A New Approach to Conceptual Change? … Maybe: A Comment on Amin

I was happy to see Tamer Amin’s [2009] article on conceptual metaphor and conceptual change. His direction is representative of what a number of folks are working on, trying to parlay cognitive linguistics from Lakoff and others into a new tool for thinking about learning. There is so much to learn about the relation of language to conception that I am genuinely hoping for cogent, interesting results from that community. In addition, Amin did a nice job reviewing several literatures. In particular, I am happy, on the whole, with how he portrayed my own work. Unfortunately, I think I’m still waiting for that real ‘spark of life’ that will convince me that the direction is ready to take off. The following issues concern me.

Expression versus Conceptualization

Amin [2009] systematically positions language and linguistic forms as constituting understanding. Relevant terms are that ideas are represented by, understood by, made sense of through language. But I think the relation is more problematic. Any of these expressions could be replaced – I think more properly – with the formulation expressed by. The point is to separate how we talk from how we think. To be sure, language is a part of thinking, but there are demonstrably nonverbal aspects of thinking. Ruling out a priori that the effects discussed in the paper are (nonlinguistic) conceptual, rather than expressive, seems presumptuous – jumping to conclusions without providing necessary support. I found many examples of this pattern. A striking one assimilated the analysis of Feynman’s text with ‘how he thinks about energy,’ rather than how he expresses or explains it. Amin’s formulation hides many important distinctions that need to be
made between the linguistic representation of ideas and their encoding and use. This case is also ironic since Feynman himself argued bluntly that the ideas of physics are actually inconceivable without the specific mathematics that we use in their expression. He is completely clear – and correct in my estimation – that concepts of science are not in any direct sense seen in the words we use.

**Conceptual Resolution**

I think Amin’s work [2009] suffers from a fault that is common but critically ignored in much conceptual change research. Concepts are highly subtle and immensely contextual. To put this in my usual formulation, a phrase or paragraph of text is completely insufficient to characterize a concept. So, what should we make of a formulation in the paper such as 'energy as an "ingredient," the release of which can be "triggered" somehow' (p. 176)? I find almost nothing characteristic of energy at all in this formulation, certainly not enough to have defined a meaning a child might have. Beyond ambiguity of meaning, many, many studies show, for example, students thinking of force (one of my main research foci) in one way, and then changing to a very different way with a change of context, or even just a shift of attention. Even if we refined each of the listed meanings, we still do not know much about which contexts they will be used in. In the kind of work that I do, my colleagues and I take on the obligation of saying much, much more about the ideas themselves, and then, also, as precisely as we can, we talk about when students think in that way, and when they think in different ways. Using what I know, I can regularly make students switch modes just by deliberately shifting their attention. Until cognitive linguistic studies get to that kind of nuance, I will treat their descriptions of concepts as coding categories – and rough ones at that – rather than true descriptions of knowledge.

Let me elaborate this very important issue. Above, I asserted that the level of detail in conceptual explication concerning naïve ideas is generally too coarse. But, on the expert end, the paper also does not really come very close to describing important elements of the scientific understanding of energy. As a token example, it does not note that energy depends on the frame of
reference. As a consequence, we have no idea in how many ways novices can misconstrue and partially appropriate ideas. How much of this can be captured in brief linguistic forms? I think very little. But the paper does not even get to the issue, let alone provide a convincing case that its descriptions are good enough (see diSessa, Gillespie, and Esterly [2004] concerning ‘specification of the concept of force’ for what a more adequate treatment might look like). We show that many studies, like those Amin cited in support of his work, are much too limited in breadth to cover the meaning of concepts.

Beyond coverage and nuance concerning conceptual description, another issue looms: importance. Amin [2009] goes on at length on aspects of energy that are plausibly captured by image schemas and conceptual metaphor. But are they important aspects, or are they only aspects that everyone gets correct in the learning process? I happen to think they are systematically some of the simplest components. I could be wrong, but the issue is not addressed. Finally, as an intuition pump, consider how much one really knows about Argument by likening it to War (one of the examples in the paper). My claim is ‘not much.’ There are a huge range of things to know about argumentation forms, reliability of different kinds of arguments, and so on, that are not captured by the metaphor. Nothing in the War metaphor is particularly specious or ad hominem. Amin would like to think that gluing together a few such metaphors will do the work. But I am very skeptical. Concepts, especially technical ones like force and energy, entail a huge range of specifics far beyond the reach of even several metaphors. In this note, I can only assert, but I believe that any technical concept clearly surpasses any metaphorical (or multimetaphorical) structure in sui generis concept-specific constructions.

A good general reference on the issue of conceptual resolution, coverage, and importance is diSessa [2008]. Some of the nuance and contextuality in description that I feel is obligatory is shown in diSessa and Sherin [1998] and in Wagner [2006].
Empirical Weaknesses

Amin’s paper [2009] is not primarily empirical, but what it does empirically is limited. One ‘result’ that is highlighted and repeated several times is that the language that children hear is likely the source for their ideas about energy. The contention is plausible, but there is really no data on this. Instead, what is demonstrated is that common adult language uses schematizations similar to what children appear to have. Here’s the ambiguity. If children get some basic ideas about energy from whatever source, then as adults, they will have them. So, adult talk will reflect that. Amin only ruled out one way of refuting the causality he proposes: adult language contains ideas similar to children’s ideas. He does not in any way make a direct argument that it does, or rule out any competitors, such as that the roots are nonlinguistic.

There are many unanswered questions and many avenues that should be pursued concerning this claim. A major issue is that children’s intuitive physics is demonstrably a long, slow development. So, with adults talking energy constantly, why does it take so long and what accounts for the particular trajectory taken by children? See diSessa et al. [2004] for some detail with respect to the concept force. With better conceptual resolution than Amin provides, the problem of unanswered and undermining question will get much worse. In this regard, local study of exactly what adults actually say to children (which, before they can read, is a far better proxy for ‘linguistic contact’ with energy ideas than textual analysis) would be a better methodological option. There is a growing literature in this mode, and Maureen Callanan is a good representative researcher.

Overclaims

Many of the items in charts concerning the analyses of linguistic structure and energy have precisely little to do with energy. ‘Up means more’ concerns any quantity whatsoever, so it cannot tell us anything distinctive about energy. The part/whole structure is also shared by ‘stuff’ (like sand or apples), length, and other quantities. So, that, too, does not get to anything distinctive about energy. The spatial/topological points are just a bit more specific, but still do not get to anything particularly energy-specific. Thus, Amin is repeating known results from cognitive linguistics with
little, if anything, particular to the concept of energy. As mentioned, these might also be the aspects about energy that everybody gets; even if the cognitive linguistic story is correct, it may not help us at all with what is really difficult – and distinctive – about energy.

**Conceptual Muddles**

There are many little examples of muddled descriptions of concepts. Each, alone, is not a big deal. But together, they undermine my confidence in Amin’s (rather unspecified) empirical analysis techniques, and also in his judgment about what a concept is. A tiny example: Amin mentioned that Feynman had said ‘There is no concrete mechanism whereby the conservation of energy can be understood’ [Amin, 2009, p. 182]. But, Feynman literally said, ‘It [conservation of energy] is not a description of a mechanism’ [Feynman, Leighton, & Sands, 1963, p. 41], not that there is no mechanism that explains it. He actually made a different point about the nature of energy, rather than its explanation. Energy conservation is not a mechanism, as \( F = ma \) is; mechanisms give a means for predicting what will happen, rather than just constraining, like energy. A ball standing in mid air without falling conserves energy! Another ‘little’ muddle that may be more substantial, is that Amin uses the term *literal* to describe some construals of energy. I think this is a category error. *Literal* applies to sentences, and it has been contested as a coherent term of use even there. I can perhaps imagine it applying to lexicon, per se, but to something as complicated as a technical scientific concept, it just does not work for me.

**What Is the Differential Value of His Claims?**

This last point may be slightly specific to my personal view on conceptual change, or to others ‘in the vicinity.’ Unlike some other theoretical points of view, several of his main points are already agreed to and elaborated in my own view. That intuitive knowledge is often much more abstract than most think – and therefore much better fodder for incorporation into scientific learning – is a lynchpin of my own ideas. In addition, the relevance of domain-general ideas and the importation from nonphysical domains are commonplace ideas in my own view. So I do not need
linguistic image schemas to get there. The particular things he seems to be trying to tell me that I do not already believe, I still find doubtful.

**Bottom Line**

I am happy – even anxious – for those who are convinced of the value of cognitive linguistics with respect to conceptual change and learning to pursue their work. I hope my list of skepticisms can set some useful directions for future work, at least if that community wants to convince me. For those who are, like myself, unconvinced so far, I do not see that Amin has made us reconsider. I am not unfriendly, but I am still skeptical.

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**References**


Situating Conceptual Metaphor’s Contribution to Conceptual Change

In this letter I would like to address three responses to my paper ‘Conceptual metaphor meets conceptual change’ [Amin, 2009]: the published commentary by Stella Vosniadou [2009] and two Letters to the Editor sent by Maria Varelas and Justine Kane [2009], and by Andrea diSessa [2009]. Vosniadou’s commentary focused primarily on situating my account with respect to existing views on conceptual change, including her own and that of Andrea diSessa. Varelas and Kane devoted their letter to pointing out what they see to be the limited extent to which language is theorized in my attempt to connect research on conceptual metaphor and conceptual change. The points raised in these two responses suggest that the authors accept as plausible the central hypothesis that metaphorical expressions, which reflect systematic experientially grounded conceptual metaphors, might be an important source of conceptual change. However, both responses indicate to me that I must make clearer various aspects of my account and what future research is implied by it. diSessa was less convinced and expressed considerable skepticism about the value of my approach. Here, too, part of my response will be to clarify what my specific objectives were and point to the need for further research to address. In addition, I defend my claims regarding the potential contribution of conceptual metaphor analysis for characterizing conceptual understanding and the role of language in shaping children’s naïve understanding. Finally, I felt that clarifications were needed regarding how the relationship between language and conceptualization is understood in cognitive linguistics. Fundamental differences in such basic issues will have to be bridged if a convincing case is to be made for the potential contributions of conceptual metaphor, specifically, and cognitive linguistics, more generally, to understanding conceptual change.

Vosniadou [2009] begins her commentary by providing a concise and accurate summary of the argument put forward in my paper. The bulk of her commentary then turns to a discussion of the relation between my view and others in the literature. Her discussion begins by suggesting that I argue that my ‘analysis supports the knowledge-in-pieces position advanced by diSessa [1988, 1993] and his colleagues in conceptual change research, over the theory change point of view
supported by Carey [1985, 1999] and her colleagues’ (p. 199). Vosniadou goes on to point out that while my position does share with the knowledge-in-pieces view the assumption that abstract concepts are grounded in experiential gestalts, there are a number of ways in which the accounts differ. I found her gloss of my position as supporting the knowledge-in-pieces position over the theory change view a bit too categorical, as I do address some of the differences between the view I present and the knowledge-in-pieces view, including an agnosticism with respect to the issue of fragmentation versus conference. My discussion of these issues was brief, however, and Vosniadou’s commentary, in discussing them at some length, presented the similarities and differences between my position and others in somewhat sharper relief. While on the whole I agree with many of her points, I find that I need to make some clarifications of my argument and highlight the need for further research to explore implications of the conceptual metaphor perspective for an account of conceptual change.

Vosniadou [2009] mentioned three main differences between the position I put forward, with the accompanying results of the conceptual metaphor analysis of energy I presented, and diSessa’s knowledge-in-pieces view: (a) my account posits a more substantial role for language and culture in the construal of experience and the formation of naïve understanding; (b) my account (following the claims of cognitive linguists) extends diSessa’s view of the embodied basis of abstract scientific concepts in positing a substantial role for language in shaping, via metaphor, the experiential grounding of such concepts, and (c) my account does not imply that naïve knowledge is fragmented and, in fact, the findings from the conceptual metaphor analysis of energy suggest a certain degree of coherence; moreover, the greater variety of metaphors reflected in the scientific usage of energy does not suggest greater coherence in the expert conceptual system.

I will not comment on the first two points, but will simply say that emphasizing the role of language, via metaphor, in shaping both naïve and scientific concepts, was indeed the central objective of my paper. Vosniadou’s [2009] discussion helped highlight key features of this aspect of my argument, which I see as most clearly contrasting my account with that of diSessa’s, a theme
which is addressed in the first main section of my paper, ‘The search for sources of conceptual change.’

With regard to the third point, the issue of fragmentation versus coherence, I would like to make some qualifications. It is true that I claimed that the conceptual metaphor analysis revealed that the majority of the metaphorical expressions in lay usage do reflect either a material resource schema or the Object Event Structure Metaphor. I also cited Jean Mandler’s [2004] work on infant conceptual development to point out that grounding an understanding of a concept in multiple-image schemas does not necessarily imply a lack of coherence in the conceptual system. However, I also cautioned that ‘to the extent that multiple construals structure the understanding of a concept, the extent and depth of coherence needs to be empirically demonstrated by investigating whether a set of mutually consistent inferences are generated by the user of the metaphors’ [Amin, 2009, p. 190]. Conversely, while it is true that I identified a larger set of metaphors in scientific compared to lay usage, I do not take that as implying less coherence in scientific understanding. My discussion [Amin, 2009, pp. 187–188] of Lakoff and Johnson’s [1980] view of how coherence can arise at the level of the inferences generated despite the use of multiple metaphors to understand a concept addressed this issue. So, overall, while I argued in the paper for the value of conceptual metaphor analysis to reveal potentially important (and not intuitively relevant) aspects of conceptual understanding in some domain, both in the layperson and the scientist, I do believe that careful problem-solving protocol analysis needs to be done to identify the role that they play (and hence the extent of fragmentation versus coherence) in reasoning and problem solving. An investigation I am currently undertaking with a graduate student, Bassem Malek, is aimed at identifying the role of metaphorical construals in the reasoning and problem solving of novices and experts when tackling problems implicating the concept of energy.

In sum then, as Vosniadou [2009] clarified, the central point of overlap between my position and that of diSessa is in the assumption of the embodied basis of conceptual understanding. But while language-based conceptual metaphors may turn out to be a source of some coherence in
naïve understanding, I am noncommittal with regard to the issue of fragmentation versus coherence in reasoning and problem solving at this early stage in the development of this work. And finally, I agree that a key difference between my position and that of diSessa’s is in the claim regarding the role of language in shaping the content of naïve and scientific concepts.

It is this latter issue of the role of language that Maria Varelas and Justine Kane focused on in their Letter to the Editor ‘Language undertheorized: conceptual metaphor and conceptual change’ [2009, May] commenting on my paper. Varelas and Kane reported that while they find my analyses from a conceptual metaphor perspective useful in that they identify similarities in everyday and scientific language, their comment focused on highlighting the limitations of such analyses in that they do not attend to differences, especially in the dialogic context of classrooms. Their comment is formulated from a sociocultural, discursive perspective on learning, citing contributions from theorists such as Bakhtin, Bourdieu, Lemke, Vygotsky, and Wertsch. The authors’ critique can be summed up as follows.

By simply examining isolated sentences in my conceptual metaphor analysis I missed the contextual and social dimensions of language use that are critical to communicative contexts like labs and classrooms. Specifically, the meanings of elements of language are not transparent but are interpreted by interlocutors in, and with respect to, particular contexts of use (e.g., everyday vs. scientific contexts). And since every participant brings their own contextual framing to a particular communicative situation, in understanding language use we need to be aware not only of intersubjectivity and the meeting of minds, but also contrasting perspectives and voices. Moreover, given the challenge of attaining intersubjectivity, linguistic meaning needs to be seen dynamically, changing subtly in response to the specificities of particular communicative situations. In addition, communicative encounters are not immune from issues of power, value, and privilege, since some voices may be more valued and privileged than others. Finally, one key difference between the contexts of everyday and scientific language is the systematicity and hierarchy that characterizes the relationships between meanings in scientific discourse. This is an important difference that
identifying conceptual metaphors and continuity between everyday and scientific understanding does not address.

My response to this critique is not to deny the value of this broad theoretical framing of the nature of language use. On the contrary, I share these broad tenets and consider them very important to guiding theorizing about the role of language in the learning process, including concept learning. However, my goal in this paper was much more specific. I sought to make the case that a particular aspect of language, metaphorical expressions that reflect underlying conceptual metaphors, are worth examining if we want to understand the contribution of language to conceptual change. Moreover, I was particularly interested in the relevance of conceptual metaphor for conceptual change in the very narrow sense of changes in concepts, not simply beliefs that express different relationships between concepts [Carey, 1999]. Given this latter point of focus, broad constructs about the nature of language use such as contextual framing and heteroglossia do not tell us how language might provide the learner with clues to the content of new concepts. My conceptual metaphor analyses were not presented as providing an exhaustive account of the process of communication but rather as part of an argument to justify examining the appropriation of verbal metaphor in real communicative contexts. Indeed, in my paper I mentioned existing attempts to bridge conceptual change and discursive approaches to concept learning but noted that ‘what these attempts have not done is identify the particular linguistic elements that are the sites of meaning negotiation most relevant to conceptual change in particular domains’ [Amin, 2009, p. 191].

Given my specific objectives, I actually found encouraging what Varelas and Kane [2009] treated as limitations of the conceptual metaphor analyses I presented. For what they pointed out as limitations, I interpreted as their acceptance of the relevance of verbal metaphors as sites of meaning negotiation worth examining if we are to understand conceptual change. They mentioned the need: (a) to understand the fate of conceptual metaphors realized in language in student-teacher interactions in classroom settings; (b) to recognize and try to understand the ‘different forms and functions that conceptual metaphors could have during interactions among learners and
more knowledgeable discourse participants’ (p. 4), and (c) to understand the role of language in helping organize and synthesize the various experiential gestalts that ground understanding of a concept. In fact, I would consider research that addressed these issues to be a necessary follow-up to the argument that I have made and very important tests of the hypothesis put forward.

While Varelas and Kane [2009] found that I undertheorized the role of language in thinking and learning, in diSessa’s [2009] view I granted language too much of a role, at least when it comes to the role of conceptual metaphor. I begin by considering the more empirical aspects of his critique and conclude by making some clarifications of some key theoretical commitments of cognitive linguistics that I believe may address his more fundamental concerns with the perspective I adopt in the paper.

First, diSessa [2009] suggested that my approach is limited in a way that is common in conceptual change research – namely, that I am simply formulating the content of some conceptualizations but do not provide any information about the contexts within which particular conceptualizations are used and the subtle influences that these contexts have on what conceptualizations are applied. diSessa pointed out that his own work and that of colleagues working within a similar perspective have been careful in characterizing such contextual influences. He summed up his skepticism toward the contribution of conceptual metaphor by saying that ‘until cognitive linguistic studies get to that kind of nuance, I will treat their descriptions of concepts as coding categories – and rough ones at that – rather than true descriptions of knowledge’.

This critique attributed more than was intended to the objectives of my conceptual metaphor analysis. I was careful to point out (as I clarified above in my response to Vosniadou) that while conceptual metaphor analysis of the kind that I presented helps identify potentially relevant image-schematic gestalts in some domain, other methods, such as reasoning and problem-solving protocol analysis of the kind that diSessa and others employ, are needed to characterize details of the application of these gestalts. So if diSessa is convinced enough of the analyses to treat them as ‘coding categories’ when doing protocol analyses then one of my main objectives has been met.
diSessa's [2009] critique of the value of conceptual metaphor analysis for characterizing conceptual understanding continues, however, suggesting that the metaphorical construals identified are not likely to be sufficiently important. He questions the importance of the conceptual metaphors I identified in characterizing the naïve and scientific concepts of energy and suggests that the metaphorical construal of quantity in terms of a vertical scale and spatial and part-whole gestalts do not have much to do with the scientific concept of energy. diSessa is making a broader point here, for he also questions more generally the strategy of using the identification of conceptual metaphors for characterizing concepts. He questions the value of the classic example discussed by Lakoff and Johnson [1980], Argument Is War, as a contribution to a characterization of the concept of argument.

Of course, the degree of importance of such metaphors will have to be demonstrated empirically in further work, as already noted, but there are good reasons to think that such an empirical endeavor is worthwhile. First, as Lakoff and Johnson [1980, 1999] and other researchers on conceptual metaphor repeatedly pointed out to skeptics, the finding that vast collections of metaphorical expressions can be systematically organized in terms of coherent mappings between conceptual domains needs to be explained. Texts, such as Feynman's Lectures [Feynman, Leighton, & Sands, 1963], are a vast repository of linguistic data. If patterns can be identified in these data that can be accounted for by positing conceptual metaphors, this constitutes valuable empirical support for the relevance of these metaphors to conceptual understanding. Second, evidence for the importance of such metaphors can be implicitly found in research on conceptual change itself. The success of instructional interventions that have used analogical (spatial) visual representations to induce conceptual change [e.g., Wiser & Amin, 2002, on differentiating heat and temperature] provides indirect evidence that certain spatial gestalts come to play a role in students’ scientific understanding, crucially, in domains where spatial relations are only analogically relevant to the domain involved.

diSessa [2009] was also not convinced of my claim that the construals I identified in the analysis of lay uses of the word energy provide support for the claim that language is the source of
children’s naïve conceptions of energy. I made this claim based on noting similarities between the language-based construals identified in my analysis and the naïve conceptions reported in the science education literature. diSessa points out that I do not consider alternatives to language as possible sources of children’s ideas about energy, such as the possibility that ‘the roots are nonlinguistic’. Indeed, I did not consider alternatives, but this was due to the absence of specific alternative proposals in the literature on learning the concept of energy. As I clarified in the paper, when sources have been considered, there have been quick suggestions that everyday discourse is the source of naïve ideas without elaboration. Rhetorically, my argument was geared to showing how, specifically, everyday discourse could be seen as the source of children’s naïve conceptions. I would be very interested to see and evaluate an account that does not appeal to language. In addition, in evaluating the substance of my proposal, diSessa suggested that there is ambiguity in the empirical finding that children’s conceptions and adult language are similar. He stated: ‘If children get some basic ideas about energy from whatever source, then as adults, they will have them. So, adult talk will reflect that’. If one accepts this line of reasoning, then indeed finding similar content in language-based construals and children’s conceptions is not a very substantive claim. However, I do not agree with the reasoning. The conceptual development literature is full of examples of differences between the concepts of adults and children – concepts of living things [Carey, 1985, 1999] and the earth [Vosniadou & Brewer, 1992] are just two prominent examples. Therefore, to identify a fairly exhaustive parallel between children’s conceptions and adult language-based construals is to provide substantive (though, of course, not conclusive) evidence for everyday discourse as the source of children’s conceptions. In addition, I would point out that when child and adult concepts have been found to differ in the literature, it is often because the sources of children’s ideas seem to be either innate constraints or early experiences not mediated by language (or, of course, a combination of both, which is typically the case). To me, this lends further substance and, indeed greater plausibility, to my hypothesis that language-based construals are the main source of the child’s concept of energy.
Finally, I would like to suggest that diSessa’s skepticism towards the contributions of cognitive linguistics to theories of conceptual change may derive from the way in which he interprets how the relation between language and conceptualization is understood in cognitive linguistics. diSessa questions my view that, in his formulation, ‘positions language and linguistic forms as constituting understanding’ and prefers the view that ideas are ‘expressed by’ language. Thus, he prefers that we ‘separate how we talk from how we think’ and while granting that ‘language is a part of thinking’ insists that there are ‘nonverbal aspects of thinking’. It is not likely to be very productive to infer, based on these brief quotes, diSessa’s view of the relations between language and nonlinguistic thought. Moreover, this is not the forum for an extended discussion on this issue. However, diSessa seems to be equating language and linguistic forms and this seems to be the basis for his insistence that we separate language and nonverbal aspects of thinking. Therefore, I would like to conclude this letter by stating very briefly three key tenets guiding research in cognitive linguistics that may help avoid some miscommunication regarding these themes.

First, in cognitive linguistics there is a commitment to a two-level account of language, where phonological (i.e., material) structures are treated as triggers that evoke conceptual structures at various degrees of generality and invite perspective taking with respect to these structures. Crucially, there is no intermediate formal, propositional layer of representation. Second, conceptual structure and perspective taking are understood in embodied terms – that is, conceptual understanding is grounded in abstractions from sensorimotor experience and perspective taking is often found to involve imagistic simulations of various kinds. Thus, conceptual structures and perspective taking are nonpropositional structures and processes but are triggered by linguistic forms. Third, assembling linguistic forms for the purpose of communication (or understanding linguistic constructions or stretches of discourse) is a problem-solving process, involving mappings and projections between conceptual structures often involving emergent meaning and inference. Together these three features mean that adopting a cognitive linguistic perspective on language is to view linguistic forms (as well as constructions and extended stretches of discourse) as material
triggers for complex meaning integration processes that are nonpropositional in nature. And while these triggers and integration processes have sufficiently conventional elements to allow communication to occur, creative meaning construction is seen as a central characteristic of language use.

In light of these tenets, it becomes ambiguous to speak of language: do we mean the phonologically realized forms only, or the whole process of using these forms to trigger conceptual structures, perspective taking, conceptual mappings, and so on. Under the restricted use of the term, it certainly cannot be seen as constitutive of understanding; however, under the broader usage it certainly can, at least vast portions of human understanding.

I hope that these points have made at least a small dent in diSessa’s skepticism. Much more empirical research and theoretical clarification will of course be needed, but diSessa’s concerns help clarify some of what still needs to be done.

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References


