Review

Exploring Sfard's Commognitive Framework: A Review of *Thinking as Communicating: Human Development, the Growth of Discourses, and Mathematizing*

Thinking as Communicating: Human Development, the Growth of Discourses, and Mathematizing, (2008). Anna Sfard. New York: Cambridge University Press. 324 pp. ISBN 978-0-521-86737-5. $99.00 (hb).

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Discourse as a medium of learning and instruction has gained tremendous ground among educational researchers and cognitive scientists. Yet earlier notions of cognition as computation have not been reconciled with views of knowing and learning as socially mediated processes. In *Thinking as Communicating: Human Development, the Growth of Discourses, and Mathematizing*, Anna Sfard asks us to re-imagine thinking as communication, with the hopes that this will resolve many of the current dilemmas facing research on thinking in general, and in mathematics education in particular. In doing so, she argues that we should move beyond the metaphor of learning as *acquiring* knowledge—for example, treating knowledge of something like counting as an object that is "held" by the mind and applied when needed—to conceptualizing learning as *participating* in discourse—for instance, participating in a discourse that engages in counting when asked "which box has more?" Sfard begins with five quandaries facing paradigms that treat learning metaphorically as acquisition—such as, if a child "possesses" counting, then why would he or she not count when asked "which box has more?" Sfard then provides a thorough yet accessible review of previous learning paradigms, and lands finally on a redefinition of thinking as internalized communication. To break out of older modes of talking about thinking, she coins the term *commognition* as a mix of cognition and communication. By the end of the book, the new perspective of commognition is offered as a way to avoid the quandaries facing paradigms that treat learning as acquisition.

In proposing commognition as a new paradigm for thinking about thinking, Sfard accomplishes two tasks. First, she addresses topics that have traditionally been *central* to cognition and mathematics education, such as concerns about transfer, the development of numerical thinking, and the process of abstracting from arithmetic to algebra. We found this part of her work highly satisfying because she illustrates the usefulness of the commognitive paradigm in understanding these topics. For example, as stated above, Sfard tackles the question of why a child who can easily count would not do so when asked to compare two sets of objects. She argues that this is a surprising and difficult-to-explain phenomenon when one views numbers as discourse-independent tools and learning as acquiring knowledge about these tools. However, within the commognitive paradigm, such a result is not only understandable but is to be expected. Children first learn each numerical routine independently, and the discursive actions are rigid and socially oriented, as when they use counting primarily to interact with a parent. Only later do they develop flexible uses of the numerical discourse and are they able to switch their purposes of counting from social interactions to enumerating the world.

Sfard's second accomplishment is to point the reader toward the "question of how the wider cultural context influences the development of specific discourses" (p. 289). Although these concerns have been gaining greater prominence over the last 20 years, this topic has traditionally been peripheral to cognition and mathematics education. We found Sfard's treatment of traditionally peripheral topics exciting and forward-looking. A particularly intriguing aspect of Sfard's conception of commognition is that it promises to deal with both the central and peripheral topics in mathematics education in one cohesive framework. If successful, Sfard's proposed paradigm shift would result in the new commognitive discourse subsuming two previous discourses—one that has traditionally reflected the cognitive perspective and another that addresses the sociocultural perspective. This would parallel the historical analysis she presents in the book of the paradigm shift in mathematics that occurred when the discourse of mathematical function subsumed the then independent discourses of algebraic expressions and of lines. In another example of the value of her framework, Sfard questions why some newcomers to mathematics are interested in mathematical discourses, whereas others are not, and why some old-timers are more welcoming to the participation of newcomers than others, arguing that "one cannot answer this query without taking into account the fact that . . . each individual belongs to numerous discourse communities" (p. 288). Although she does not explicitly make the connection, this line of inquiry has implications for questions of equity and diversity in mathematics, many of which center on issues of identity. In the end, she leaves questions about these traditionally peripheral topics largely unresolved. Although doing so raises questions about the ability of her framework to encompass sociocultural issues in learning, it also invites her and others to apply this framework to new questions in the future.

Throughout the book, Sfard relies heavily on excerpts of interviews and classroom exchanges involving elementary-school-aged children. As might be expected, these data are well suited to addressing topics central to mathematics education. As an illustration of the potential of this new framework to bridge the cognitive and sociocultural perspectives, we can see how the commognitive framework can be used to understand issues of transfer and the situatedness of knowledge. Sfard tells us that transfer, for example, the transfer of school mathematics to an everyday setting, requires that one can use school discourse in a way that subsumes everyday discourse. This can only occur if the individual can use the school discourse in which numbers are used in an objectified manner; that is, number words "are being used as signifying intangible entities" (Sfard, 2008, p. 266). In an earlier debate between the cognitivists and the situativists (Anderson, Reder, & Simon, 1996; Cobb & Bowers, 1999; Greeno, 1997), Greeno (1997) framed the cognitivists' question in this way: "Does knowledge transfer between tasks?" (p. 11). Within the commognitive framework, one reconceptualizes the acquisition and transfer of knowledge as one's ability to use numerical discourse in an objectified manner. The commognitive framework can then also address Greeno's situated version of the transfer question, which focuses on proficiency across situations, by emphasizing the individual's ability to use one discourse as though it subsumes another, allowing the individual to participate productively across situations.

Part 1 of Sfard's book takes up thinking and learning in general, although many of her examples are mathematical in nature. She begins with several quandaries facing acquisitionist views of thinking ranging from the challenges with counting discussed above to difficulties in defining understanding. Following this, Sfard's major task is to detail the metaphor of object that she argues pervades all our discourses, not only those about mathematics and learning. She carefully illustrates how we distill *processes*—such as counting a set of objects and ending on the word *five*—into discursively constructed *objects*—such as the number *five*. This act of *objectification* is central to the development of human thought, and she illustrates how mathematics could not progress as a discipline without it. However, when it comes to thinking about thinking, Sfard cautions us that removing the temporality and context of processes hides important details. This obfuscation may lie at the root of the five quandaries that drive Sfard's theory.

After an accessible yet thorough walk through the literature that takes us from behaviorism to participationism, Sfard comes to rest on "*thinking* [as] an individualized version of (interpersonal) communicating" (p. 81). Her notion of commognition, then, emphasizes that she views cognition and interpersonal communication as two sides of the same coin. As an example of commognition, Sfard argues that the symbolic statement $3 + 4 = 7$ is essentially a communicative statement about acts of counting. In other words, we may understand $3 + 4 = 7$ roughly as the following string of statements:

• I have a set and when I count it, I end on the word *three*.
• I have a second set and when I count it, I end on the word *four*.
• If I combine the two sets and count them, I will end on the word *seven*.

Thus, our thinking about $3 + 4 = 7$ is the result of objectified communicative utterances about the process of counting. In a second example, Sfard argues that "instead of saying ***We shall call*** *a polygon a triangle if and only if it has three sides*, we say *A polygon* ***is*** *a triangle if and only if it has three sides*" (italics and boldface type in original, p. 57). Therefore, although what we say appears to be about objects in the world (the properties of triangles), Sfard argues that this is in fact a statement about our own communicative act of defining a triangle.

Sfard's argument in favor of commognition, drawn from her evidence, is compelling. Yet, it is also reasonable to ask whether there is selection bias in the evidence that she brings to bear. One specific concern is that the selected emphasis on communicative exchanges about mathematics might lead her to overgeneralize. For example, mathematics is also conducted spatially, physically, and through other mental processes that may not readily translate to communicative forms. In such cases, there may be a self-fulfilling prophecy that thinking is communication. Conversely, if thinking is axiomatically taken as communication, then we run the risk of ignoring other behavioral measures such as kinesthetic and visual imagery, eye movements, and reaction times as evidence of thinking, especially when they do not appear to be playing a communicative role. Resolving these issues seems valuable to meet the long-term goals of this comprehensive framework.

In Part 2 Sfard turns more explicitly to mathematics and details how the commognitive paradigm explains mathematical activity, thinking, and learning. It is here that Sfard deals most carefully with topics that are traditionally central to mathematics education and draws most heavily on excerpts from interviews and classroom exchanges to illustrate the role of commognition. Sfard places a particular emphasis on the recursive nature of language throughout her book as the primary means of intellectual progress. In this way, language can refer both to objects "in the world" and to discursive objects from language itself. She uses this aspect of language to detail the historical development of mathematical discourses through time in which one discourse subsumes preexisting discourses. This occurred, for example, when mathematicians recognized that statements about algebraic expressions could be translated into equivalent statements about lines in the plane and this subsumed both discourses under the discourse on functions. Sfard describes mathematical practice as particularly focused on discursive statements about its own discourse and identifies this as the primary means by which the field progresses. A focus on statements about discursive objects as opposed to statements about objects "in the world" is what, from Sfard's perspective, separates mathematics from other disciplines.

Routines, which she defines as sets of constraining but flexible rules that govern patterns in discourse, are central to mathematical practice and learning in the commognitive paradigm. Routines are reminiscent of schemes (von Glasersfeld, 1995) in that they consist of applicability conditions, the action taken, and the closing conditions. Sfard argues that the middle component—the action taken, or the *how* of the routine—is generally the most easily learned. It is the *when* of the routine—the applicability and closing conditions—that takes the most time to learn and where profound innovation occurs. Notably, this awareness of the challenge of learning when conditions apply was an important topic among those doing work on information processing and production rules (e.g., Greeno & Simon, 1988). A change in the *when* of a routine can result in the emergence of new discourses, much as we saw previously with the historical evolution of mathematical discourse.

Sfard details three types of routines: deeds, explorations, and rituals. Deeds and explorations are aimed at "extradiscursive reality"—deeds result in changes in the world—whereas explorations, which Sfard considers to be the primary mathematical activity, result in new endorsable statements about reality. Rituals, however, are participated in for social reasons—for example, a young child counting with her parents not because she is curious about the number of blocks in front of her but because she wishes to interact with her parents. Although educators may bemoan rigid rituals, Sfard posits that they are in fact a natural and generally necessary process of mathematical learning. Sfard argues that without engaging in ritual a learner will have little reason to learn or confront new mathematical routines. Through continued use of a ritual, learners come to see how that ritual may vary and thus gradually transform into an exploration. Sfard also argues that "metalevel learning," such as changing the way in which one defines a word or identifies geometric figures, occurs primarily through commognitive conflict, which occurs when one comes into contact with a discourse that is incommensurable with one's own. Generally, due to the power relationships in the classroom, it is the child who is expected to adapt to the teacher's discourse. However, as Sfard indicates, the resolution of *commognitive conflict* is always an act of power that determines what counts as the "official" discourse.

It is not until the end of her book that Sfard takes greater stock of topics that have traditionally been peripheral to mathematics education, such as who is allowed access to mathematics communities of practice and how one's own identity influences one's access. For instance, Sfard raises the argument that "one's participation in mathematical discourse may be informed by this person's experiences as a participant of other discourses" (p. 270). This argument can be extended to insights about the power relationships between participants in different discourses, the relative status of different discourses, and how these status relationships support some over others in entering mathematical discourses in the classroom or workplace. In our view, Sfard misses the opportunity to illustrate the broader utility of the commognitive paradigm in addressing general issues of power and status by relying on child interviews and classroom episodes, which provide a window into only a subset of the range of settings where mathematical talk occurs. Moreover, we believe that the lack of attention to these concerns leads Sfard to ignore a line of reasoning that participation in different discourses is related to issues of race, class, gender, and other markers of difference in our society. For instance, it remains an open question what the commognitive paradigm has to tell us about Tate's (1994) thoughtful analysis of the dissonance between the daily realities of the lives of many African American students and instruction assuming an idealized traditional white middle-class experience. This is unfortunate because we find these concerns could be of central importance to the commognitive paradigm. Sfard seems to agree when she writes that "the more general question of how the wider cultural context influences the development of specific discourses may well become one of the central foci of commognitivists' research in the years to come" (p. 289). Despite these few shortcomings, Sfard lays out an ambitious new agenda for mathematics education and offers the promise of uniting seemingly disparate conceptions of learning under the commognitive framework. We expect that this book will serve as a powerful introduction to thinking of *thinking as communication* to many raised with the acquisitionist metaphor of knowledge and learning.

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