Reconceptualizing Educational Psychology:
A Pragmatic Approach to Developments in Cognitive Science

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The locus of the mind is not in the individual. Mental processes are fragments of the complex conduct of the individual in and on his environment.[1]

PROLOGUE

This paper responds to and hopes to continue the conversation begun by Eric Bredo's plenary presentation at the 1994 Philosophy of Education Conference in Charlotte, North Carolina. In that forum Dr. Bredo argued that education would benefit from "reconstructing educational psychology" by substituting situated perspectives (including pragmatism, situated cognition, and activity theory) for the symbol processing view of cognition. We will argue that this is only half of the movement necessary to reconceptualize educational psychology. We understand situated cognition as answering the need for a non-dualistic conception of knowledge, but by this very token, it is unable to provide a basis for understanding the learning of the individual-in-action that education also requires. Educational psychology is not properly about knowledge, but about learning; a successful understanding of knowledge does not directly aid this enterprise.

The present inquiry is guided by a pragmatic commitment to education as a human practice -- that is, it is aimed at providing a framework within which our problem-solving habits may become more adequate to the task of education.

DEPARTURE

We take as our point of departure a claim made by Bredo near the end of his paper where he remarks that "the difficulties with the approach [symbol processing] would all vanish if it were seen, once again, as simply an attempt to model human capacities on the computer."[2]

The difficulties with the symbol processing approach, on the basis of our analysis, *cannot* be made to vanish if it is treated as "simply" a tool. As will be explored below, a tool cannot be so easily disassociated from the ontological assumptions that make its use sensible -- and in this case those assumptions are at war with the situated position that we, with Bredo, wish to adopt. We are particularly concerned with Bredo's, perhaps casual and conciliatory, remark because, on our analysis, situated perspectives are theories of knowledge, and by allowing symbol processing to be the implementation method for modeling situated knowledge one implicitly reinstates formal logic as a model of *learning*. Changing our model of knowledge without changing our model of learning will not enable the sorts of changes we seek in educational practice.

THE PRESUMED OBJECTIVITY OF THE SYMBOL PROCESSING APPROACH

The idea that tools are *not* assumption-free objects is relatively well-established in the literature. Most dramatically, Kuhn's analysis of paradigmatic shifts rests, in part, on his understanding of the practices associated with the use of the telescope.[3] In Kuhn's, view the development of the telescope was central to the acceptance of solar-centric alternatives to Ptolemaic understandings. What was made evident with the use of the telescope was that the planets, by revealing a discernible disc to the

telescopic gaze, revealed themselves to be of a dramatically different "type" than the visually similar stars. This activity isolated solar bodies from stellar ones and made explanations which applied only to the solar category conceptually compelling. The telescope, in short, made possible -- in a sense, compelled -- a different ontology, with different assumptions about what constituted the basic categories of the universe.

Symbolic approaches to thought as discussed in cognitive science, and as inherited from a long line of Western philosophy, carry with them fundamental assumptions that align such symbols within a matrix of deductive logics, geometry and the syllogistic structures formalized by Aristotle. Two of these are: the nature of categories and a serial, linear order of operations. These assumptions are not, we contend, compatible with what we, following Bredo, will call "situated approaches."

SYMBOL-PROCESSING IS NOT A MODEL OF HUMAN LEARNING

As a wide range of commentators have remarked, from both within and outside the perspective, symbol processing, built as it is on a model of geometric logic, is not a model of learning.[4] Rather, it is better conceived of as an idealization of knowledge and its validation, according to the traditional standards of deductive logic and self-evident assumptions. As this approach is exemplified in the field of artificial intelligence, it is a distinctly structuralist approach to determining the proper form of knowledge, of representation, and of determining the most efficient means of transferring that knowledge.

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But we, following the pragmatists, cannot presuppose logical representation.[5] A type of representation which will satisfy the assumptions of formal logic must produce categories which are distinct and well-defined; that is, anything can be reliably said to be, in all situations, either in or out of the category. Unless this constraint can be satisfied, logical operations will produce contradictory results. This separability has traditionally been established by reference to the doctrine of necessary and sufficient features -- an object is classified as a member of a category by the possession of the requisite features.

Human categories, the sorts of categories people base their day-to-day activities upon, are radically unlike logical categories; any theories which presuppose them should be judged as inadequate to form the basis of a distinctively human theory of knowledge.

A broader, more human, approach to categories is hardly a new position; it has been argued at length by others in the traditions we are most interested in exploring in relation to developing a situated approach to learning and knowledge.

The classic demonstration, used by Dewey and later by Wittgenstein concerns the human category of "chair." As their discussion demonstrates, the work-a-day human categories upon which our activity is based cannot be adequately modeled by any categories that assume stability and separability -- nor even by essentially functionalist reasoning. Rather, the meaning of the term"'chair" changes with both the context of its use and the human purposes which are currently at stake. The rigidity of logical categories makes them constitutionally unable to model the categories that people actually use to mediate their relations to others and the world. As the Viennese architect and Wittgenstein's colleague, Adolph Loos, insisted in his critique of Viennese aesthetic orthodoxy, an object's use is a reflection of life in a culture: "We do not sit in such-and-such a way, because a table maker has built a chair in such-and-such a way; rather the table maker makes the chair as he does because someone wants to sit in it that way."[6]

The "discovery" of experience-based, malleable categories is not limited to philosophical approaches to cognition. The project of reconceptualizing educational psychology can also learn from the prototype model advanced by Eleanor Rorsch and those who have extended and modified

her work such as George Lakoff and Mark Johnson. Rorsch's account of categories in more recent formulations eliminates the central, definitive image and substitutes a much more context-dependent and "poorly bounded" understanding of categories.[7]

SITUATED COGNITION IS A MODEL OF HUMAN KNOWLEDGE

In their current state, situated theories such as those advocated by Lave, Walkerdine, and Brown, Duguid and Collins[8] are all theories of knowledge -- they speculate on the conditions under which knowledge is acquired and upon the nature of that knowledge. In this one way they join their critics by referring to descriptive theories of knowledge acquisition as theories of learning. They confound a static theory of knowledge with a theory of the process of change that is learning's more useful referent. In their reaction to the inadequacies of an epistemology that focused its entire attention on sovereign individuals, situated theorists have insisted on the necessarily social nature of knowledge, to the exclusion of a consideration of the individual acting across contexts. While we are very sympathetic to the analysis of *knowledge* implied by situated cognition, and related analyses of knowledge advanced by the pragmatists and by phenomenologists such as Wittgenstein, we are also sensitive to the profound hostility to "psychologizing" exhibited by many of those just cited. These theorists are concerned with socially-grounded *continuities* between actors, and often view individualistic claims as being in conflict with the basic trend of their work. The work of Dewey and Mead comes closest to refusing this dichotomy, and the educator may conclude that their more nuanced presentation is due to a sustained, distinctly pragmatic interest in education which makes it difficult to dismiss the role of agency in human learning.[9]

Western, formal education has been historically understood to be about learning something in one context that will be useful in another. Its implicit assumption is that this transfer is possible, and also that it is *more* effective to teach certain sorts of valuable knowledges outside of the domain of their use. As a historical matter, Enlightenment institutions of schooling arose, not only to present decontextualized knowledge, but also, quite deliberately, to present *decontextualizing* knowledge. That is, schooling was intended to help the individual break away from the stifling constraints of the local communities -- in particular the constraints of church and the craft master -- and to make a broader set of liberatory knowledge available.

If situated approaches are implicitly hostile to this Enlightenment vision of the purposes of knowledge, then educators who participate in the liberatory tradition of enlightenment education are deservedly wary of understanding situated cognition as a theory relevant to the needs of education.

More immediately, the daily task of educators focuses less on the similarities between the induction of social actors into a community of practice, and more on the differences between students and the differences within a student over time. A distinctly psychological perspective is needed for this task . However valuable a more adequate theory of knowledge is -- and we reiterate that we consider it very valuable -- it cannot alone be the foundation for a more adequate framework within which to understand instruction.

WITTGENSTEIN'S PRAGMATIC PHILOSOPHY OF COGNITION

Philosophers who have focused on explicating a theory of knowledge that places experience in the foreground have been notoriously misinterpreted. The educational community is certainly familiar with misappropriations of Dewey's work that reinstanciate a division between what is learned and the activity of learning. G. H. Mead's social interactionism suffered an even more dramatic reversal which assimilated his dynamic account to a static structuralism from which it has yet to recover. But the more ironic, and less appreciated case is that of Wittgenstein.[10]

Traditionally, Ludwig Wittgenstein's *Tractatus* has been understood as the corner-stone for logical positivism/empiricism which made logic and scientific knowledge the descriptive metaphor for how rational humans think. For most of this century, analytical philosophers saw Wittgenstein's "picture

theory" of knowledge representation as a direct extension of Bertrand Russell's and Gotlieb Frege's prepositional calculus, and in support of Ernst Mach's anti-metaphysical critique of science. In Wittgenstein's "atomic facts," these philosophers saw a marriage of symbolic calculus with sense impressions, which provided them with the most complete epistemological guarantees to date. These guarantees were based upon an understanding that the propositional calculus of the *Tractatus* provided a direct or ostensive definition that logically anchored formal axiomatic language to the facts -- as sense data -- about the world it represented.[11]

Wittgenstein believed, to the contrary, that philosophy is the art of seeing connections in the world as a synoptic presentation -- an active piecing together of what we have come to know. A thought, for Wittgenstein, was represented as an immediate presentation (or re-presentation) of an immediate experience. Crucial to understanding Wittgenstein's philosophy is an understanding of his sense of representation through his use of the German word *Darstellung* rather than *Vorstellung* to explain how thought is represented. Both in his *Tractatus* and *Philosophical Investigations*, *Darstellung* is used to describe a more active or generative sense of representation as opposed to the more passive *Vorstellung*, which had been used by Kant to describe knowledge.[12]

The logical process that represents thought in the *Tractatus*, rather than being presented as a formal method, is discussed in active and constructive terms. What Wittgenstein was interested in doing in his *Tractatus* was to show the process of how a thought is configured, not of what the ideal symbols of thought might be made. A thought, "a logical picture of facts," is the sense we have of a particular configuration of objects from the contingent multiplicities that make up the possible relationships inherent in a state of affairs.[13] Only objects (things) are "unalterable and subsistent"; their configuration -- that which "produces states of affairs…is [however] changing and unstable."[14] The meaning or sense that a fact may posses cannot exist a priori to its configuration. Therefore, a thought cannot be a merely passive mental image or formal symbol of some a priori ideal (this would be *Vorstellung*) that we receive from the outside as sense impressions, but rather, is a projection of a model of reality that we produce -- an artifact -- as an artist paints a picture.[15]

"As a projection of a possible situation ," a thought finds expression in a proposition that, as Wittgenstein argues, "constructs a world with the help of a logical scaffolding, so that one can actually see from the proposition how everything stands logically."[16] It is the logical scaffolding or logical architecture -- the configuration of the picture-model -- that determines the logical space through which a proposition -- a thought -- is projected.[17]

For Wittgenstein, philosophy (and, therefore, logic) is an activity, not a body of doctrine, that seeks to clarify how thought is constructed. Philosophy should not be concerned with a theory of knowledge but with explaining how knowledge occurs. Questions of epistemology, he insisted, belonged to the philosophy of psychology.[18] Wittgenstein's philosophy provides a sense of logic that is contingent and pragmatic. The *Tractatus*, more properly understood, provides an explanation that thought is an active construction of what is possible in the world. In so doing, it provides an anti-epistemology of the kind that helps to begin answering that important educational question: How do we come to know?

It was through this attempt to show how thought is constructed as a *bildliche Darstellung*, a modeling of the possible connections inherent in the sense a proposition projects, that links the Wittgenstein of the *Tractatus* to Wittgenstein's later philosophy. What Wittgenstein apparently did in his move from the *Tractatus* to the *Philosophical Investigations* was to eliminate abstract logical forms [the metaphor of logical scaffolding] as the basis for meaning.[19] Instead, the later Wittgenstein attempted to show how thought is constructed through the concrete features and practices of everyday living. The process of synoptic presentation, *ubersichliche Darstellung*, "produces just that understanding which consists in 'seeing connections.'"[20] Presented synoptically, thought, consisting of our material practices and habits of immediate living, is rooted in the various "forms of life" that make up the world.[21]

What Wittgenstein's later philosophy showed was that how people come to know emerges from the immediate activities in which they are engaged. These practices -- the way people build shelters, construct roads, plow the land, or, in particular, use language (which he calls language-games) -- are the ways people go about shaping the world and are shaped by it. A language-game consists "of the language and the actions into which it is woven."[22] Therefore, he insists, to imagine a language means to imagine a form of life.[23]

As Wittgenstein shows in his later philosophy, learning is connected to the immediate moment and to immediate practices -- ways of doing and the tools we use to do it. "Try not to think of understanding as a 'mental process' at all."[24] Instead, understanding and, therefore, learning, is tied to the immediate circumstances in which the process occurs. Rather than being a "mental state," understanding is a material apperceptive process intimately linked to a form of life. As Wittgenstein argued, "By being educated in a technique, we are also educated to have a way of looking which is just as firmly rooted as that technique."[25]

This sense of understanding as an immediate, material condition can best be seen in Wittgenstein's explanation of family resemblances in category formation. He argued that we group our experiences into categories of "family resemblances." "And the result of examining this is: we see a complicated network of similarities overlapping and criss-crossing: sometimes overall similarities, sometimes similarities of detail."[26] This is how we come to know the world. What exists are the immediate connections that bind our thoughts to the world in the same way that a spinning thread "twists fibers on fibers." In thought as in fiber, "the strength of the thread does not reside in the fact that some one fiber runs through its whole length, but in the overlapping of many fibers."[27]

Through the thread of our language-games, we come to learn by the way we connect the actual features of our forms of life (the various fibers of our existence) on which our fundamental concepts, categories and forms of thought depend. In other words, a form of life and the language-game that is embedded in it is the process by which we come to think about the world. If how we think is fundamentally linked to our various forms of life, the activities and practices we are engaged, then the process of learning is fundamentally tied to these practices. We believe that this is the sense of learning that the practices referred to as situated cognition seem to point to and that symbolic processing chooses to ignore. Consequently, if, as Wittgenstein argued, epistemology is the philosophy of psychology, then what Wittgenstein provides, both in his *Tractatus* and later, is a philosophy for cognition upon which a theory of learning for education can be built.

Still, Wittgenstein's work, like that of the pragmatists and the more recent workers in situated cognition is a descriptive account of knowledge. It remains doubtful whether psychology, understood as an account of learning, can advance from a starting point established by situated knowledge.

CONNECTIONISM AND AN EDUCATIONAL PSYCHOLOGY OF LEARNING

Educational psychology, understood as an account of change which does not ignore individual change and difference, remains necessary; however, neither the situated approach to knowledge that we wish to accept nor traditional logicist positions will be able to form a basis for a *reconceptualized* educational psychology. Such a reconceptualization would narrow its focus to methods of learning and the material processes inherent in these activities. This would be a leaner, but hopefully more helpful, psychology.

The search, then, is for a learning theory which does not conflict with the account of situated perspectives concerning knowledge. We believe that the most viable theory of learning currently available is the one proposed by connectionism. The possible relationship between social understandings of knowledge and connectionist approaches to learning has been discussed elsewhere, but is worth reviewing in this context.[28]

Connectionism is well suited to serve as a substitute for the positivism which has been seen here as incompatible with situated insights into human learning. Connectionism is a theory of the process of change that we call learning, and is directly inspired by the architecture of the human brain. It succeeds where humans succeed, and fails where humans fail. As a theoretical position in cognitive science it has quickly become dominant in the understanding of pattern perception and category formation. It arose in response to the failings of the symbol-processing school, particularly in response to the failure of the physical symbol hypothesis to model learning. Connectionist models make difficult just those things people find difficult -- that is, it takes an inordinate amount of resources to do serial, deductive logical manipulation using this networked, relational architecture; there is a continuing sense among some in the field that the unbounded, poorly defined, contextually-driven responses to learned patterns -- categories that fulfill the functions of memory in a connectionist account -- are not the sort of stuff from which rationalityis made. From our distinctively educational point of view, these last "deficits" are simply more evidence that connectionism is the right sort of theoretical frame: it models the difficulties of human thought as well as its successes.

The main point of contact between connectionist perspectives and situated perspectives on knowledge (such as Wittgenstein's and Dewey's) lies in the nature of the categories that both propose. Connectionism's material process of category formation leads to categories which are very similar in character to those categories which both Wittgenstein and Dewey describe when they discuss the category "chair." But such situated approaches fill in the deficits of standard connectionist implementations which do not adequately recognize the nature of knowledge as grounded in social activity. Thus, linking connectionism to Wittgenstein's anti-epistemological philosophy and Dewey's pragmatism seems a beneficial direction to take in understanding human learning.

IN CONCLUSION

We have argued here that Bredo's movement toward situated perspectives is well-founded and likely to serve the educational enterprise. Situated perspectives -- in which we would include both Deweyan pragmatism and Wittgensteinian phenomenology -- provide us with an opening toward an understanding of knowledge which avoids the rationalism that can no longer be considered a viable basis for understanding human knowledge and its acquisition.

However, we disagree that such situated perspectives can be an adequate basis for an educational psychology. Educational psychology is properly concerned with a theory of learning, not simply with descriptive theories of knowledge acquisition which the tradition has conflated with a theory of the material process of change which constitutes learning. Situated perspectives, while valuable in their own right, participate in this tradition in a way that threatens to block educational inquiry.

We also want to turn away from the rationalist temptation to use the "objective" methods associated with symbolic processing as a modeling tool in the study of human thought on the grounds that its assumptions leave it incapable of modeling the path that students take as they learn. Such models presume categories and learning mechanisms that are radically unlike those we find in humans. Instead, we advocate the use of another model of human thought -- the connectionist model -- which more adequately responds to the concerns of educators searching for insights into how human learning occurs.

1. G. H. Mead,*The Philosophy of the Act* (Chicago: The University of Chicago Press, 1938, 372.

2. Eric Bredo, "Reconstructing Educational Psychology: Situated Cognition and Deweyan Pragmatism." in Philosophy of Education 1993, ed. Michael Katz (Urbana, Ill.: Philosophy of Education, 1994), 7.

In disputing this statement, we do not wish to condemn all modeling, just modeling which unproblematically assumes that symbolic logic accurately models human capacities. Connectionist modeling, for instance, does not fall into this trap.

3. Thomas S. Kuhn, *The Copernican Revolution* (Cambridge: Harvard University Press, 1957).

4. Jerry Fodor, "Chapter 6: On the Impossibility of Acquiring 'More Powerful' Structures," in *Language and Learning, The Debate Between Jean Piaget and Noam Chomsky*, ed. Massimo Piatelli-Palmarini (Cambridge: Harvard, 1980), 142-62; and David E. Rumelhart and James L. McClelland, "PDP Models and General Issues in Cognitive Science," in *Parallel Distributed Processing, Volume 1: Foundations*, ed. David E. Rumelhart, James L. McClelland, and the PDP Research Group (Cambridge, Mass.: MIT Press, 1986), 110-49.

5. Indeed, such a postion is a hallmark of pragmatist epistemlogy. See, for instance, Dewey's remarks on the "postulate of continuity" in his "The Existential Matrix of Inquiry: Biological." chap. in *Logic: The Theory of Inquiry* (New York: Holt, 1938), 23-41.

6. Allen Janik and Stephen Toulmin, *Wittgenstein's Vienna* (New York: Simon and Schuster, 1973), 99.

7. George Lakoff, *Women, Fire, and Dangerous Things: What Categories Reveal about the Mind* (Chicago: The University of Chicago Press, 1987); and Eleanor Rosch, "Principles of Categorization," in *Cognition and Categorization*, ed. Eleanor Rosch and B. B. Lloyd (Hillsdale, N.J.: Lawrence Erlbaum, 1978), 27-48.

8. Jean Lave, *Cognition in Practice* (Cambridge: Cambridge University Press, 1988); and Valerie Walkerdine, *The Mastery of Reason: Cognitive Development and the Production of Rationality* (London: Routledge, 1988); and John Seely Brown, Allan Collins, and Paul Duguid, "Situated Cognition and the Culture of Learning," *Educational Researcher* 18 (January 1989): 32-42.

9. See, in particular, John Dewey and Arthur F. Bently, *Knowing and the Known* (Boston: Beacon, 1949); and George Herbert Mead, *The Philosophy of the Act* (Chicago: University of Chicago Press, 1938).

10. Although Wittgenstein's philosophy has traditionally been seen as the foundation for logical positivism, beginning with Janik and Toulmin's *Wittgenstein's Vienna*, scholars have begun placing his philosophy within phenomenology and grounding it in German organic philosophical tradition.

11. Allen Janik and Stephen Toulmin, *Wittgenstein's Vienna* (New York: Simon and Schuster, 1973), 216-17.

12. Janik and Toulmin, *Wittgenstein's Vienna*, 132-56. Nicholas F. Gier, *Wittgenstein and Phenomenology: A Comparative Study of the Later Wittgenstein, Husserl, Heidegger, and Merleau-Ponty* (Albany, N.Y.: State University of New York Press, 1981), 81-82.

13. Ludwig Wittgenstein, *Tractatus Logico-philosophicus* (London: Routledge Humanities Press International, Inc., 1988), 3, 4.04.

14. Ibid., 2.0271-2.0272.

15. Ibid., 2.221, 2.225, 3.12. Janik and Toulmin, *Wittgenstein's Vienna*, 132.

16. Ibid., 4.023.

17. Ibid., 3.1, 3.11, 3.42.

18. Ibid., 4.112.

19. Janik and Toulmin, *Wittgenstein's Vienna*, 223.

20. Ludwig Wittgenstein, *Philosophical Investigations* (New York: Macmillan Publishing Co., 1973), 122.

21. Gier, *Wittgenstein and Phenomenology*, 78.

22. Wittgenstein, *Philosophical Investigations*, 7.

23. Ibid., 19.

24. Ibid., 154.

25. Ludwig Wittgenstein, *Remarks on the Foundations of Mathematics* (Cambridge, Mass.: M.I.T. Press, 1967), 124.

26. Wittgenstein, *Philosophical Investigations*, 66.

27. Ibid., 67. This is similar to the "rope" metaphor used in James's *Pragmatism* (Buffalo, N.Y.: Prometheus, 1991), 64. This may not be mere coincidence as Monk, in his *Ludwig Wittgenstein: The Duty of Genius* (New York: Free Press, 1990) 478, reports that James is one of the few philosophers that Wittgenstein read and approved of.

28. William J. Clancey and Jeremy Roschelle, "Situated Cognition: How Representations are Created and Given Meaning." Paper presented at the Annual Meeting of the American Educational Research Association, Chicago, April 1991; and John St. Julien, "Cognition and Learning: The Implications of a Situated Connectionist Perspective for Theory and Practice in Education" (Ph.D. dissertation, Baton Rouge, La., 1994).