirical research has aimed to test various hypotheses that EC entails. There is compelling evidence in favor of at least some form of embodied cognition. It is not, as Farina (2020) puts it, "just a philosophical mantra empty of empirical content" (p. 73). Farina provides a survey of empirical evidence in his article, "Embodied Cognition: Dimensions, Domains and Applications" (2020). Farina's essay surveys some of the current debate over the validity of EC, including common characterizations of the view. Farina concludes his survey of EC by saying that "there is a substantial body of empirical work showing how embodied activities constitutively shape many aspects of human cognitive life" (p. 84). Farina argues that this substantial body of evidence includes data collected from numerous areas of scientific investigation, including laboratory studies, naturalistic field observations, neuropsychological case studies, research on artificial intelligence, and various phenomenological reports (pp. 77-84).

That said, my focus will be on a limited number of studies examining EC specifically in the context of language learning. Macrine and Fugate explore much of this area (2022). Their anthology includes multiple essays explaining and interrogating recent empirical work on language acquisition as it relates to bodily movement. A contribution from Gomez and Glenberg (2022), for instance, looks at research on language learning in three different domains: vocabulary acquisition, second-language acquisition, and abstract

language comprehension for adults.

Gomez and Glenberg focus on research intended to measure the effectiveness of various embodied classroom activities. For preschool children developing language, Gomez and Glenberg cite a study done by Wall et al. (2021), which investigated whether procedures that ground meaning in embodied sensorimotor activities really help children learn vocabulary. The study looked at children's ability to comprehend vocabulary while using a "dialogic reading" approach. This is, in short, a method where adults and children read together while the adults ask questions related to the text in the service of prompting dialogue. Most uses of dialogic reading are purely verbal.[5] An embodied approach to dialogic reading, in contrast, will incorporate more than just verbal inquiries and discussion. It will, for instance, provide items for the children to manipulate, directives for the child to move or enact aspects of the story, etc.

For the study, Wall et al. created triplet groups composed of preschool children who were matched on age and vocabulary test scores. One child in each triplet was randomly assigned to one of three conditions: the control condition, the "dialogic-then-combined" condition, and the "combined-then-dialogic" condition.[6] The control condition approached dialogic reading in a more traditional, purely verbal way by reading from an electronic tablet and engaging in directed dialogue with an adult throughout the sessions. The other two conditions incorporated bodily engagement during the dialogic process, such as manipulating the movements of dolls and getting up and enacting aspects of the

5. Gomez and Glenberg (2022) provide the example of PEER—prompt, evaluate, expand, and repeat—to illustrate traditional (purely verbal) approaches to dialogic reading: "Adults are taught to provide a *P*rompt to the child (e.g., 'What is this?'), *E*valuate the child's answer (e.g., 'You are right! It is a sheep'), *E*xpand on the child's utterance (e.g., 'The sheep has a wooly coat') and ask the child to *R*epeat the longer utterance (e.g., 'Now you say it: The sheep has a wooly coat')" (p. 80).

6. Gomez and Glenberg (2022) explain the details of the three conditions as follows: "[For the control condition] a child and an experimenter listened to a commercially available electronic story presented on an iPad [...] They listened to the story once a day for eight days. The children took tests at three time points: before any listening (pretest), after the fourth listening (midtest), and after the eighth listening (posttest)" They go on to explain that there were two types of tests: "the comprehension test asked questions such as 'What animal does Ahmad take on his trip?'; the other test was of twenty vocabulary words (e.g., the child was asked 'What do you think "startle" means?'). The second condition was called 'dialogic-then-combined.' As in the control condition, the children heard the story eight times and took the pre-, mid-, and post-tests" (pp. 80-81).

story they were reading.[7] The difference between the combination control conditions was *when* during the study they incorporated principles of embodied cognition. The children in all the groups showed "substantial improvement" overall, in both comprehension and vocabulary acquisition, but the children who received the combined script improved the most (see figures 5.1 & 5.2). As Macrine and Fugate note, adding the embodied activities "appeared to supercharge dialogic reading" (p. 81).

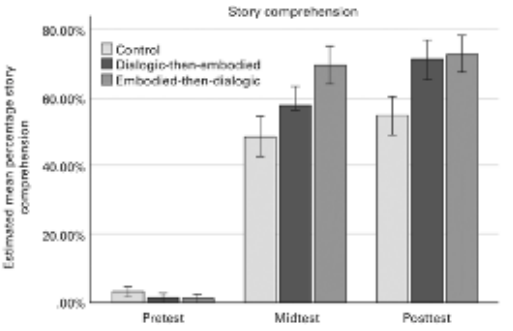

Figure 5.1
Data from the story comprehension test. Source: Wall et al. (2021).

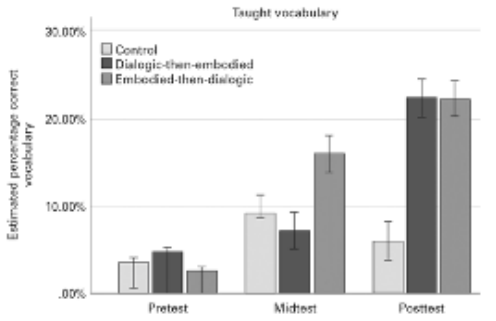

Figure 5.2
Data on acquisition of targeted vocabulary words. Source: Wall et al. (2021).

This study from Wall et al. (2021) is limited in scope due to the small sample size and the possibility for confounding variables. Nonetheless, it offers promising results for the potential applications of embodied learning for language. Gomez and Glenberg provide other promising studies on the effectiveness of EC for learning language, specifically for second- and third-grade students learning physics vocabulary (pp. 81-85) and for adults learning foreign language vocabulary (pp. 86-88). Gomez and Glenberg's

7. One example of this used the word "startle" to illustrate vocabulary acquisition and story comprehension: "[EC] principles were implemented using manipulatives including a small doll named Ahmad, a bed, and other items. Upon getting to the word 'startle,' the script read, 'Why does Ahmad wake up? He was startled. That means felt frightened or scared. Because he's startled, he jumps out of bed. Make him jump. Let's make him startled. [The experimenter shakes the Ahmad doll and hands it to the child to shake.] Can you say startled?' Thus, the child generates sensorimotor and emotional activity to associate with the word 'startle'" (Gomez and Glenberg, 2022, p. 81).

research around adult learning of abstract concepts is of particular interest.[8]

For their research, Gomez and Glenberg hosted lectures for adult learners discussing the principles of EC and then used these principles to teach some unrelated abstract concepts. This, they argue, allowed for the lecture to act as proof of concept. That is, "to the extent that the viewer (you!) learns the [abstract concept], it demonstrates the validity of the principles" (Gomez & Glenberg, 2022, p. 86). The goal of these lectures is to clarify abstract concepts primarily using grounding, i.e., building abstract concepts upon more concrete concepts. Grounding is done by engaging activity in the sensorimotor and emotional systems to ground simple concepts and then using extended procedures to ground complex or abstract concepts.

Glenberg (2021) aims to teach readers the highly abstract concept of "regression to the mean." Glenberg employs concrete experiences like weighing oneself on a scale, along with the concept of measurement errors grounded in these experiences, to clarify this abstract concept. Random error is difficult to ground in one measurement, in one single instance of standing on a scale. Grounding the concept of random error involves *repeatedly* standing on a scale and experiencing changes as a result: factors like the location of the scale, how the person steps on the scale, etc. Thus, grounding the concept of random error requires multiple instances of measurement, what researchers call "extended procedure." The use of an extended procedure is, according to Gomez & Glenberg (2022), "a common technique for grounding abstract terms" precisely because abstract terms so frequently refer to procedures or processes rather than objects or instances (p. 88). Glenberg (2021) uses several extended procedures (in addition to that used to define random error) to illustrate regression to the mean. As another example, consider teaching the concept of "democracy":

> Children might be introduced to the procedures of having an election by literally having candidates, ballots, and counting ballots. After the procedure is acted out, the child can be taught that in democracies, elections like these are used to choose representatives or decide issues. (Gomez & Glenberg, 2022, pg. 88)

Grounding in this manner has similarities to the ways that Lakoff and Johnson famously initiated the conversation about embodiment as it relates to linguistics (specifically metaphor). Lakoff and Johnson (1980) argue that abstract language is always rooted in some form of bodily engagement with the world. When we use metaphorical language (such as "I clearly see the point of your argument"), we are, ultimately, appealing

8. Gomez and Glenberg provide a video demonstration of their study on adult learning of abstract concepts. For the full video, see Glenberg, 2021; for a description of the video, see Glenberg et al., 2021.

to some deeper and more fundamental way of how creatures like us navigate, manipulate, and make sense of our environments (such as how vision allows us to literally see things clearly). This relationship goes both ways: metaphors are informed by the comportment of bodies, and bodies (including the processes of the brain) function in deeply metaphorical ways. Put another way, bodies inform concepts, and concepts inform bodies. "The concepts that govern our thought are not just matters of the intellect," write Lakoff and Johnson (1980). "They also govern our everyday functioning, down to the most mundane details. Our concept's structure is what we perceive, how we get around in the world, and how we relate to other people. Our conceptual system thus plays a central role in defining our everyday realities" (p. 11).

This sample of studies regarding EC and learning acquisition offers compelling reasons for deploying full-bodied, interactive pedagogical techniques in the classroom.

IV. Teaching Using the Techniques of EC

Embodiment research is particularly relevant for incorporating EC into college humanities courses, which often involve abstract concepts like metaphor, exigency, genre, and various literary and linguistic devices. The following proposals for incorporating EC into college classes involve empirical claims and contain testable hypotheses that could prove effective with more research.

Because such abstract concepts are being taught to adult and young adult learners, an important step in this process is meta-discussion. To maximize the positive effects of EC-informed pedagogy, having a higher-order discussion with students about *what* embodiment is, why one is adopting embodied techniques in the classroom, and *how* that will happen could prove useful. It is not unheard of for instructors to have a meta-discussion about their personal approach to teaching (often found in the syllabus). Instructors are more likely to have this type of discussion if they are adopting novel or more radical approaches to teaching. EC in the college classroom could be considered both novel and radical; having time dedicated to discussing embodiment, including why and how it will be incorporated in the lessons, would be an important and effective way to begin EC-informed teaching.

What could starting this process look like? For starters, a definition of EC would be provided directly in the syllabus. An explanation for why it is being incorporated throughout the course would accompany the definition. Finally, each individual lesson on the syllabus could have an "embodied element" that will be brought in to help clarify or reinforce the ideas being explored. As an example, the syllabus could have an "Embodiment in the Classroom" section that lays out the guiding teaching philosophy for the course. This could provide something like the definition provided at the outset of this

essay: "Embodied cognition is the position that thinking, learning, memory, and language use all require more than just the brain; they require, to some degree, the activation of our bodies and engagement with environments." Then, to help explain why this style is being adopted for the course, this section could provide language about the robust empirical evidence in support of EC: "I will be incorporating principles of embodied cognition throughout this course because there is ample scientific evidence in support of the idea that our thinking and learning occurs using more than just our brains; we learn better when our bodies and environments are more engaged." The "Embodiment in the Classroom" section of the syllabus can act as a launching point for discussion at the start of the course. Most importantly, there should be an EC element involved in this meta-discussion. What better way to teach the concept of EC than to practice EC? This could look something like the dialogic and embodied activities used in the Wall et al studies. mentioned above. Students could participate in interactive activities that involve them getting up and moving around the classroom and "acting out" sections of the lesson plan. The students could also do artistic representations of the differences between embodied cognition and disembodied cognition, such as drawing "brains in vats" or re-creating relevant scenes from *The Matrix*.

Similarly, the lesson plans can offer an opportunity for more specific incorporation of EC. If, for instance, the course includes a section on prescriptive and descriptive linguistics, then the syllabus can provide a brief description of how embodiment will be incorporated for those specific lessons. This might involve exercises where students break into groups and analyze each other's writings for traditional grammatical errors and discuss their emotional and physical responses to having these so-called errors pointed out (e.g., "I feel defensive over the way I spelled these words, and I can feel this sensation as a tightness in my chest and jaw"). Following the guidance of Glenberg (2021), the teaching of such abstract concepts will be aided through extended procedure where multiple lessons engaging the body in the service of clarifying and reinforcing such concepts could be helpful. A secondary lesson on prescriptive and descriptive grammar, then, could involve more embodiment exercises, such as having students read pieces of writing in a variety of dialects, including ones rich with errors according to Standard English, and discuss if there are any levels of comprehension loss (or in what ways the meaning changes). A way to further incorporate embodiment in these exercises could be to explore dialects in, for instance, scripts for stage plays, where

students can act out their understanding of the language being used.[9]

Abstract concepts are a given in higher education and certainly prevalent in the humanities. Following the traditional way of learning abstract concepts by treating students as receptacles for definitions while testing their ability to memorize is, based on more and more emerging neuropsychological evidence, an inadequate way of approaching pedagogy. Abstract thinking has long been considered the highest level of cognition and has been assumed to develop later during adolescence.[10] Because humans function with hierarchical thinking, this way of approaching cognition often aims to *replace* thinking based on sensory and motor processes with formal logical thinking (Kiefer et al., 2022, p. 25). But this is both unhelpful and empirically indefensible. Cognition does not entirely cease to be tied to our bodies and environment, no matter how abstract cognizing may be. We should not abandon EC and embodied learning after grade school. Instead, we can take steps to ensure that embodiment is better understood and more embraced at all levels of education. Educators can be better served recognizing that, even when reasoning abstractly, there is still engagement with body-based concepts.

9. An exercise like this immediately raises concerns over what it means to move and act and engage with the body in the classroom. It should be noted that discussion of embodiment in the classroom will invariably entail discussion of *ability* in the classroom as well. The philosophy of embodiment can bring about a worry that there will be *essentializing* of human bodies, i.e., the idea that there is one (or some) necessary and sufficient condition that defines a human body. This runs the risk of excluding or marginalizing certain people, especially people with disabilities. Thus, it is important that any discussion of embodiment takes steps to ensure a pluralistic approach to bodies: there are many different kinds of bodies, with many different kinds of abilities and affordances.

10. This results largely from Jean Piaget's hugely influential model of cognitive development, which Kiefer et al. (2022) summarize as follows: "According to Piaget's theory of cognitive development, children acquire knowledge through sensory experiences and the manipulation of objects until the age of two. After learning to use symbols (e.g., words, pictures) to represent and think about objects and events, children are thought to develop logical thinking, which is still based on concrete events between the ages of seven and eleven [...] Formal logical thinking detached from sensorimotor experiences, the highest level of cognition, is assumed to develop later during adolescence. According to this theory, formal logical thinking replaces thinking based on sensory and motor processes" (p. 25).

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