

Mind, Education, and Active Content

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The notion of mind as an information processor has dominated much of the contemporary debate surrounding theory of mind. While mind-brain supervenience is generally accepted by theorists, the degree to which mind, and its attendant consciousness, can be viewed as a computer is an open question which forms the crux of the existing debate. From Daniel Dennett's model of mind as a von Neumannesque serial processor implemented on the parallel architecture of the brain, to John Searle's insistence on a purely metaphorical relation between mind and computer, to Roger Penrose's dismissal of even metaphoric similarity, the topic has inspired models across the spectrum. While such speculative debate continues, the relation of these theories to education needs to be addressed. As Shelby Sheppard notes, mind and education are naturally "bound at the hip" when we assume that education *is*, in large part, the development of mind.¹ Viewed from the perspective of theory of mind, the relation between mind and education focuses on how particular theories of mind account for the development of mind — that is, what can be learned and how we go about such learning. Looked at from the educational perspective, however, the focus is somewhat different. Rather than seeking descriptive and explanatory answers to the questions of what and how we learn, the question becomes how the constraints imposed by a theory of mind align with our normative view of what it means to be educated. In this case, we start with our normative ideal, assume some justifiable basis for its truth, and evaluate the viability of a theory based on how well it aligns with that ideal. Specifically, does the theory support claims of what *should* be learned with its claims of what *can* be learned? To the degree that we are unwilling to abandon the ideal, our normative view of education can be seen as a litmus test for theories of mind.

Sheppard suggests that information processing (IP) theories of mind fail such a test. Claiming that IP theories are presupposed as part of the theoretical basis of the "computer model of education,"² she uses Searle's criticisms of the computational underpinnings of information processing to reject IP theories, along with their attendant educational ideal. The implication is that since the computer model of education is incompatible with our normative view, IP theories themselves cannot prove to be consistent with, and supportive of, the normative view. While I agree that some IP models are incapable of providing sufficient theoretical backing to our normative view, I do believe that we can develop a theory in the functional/computational mold that is rich enough to provide the theoretical basis for the essential characteristics of our normative view. Such a model, though, would have to include what I call an "active" role for content, one that extends beyond the traditional role of passive token whose syntactic form constrains how it is acted upon by mental operations. This "active content" maintains the causal power to transform mental operations — to alter the software itself, so to speak. Ultimately, it is this

operation of the operand on the operator that will enable us to satisfy the theoretical requirements demanded by our normative view of education.

The specific thesis I wish to defend is a bit stronger still. I first propose that active content occupies a crucial role in the social learning theory of L.S. Vygotsky. I then suggest that we can slightly modify some active content IP theories — particularly Dennett’s eliminativist model — to obtain a viable physical reduction of social learning theory. Given that social learning theory passes the litmus test defined by Israel Scheffler’s normative view of education, we can then claim that our modified IP theory passes this test as well. Along the way, I illustrate the crucial role that active content maintains with regard to such a normative view.

NARROW AND BROAD CONCEPTIONS OF EDUCATION

To say that there exists a normative conception of education is not to say that such a conception is regularly implemented and practiced. Indeed, both Sheppard and Scheffler distinguish what I would call our “broad” normative ideal from our “narrow” implemented conception. Sheppard describes the narrow ideal as being defined by the retrieval of information from memory and its subsequent mental processing: “The development of mind (cognitive change) is achieved when one develops the ability to process efficiently — to access, retrieve and manipulate information.”³ Scheffler calls this the “computer model of education.”⁴ At its core, it equates information with knowledge, and thinking with information processing. Education then strives to maximize the efficiency of the cognitive processing of such information, and increase the amount of information stored and made readily accessible to mind.

Scheffler, himself, offers a well-known elaboration of the concept of education, which I shall take as an exemplar of the normative view. In contrast to the narrow conception, he presents a description of the educated person that extends well beyond the idea of one who has acquired information. Indeed, in Scheffler’s model information is used to (a) actively generate principles “that locate our beliefs and actions within a framework,”⁵ (b) recognize patterns to create new conceptual forms — that is, new information, and (c) transform perception and thought. In contrast to the passive quality of the narrow view, where information is simply stored and retrieved as efficiently as possible, Scheffler’s notion entails the use of information to actively generate new understanding, thinking, and perception of the world that necessarily modifies our behavior. In short, the normative ideal seeks to transform the individual.

INFORMATION PROCESSING MODELS AND THE NORMATIVE VIEW

Sheppard argues that we have reason to abandon the narrow conception of education based on its inherent commitment to IP. Since every educational ideal must commit to a particular theory of mind, we can conclude that such is the situation with the narrow conception of education. And it just so happens that IP is the model of mind presupposed in this case. Given that rejection of IP thus entails rejection of the narrow conception, John Searle’s critique of IP, according to Sheppard, provides the ideal resource for educators to question the computer model of education.

If we employ the broad conception of education as a litmus test for theories of mind, the question is whether or not IP theories pass that test. For Sheppard they clearly do not. If they did, Searle's criticisms of IP would likely force Sheppard to reject the broad ideal, for which she clearly has an affinity. Further, Sheppard's claim that the narrow ideal presupposes IP extends beyond the requirement that IP be consistent with, and provide sufficient theoretical support for, the ideal. It is a claim that suggests that the constraints imposed by IP theories make it well-suited to the narrow ideal, and that the requirements demanded by other ideals are not satisfied by IP. Given that the broad ideal specifies vastly more robust requirements for education than the narrow ideal, she cannot but think that IP, at the very least, fails to provide sufficient theoretical support for the broad ideal. However, it is not at all clear to me that this is the case for all variants of IP. While I would not go so far as to say that the broad ideal presupposes IP, I do believe that IP can meet the theoretical requirements specified by the broad conception of education.

Contrary to Sheppard's argument, the problem with getting the standard computational models⁶ to align well with our normative view of education does not concern issues of syntax and semantics.⁷ Rather, I propose that such models fail to provide sufficient theoretical support for a conception of education as a *transformative process*, where what we learn actually alters our perception, thought, and action. Scheffler, himself, situates the normative ideal on such a foundation. To Scheffler, acquired knowledge is not the inert information comprising the domain of learning postulated by the narrow ideal. Rather, it is the cause of mental change, a starting point for the "active combination and recombination of ideas rather than acquisition of new information."⁸ Thus considered, it is difficult to see how an IP model that views its operands as inert tokens, utilized solely for input to functionally defined operations, could be seen as providing a sufficient theoretical basis for a normative view of education. And yet, the fact that we can point to inert content as the weak link in IP theories — at least from the perspective of passing our litmus test — suggests a kind of theory that could provide this theoretical basis. Such a theory would have to posit a notion of active content, content that causally acted to transform the mental operations described by Scheffler — perception, thought, disposition, and discrimination, for example. The social learning theory of Vygotsky does just that.

SOCIAL LEARNING THEORY AND ACTIVE CONTENT

Vygotsky elaborates two concepts central to learning: the internalization of socially mediated interactions, and the zone of proximal development. During the process of internalization, an individual assimilates external cultural interactions to develop uniquely human psychological capabilities. As an example, Vygotsky describes how the concept of pointing develops from the repeated interactions between parent and infant that result from the infant's failed attempts to grasp an object that is out of reach. The zone of proximal development, on the other hand, is a developmentally defined timeframe in which individual cognitive growth can be stimulated by learning. It is the period of time where mental functioning is such that an individual is capable of completing a mentally demanding task only with the help

of others, and where such help literally causes the cognitive development that results in the individual's ability to perform the task on their own.⁹ Together, internalization and the zone of proximal development define a role for learning that fosters the cognitive transformation demanded by our normative educational ideal. Unlike the standard IP models of mind, social learning theory postulates that what is learned actually transforms internal cognitive mechanisms: not just *some* cognitive mechanisms, but all the "higher" functions.¹⁰ Education is significantly responsible for all cognitive change, as biologically dictated cognitive development is not only improved with properly timed learning, but is generally initiated by it.¹¹ Indeed, contrary to theorists like Jean Piaget, Vygotsky postulates that development itself *lags* behind the learning process; in other words, fully developed mental capability is not necessary, nor even possible, for learning to occur. Ultimately this lag, which defines the zone of proximal development, is responsible for the causal relationship of learning to cognitive development, without which much uniquely human cognitive functionality would never be realized.

The mechanism by which learning stimulates cognitive development in Vygotskian learning theory has been subject to different interpretations. While it is clear that Vygotsky defined a causal relation between the interpersonal use of sign operations and cognitive development, the nature of those operations, and how they account for the movement from the interpersonal to intrapersonal, has been debated. The "text mediational" view of internalization offers the most viable and detailed explanation of the process. Founded on the work of Yuri Lotman, the text mediational view is premised on the dual function of text as both a vehicle of transmission and a generator of meaning.¹² As such, text can manifest as written, oral, and artistic elements. As an agent of transmission, text maintains the ability to faithfully convey meaning between individuals, thus facilitating the acquisition of reproduced knowledge. In its "dialogical" capacity, however, text maintains an antithetical function: that of creating new meaning from social knowledge. Such capability derives from the existence within the text of various conflicting and mutually untranslatable subtexts or meanings. This latent conflict manifests as a meaning "generator" when a conscious entity encounters text; that is, it acts to stimulate cognition in the effort to generate new meaning from the intractably conflicting subtexts. New meaning then becomes assimilated into the text — another unit in the set of subtexts — resulting in a never-ending feedback loop of semantic and conceptual change.

Thus, the text mediational view provides an account of the process of internalization by positing a vehicle of transmission from interpersonal to intrapersonal whose content exhibits causal efficacy. I would readily characterize such a vehicle as an example of what I have been calling active content: an essentially semantic object whose causal properties target the mind. As a means of transmitting information, text is passive and inert. Yet, in its dialogic capacity, text serves the additional role as stimulus for cognitive development. Its internal structure, defined by mutually incompatible meanings, causes mind to reorganize. In short, Vygotsky, with some help from Yuri Lotman, elaborates a learning theory that provides theoretical justification for the normative view of education. The domain and

mechanism of learning is both consistent with, and explanatory of, our intuitive understanding of what we *should* learn. And, as we have seen, the theory's reliance on a concept of active content is central to enabling such alignment.

DENNETT: AN ACTIVE CONTENT COMPUTATIONAL MODEL

As a theory of developmental psychology utilizing semiotic constructs, social learning theory is not required to elaborate and defend its implicit ontological commitments. That is, we may take Lotman's attribution of causal powers to text as having explanatory value without demanding a further reductive account of such causality. Given the priority of physicalist accounts of mental processes, though, the question becomes whether we can develop a physicalist notion of causality to account for the psychological reorganization caused by text. As I mentioned earlier, I would like to propose that there are IP theories of mind that serve as reductionist explanations of social learning theory, expounding a physically based notion of active content to account for cognitive development. I would like to focus on two such theories, one proposed by Daniel Dennett, the other offered by Willard Miranker.

While Dennett's and Miranker's models of mind differ in their degree of commitment to a purely computational model, both rely on the concept of the meme as their active content construct. As originally proposed by Richard Dawkins, the meme is defined as a self-replicating unit of cultural transmission,¹³ paradigmatic examples of which are blue jeans, the choral finale of Beethoven's 9th Symphony, and memorable commercial slogans like those found on television. Conceived as the analog of the biotic genetic replicator, Dawkins offers the meme as a means of explaining cultural evolution. Subject to the same selective forces of biotic evolution, Dawkins proposes that extant cultural diversity and complexity are a result of both the replicative capabilities of memes and their differential fitness. Indeed, the entire description of a memosphere is founded upon a strict analogy with biotic evolution.

Though Dennett is a leading proponent of memetics, he incorporates its tenets in his theory of mind not to account directly for cultural evolution, but rather as part of a computational theory of mind the goal of which is to explain how modern human cognitive capacity could have developed to such a degree with barely any change in brain structure.¹⁴ Indeed, Dennett proposes that human consciousness itself can best be thought of as software, a "von Neumannesque virtual machine implemented in the parallel architecture of a brain."¹⁵ Though consciousness can be fully identified with the physical operations of the brain, those operations are so complex and diffuse that they are likely forever beyond our understanding. Thus, the software model provides the best explanation available.

As a result of the brain's plasticity, such software is unlike the desktop software to which we are accustomed. Instead, it has the ability to be changed over time. The agent of that change is the meme, which Dennett describes as having a dual role: it exists both as a vehicle of information as well as the stimulus of cognitive development. In its inert role, it is the operand of a functionally defined cognitive

operator. In its active role, it operates on the operator. Dennett's model of mind elaborates a mechanism by which human cognitive functioning develops in accordance with its cultural environment. Cultural elements exist interpersonally and are incorporated into the cognitive functioning of individuals through an active agent. Their incorporation results not only in the acquisition of culturally based information, but also entails some modification of both the cognitive architecture hosting the element and the acquired element itself. If this description sounds oddly similar to the text mediational view of Vygotskian learning theory, that's because it is.

At the very least, Dennett's theory of mind is both consistent with, and provides significant theoretical support for, the social learning theorized by Vygotsky. However, I do not think it is a stretch to claim that Dennett actually offers a partial physicalist reduction of social learning theory. As I mentioned earlier, when Vygotsky and Lotman claim that psychological activity is reorganized by sign operations, they do not make any ontological commitments to the nature of mind. Dennett's theory gives us a physicalist basis for what it means to reorganize psychological activity: memes reconfigure brain matter, and changes to brain matter are, ipso facto, changes to psychological activity.

Yet, such a model offers only a *partial* physicalist reduction of Vygotskian theory, since Dennett's does not describe the mechanisms by which memes inhabit and causally change brain matter in physicalist terms. Instead, Dennett assumes an intentional stance in his descriptions, offering claims such as "some memes definitely manipulate us into collaborating on their replication."¹⁶ As Holdcroft and Lewis note, Dennett defends the intentional stance, claiming that "the underlying physical and neuro-physical complexity is so great that we have no chance of understanding it and predicting it on that level."¹⁷ But given the invisible character of memes, such a defense begs the question whether the underlying mechanism is purely physical in the first place. Dennett himself entertains this criticism, offering the rather weak defense that memes replicate independently of any benefit to their host.¹⁸ That is, he suggests that if humans, as intentional entities, were to causally participate in the restructuring of our cognitive architecture — in our thinking, perception, and dispositions, for example — pernicious memes would have no chance of widespread replication.

Ultimately, Dennett's insistence on the physical basis for memes is best justified by his insistence on a physicalist ontology, which he proposes at the beginning of *Consciousness Explained*.¹⁹ Thus, physicalism becomes an axiom of Dennett's model. Indeed, one can argue that Dennett requires a material conception of memes to make his theory work. For if memes are "simply a graphic way of organizing very familiar observations about the way items in our cultures affect us," the only other reasonable way to explain the vast achievements of the past 10,000 years is to posit agentic individuals, entities with irreducibly intentional powers. In short, without a viable physicalist explanation of the causal mechanisms of meme behavior, Dennett's claim to a purely non-intentional account of mind becomes tenuous.

MIRANKER: A PHYSICALIST ACCOUNT OF ACTIVE CONTENT

Willard Miranker proposes a model of active content that attempts to address this issue.²⁰ While Miranker's model of mind is partially described in computational terms, it differs significantly from Dennett's by proposing a role for an irreducibly immaterial, though brain-supervenient, notion of consciousness. Thus, it is questionable from the start whether the model truly qualifies as a type of IP theory. However, I think it necessary for my purposes to show only that Miranker's account of meme behavior provides Dennett's paradigmatic IP model with the necessary physicalist account of memes that it lacks. If we appropriate Miranker's description of active content and apply it to Dennett's computational model, we will then, I maintain, have an IP model of mind that provides a complete physical reduction of Vygotskian learning theory. And as I suggested early on, a model of mind that provides such a reduction passes the litmus test defined by the normative ideal of education.

Contrary to Dennett, Miranker does not identify consciousness with the computationally defined neuronal architecture of the brain resulting from meme behavior. Rather, it is conceived as an irreducible entity biologically created by meme competition. Memes are instantiated as neuronal arrays²¹, and comprise the unconscious portion of mind. Subject to the same evolutionary forces as biotic genetic material, they compete with each other for residence within the finite boundaries of the brain. Miranker speculates that this competition manifests in the production of conscious experience, which itself supplements the unconscious utilization of the meme to further increase its likelihood of survival. The process produces a "grammar of the mind," a functioning computational engine, the development and effectiveness of which continues to generate increasingly complex manifestations of consciousness. The development of the grammar constitutes the essence of learning: the more complex the grammar, the more powerful the conceptual framework used to understand the world.²²

Once again, we encounter a dual role for content. Miranker's meme serves the "passive" function as a vehicle of information transmission as well as the "active" role of modifying the architecture that utilizes that information. Yet, unlike either Lotman or Dennett, Miranker provides a sufficiently detailed physical description of active content and its behavior that renders the concept a plausible physical entity. Much like Dennett and Dawkins, Miranker seeks to maintain the fundamental analogy between biotic evolution and memetic evolution. Starting from Gerald Edelman's theory of neuronal pairing,²³ where brain development involves the programmed cell death of unused neuronal arrays, Miranker defines the brain as the site of an evolutionary process of selection. Put simply, cognitive development occurs because neuronal arrays that fire often enough survive, while those that do not die. Given that memes are instantiated as neuronal arrays, they are taken as the phenotypes subject to this competition. Since neuronal firing is a direct result of the input of a neuron's afferent synapses, the synapse is considered the source of array strengthening or weakening. Arrays that fire enough survive because of the effectiveness of the array's multiplicity of afferent synapses. Miranker terms this

effectiveness the “distributed synaptic weight” of the neuronal array.²⁴ Thus, synaptic strengthening is viewed as analogous to biotic genetic replication, where both the synapse and the biotic replicator (the gene) directly determine the effectiveness of information-conveying agents, the genetic and memetic phenotypes. As such, the memetic (neuronal) synapse can be viewed as analogous to the biotic genotype.

Just as the genomic information conveyed by the biotic phenotype (the organism) is contained in the genotype (DNA), memetic information is encoded in the memetic genome, the distributed synaptic weight of the neuronal array.²⁵ Assuming that such memetic encoding is really the case, that semantic content is truly reified in the synaptic weights of a neuronal array, we can now appreciate Dennett’s advocacy of the intentional stance when describing memes. The immense complexity of such encoding seems utterly impenetrable. By the same token, we can also see the weakness of Dennett’s argument. While the complexity of the underlying neural mechanisms may force us to adopt intentional terminology to explain or predict *particular* meme behavior and structure, Miranker has shown that such complexity need only be *referenced*, not detailed, when describing the general physical mechanism. In other words, a hypothesis with explanatory value need only paint a general picture of an immensely complex situation without having to delve into the details.

To complete this account of meme structure and behavior, Miranker describes the process of meme instantiation in the host, whereby an external stimulus initiates an alteration of the afferent synapses of a neuronal array to execute the instantiation. Once instantiated, subsequent cognitive retrieval of the meme requires some “exogenous sensory cue” from either the body or the external environment.²⁶ When such a cue exists, the entire mechanism of meme (neuronal) behavior is initiated, with the possible result being a manifestation of consciousness. Over time, those neuronal arrays with memetic genomes that do not get cued often enough die, while those that do, survive. As in biotic evolution, memetic replication is directly correlated with phenotypic survival, so that only those memes that survive long enough get incorporated into speech or writing acts that can serve as exogenous stimuli for meme replication in other hosts.

CONCLUSION: A COMPLETE REDUCTION

Again, I suggest that we simply appropriate Miranker’s account of the meme to fill the holes in Dennett’s account. Miranker’s memes serve the same dual role as Dennett’s. They are both vehicles of information, and the sources of a postnatally developing computational grammar. Miranker’s account simply provides the physical account of memes that Dennett argued was beyond comprehension. When combined in this way, the Dennett/Miranker model provides the complete physical reduction of social learning theory. And since social learning theory passes the litmus test defined by Scheffler’s normative view of education, so does the Dennett/Miranker model. That it passes this test is certainly not equivalent to claiming that the model should be accepted. Rather, it illustrates that from the perspective of education, the model “works”; that is, what we think should be learned during the process of education can be learned. Sheppard’s problem with the computational

model of mind is that it imposes constraints on the subject that force a particularly barren image of the educated person, one that we know is simply not the case. Education extends beyond the aggregation and efficient processing of information. It involves a fundamental transformation of the individual — a transformation of “perception, sensitivity, alertness, discrimination and disposition.” Yet, as I have suggested, a computational model that incorporates a physically based notion of active content is capable of accounting for just such a transformation.

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1. Shelby Sheppard, “Does Mind Matter? Education and Conceptions of Mind,” *Educational Theory* 51, no. 2 (2001): 243–258.
 2. Israel Scheffler, “The Concept of the Educated Person,” in *Work, Education, and Leadership*, eds. Israel Scheffler and V.A. Howard (New York: Peter Lang, 1995), 83.
 3. Sheppard, “Does Mind Matter?,” 251.
 4. Scheffler, “The Concept of the Educated Person,” 83.
 5. *Ibid.*, 85.
 6. I take the “standard” computational models to be defined by Jerry Fodor’s Language of Thought hypothesis.
 7. In a longer version of this essay, which is unpublished, I address the criticisms of IP offered by Searle that form the basis for Sheppard’s argument.
 8. Scheffler, “The Concept of the Educated Person,” 85. Indeed, I think that IP proponents would define transformative mental development precisely in terms of the increasing complexity of concepts created by active combination and recombination of information. However, I find such an explanation wanting on several counts.
 9. Lev Vygotsky, *Mind In Society* (Cambridge, MA: Harvard University Press, 1978), 86.
 10. Vygotsky defines the “higher” functions as those psychological capabilities that are uniquely human.
 11. *Ibid.*, 90.
 12. Yuri Lotman, “The Text Within the Text,” *PMLA* 109, no. 3 (1994): 377–384.
 13. Richard Dawkins, *The Selfish Gene* (Oxford: Oxford University Press, 1976).
 14. Daniel Dennett, *Consciousness Explained* (Boston: Back Bay Books, 1991), 190.
 15. *Ibid.*, 210.
 16. *Ibid.*, 203.
 17. D. Holdcroft and H. Lewis, “Memes, Minds and Evolution,” *Philosophy* 75, no. 292 (2000): 181.
 18. Dennett, *Consciousness Explained*, 204–205.
 19. *Ibid.*, 37.
 20. Willard Miranker, “Memes and Their Themata,” *American Journal of Psychology* 123, no. 3 (2010): 307–317.
 21. According to Miranker, memes can also be instantiated as speech acts and written material, which is precisely analogous to the three types of meme vehicles proposed by Dennett.
 22. Miranker, “Memes and Their Themata,” 313.
 23. Gerald Edelman, “Naturalizing Consciousness: A Theoretical Framework,” *PNAS* 100, no. 9 (2003): 5520–5524.
 24. Miranker, “Memes and Their Themata,” 310.
 25. *Ibid.*, 310. According to Miranker, this attribution is meant to be taken literally.
 26. *Ibid.*, 312.