

Note: This is an earlier and slightly longer version of the manuscript that was later published as:

Cognition as a Semiotic Process:

From Situated Mediation to Critical Reflective Transcendence

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Tony Whitson (January 2005)

I. Introducing Semiotics

My purpose in this paper is parallel, in some respects, to that of Carl Bereiter in his article on “Implications of connectionism for thinking about rules” (1991). Bereiter notes that connectionism is but one of the significant recent departures from classical, rule-based views of cognition and learning, and he identifies *situated cognition* (citing Brown, Collins, & Duguid, 1989a) and *embodied cognition* (citing Lakoff, 1987, and Johnson, 1987) as other examples deserving particular attention from educational researchers (Bereiter, 1991, p. 13). Bereiter stipulates that he is not presenting connectionism as a competing theoretical alternative, but rather “as a way of conceiving a whole class of alternatives in computational terms” (p. 14).

It is not clear to me that “situated cognition” and “embodied cognition” should be seen as rival or competing theoretical alternatives, for that matter, rather than as potentially complementary aspects of an emerging class of alternatives to the classical rule-based theories. Also, it seems to me that various forms of “constructivism” and “constructionism” should be included (whether as “competing theoretical alternatives,” or as aspects of more comprehensive theories).

Bereiter's presentation of connectionism is put forward as an explanation how “computational” tasks are performed by the brain in ways that are consistent with the alternative views of cognition as “situated” or “embodied,” as opposed to the more classical “rule-based” approaches. In a somewhat similar spirit, I am presenting semiotics as a way of accounting for the cognitive functioning of sign-activity, or *semiosis*, that I see as relevant to the whole class of theoretical alternatives. The semiotic perspective might, in fact, provide conceptual resources for observing crucial relationships among “situated,” “embodied,” “connectionist,” “constructivist,” and other aspects within emergent understandings of cognition. In this connection, I must emphasize, I do not see semiotics in itself as providing a more comprehensive theory of cognition, subsuming all those “other aspects”; rather, I see semiotics (1) as offering

subsuming all those “other aspects”; rather, I see semiotics (1) as offering an elemental conceptual vocabulary for tracing the interrelationships through which those aspects of cognition actually do work together in the real world,¹ and (2) as offering a non-dualistic perspective in which cognition, understood as one function of *semiosis* (i.e., the activity of signs), takes place within the world, and not in “minds” construed as somehow separate from or outside of the world.

A. Peirce & Saussure: Sources and Traditions of Semiotic Inquiry

In her paper for this symposium, Walkerdine (1992b) introduces one kind of semiotic analysis in her critical investigation of problems in current approaches to understanding situated cognition. Her semiotic vocabulary and approach are derived from the European tradition in semiotics which was proposed (under the name “semiology”) by the Swiss linguist, Ferdinand de Saussure.

My own point of entry into the discussion of situated cognition will be my response to problems raised by Clancey and Roschelle (1991), in which I draw primarily from the semiotic tradition inaugurated earlier by the American philosopher, C. S. Peirce. I believe that both traditions have something to offer toward the understanding of cognition as a situated social process, and that these potential contributions will be enhanced by an inclusive

¹In sympathy with a recent movement in the USA to provide warning labels on the packaging of audio recordings with lyrics that might be offensive to some listeners, I want to warn my readers that I do see semiotics as a basis for a critical realism both in everyday cognition, and in the study of cognition. Of course, such realism can remain critical only so long as it is humbled by a recognition that practices grounded in our social-historical and biographical fantasies and ideologies do not merely “distort” reality, but actually produce material reality in ways that we cannot expect to understand from within those practices themselves (as Walkerdine demonstrates convincingly throughout her writings). I believe, however, that semiotics shows how, despite our awareness of such limitations, we can still sensibly construe cognition as a matter of engagement with the real world in which we live — even as that world may be affected by our own “cognitive” activity within it. I expect that this stance puts me at odds with some “postmodern” versions of constructivism. I believe that a realist approach provides more valid accounts of cognitive activity; but of course this begs the question, since “validity” may not be meaningful or relevant from a non-realist perspective. Beyond that, I would suggest that the perspective presented in this paper includes recognition of dynamic relationships within cognitive semiosis which provide an intrinsically realist basis for the “critical” engagement of human cognition (noted especially by Lave and others who understand cognition as a social process).

framework recognizing the articulations among semiotic structures and relationships examined by the followers of Peirce and of Saussure. After discussing implications of each of these traditions, I will venture my own suggestions toward such an inclusive articulated framework.

Others have generally avoided trying to reconcile the two traditions. Those favoring a Peircean approach (e.g., Merrell, 1992) are often dismissive (if not contemptuous) of Saussurean semiotic structuralism, while European structuralists (e.g., A. J. Greimas) are generally oblivious to the Peircean approach.

As explained by Gérard Deledalle (1992), who is highly respected as a translator of Peirce for French readers more familiar with Saussure:

Everybody knows that Peirce defines a sign as a triad made of three indecomposable elements: a representamen, an object and an interpretant.

For Saussure, a sign is an indissoluble pair or couple composed of a signifier and a signified.

Can we translate Peirce's definition into Saussure's? My opinion is that the two theories are untranslatable into one another, because their underlying philosophies and logics are incompatible. (pp. 289-290)

I do not believe that Deledalle is overstating the difference between Peircean and Saussurean approaches. The inclusive framework that I will suggest below is not one that attempts to translate the terms of one definition into terms of the other. Instead, I will suggest that each approach captures some aspects of the structures and relationships involved in all semiotic processes—including cognitive processes.

Deledalle (1992) comments: “If I were permitted to give some advice to readers of Peirce, I would say: If you want to understand Peirce's theory of signs, never read ‘sign’ when you see the word, but translate it either by ‘representamen’ or by ‘semiosis.’ And leave the word ‘sign’ to Saussure's terminology”² (p. 300). The

²“Semiosis” refers to the activity of signs, while “semiotics” properly refers to the study of semiosis (although “semiotics” is often used for both). “Representamen” will be defined and discussed at length below. Peirce was constantly reformulating his analysis and revising his usage throughout his life,

Peircean tradition emphasizes *semiosis* as the continuously dynamic and productive *activity* of signs. Saussure was more concerned with relatively stable structures, such as the phonemic or syntactic structures of a language.³ I take these not as rival theoretical approaches to the same phenomena, but as complementary traditions exploring different aspects of phenomena that are not exhaustively accounted for within either approach.

B. Triadic Sign Relations, and the Problem of Representation

One perennial problem for theories of cognition has been how to account for the nature of representation. Clancey and Roschelle (1991) have addressed this problem in a way that is extremely relevant to an appreciation of cognition as a situated social process, arguing that “cognitive science research has distorted the nature of representations, and hence at its heart distorted the nature of cognition” (p. 9). Roschelle & Clancey (1992) observe that “cognitive science has most frequently taken a correspon-

so there is no usage that is consistent with all of his writings. (Deledalle, 1992, provides an excellent discussion of such problems in reading Peirce.) I agree that Peirce's view is best understood in terms of Peirce's definition (quoted from Deledalle, above) of a “sign” as “a triad made of three indecomposable elements: a representamen, an object and an interpretant” [discussed below]. From this it follows that we should read “*representamen*” in place of “sign” when Peirce is referring to that *one element* within the triad (as Deledalle advises); but the word “*sign*” should still be used for the *triad* constituted by those three elements (provided that we do not confuse this Peircean “sign” with the “sign” defined differently by Saussure). “Semiosis” is not really a substitute for “sign”, as a word referring to the triad; “semiosis” refers, rather, to the continuous activity of mediated and mediating relations in which the elements function together as networks, webs, or relays of triadic signs.

³Some critics fault Saussure for discounting the dynamic social character of language and other semiological phenomena. In fact, however, Saussure (1916/1986) actually defined ‘semiology’ as a science whose object is essentially social in character:

It is therefore possible to conceive of a science *which studies the role of signs as part of social life*. It would form part of social psychology, and hence of general psychology. We shall call it *semiology* (from the Greek *sēmeion*, “sign”). It would investigate the nature of signs and the laws governing them. . . . Linguistics is only one branch of this general science. The laws which semiology will discover will be laws applicable in linguistics, and linguistics will thus be assigned to a clearly defined place in the field of human knowledge. (pp. 15-16; emphasis in the original)

I believe that Saussure's focus on stable structures does not reflect any disparagement of creativity and change occurring in the use of semiotic structures. I believe that it reflects, rather, a particular traditional understanding of what constitutes a “science,” and a notion that only objects that conform to stable law-like regularity can yield the kind of knowledge sought by “scientific” inquiry.

dence view of representation, a retrieval view of memory, and an individualistic view of meaning,” and that “these views minimize the need to consider social and neurological processes jointly” (p. 14).

While these researchers have embraced situated cognition theory, and expressed appreciation for the work of Lave and others who have begun to recognize cognition as a social process, they have insisted that we need to account for cognition as a process that is both social and neurological, one in which “representations are created and given meaning in a process that integrates social and perceptual levels of organization (Clancey & Roschelle, 1991, p. 4):

To make progress now, cognitive scientists, AI researchers, and educators cannot continue to live in a representational flatland. Neither social nor neural science can be simply left to other researchers, as if they are merely levels of application and implementation for psychology The time is right for relating these perspectives, for creating a kind of neural-sociology of knowledge that will constitute a new cognitive science, which is neither individual nor social, but does justice to both. (p. 5)

The rule and schema-based models are said to portray a “representational flatland” because they omit “the vast variety of materials and physical forms that people claim to be representations” (p. 7).

The Peircean model of sign-activity is one that does recognize the unlimited variety of forms and substances that can participate as elements of dynamic signifying relationships, but without regarding “representations” as being limited to things that people consciously recognize or “claim” to be representations. Peirce's approach obviates the problems of voluntarism and subjectivism found in Clancey and Roschelle's (1991) formulations, while revealing greater importance to some of their formulations than even they are likely to have realized. As they have explained the matter, for example, “something becomes a representation by virtue of someone claiming that it stands for something. Meaning is not inherent in the form, but attributed by further representations about the form. That is, representational status is attributed by an observer” (p. 9).

In Peircean terms (see Figure 1.), something becomes a

representamen (*r*), in relation to an *object* (*o*), by virtue of the possibility that an *interpretant* (*i*) will be produced, i.e., a singular event, or an habitual or regular response, which responds to the representamen *as* signifying an object (something other than itself) in some respect. This model recognizes even more far-reaching implications of the principle that signification (including representational signification) is a matter of further significations, but without the suggestion that it is a matter of subjective, conscious, or even voluntary attribution. In one of Peirce's own notoriously dense formulations:

I define a sign [here, “representamen”] as anything—be it an existent thing or actual fact, or be it, like what we call a “word,” a mere possible form to which an audible sound, visible shape, or other sensible object may conform to [sic], or be it a property or habit of behaviour of something either experienced or imagined,—which is on the one hand so determined (i.e. affected either by causation or through the medium of a mind) by an object other than itself and on the other hand, in its turn so affects some mind, or is capable of doing so, that this mind is thereby itself mediately determined by the same object. (3:233 [1909])⁴

The object is interpreted, in some respect, in the interpretant—not directly, or im-mediately, but only through the mediating representamen. (In Figure 1. the horizontal bar and broken line indicate that the object is not immediately present to the interpretant.) The representamen is related to the object, in some way (e.g., symbolically, indexically, or iconically), so that the object “determines” the representamen *as* something having a potential to “determine” something else, in turn, *as* an interpretant, which is indirectly “determined” *as* a mediated interpretation of the object.

An example might be helpful at this point:

Suppose I look at a barometer, say “Let's go,” pick up my umbrella, and start for the door. You pick up your umbrella and follow. The barometer reading is being interpreted as a sign of rain (the object represented). It is functioning as a sign when it produces as its interpretant the event (me picking up my umbrella) in which the reading is interpreted as a sign of rain. That interpretant can, in turn, function as a sign of rain producing a subsequent interpretant (for example, you taking your umbrella). The two of us both leaving

⁴Unless noted otherwise, quotations from Peirce will be referenced in the standard manner to the volume and paragraph numbers in the *Collected Papers*, along with the original year for the quotation. On terminological shifting in Peirce, see Deledalle (1992) and footnote 2 (above).

with umbrellas can function as a sign producing (as an interpretant) a co-worker's decision not to go out for lunch. [Cf. Figure 2.]

My barometric “reading” is actually already an interpretant which takes the needle position as a sign of atmospheric pressure, and hence a mediated sign of rain. But what, exactly, is “atmospheric pressure,” and how does it come to function as a sign of rain? If the rain is not yet (presently) falling, then [it is clear that] it didn't dynamically cause the needle position on the barometer, which can in any case function as a fallibly interpretable sign even if it's not functioning mechanically at all. Peirce's basic idea is that the efficacy of the triadic (object-sign-interpretant) functioning of semiosis is not reducible to the dyadic (cause and effect) functioning of mechanics. In this sense, my use of barometric pressure is mediated semiotically by elementary school science classes, TV weather reports, and (by extension) my situation within the society and culture generally. (Whitson, 1991a, pp. 245-246)

First, it should be noted that this model of continuously productive triadic sign-relations can accommodate relations among the most diverse elements even within a single triadic sign. A verbal utterance or a cultural norm can occur as an interpretant—as can an institutional policy, a connectionist pattern of neurological activity, a sound, a shape, a color, a physical movement, or a social practice. Of course, any of these (or other kinds or combinations) can also function semiotically as an object or as a representamen within other triadic signs; moreover, a single triadic sign might be comprised of widely disparate elements, ranging across physiological, linguistic, and social levels. This model would support Clancey and Roschelle's movement beyond “representational flatland”: It would include not only “the vast variety of materials and physical forms that people claim to be representations,” but also the even broader variety of things that can participate as elements of triadic signification, within the continuous activity of semiosis.

Recognition that the most diverse elements can operate within a triadic sign also has implications for the kind of interdisciplinary work needed to account for cognition and other semiotic processes. Instead of seeking linkages, or ways of bridging gaps between social, economic, cultural, linguistic, psychological, neurological, or other “levels” of organization, this approach (first) shows the need to account for processes that actively and intricately cut across such levels (so that it cannot be assumed that

order is established first on each of those respective levels, which might then be seen to “interact”), and (second) provides a conceptual and notational vocabulary for investigating such processes.

Finally, Peirce's use of the term “mind” in the above quotation demands some comment. Peirce sometimes spoke of the interpretant as being produced by a mind or by a person who is interpreting the representamen; but he himself referred to this usage as a compromise he made in “despair of making my own broader conception understood.”⁵ A more adequate expression of Peirce's “broader conception” can be seen in his references to signs as being used not only consciously by human persons, but used as well by any kind of “‘scientific’ intelligence, that is to say, by an intelligence capable of learning by experience.”⁶

⁵Letter to Lady Welby, December 14, 1908, in Hardwick, 1977, pp. 80-81.

⁶“Experience” is used here in the broad sense of being affected by the results of past interpretive responses; it need not involve all of what Dewey and others have described as aspects of human experience. Thus, Peirce's usage here would include the evolution of a species' semiotic capabilities (e.g., the instinctive responses of some species to the shapes, colors, or other signs of their predators—responses which [in the species, if not in the individual] can be adapted for responding more successfully to deal with such things as camouflage by predators, and mimicry by other species) as a kind of learning from experience; and the system capable of such learning could be regarded as a “scientific” intelligence, in that sense. For Peirce, even a plant species was exhibiting a rudimentary intelligence in the evolution of its heliotropic response to sunlight. Note that the plant's leaves are not dynamically caused to move by any mechanical force from the sunlight; instead, the plant has its own mechanism for triadically responding to the sunlight as a sign of the energy to be absorbed by its leaves. A single specific instance of such movement could be described as a series of dyadic (cause and effect) events. But that description does not account for the existence of the phenomenon, which is actually (although somewhat “degenerately”—see this footnote, below) triadic. Since the culture of positivistic analysis trains us to think that we have not understood something “scientifically” until we understand it exclusively in terms of dyadic causation, it is not surprising if the description of the plant's movement as an interpretant, or as an event in which the plant responds to the sunlight as a sign (or, more precisely, as a representamen) of nutrient energy, strikes us as unwarranted and unscientific pre- (or post-) modern anthropomorphizing mysticism.

But the scientific justification for Peirce's view is demonstrated easily enough (and we should remember that Peirce made his career as a practicing laboratory scientist, as well as a philosopher of logic and mathematics), in the familiar principles from which a biologist could hypothesize that a plant species would adaptively come to discriminate in responding to different kinds of light (based on color or other qualities, for example) signifying differences in the energy available for photosynthesis. The process does comprise a complex of mechanical (dyadically caused) events; but the process itself occurs, and the outcome of the complex of mechanical events is determined, on the basis of a triadic relation in which the leaves respond to light *not* as a simple cause or stimulus, and *not* for the energy which *that* light made available for photosynthesis, but *as a representamen*, i.e., as something signifying the energy available from the light to be absorbed later, after stems and leaves have moved. This triadicity can be seen in the “corrigibility” of the process, by which the response

As a matter of existential fact, there must always be some kind of intelligent interpreter (i.e., some system or processes capable of being modified on the basis of past results) which produces the interpretant in responding to the representamen *as* a representamen “standing for” an object other than itself in some respect. But, as a matter of logic (and we must remember that Peirce was a philosopher studying the logical aspects of semiosis⁷),

to light can be corrected, modified, or lost as the species “learns” from its “experience” in responding to the source of non-present (future) energy through the mediation of the present light.

In the present light of this discussion, we can consider how the “scientific intelligence” of the botanists differs from that of the plants. The measurements, designs, constructs, models, and calculations developed and produced by the scientists would be included among the kinds of things that Clancey and Roschelle (1991) define as “representations” (see above, pp. 4-5). The botanists themselves are at least partially *aware* that they are interested in these things *as* representations of things other than the signs themselves, so the scientists (unlike the plants) are capable of deliberately and consciously changing their representational and interpretive practices to better serve their interests (including scientific, as well as budgetary, career, ideological, or other interests). Peirce would account for this as an example of how triadicity is more fully realized in the semiotic activity of the botanists than in that of the plants. A false hypothesis or less-than-satisfactory model or instrument can be corrected or improved through critical symbolic reflection, and does not depend on such a crude corrective mechanism as “survival of the fittest.” Although the plant species might also exhibit rudimentary triadic intelligence, its triadicity is relatively “degenerate” (i.e., in a sense analogous to that in which Peirce, as a mathematician, would recognize a circle as a degenerate ellipse, and a square as a degenerate tetrahedron. Peirce did explore various kinds and degrees of “degeneracy” in the triadicity of signs, but the implications of this line of inquiry need not be explored here.).

We see that Peirce's notion of “scientific intelligence” extends beyond the traditional American psychologist's notion of intelligence in human individuals. It would include the social intelligence involved in situated cognition at the level of “interactions between people over the course of a few minutes,” as discussed by Clancey and Roschelle (1991, p. 4; and Roschelle and Clancey, 1992). Beyond this, it includes various kinds of intelligence in broader social processes. Peirce's faith in science as advancing through communally self-critical inquiry might open him to the kinds of criticism applied to Sir Karl Popper and his “critical realism,” but Peirce's followers also include some of Popper's severest critics, such as Jürgen Habermas. Although Toulmin (1972) would expect to find both Popper's and Thomas Kuhn's processes at work, Toulmin's own evolutionary model might suggest how the intelligence of peer review in determining “survival of the fittest” research programs more closely parallels the intelligence of heliotropic plants than some philosophers of science would like to think. Beyond that, of course, are the Foucauldian insights that Walkerdine brings to our present discussion, in light of which we need to understand that presumably scientific and cognitive activities at any level may be determined by the interested generation of new realities, rather than by “cognitive” or “scientific” interests *per se*.

“Logic”-bashing has become something of a predilection among advocates of situated cognition, connectionism, and other approaches within the family of related alternatives to the rule-governed approach in cognitive science, so it is imperative to note the crucial difference between what Peirce (undeniably one of the greatest logicians of all time) meant by “logic,” and the narrow formalistic “logic” condemned by critics of the traditional algorithmic cognitive science.

Peirce regarded “semiotic” as another word for logic in general, or logic in its

the interpreter was an external condition of the sign, and not an essential internal constituent of the triad.

The sign consists *essentially* of the tri-relative activity of object, representamen, and interpretant. This relationship is genuinely triadic, and cannot be decomposed or analyzed as a series or combination of dyadic relationships (See footnote 6). To clarify this, we might consider how relations between any two terms of the triad are mediated by the relations between both of the other pairs.

For the sake of this discussion, I will refer to the relationship between interpretant and object as the “orientation” of the sign, and speak of “ground” and “mediation” with reference to relations between the object and representamen, and the representamen and interpretant (See Figure 3.a.).

One of the best known features of Peirce's semiotics is his classification of signs as icons, indexes, or symbols, based on how the sign is grounded (See Figure 3.b.). Prototypical examples are a portrait, which has a potential to signify iconically grounded in its visual resemblance to the person represented; a weathervane, its signifying potential indexically grounded in the existential relationship between the wind direction and the direction of the arrow; and a red octagonal stop sign, symbolically grounded in established habits and conventions. The most obviously triadic of these is the symbol: There is nothing about a stop sign, for example, that has anything to do with stopping, except for the established interpretants (mental, verbal, muscular, legal, etc.) which support the expectation that the sign will be interpreted as a sign to stop.

The icon and index could more easily appear to be grounded in

full extent and generality (see, e.g., 2.227 [c. 1897]). Formal, syllogistic Aristotelian logic would be found within this field, but only as a narrow and quite exceptional corner of logic in general. In this conception, Peirce was following John Locke who, in his analysis of the three branches of all learning (1690-1710, Book 4, chapter 21), held that “the third branch may be called *Σημειωτική* [semiotiké], or *the doctrine of signs*; . . . aptly enough termed also *Λογική*, logic; the business whereof, is to consider the nature of signs, the mind makes use of for the understanding of things, or conveying its knowledge to others.” Locke noted that if the study of signs were undertaken properly, it might “afford us another sort of logic and critic, than what we have been hitherto acquainted with”—a prospect that is only now being pursued with the renewed interest in Peircean semiotics.

dyadic relationships between representamen and object. But the existential relationship between the wind and the weathervane creates the signifying potential only because of *both* the interpretant's orientation to the object (the interpretant being motivated by the wind direction, not by the mediating weathervane), *and* the weathervane's mediating relationship to the interpretant. Iconicity might appear even more to be a dyadic relationship. But visual resemblance to the object is not an objective, positive quality of the representamen in itself. Again, the qualities of the representamen are iconically related to the object insofar as this relationship can occur triadically, together with the orienting and mediating relationships engendered by the three terms of the sign.

In like fashion, we can see that orientation to the object is also a triadic affair (See Figure 3.c.). It might appear that when I pick up my umbrella, that act is motivated simply by an orientation to the threat of rain; but that orientation is clearly mediated by weather forecasts, barometer readings, the sky's appearance, and other representamina, and grounded on the relationships which potentiate those elements to signify impending rain (cf. Figure 2., p. 6 above).

Finally, it is relatively easy to see that the mediating function of the representamen in relation to the interpretant will always be one aspect of an irreducibly triadic grounded, oriented, and mediated sign-relation (See Figure 3.d.).

This irreducible triadicity has important implications for our understanding of representational signification and cognition. By showing how cognition operates on the "atomic" level through the action of signs that combine elements as diverse as social policies and neurological or even meteorological events into indecomposable signifying triads, this helps to demonstrate how knowledge is always situated in the world, and how knowledge exists as something distributed across diverse aspects of our mental, physical, and social world. But this is not subjectivistic in the way suggested in the formulations of Clancey and Roschelle (1991), whose line of argument asserts that "knowledge is always subjective," since "the world ('reality') has no objective properties" (p. 6).

From the Peircean perspective, if it is true that the world has no properties that are “objective” (in the sense of being non-subjective), this is because such a dichotomy between “objective” and “subjective” is false; so it does not follow that knowledge is always “subjective” (in the sense of being non-objective). I believe that Peircean semiotics helps us to account for the specific ways in which representations and cognition are at once both objective and subjective (with those terms understood differently than in the Classical/Cartesian/Kantian frame of reference that has constrained mainstream and dissident cognitive scientists, alike).

I believe a more adequate alternative is made possible by including aspects of existential phenomenology within the framework opened up by Peircean semiotics. This framework enables us to account for the specific ways that things appear within and against the particular horizons and backgrounds of specific phenomenological subjects (see Figure 4.). For example, the representamen can be seen to appear within a horizon which does not include the object itself, and we can describe how the appearance of that representamen is conditioned by the background against which it appears—thus conditioning the kinds of interpretants that can be produced as mediated interpretive representations of the object. Such representations are subjective in important ways but without denying them their objectivity.

The existential phenomenology which informs this perspective has important implications for our understanding of the “practices” within which situated cognition takes place. Existentialists understand practices as being fundamentally determined by their phenomenological horizons.⁸ Jean Lave, however, is developing an understanding of practices which is influenced by Pierre Bourdieu, who presents his subtle and complex work as a critique of both the

⁸The canonical source is Heidegger's *Being and Time* (1927/1962). Dreyfus (1991) is perhaps the best secondary source in English, and one that emphasizes the importance of practices. In other works (e.g., Dreyfus & Dreyfus, 1986), Dreyfus is a leading critic of the mainstream rule-based approach in cognitive science. Another often praised and often criticized work in this tradition is Winograd and Flores (1987). My own use of phenomenologically-informed semiotics in work on specific discourses on education can be seen in Whitson (1991a).

phenomenological and structuralist traditions.⁹ I agree with Bourdieu in rejecting either structuralism or phenomenology as providing the overall framework for explaining practices in general. On the other hand, I believe that phenomenological aspects such as backgrounds and horizons are of crucial importance for an understanding of many practices, and particularly those practices which are more importantly concerned with cognitive interests and processes; and I believe that the tools of structuralist analysis are especially valuable for understanding backgrounds and horizons that can decisively enable and constrain the development of practices.

We can now turn to the tradition of structuralist semiotics, to see how the insights and analytical devices from this tradition complement those from phenomenology and Peircean semiotics, within a more comprehensive semiotic approach to human cognition.

⁹See, e.g., Lave and Wenger (1991), and Bourdieu (1972/1977; 1980/1990).

II. The Structural/Post-Structural Tradition

A. Saussure's Model of the Sign

As noted earlier, the use of semiotics in the discussion of situated cognition theory has been introduced by Walkerdine (1992b). Her discussion employs terminology derived from Jacques Lacan's radicalized variation on the model of “semiology” introduced by the Swiss linguist, Ferdinand de Saussure. While Lacan's variation is certainly more capable of accounting for the dynamic and *creative* (i.e., not merely static and *representative*) character of sign-activity, I believe that it neglects features of Saussurean or “structuralist” semiotics that make it possible to account for other aspects of semiosis in general, and of cognition in particular.

Without neglecting the important differences among semiotic theories, we can begin our introduction to Saussure with a central point on which all semiotic theorists agree: Semiotics begins with a rejection of the naive, common-sense understanding of the “sign” as something that simply *denotes* another object in the world. Saussure's definition of *the sign, in general*, is derived from his definition of *the linguistic sign, in particular*:

The linguistic sign is, then, a two-sided psychological entity, which may be represented by the following diagram [see Figure 5.a]. . . . In our terminology a *sign* is the combination of a concept and a sound pattern [*image acoustique*]. But in current usage the term *sign* generally refers to the sound pattern alone The ambiguity would be removed if the three notions in question were designated by terms which are related but contrast. We propose to keep the term *sign* to designate the whole, but to replace *concept* and *sound pattern* respectively by *signification* [*signifié*, the “signified”] and *signal* [*signifiant*, the “signifier”—see Figure 5.c].¹⁰

As Holdcroft explains,

In one fairly natural usage, if a word expresses an idea it might be said that it is a sign of an idea. But this usage is not Saussure's. For him, a sign does involve two things, an acoustic image and a concept,

¹⁰Saussure, 1916/1986, pp. 66-67. I have retained the original French terms in Figures 5a-5c in view of difficulties translating them into English. In his careful translation, meticulously informed by the critical literature on Saussure's text, Harris uses “signification” and “signal” as the English terms for “*signifié*” and “*signifiant*” (rather than the conventional “signified” and “signifier”, which will be used in this paper except when quoting from the Harris translation). This is apparently his way of dealing with the terminological problem indicated here by Saussure, as well as Saussure's insistence that “A linguistic sign is not a link between a thing and a name, but between a concept and a sound pattern” (p. 66).

but he does not think of the former as a sign of the latter. On the contrary, the sign is the union of both of them, and can be represented as in [Figure 5.a.]. (Holdcroft, 1991, p. 50)

Saussure illustrated his definition with the example of the sign formed by the union of the concept <tree> with the sound pattern “*arbre*” (or “*tree*”). (See Figure 5.b.). The sign is not a *sound* referring to a *tree*. The elements which comprise the sign are a structurally generalized or typical *pattern* of sound, together with a structurally generalized or typical *concept* of a tree. Of course, an infinite variety of sounds can be produced within the limits of the human vocal apparatus. But the only sounds that can be used in intelligible speech are those which will be understood as expressions of the general sound patterns which have *phonemic* value within the phonemic structure of the given language. Through their conjunction with concepts (which, in turn, are [similarly?] determined through structures of difference from related concepts), these sound patterns participate in determining the *semantic* values available to speakers of the language.

Harris characterizes the expression *image acoustique* as “perhaps the most unhappy choice in the whole range of Saussurean terminology,” noting that in English translation “‘sound-image’ unfortunately suggests some combination of the spoken and the written word (as if words were stored in the brain in quasi-graphic form).” As Harris explains:

Insofar as it is clear exactly what is meant by *image acoustique*, it appears to refer to a unit which supposedly plays a part in our capacity to identify auditory impressions (e.g. of sounds, tunes) and to rehearse them mentally (as in interior monologue, humming a tune silently, etc.). It is thus an auditory generalisation which the mind is able to construct and retain, just as it is able to construct and retain visual images of things seen or imagined. The English expression which seems best to designate this is ‘sound pattern’. (in Saussure, 1916/1986, pp. xiv-xv)

Ironically, it turns out that the insight into ‘sound patterns’ of this kind might justify *image acoustique* as a happy choice, after all, in light of the connectionist discoveries discussed by John St. Julien (1992) in this symposium.

Indeed, it turns out that ‘concept’ (the counterpart of *image acoustique*) is in fact the more problematic term. Holdcroft cautions against understanding “signified” as “a near-synonym for ‘con-

cept”, in light of Saussure's efforts “to elucidate the notion of a signified in terms of the notion of value, albeit a very special kind of value arising from social usage”, so that “the suggested identification of a signified with a concept, and not even a concept of a special kind, is, to say the least, unfortunate, since the dangers of lapsing into the sort of nomenclaturist theory that Saussure so objected to are clear” (Holdcroft, 1991, p. 51).

For us, however, the problem of correctly understanding Saussure's theory is subordinate to our interest in an understanding of cognition as the achievements and processes of socially situated human activity. The semiotic account of cognition offered in this paper suggests that “concepts” of the kind addressed in formal logic are in fact not the kind of things that thought (cognitive or otherwise) is made of. Implications of this difference include those observed by Walkerdine (1992b) in her discussion of ideologically differentiated attributions of “conceptual” versus “non-conceptual” achievements of students.

Saussure himself moved beyond the model of concepts united with sound patterns, when he replaced that terminology with his more general definition of the sign as a combination of a “signified” together with its “signifier” (see Figure 5.c., and text at Footnote 10, page 14). Although Saussure explains this substitution as a way of indicating the relatedness of terms within the sign, it also generalizes his definition of the sign beyond his initial reference to *linguistic* signs (with sound patterns as signifiers), so that he could now propose a more extensive new science of “semiology”:

It is therefore possible to conceive of a science *which studies the role of signs as part of social life*. It would form part of social psychology, and hence of general psychology. We shall call it *semiology* (from the Greek *sēmeîon*, ‘sign’). It would investigate the nature of signs and the laws governing them. . . . Linguistics is only one branch of this general science. The laws which semiology will discover will be laws applicable in linguistics, and linguistics will thus be assigned to a clearly defined place in the field of human knowledge. (Saussure, 1916/1986, pp. 15-16 [original emphasis])

B. From Saussure to Lacan

The anthropologist Claude Lévi-Strauss has provided the most influential example of how Saussure's structuralist approach

could be generalized for diverse uses in the humanities and social sciences (see, e.g., Howard Gardner, 1981). The influence of the psychoanalyst Jacques Lacan is more important for our purposes, however, since it is Lacan's departures from Saussure's model of the sign that paved the way for a recognition of the semiotic processes discussed by Walkerdine (1992b). At the risk of violently oversimplifying Lacan's notoriously subtle and complex formulations, we can identify two basic steps in the transformation of Saussure's semiotic model which have been adopted in a broad range of “post-structuralist” semiotic analysis.

First, Lacan inverted the priority of “signified” over “signifier” that was at least implicit in Saussure's model of the sign. Although Saussure did not overtly attribute any great significance to the vertical arrangement of the terms within his diagrams (see Figures 5.a.-5.c.), Lacan pointed out that formulation of the sign as $\frac{\text{signified}}{\text{signifier}}$ does in fact tacitly preserve a kind of classical bias (cf. Plato) that accords some kind of priority to the signified—whether the signified is seen as a purely mental concept that can be “communicated” through expressions of a related sound-pattern, or whether the signified is seen (even more mistakenly, from a structuralist point of view) as a referent (i.e., an object that exists prior to the sign, and is referred to by the signifier). Lacan insisted on inverting this relationship, yielding his formulation of the sign as $\frac{\text{signifier}}{\text{signified}}$, and accordingly recognizing far-ranging autonomy for a dynamic and continuously productive play of signifiers that was not so easily recognized when it was assumed tacitly that a signifier was somehow constrained under domination by the signified. The more autonomous play of signifiers can be seen, for example, in a kind of

“chaining” process, $\frac{\frac{\text{signifier (2)}}{\left\{ \begin{array}{c} \text{signified (2)} \\ \text{signifier (1)} \end{array} \right\}}}{\text{signified (1)}}$, in which the signifying term (Signifier₁) in a preceding sign combination comes to serve also as a signified term (Signified₂) in a succeeding sign combination.

In such a “chaining of signifiers,” the preceding signifieds and sign-combinations are sometimes described as “sliding under” the succeeding signifiers (Cf. Figure 6.a.). Terms which may have originated in relation to certain needs and interests of the “speakers”

ers” (or of those engaged in practices using linguistic and/or non-linguistic signs) become displaced from active use by terms of the succeeding signs. Succeeding signifiers may initially be admitted into use as substitutes for the preceding terms, as if the sense and import of those terms has been preserved through the succeeding links along the “chain” of signifiers. Ironically, it is the very ability of succeeding signifiers to appear as sense-preserving substitutes which allows preceding terms to disappear without notice, as the use of succeeding terms gets taken over by the competing projects and practices in which they are introduced and deployed.

Common misunderstandings can be avoided by observing Walkerdine's example from a dialogue in which “one mother gets her daughter to name people they are pouring drinks for and to work out how many drinks by holding up one finger to correspond with each name” (1992b, pp. 19-20). Here (cf. Figure 6.b.), we might begin with the peoples' names as “signifiers₁”, in conjunction with the “signifieds₁” which somehow designate those other people,¹¹ within the conversational and mental discourse(s) of the mother and daughter. As Walkerdine observes, however, those names drop quickly to the level of signifieds₂ in relation to new signifiers₂—the fingers. Subsequently, spoken numerals might be used as signifiers₃ in relation to the fingers, which are now signifieds₃. “By this time any reference to people or outside the counting string no longer exists within the statement”. Walkerdine reports observing how, at this point, the combination of fingers and numerals starts being used in “small addition tasks of the form: `five and one more is . . . !”

Walkerdine calls our attention to the “discursive shift” which has occurred when the numerals and fingers are used to deal with

¹¹I realize that, in this context, my use of the word “designate” is redundant or circular, rather than explanatory. Any choice of terms here will be implicated in accounting for the relationship between sign-elements and their presumed *referents* in the world. In this case, where the presumed reference is to other people, this also involves the manner in which personal identities are constituted semiotically within social or discursive practices—a problem which has been extensively explored, in differing ways, by both Lacan and Walkerdine. My own responses to these problems would require the use of Peircean as well as phenomenological vocabularies.

problems posed in forms that “can refer to anything.” The same physical fingers and sound patterns might be used in either discourse, but these are merely the “sign vehicles”: When they occur in discourses of abstract calculation, the signs in which the numerals serve as signifiers, and fingers serve as signifieds, are not the same signs (and those numerals and fingers are not the same signifiers and signifieds) as those which occur in other discourses (even when the same fingers and numerals are being used in either case). In such cases, the same sign vehicles are conveying different signs, with different semiotic values, when employed in different discourses. All of this might sound like a scholastic or sophistic quibble, except for all that we have learned from Walkerdine and others who have shown numerous and varied examples of how such differing discourses provide very different structural potentials for the positioning of subjects able to participate within those discourses—with dramatic consequences for formation of the very selves and subjectivities of the participants. Such examples help us avoid misunderstanding the “chaining of signifiers” as a process in which originally real and material signifieds are progressively concealed behind illusory or “merely symbolic” signifiers. Instead, we understand sites along the chain as sites of conflict among competing material practices—conflict in which the sign activity produces real and consequential practices even as those practices produce the signs by which they are themselves conducted.

Such uses of Lacanian semiotics by Walkerdine and other critical social scientists have impressively succeeded in escaping limitations of Saussure's structuralism. In doing so, however, I believe that they have overlooked aspects of structuralist semiotics which, when used within a less confining semiotic framework, can reveal semiotic structures that are important in supporting and constraining human cognitive activity. I believe that a more capacious framework can be developed by including elements of phenomenology as well as structuralist (e.g., Saussure and Greimas) and post-structuralist (e.g., Lacan and Walkerdine) semiotics along with the Peircean approach to signs and sign-activity. After briefly introducing what I see as important aspects

of structuralist semiotics, I will briefly indicate how I think the elements from these disparate traditions need to be integrated within a more comprehensive framework. Finally, I will review what I see as the major potential contributions of this semiotic approach in accounting for human cognition as a situated social process.

C. Structures of Semantic Difference

It is my contention (following Henriques *et al.*, 1984) that the signifier 'woman' does not describe or represent a unitary signified. Rather, any woman exists at the nexus of contradictory discourses, practices, and therefore positions. In this case, we could take the signifiers 'child', 'teacher' and 'girl', or the dichotomies 'active'/'passive', 'rote-learning'/'real understanding', as examples. (Walkerdine, 1990, p. 74)

Again, Walkerdine's analysis provides examples that can be used to explain aspects of structuralist semiotics, and to illustrate the value this might have in advancing our critical understanding of the matters involved here.

Although Lacan's notion of a chaining of signifiers helps in explaining how signifiers can take on lives of their own, as it were, free from domination by any "true nature" of the "signifieds" that might be presupposed as a realistic basis for the signs in use, Lacan's focus on relations between signifieds and signifiers neglects the relationships of *difference* (as in the "dichotomies" noted by Walkerdine, above) which have been observed as the basic elements of semantic structures.

The semiotic structuralist Algirdas Greimas has made the most elaborate study of such structural relationships, making particular use of what Greimas and Cortés (1979/1982, pp. 308-311) define as a "semiotic square" (See Figure 7).¹² The square marks out four central positions related to each other by contradiction,

¹²Although the square resembles an Aristotelian "square of opposition," there are important differences. The square of opposition was used extensively in medieval texts on formal logic to map out logical relationships among *propositions*. The Greimasian semiotic square also features relationships of contradiction and (non-contradictory) opposition as central generative elements of expanding webs of meaning; but the terms of these relationships are no longer limited to formal propositions: they can include any and all kinds of semiotic elements (e.g., verbal or non-verbal; semantic, syntactic, thematic, figural, gestural, olfactory, etc.) that can take on specific values through the structure of their differences from other terms within their semiotic universes.

opposition, or presupposition. Discursive practice makes use of verbal, conceptual, or other sign-elements as they are invested in the structure of these relationships, thus generating a field of more extensive semiotic positions to be invested with related terms within the discourse.

The disparate uses of the word “more” discussed by Walkerdine (1992b, pp.15-18) can be used as an example. In school-mathematics tasks, “more” is used for quantitative comparisons, in opposition to “less” (See Figure 8.a.). “Less” is actually only one of the possible oppositions that would presuppose the negatively-defined contradictory (not-more); but when “more” and “less” are used as antonyms in these discursive practices, then the practices within which *that* opposition is most relevant will pragmatically determine the semantic sense of both terms in their relation to each other. (This, by contrast with a positivistic understanding meaning, in which words or concepts have their meanings *positively* (versus relatively), prior to their relationships and differences with other terms.)

Walkerdine demonstrates the kind of mistake that researchers can make when neglecting the differences between school-mathematics tasks of this sort, and other tasks, in other situations, in which particular students might be more consequentially familiar with the “same” words (such as “more”), but with very different meanings—as in the example where the opposite of “more” is not “less”, but “no more” (See Figure 8.b.). As in this case, that difference can be even greater than one of differing conceptual opposition: Here, the conceptual or *semantic* opposition between <more> and <less> is contrasted with a *pragmatic* opposition between speech-acts: “More (please)?” and “No more!”

Filling in the central terms of the square (see Figure 8.c.), we can begin to appreciate the value and continuing validity of principles that are neglected when Lacanian “post-structuralism” loses sight of its structuralist origins. Walkerdine (1992b) argues that “while [the terms ‘more’ and ‘less’] might be the same signifiers the actual signs, the specific relation with signifieds was made in specific practices” (p. 16). While Lacan’s “chaining of signifiers” would help in accounting for the flexibility of sign-

relations in accommodating certain social and cognitive requirements of the practices in question, it neglects other structural dimensions of those sign-relations, and the ramifications that can both influence and transcend those practices.

One general form can be observed, first, in the example that we have already been dealing with. Figure 8.d. illustrates what Greimas would refer to as “secondary meta-terms” of the square generated by the opposition of “more” (as a demand or request) and “no more” (as refusal or denial). On this level we find oppositions between engagement and non-engagement, and between satisfaction or compliance and discipline or deprivation. The semiotic structures both incorporate and generate the semantic meaning and pragmatic force of terms within the discursive practice here, in sharp contrast to school mathematics or other discourses in which some of the same signifiers might occur.

Figure 9.a. illustrates a situation reported by Walkerdine (1990, pp. 61-81; 1992a) and Walkerdine et al. (1989) in which, paradoxically (at least from the standpoint of official rationales for schooling), school achievement *by girls* is disparaged, even as non-achievement by boys is regarded in a more positive light—and sometimes even treated as a sign of brilliance!

The structural coding of these attributions can be understood in relation to what Walkerdine (1992b) reports as “the concern expressed when poor children appear to possess advanced calculating skills, indeed, sometimes not only more advanced than their school performance would suggest, but actually more advanced than their higher class peers” (p. 6). Having observed that “teachers tend to understand such children as ‘underdeveloped and over mature’” (cf. Figure 9.b.), Walkerdine explains that “those children taken to display procedural knowledge or rote learning are taken to have demonstrated an apparent maturity that hides their lack of appropriate conceptual development” (p. 7).

As Walkerdine (1990) explains (cf. Figure 9.c.):

Girls may be able to do mathematics, but good performance is not equated with proper reasoning. . . . On the other hand, boys tend to

produce evidence of what is counted as “reason”, even though their attainment may itself be relatively poor. . . . Throughout the age range, girls' good performance is downplayed while boys' often relatively poor attainment is taken as evidence of real understanding such that any counter-evidence (poor attainment, poor attention, and so forth) is explained as peripheral to the real (Walden and Walkerdine, 1983). It is interesting that in the case of girls (as in all judgments about attainment), attainment itself is not seen as a reliable indicator. (p. 66)

One aspect of this discourse addressed by Walkerdine (1990, p. 72) is its articulation with the opposition between “production” and “reproduction” (see Figure 9.d.). Achievement by girls is attributed to rote-learning and rule-following, which *is* invested with positive value as a kind of *reproduction*, even though this is not credited with the value attributed to the boys' achievement, which is marked, rather, as a *production* of “real” (i.e., “conceptual”) understanding. Walkerdine notes, in this connection, that the peculiar combination of (reproductive) attainment along with a purported lack of real (productive) cognitive development

. . . is precisely that combination which is required for the entry of girls into the “caring professions”, in this case specifically the profession of teaching young children. Recruitment to elementary teacher training requires advanced qualifications, but usually a lower standard (poorer pass marks, for example) than that required for university entrance. (p. 72)

In this observation of discursive practice in specific homes and classrooms, we can begin to see how the structures in which terms (such as “achievement,” “development,” “maturity,” “conceptual”, etc.) take on their effective meanings in concrete social practices, do so in part by embedding the specific local practices within semiotic structures as far-reaching as the schemata generated by encodings of difference between “production” and its opposites and contradictories (See Figure 9.e.).

The next step is to see how semiotic structures of this kind can be articulated with the triadic sign relations featured in the Peircean approach to semiosis.

III. An Integrated Approach

A. An Example: Signifying “Motivation”

To illustrate how structural and Peircean semiotics can be used together in the analysis of specific cases in education, I will use an example in which student misunderstandings of a textbook lesson resulted from an assimilation of the textbook material into semiotic structures that were acutely meaningful to them in their life practices both in and out of school. The material in question was a chapter on “motivation,” which a few of the first year college students interpreted in a sense that was more meaningful to them, but which prevented them from understanding the terminology and problematics of their textbook. The problem arose with students for whom “motivation” was a highly salient concern within their daily lives—but in a sense that educational psychology traditionally would describe as “interfering” with the students' ability to correctly understand a text which used the “same word” in an altogether incommensurable sense.

Such problems are traditionally addressed by providing more explicit definitions, along with “examples” and “non-examples” from which students are to learn the defining characteristics of the concept to be learned (cf. St. Julien, 1992), as if this were a problem of providing enough information to identify a formal concept analytically defined in terms of “intensional” and “extensional” properties. But “motivation” functioned in the lives of these students, as well as in the program of behaviorist research presented by the textbook, not as a formally determined “concept,” but as a *sign* determined by a myriad of substantial signifying relations. We can begin, however, with the formal structure of relations between “motivation” and its opposites and contradictories (see Figure 10.a.).

In a “Consumer Science” course taken primarily by first-year college students, a textbook on “Consumer Behavior” included a chapter on motivation. The chapter presented findings from a massive body of research on “motivation,” which was theoretically defined and experimentally operationalized in terms of changes in the human or non-human subjects' levels of physiological arousal, and overt behaviors correlated with arousal. When used in the

marketing and merchandising discourses of such textbooks, this construction forms the nucleus of categories relevant to purchasing behavior (see Figure 10.b.). The primary positive term is addressed as a matter of how to stimulate the desired level of motivation. The opposing positive term is relaxation, and its contradictory is arousal (which is presupposed by motivation, as non-arousal is presupposed by non-motivation). A therapeutic discourse might be more concerned with a healthy integration of the positive terms (motivation and relaxation), as opposed to a pathological union of negatives (such as arousal without motivation); but the discourses and practices of marketing are more concerned with aroused and motivated directed (purchasing) behavior, as opposed to non-motivated inactivity.

For some students in the class, however, the word “motivation” was engaged in a completely different set of discourses and practices. Their writing and comments in class revealed that for them “motivation” was a highly charged and deeply significant term, one that was most often heard as an explanation for someone's academic or personal failures, as in: “I knew he would flunk out; he didn't have enough motivation.” For them, motivation was not a scientific matter of physiological arousal, to be manipulated for therapeutic or commercial purposes; instead, it was a matter of morality and personal character (See Figure 10.c.). With motivation signified in terms of striving for achievement, its opposite was signified in terms of positive distracting or competing pleasures and appetites (rather than “relaxation”, which had invested that structural position in the discourse of physiological behavior). This moral discourse celebrates self-control and discipline, in various forms, as the means, the outcome, and the signifying evidence of successful reconciliation of the conflicting positive terms.

(Two variations of this moralizing discourse were actually observed: In one, expressed by students from fundamentalist religious backgrounds, the conflicting positive terms were signified more as a conflict between virtue and temptation to sin. The other discourse, expressed by students with quite secular agendas, signified both positive terms as competing virtues. In

this discourse (unlike the fundamentalist) the successful reconciliation could be materialistic “yuppies” who take pride in “partying” as hard as they work, and the combination of negative terms could be embodied in the “nerd”.)

Although European structuralist semiotics is often regarded as being fundamentally incompatible with Peircean semiotics, I believe that semantic structures such as those illustrated above can complement the analysis of triadic sign activity.

Figure 10.d. illustrates the kinds of triadic signifying relationships in everyday practices which both sustain and are sustained by such semantic structures. Here, such elements of the college student's everyday regimen as his or her use of alarm clocks and coffee can be understood as elements of triadic signification, in which practices that play a part in forming one's self-concept might also reinforce the semantic schema for “motivation” in a way that influences how one understands the “motivation” chapter in a textbook on psychology. In Figure 10.d., routines of self-regulation through the use of coffee and an alarm clock are represented as two interpretants, each signifying motivation, in some sense, through the mediation of a person's reflective thoughts of discipline and self-control. Of course such practices may be determined in large part for the sake of their more direct effects (such as waking up and making it to school on time); but specific aspects of those practices, as well as their more general significance, can at the same time be determined partly by the overarching strategies and practices of self-formation within which they occur.

As Figure 10.e. illustrates, coffee and alarm clocks can directly (or dyadically) cause physiological conditions such as sleep deprivation and stimulation from caffeine. But these conditions themselves might still be serving as representamena (r_{3i}) mediating the sense in which “motivation” will be signified through an interpretant (i_j). Here, we would not expect that the production of sleep deprivation and caffeine stimulation would have any intentional purpose of signifying motivation, so it may seem strange to think of these things as representing “motivation” in

any sense. But they are related to the idea of motivation through the mediation of the two triads illustrated earlier, in which the alarm clock and the coffee served as interpretants ($i_1, 2$). This mediated relationship between caffeinated sleep deprivation and the “motivation” idea provides the grounding for sign activity in which those physiological conditions can actually “stand for” motivation, insofar (for example) as a person can respond to feelings of such physiological stress, in part, by feeling pride in their self-disciplined program of accomplishment. That stressed-out physical condition can thus serve together with the clock use and coffee use as representamena (r_{3a-3c}) in relation to such feelings, which in turn serve as interpretants (i_3) mediately signifying motivation.

It might still seem that these physiological conditions, directly (dyadically) caused by sleep interruption and the pharmacological effects of caffeine, were not really produced as signs of motivation, and do not really represent motivation unless someone believes or claims that they are representations. A close analogy might help. The sensation caused by muscle strain is unpleasant, if not painful; yet, the weight lifter is not bothered by this pain, and may actually enjoy the sensation as a sign of progress in his strength training or body building program: “No pain, no gain,” as they say. That same sensation will become a painfully disturbing one, however, if he learns that it's a symptom of a degenerative disease syndrome. Likewise, if the stressed-out student learns that feelings of fatigue are caused by a chronic illness, she might change her daily practices to make sure she's better rested, and abandon regimens that were previously reinforced, rather than discouraged, by the weariness attributed to a highly motivated self-regulation. This attribution need not be consciously entertained before it functions in triadic signification. This can be seen in the counterfactual: The sensations may be ones that would give rise to worry about one's health, *except* for the explanatory attribution, which might function only tacitly in such a way that no thought is even given to the stress and weariness. In this case, what occurs as an interpretant is the very *absence* of the worried

interpretations that would have arisen in response to those same physiological conditions, had they not become triadically involved within signs signifying motivation and self-discipline.

Figure 11. illustrates how this interpretant can be endowed with semantic value by virtue of its position within the structure of semiological possibilities. The absence of worry can function as an interpretant even though it is not something that exists or occurs in a *positive* way, apart from its structurally significant relations with other things and events. Without raising the ontological question of whether there are any entities existing *positively* in this way, I would argue that any thing or event which participates in triadic signification—including, from this Peircean perspective, all cognitive processes—participates by virtue of its *relative* existence: i.e., its existence as one term of its relationships with the things or events (including absences and non-occurrences) which serve as the other terms of those relationships. As Saussure learned from the exceptionally obvious example of phonemic value, value (“*valeur*”) derives from the relationships: A sound-type does not have phonemic value in and of itself, for example, but only as a term within the structure of phonemic similarities and differences. Potentially significant value does not inhere in things or events as positive entities, but accrues to them as terms within relationships.¹³ These include both *syntagmatic* relationships (i.e., relationships of combination, with other co-occurring things or events within the context) as well as *paradigmatic* relationships (i.e., relationships of alternation or exclusion, with other things or events that could occur within the context, but to the mutual

¹³Cf. Clancey & Roschelle (1991): “. . . the ‘situated’ aspect of cognition is that the world is not given as objective forms. Rather, forms must be constructed and given meaning in a perceptual process, which involves interacting with the environment, detecting differences and similarities, and hence creating information” (p. 20). While agreeing on many points (interaction with the environment, priority of relations such as difference and similarity, etc.), my theoretical interpretation of these points departs from theirs in several ways. Again, for example, their distinction between “objective” and “subjective” does not seem meaningful within my semiotic perspective.

exclusion of each other).¹⁴

Within a web of triads signifying “motivation,” we have used semiotic squares to identify self-image (as an interpretant) and “motivation” (as an object, elaborated more extensively in Figures 10.a.-10.c.) as terms that are also located within such structures of semiological constraints and possibilities. I believe that this could also be done with the mediating representamena, such as clock use and coffee use.¹⁵ Each element within the triadic sign-relation is seen to be endowed, therefore, with semiological value that arises from the structure of its binary relations of similarity and difference with other terms. But even as such binary structural relations are in that sense internal to the constitution of each term in the triadic sign-relations, so also are the triadic sign relations internal to the constitution of each semantic term that enters into binary or serial structural relationships with other semantic terms. Thus, each of these two kinds of semiotic relationships (the Peircean/triadic, and the Saussurean/binary) is internally constitutive of terms or elements within the other. This does defy the simple logic of positivistic analysis (in which anything can be analyzed into positively self-identical constituents); but that is not a flaw in this semiotic account if, in reality, cognition and other semiotic processes conform instead to principles of other logics, logics of reciprocally internal relationships among things and events.

This extended exploration began with an example of students

¹⁴The distinction between *syntagmatic* and *paradigmatic* structural dimensions has been generalized from Saussure's linguistic analysis. A prototypical syntagmatic structure is that of subject, predicate, object, etc. occurring together in a sentence. *Paradigmatic* relations can be seen in grammatical “paradigms” such as “*amo/amas/amat/...*” from which one form will appear in the sentence to the exclusion of the others. Another *paradigmatic* relation can be seen in the significant difference between the verbs in “The passenger was killed” and “The passenger was murdered.”

Other *syntagmatic* structures can be seen in the narrative grammars (analogous to sentence grammars) explored by Greimas and others. Narrative structures are only one of many kinds of semiotic structure that may be relevant to situated cognition, but are slighted or neglected in this paper. See, for example, Lemke (1990, pp. 183-213).

¹⁵This would require a discussion (not undertaken in this paper) of how semiotic squares can be invested with things or events that are less clearly analogous to linguistic elements.

interpreting the concept of “motivation” in a way that was fundamentally different from its use as a scientific construct in their psychology text. I believe that the example does show how contextual situations are pragmatically implicated in the very constitution of the sign. In this light we may consider the “contextualism” of James Jenkins (1974) who was quoted by Clancey and Roschelle (1991) as he “describes the roots of situated cognition in American pragmatism, in the work of William James, C. S. Peirce, and John Dewey” (p. 2). Instead of focusing on the “pragmatist” criteria for truth,¹⁶ Jenkins (1974) chooses for emphasis “the less familiar, but more descriptive, name *contextualism*”:

Contextualism holds that experience consists of *events*. Events have a *quality* as a whole. By quality is meant the total meaning of the event. The quality of the event is the resultant of the interaction of the organism and the physical relations that provide support for the experience. The relations can be thought of and analyzed into *textures*. A texture in turn consists of *strands* lying in a *context*. (p. 786)

An approach that integrates the semiotics of Peirce and Saussure enables us to identify very diverse strands and textures through which “contextual” structures are woven into the structures of the signs themselves, as within these structures signs give rise to other signs:

Symbols grow. They come into being by development out of other signs, particularly from icons, or from mixed signs partaking of the nature of icons and symbols. We think only in signs. These mental signs are of mixed nature; the symbol-parts of them are called concepts. If a man makes a new symbol, it is by thoughts involving concepts. So it is only out of symbols that a new symbol can grow. *Omne symbolum de symbolo*. (Peirce, c. 1895, 2.302)

I have been trying to demonstrate how these strands and textures weave together elements of the most diverse kinds, including abstract verbally articulated concepts as well as habits, regimens, ideologies, emotions, and physiological states. Respond-

¹⁶Jenkins neglects to note that it was William James who popularized this version of “pragmatism,” which was so different from Peirce’s thinking that Peirce gave up the word, adopting “pragmaticism” as a new word (so ugly that it would not be usurped) for his original ideas, which had been proposed as the basis for a theory of meaning, and never as a theory of “truth.”

ing to Clancey's and Roschelle's point that "a science of learning without the neural perspective is like agriculture without genetics" (1991, p. 5), I have tried to demonstrate an approach in which the kinds of neurological phenomena described in the discussions of connectionism by Bereiter (1991), Gee (1992), and St. Julien (1992) can be seen as elements that can participate triadically with other elements as diverse as social norms and public policies within the fundamental nuclei of sign-activity.

Starting with the "motivation" example, however, I fear that my demonstration may have remained too close to the personal, psychological, and physiological, and not gone far enough toward demonstrating the participation of such elements in triads which also include social, economic, institutional, political, and cultural phenomena as other objects, representamena, and interpretants within the same triads, along with psychological and physiological elements. I have no doubt that this could be done with the "motivation" case itself (recall that some of the students were invoking discourses from their fundamentalist church backgrounds, while others were pursuing Reagan-era dreams of being young upwardly-mobile professionals).

B. Representation, Concepts, and Perception

Referring more directly to the kinds of subject-matter taught in schools, Toulmin (1972) proclaims that “*Concepts are Micro-Institutions*” and “*Institutions are Macro-concepts*” (pp. 352-353 [Toulmin's emphasis]). Toulmin persuasively describes social and historical institutions functioning as concepts; but I believe that our Peircean approach makes it even easier to understand in a more fundamental theoretical sense that concepts are comprised of triadic sign-relations in which even the most “macro-level” institutions can participate.

This raises the problem of how to understand “concepts” and “conceptuality” in relation to the situated nature of cognition. According to Brown, Collins, and Duguid (1989a):

For centuries, the epistemology that has guided educational practice has concentrated primarily on conceptual representation and made its relation to objects in the world problematic by assuming that, cognitively, representation is prior to all else. A theory of situated cognition suggests that activity and perception are importantly and epistemologically prior—at a nonconceptual level—to conceptualization and that it is on them that more attention needs to be focused. An epistemology that begins with activity and perception, which are first and foremost embedded in the world, may simply bypass the classical problem of reference—of mediating conceptual representations. (p. 41)

Clancey & Roschelle (1991) agree with the emphasis on perception; insisting that “it is by perceptual processes that representations are created and given meaning” (p. 3), however, they would not recognize representation as belonging to some non-perceptual “conceptual” level:

Perception involves coordinating current processes of talking, seeing, and moving with the processes that have been constructed previously. The result is always novel, though composed of past coordinations. To the extent that environment is regular, stable behaviors will develop. Representations are created and given meaning in the course of this perceptual process. (pp. 21-22)

This seems to agree with Brown, Collins, and Duguid (1989a) when they claim:

A concept . . . will continually evolve with each new occasion of use, because new situations, negotiations, and activities inevitably recast it in new, more densely textured form. So a concept, like the meaning of a word, is always under construction. (p. 33)

Rather than excluding concepts from any important place in their

accounts of cognitive activity, Brown, Collins, and Duguid (1989a) are concerned to clarify how concepts should be better understood, as when they argue that “to explore the idea that concepts are both situated and progressively developed through activity, we should abandon any notion that they are abstract, self-contained entities” (p. 33). It is still not altogether clear, however, how situated cognition theory would account for the attainment of conceptuality.

But first, it is not even clear what is being meant by “concept” or “conceptuality.” Brown, Collins, and Duguid (1989a) comment that “whatever the domain, explication often lifts implicit and possibly even nonconceptual constraints (Cussins, 1988)¹⁷ out of the embedding world and tries to make them explicit or conceptual” (p. 41). In Cussins and the other sources we might turn to (e.g., Johnson, 1987; Lakoff, 1987) we find extensive and sophisticated arguments against trying to understand cognition primarily or exclusively in terms of abstract, formal, decontextualized “concepts.” Yet, whether these authors are making a case for the importance of “nonconceptual” elements, or arguing for a less restrictive understanding of the “conceptual,” it is never clearly stated what they take “concept” or “conceptuality” to mean.

We cannot assess competing descriptions of “conceptuality” until we have an idea of what it is that we mean to describe. Nor can we assess the merits of a plea for the “nonconceptual” until we know how that is being distinguished from the “conceptual.” In Cussins' usage (accurately reflected in the above reference by Brown et al.), “conceptuality” seems to be defined partly on the basis of explicitness. Lakoff relies heavily on the formulation of “preconceptual experiences” discussed in more detail by Johnson (1987; see Lakoff, 1987, pp. 267-268); and again, while their structural descriptions of the levels referred to as “conceptual” and “preconceptual” are clear and persuasive, it is not clear how and why “conceptuality” itself is being understood in terms of abstract-

¹⁷I am assuming that the research report cited by Brown et al. is essentially the same as the paper published later under the same title (Cussins, 1990).

ness and explicitness, almost as if by some unquestionable definition of the word. Brown, Collins, and Duguid (1989a) argue against the ideology of teaching “abstract, decontextualized formal concepts,” “the abstract concept alone,” or imparting “abstracted concepts as fixed, well-defined, independent entities that can be explored in prototypical examples and textbook exercises,” to students who will then be able to “manipulate algorithms, routines, and definitions,” but without showing any real understanding or ability to make use of real knowledge in authentic situations (pp. 32-33).

While I agree with those who challenge this ideology of abstract, rule-determined concepts, I would like to hear “conceptuality” itself defined, so that we have some basis for considering how other characteristics may or may not pertain to “concepts.” If “conceptuality” is understood as the capacity of an idea or sign to serve as “a general idea [or sign] derived or inferred from specific instances or occurrences”;¹⁸ then we can see “abstractness,” “analyticity,” “explicitness,” etc. as other characteristics which are not intrinsic to the sense or meaning of “conceptuality” as such, but which have become incorporated into established theories of how conceptuality occurs. These are not the only possible explanations of conceptuality, however, and I would argue that the Peircean approach explains how the generality of “concepts” as such can be achieved concretely (and not by “abstraction”¹⁹) and in ways that are not necessarily analytically rule-governed or explicit.

I believe that this is an important problem for situated cognition, so I hope that it does not sound like pedantic quibbling over

¹⁸First definition under “concept,” in *The American Heritage Dictionary of the English Language*, Third Edition (1992).

¹⁹Cf. Brown, Collins, and Duguid (1989b): “One possible misinterpretation of our argument is that, because all knowledge is situated, no generalization is possible. But that is not what is intended. Quite the contrary. Ours is an argument against teaching abstractions, devoid of connections with the world. The distinction between generalizations and abstractions parallels the distinction between fables, such as those Aesop wrote, and their morals. . . . Much of what is taught in school, whether the multiplication algorithm or the dates of the Civil War, is like morals without grounding in any fable” (p. 12).

words (“merely” semantic, as they say). St. Julien (1992, p. 5) argues that any adequate theory of situated cognition must recognize that transfer of learning does sometimes occur, and must be able to account for how such transfer can take place. I am not sure that “transfer” is a good metaphor for what is happening,²⁰ but certainly we do need to account for how learning can be generalized as meaningful and useful beyond the immediate situation in which it has originally occurred. While I would not claim that the basic Peircean model of triadic signs, in itself, provides a sufficient theory of generalizable learning, I believe it does provide a way of understanding conceptualization that is significantly different from those that assume processes of analytical abstraction or other rule-governed operations performed on elements of the kinds of symbol systems proposed in mainstream cognitive science.

As John St. Julien (1992) has observed:

Knowledge—insofar as that which enables competence can still be called knowledge—is found in the context, in structuring resources and discursive practices, in the habits that get us through the day. For the most part competence is more understandable as a matter of appropriate perception and habituated action than as formal reasoning over classical objects of knowledge. (pp. 4-5)

Figure 12. illustrates how multiple triadic relationships can incorporate perception and habituated action in ways that can give rise to concepts as both generalized and situated semiotic practices. Two triads are presented. In both, the action of slicing twenty-five cents worth of cheese serves as an interpretant [*i*] which, through the mediation of the coins presented (either five nickels [*r*₁] or one quarter [*r*₂]), signifies a common monetary value [*o*]. “Twenty-five cents worth” thus becomes conceptually generalized as a value that can correspond not only to various coin combinations, but also to specific quantities of cheese or bread or other goods. Although this might be described as an “abstract” value, we should note that it has not become established in this

²⁰I would prefer to speak of “application,” if only there were some way to assure that this would be understood as it is used in hermeneutical phenomenology (see footnote 36, page 63).

illustration through the formal logical procedure of abstraction. Instead, it has been *conceived* as a general sign in a manner very much like that in which five nickels came to *perceived* as the sign of an equivalent value.

At least in the case of such regularly encountered quantities, the value of the nickels will not be *calculated* by the “expert” cheese vendor, but simply *recognized*. Every time five nickels are encountered they will differ in their physical arrangement. There might be a darkened dirty nickel, a Canadian nickel, or an old “Indian head” nickel, variously showing “heads” or “tails”. The vendor is confronted with a different visual image every time. But this does not mean that, each time, the vendor must go through an algorithmic rule-governed procedure to ascertain the monetary value of the coins. In the case of five nickels, the expert does not even execute the rudimentary procedure of counting them; she simply *recognizes* them *as* 25¢. Experts might recognize the value of five nickels more readily than that of five dimes or even four nickels. If so, this is because of the repeated and familiar practical relationship between five nickels and the frequently encountered monetary value 25¢. In that case, the *perception* of five nickels is no less abstract than the *conception* of 25¢; the concept is not derived from the concrete objects through rule-governed processes of sensation, information processing, and calculation. Instead, in the manner described by John St. Julien (1992), the recognition of five nickels is itself arrived at through the unruly but reliably regular processes of (socially supported and constrained) perceptual pattern completion, and the pattern of five nickels, in particular, is more readily perceived because of its relation to an “abstract” quantity (25¢) which may be semiotically more *solid* than the metal coins themselves, by virtue of the density of practical transactions and communications in which the value of that quantity is so well established. Quantities of cheese, coins, and monetary value are sustained in practical cognition through the habituated relationships among them, and among them and the terms of countless networks of other triads in which they are also involved.

We see here a conceptual generality of signs that coordinate

conception with *perception* and action. Cf. Roschelle and Clancey (1992), who explain that the “social-neural standpoint” helps us see how

. . . . the emergence of new categories is a matter of re-using transient organizations of neural maps; structured cues from the physical and social world gradually can stabilize new relations of features and the world. Crucially, these maps coordinate perception and action—they do not *represent* how behavior or the world appears to an observer. (p. 12)

Again, they tell us, “Representing is, in essence, coordinating perception with action; this coordination takes place in a dialectic between the social and neural processes” (p. 14). I believe that our examples of triadic signification do illustrate semiotic processes in which such coordination can take place. On the other hand, I think that these quotations from Roschelle and Clancey reveal an ambivalence in their use of “representation” which might now be clarified, in part, by differentiating between the senses of “representation” as *Vorstellung* or as *Darstellung* (helpfully discussed in Toulmin, 1972, pp. 193-199, 429-436).

The kind of representation that is denied in the first quotation is more an example of *Vorstellung*. As Toulmin (1972) explains:

By contrast [with *Darstellung*], the term *Vorstellung* suggests a “representation” as private or personal as a *Darstellung* is public. A *Vorstellung* “stands for”, or symbolizes, something “in the mind” of an individual. The term carries the same burden as words like “idea” and “imagination”: it is, in fact, the standard German translation for the Lockean term “idea”, and runs into all the same difficulties. (p. 195)

Toulmin explains that

a *Darstellung* is a “representation”, in the sense in which a stage-play serves as a theatrical representation, or in which an exhibition or recital provides a public presentation or representation of works of art or music. To *darstellen* a phenomenon is then to “demonstrate” or “display” it, in the sense of setting it forth, or exhibiting it, so as to show in an entirely public manner what it comprises, or how it operates . . . (p. 195)

Toulmin concludes that “the relationship between a *Darstellung* and the reality which it ‘displays’ or ‘represents’ is, accordingly, a relationship between two public entities” (p. 195). This conclusion is questionable in a couple of respects (at least as it pertains to our interest in representation, rather than his immediate

purpose in explaining the established usage of the German word). First, we do not see the elements of representational signification as “entities” which can be identified existing in themselves; in general, we see the elements themselves produced, and identifiably existing, *as the terms* of their relationships with other elements. Toulmin's point that both elements are “public” is also an overstatement—understandable in the context of his criticism of the received framework of Kant, Locke, and Descartes. From our standpoint, however, we understand representational sign-relations as including such things as the transient “activation states” and “neural maps” which Roschelle and Clancey describe as occurring neurologically in individuals (1992, pp. 11-12; cf. St. Julien, 1992). Although not “public,” these too exist as terms of their relationships with other things and events in the world, including things and events outside the brain or psyche of any single individual. Our framework enables us to deny the very split between *mind* and *world* that is presumed in the Cartesian framework, and reflected in the Lockean notion of “private” representation which Toulmin is at such pains to rebut.²¹

We should also note a possible apparent difference between *Darstellung* in the exhibition of a visual work of art and in the performance of a musical composition. While it might be thought that the particular performance of a work of music “represents” the composition in the sense that any *token* represents a *type* (as when the sounds I vocally produce while speaking may be regarded as tokens representing their phonemic types, or the

²¹Cf. this passage by Peirce, in his 1905 article, “What Pragmatism Is”:
Two things here are all-important to assure oneself of and to remember. The first is that a person is not absolutely an individual. His thoughts are what he is “saying to himself,” that is, is saying to that other self that is just coming into life in the flow of time. When one reasons, it is that critical self that one is trying to persuade; and all thought whatsoever is a sign, and is mostly of the nature of language. The second thing to remember is that the man's circle of society (however widely or narrowly this phrase may be understood), is a sort of loosely compacted person, in some respects of higher rank than the person of an individual organism. (5.421 [1905])

On *Darstellung* in consciousness and the unconscious, see Derrida (1972); on levels, kinds, and senses of representation, see also Derrida (1982).

printed character “R” on this page is a *token* of the letter “R” in the Roman alphabet), this is clearly not the sense of *Darstellung* involved in the case of an exhibition of a painting or a sculpture. In both the visual and musical examples, however, *Darstellung* involves the work itself—the object represented—being actively engaged with in the world. If we recall that Toulmin used the works of art as an example in explaining the nature of representation in collectively developed and shared scientific concepts, it is easier to avoid the mistake of understanding this as a matter of (formal) types represented by (substantial) tokens. In both science and the arts, as well as in everyday practical cognition, this sense of *Darstellung* is not so much a matter of public versus private, but it is clearly something socially accomplished, and not a matter of performing formal operations on some inward mental symbol system (as in *Vorstellungen*).

As Clancey & Roschelle (1991) explain in their discussion of an activity for learning physics concepts,

Schema models are good for representing the ways of talking and seeing that the students bring to bear But schema models of interpretation require input concepts and relations . . . which are constructed in the activity itself. “Triggering a schema” is a perceptual process, but not a matter of matching given tokens. Perception involves coordinating current processes of talking, seeing, and moving with the processes that have been constructed previously. The result is always novel, though composed of past coordinations. To the extent that environment is regular, stable behaviors will develop. Representations are created and given meaning in the course of this perceptual process. (pp. 21-22)

As we have seen, Peirce's semiotic approach shows how such coordinations occur in triadic relationships, with perceived or conceived objects represented in the activity of interpretants through the mediation of the representamena. Considering the breadth of possible examples, we can see more clearly now why the kind of “representation as coordination” demonstrated by Clancey and Roschelle should not be restricted to the kinds of things that match their definition and examples of a representation as something that is recognized or claimed by somebody as a representation. The stability that they describe as a tendency of constrained novelty in the resulting coordinated behaviors (interpretants) is partly determined by the regularity of the object and its *Darstellung* in the triadic sign. This is what constitutes the

sign as a representation of the object, and it does not depend on being claimed or otherwise acknowledged as such.

To account for the developmental aspect of representation noted by Clancey and Roschelle, it may be helpful at this point to add the last bits of Peircean arcana to be introduced in this paper: the distinctions between immediate and dynamic objects, and immediate, dynamic, and final interpretants. As T. L. Short (1981) explains:

The immediate object is the world, or some part of it, as the sign represents it to be, while the dynamic object is the world—or the relevant portion of it—that will actually determine the success or failure of any given interpretant of the sign. This success or failure will sometimes be manifest in the semeiotic process itself, namely, when there is opportunity to form more than one dynamic interpretant of the same sign. For then each interpretant implicitly adds to or corrects the preceding interpretant. (pp. 214-215)

In one of Short's examples of this process,

several physicians consulting can agree that a thermometer reading indicate that the patient has a fever, while disagreeing about what else this signifies. The immediate logical interpretant²² is that the patient has a fever; what their dynamic interpretants add to this will depend upon their collateral observations of the patient, of similar cases, and so on. The immediate object of the sign is fever; the dynamic object is the actual physical condition of the patient so far as that bears on the physicians' practical problem (for their goal is only practical, not theoretical). Sufficient collateral observations will produce dynamic interpretants close to the final logical interpretant, in which this dynamic object would be fully apprehended. (p. 216)

Finally, Short explains that “the final interpretant (toward which the dynamic interpretants of a sign tend) could, depending on the sign and the goal of interpretation, be either the feeling or the action or the thought²³ which *would be* the ideally adequate interpretation” (p. 213) Thus, “the ultimate form of a logical interpretant is the testable form of that interpretant. The final logical interpretant is the logical interpretant that would survive all possible tests” (pp. 218-219).

We are now prepared to reconsider the nature of concepts as

²²In this paper we need not be concerned with the trichotomy of “emotional,” “energetic,” and “logical” interpretants, which is reflected in Short's explanation.

²³See footnote 22.

representational signs which coordinate between social and neurological levels. Let us recall the notorious Weight Watchers “cottage cheese” example:

In this case they [the dieters] were to fix a serving of cottage cheese, supposing that the amount allotted for the meal was three-quarters of the two-thirds cup the program allowed. The problem solver in this example began by muttering that he had taken a calculus course in college (an acknowledgment of the discrepancy between school math prescriptions for practice and his present circumstances).^{*} Then after a pause he suddenly announced that he had “got it!” He filled a measuring cup two-thirds full of cottage cheese, dumped it out on a cutting board, patted it into a circle, marked a cross on it, scooped away one quadrant, and served the rest. Thus, “take three-quarters of two-thirds of a cup of cottage cheese” was not just the problem statement but also the solution to the problem and the procedure for solving it. The setting was part of the calculating process and the solution was simply the problem statement, enacted with the setting. At no time did the Weight Watcher check his procedure against a paper and pencil algorithm, which would have produced $\frac{3}{4} \text{ cup} \times \frac{2}{3} \text{ cup} = \frac{1}{2} \text{ cup}$. Instead, the coincidence of problem, setting, and enactment was the means by which checking took place. (Lave, 1988, p. 165 [*footnote omitted])

Some questions were raised by critical discussants after Brown, Collins, and Duguid (1989a) described this resolution as “inventive,” and the dieter's solution path as “extremely expedient” and an example of situated cognition as used both by real practitioners and by “JPFs” [“Just Plain Folks”], as opposed to the non-contextualized procedures taught to students in school (p. 35). Instead of seeing this as an “inventive resolution” of the problem, Palincsar (1989) described it as “an act of desperation, born of ignorance.” Asking “Where does this so-called resolution lead? Nothing has been learned that could be generalized,” she noted her suspicion that “the underlying problem here is that, due to the decontextualized teaching of fractions, the Weight Watcher never internalized procedures for simple mathematical computations that could be used to solve a practical problem” (p. 7). Wineburg (1989) added the observation that this dieter “could not use a simple algorithm and a time-honored culinary tool—the fractionalized measuring cup” (p. 9).

Responding to the criticism, Brown, Collins, and Duguid (1989b) explained:

We do not doubt that it is useful to resort to algorithms in many

cases, but we suggest that people will first try to deploy useful aspects of the task and their understanding of the context in order to limit and to share the representational and computational load. If this situated approach fails, they may, step by step, fall back on abstract algorithms. But we still need to understand the initial impulse to try a situated approach. And if this approach indeed succeeds, reflecting on and justifying that success is a productive learning experience. (p. 11)

The peculiar thing is that, for all the talk about whether or not algorithms should be used, or when and how, the only kind of thinking described by anyone in this exchange is algorithmic—whether “situated” or “abstract”—to the exclusion of non-algorithmic responses that are possible on the basis of the more substantive and intuitive (rather than procedural and algorithmic) conceptual understanding that can be built up through engagement in triadic sign-activity, involving the kinds of perceptual activity and habituated pattern-completion described by Clancey and Roschelle (1991) and by St. Julien (1992).

Lave finds it significant that the dieter did not use the “paper and pencil algorithm” which would have produced a solution in the form $\frac{3}{4} \times \frac{2}{3}$ cup = $\frac{1}{2}$ cup.²⁴ Notice, however, that “take three-quarters of two-thirds of a cup of cottage cheese” is also being used as an algorithm when it serves not only as the problem statement, “but also the solution to the problem and the procedure for solving it” (When the Weight Watcher “suddenly announced that he had ‘got it,’” what he had in mind was a context-specific algorithm).

The “paper and pencil algorithm” would presumably involve cancelling numerators and denominators, $\frac{3}{4} \times \frac{2}{3}$, to get the product, $\frac{1}{2}$. If the algorithm is executed properly it will produce the correct answers; but I have actually seen first-year college undergraduates cancelling numerators and denominators across unrelated problems! Advocates of rule-based theories and pedagogy would say that we need two sets of rules: one for knowing when to “apply” a given algorithm, and the other for knowing how to apply it properly. Many critics have argued that the range of human abilities that can be accounted for in this way is quite

²⁴Notice that this should be “ $\frac{3}{4} \times \frac{2}{3}$ cup,” not “ $\frac{3}{4}$ cup \times $\frac{2}{3}$ cup” (as published). This is not meant to quibble, but to insist upon the importance of such sign-elements in developing an intuitive conceptual sense of the representation, rather than relying upon either “context-free” or “situation-specific” algorithms without guidance from such conceptual comprehension.

narrow and exceptional (e.g., Dreyfus & Dreyfus, 1986; Winograd & Flores, 1987). When the task is one that can be accomplished in this way, we might still consider that it is worth sacrificing greater generalizability in the decontextualized rule-based approach, for the sake of greater functional success and accessibility using more ad hoc, makeshift situation-specific algorithms. But comparisons on these instrumental functionalist grounds omit what I see as another distinct advantage of the situated approach, one which is more important, I believe, at least for the distinct educational purpose of the school curriculum.²⁵

I believe that situated approaches to problem-solving should be appreciated not only in terms of their functional sufficiency, but more importantly (at least for educators and educational researchers) in terms of the substantial understanding which is required for the more inventive problem-solving (and, perhaps more important, for the situationally-responsive practical judgment in problem-formulation), and which might not be required at all in getting correct results to pre-defined problems through rote application of procedural rules. I believe that education does properly aim for a more fundamental conceptual²⁶ understanding that might not be required for functional adequacy in solving this or that specific technical problem.

We have seen that although Brown, Collins, and Duguid have criticized traditional notions of conceptuality, they are not dismissive of conceptualized learning; rather, they would propose a notion of conceptuality as something that perpetually develops from the kinds of situated cognitive activity exhibited by the Weight Watcher with his cottage cheese. While I believe that they have validly distinguished such conceptualizing activity from the traditional rote-learning and “application” of “concepts,” I believe that they are still describing algorithmic procedures, which are now seen to include “micro-routines” in which “parts of the cognitive task” are “off-loaded onto the environment” (1989a,

²⁵This point is related to St. Julien's (1992) concern that schools do have an important and distinctive role in the intellectual formation of students, which is neglected when situated cognition is supported primarily on instrumentalist or functionalist grounds.

²⁶See pp. 35-38 on the meaning of “conceptuality.”

p. 35), and people “deploy useful aspects of the task and their understanding of the context in order to limit and to share the representational and computational load” (1989b, p. 11). They contrast this situated approach with “the processing solely inside heads that many teaching practices implicitly endorse” (1989a, p. 35), as well as the “abstract algorithms” that it might be “useful to resort to” or “fall back on” when the situated approach is not successful (1989b, p. 11). The problem with these formulations is that they too narrowly restrict our view of cognition, in part through the dichotomization of purportedly non-algorithmic activity situated in the environment, versus abstract algorithmic activity “solely inside heads.” This framework does not seem to provide a place for the role of such things as the pattern-completion and perceptual activity described by St. Julien (1992) and by Clancey and Roschelle (1991).

I believe that a Peircean framework would more adequately account for how these processes participate together with the other processes that operate together within cognitive activity. One glimpse of this possibility might be provided by considering a kind of conceptual understanding that mathematics instruction might aim for in the schools, and which is not a matter of algorithmic procedure (either abstract or situated), but which would also have been useful to the Weight Watcher who wants to eat just-the-right-sized portion of cottage cheese.

In that case, the situated algorithm that was ultimately used has been described to us as an inventive and efficient way of getting the right answer, without any need for remembering the more abstract algorithms for

(a) formulating the problem as one that requires solving for x in $x = \frac{3}{4}x\frac{2}{3}$ cup, and then

(b) performing the correct operations on the formula to find the correct answer. I want to argue, however, that without either recalling and executing those “abstract” calculations or inventing and executing situated calculations more concretely on the cottage cheese itself, a Weight Watcher with the conceptual understanding of mathematical relationships that we should be aiming for in school could have more efficiently and directly recognized $\frac{1}{2}$ cup of cottage cheese as the quantity desired.

When told to “take three-fourths of two-thirds of a cup,”

When told to “take three-fourths of two-thirds of a cup,” someone familiar enough with quantitative relationships will recognize “three-fourths of two-thirds” as a designation for the same value as “two-thirds of three-fourths” or simply “one-half.” If this were a matter of cancelling numerators and denominators, then it would make no difference whether the quantity were represented as $\frac{3}{4}$ of $\frac{2}{3}$ or as $\frac{2}{3}$ of $\frac{3}{4}$. The latter is much more easily *recognized*, however, as another representation for the same quantity that is more often designated as $\frac{1}{2}$ (see Figure 13). For someone who has developed a sufficiently “expert” familiarity with such quantitative relationships there will be no need to remember that multiplication is a commutative operation (i.e., that $a \times b = b \times a$) and to “apply” a commutation procedure before deriving one form from the other. Instead of thinking about the forms of fractional expression, the person would be able to recognize the common value as directly as she could recognize the common value of five nickels and five other nickels, or one quarter, without first turning them so that they are all showing the same side (heads or tails), or “applying” some remembered rule about an “Indian head” nickel being equal to a Jefferson nickel, and then counting them and multiplying by 5¢ (See pp. 38-40, above). In the cottage cheese example, there is no need to remember the commutativity of multiplication—or for cancelling numerators and denominations, for that matter—because there is no need for multiplying any fractions. Instead, just as the cheese vendor can recognize five nickels as a value equal to the same amount of cheese as one quarter, so too could the Weight Watcher see “three-fourths of two-thirds” as calling for a half-cup of cottage cheese.

The kind of conceptual familiarity with fractional quantities and relationships that I am speaking of can be developed and habituated in the kind of triadically signifying practical activity illustrated in the cheese-selling example (Figure 12, p. 35). Far from being esoteric, rare, or academic, such familiarity can be observed in the everyday activities of “Just Plain Folks,” such the adult workers in a milk processing plant reported and discussed in Scribner (1984, 1986), and the 5- to 16-year-old Brazilian candy sellers in Saxe (1990).

Like the coins and cheese slices in Figure 12, physical objects

participate in the active triadic sign-activity in which more general signs or concepts are developed. In Scribner's study, for example, workers in a milk processing plant were deftly manipulating cases partially filled with cartons of milk to fill orders by their customers. For illustration purposes, Figure 14.a. uses an egg carton showing one-half as two-thirds of three-fourths, in a palpable form that could participate in the formation of the more general conceptual relationships. Figure 14.b. presents a dozen eggs divided into thirds, with three-quarters of two-thirds again comprising half-a-dozen eggs.

Again, these illustrations might be easily confused with familiar classroom methods for teaching algorithmic processes. If we were contemplating using the eggs as “manipulatives” in teaching fractional arithmetic, then the division of a dozen eggs into fourths and into thirds might be employed with equal effectiveness. But that is not the same thing as the kinds of situated learning and cognition observed by Scribner and by Saxe, which I would describe as being situated not only with respect to local and specific time and place, but also with respect to their embeddedness within the dynamic structured networks of semantic and pragmatic relationships which make them consequential and significant within the practices and projects of people's real lives in the social world. In real life we deal frequently with a “half-dozen” as a quantity of eggs or other familiar things, but there is probably less basis for intuitive familiarity with two-thirds of a dozen. On the other hand, a student whose life revolves around sharing six-packs (Figure 15.a.) with two regular companions might be more likely to have formed a robust, intuitive conceptual familiarity with “half” as “three-fourths of two-thirds” (see Figure 15.b.).

It is in our everyday lives that we are engaged in practical occasions for the situated development of more general conceptual understanding; but I believe that school instruction can make an important difference in the likelihood of gaining such conceptual development in everyday experience. Daily practical experience with sixpacks, milk cartons, or Brazilian candies can be expected to produce robust intuitions of the quantitative relations that are most commonly encountered. But classroom practices in which

conceptual understanding is itself featured as a practical objective could open up additional dimensions of more general mathematical relationships within which cognitive activity situated outside of the classroom can be more richly embedded and elaborated, so that the sixpack-swilling Weight Watcher is more likely to recognize half-a-cup as the desired quantity of cottage cheese.

Of course, most of us who are mathematically “Just Plain Folks,” even with the kind of conceptual familiarity with mathematical relationships that I claim we should be aiming for in school instruction, would not see the value as “half-a-cup” in one single act of recognition.²⁷ Most of us would see “one-half” only

²⁷We can expect that some people would, however. For an extreme case, consider this footnote in William James' *Principles of Psychology* (1890/1950): Mozart describes thus his manner of composing: First bits and crumbs of the piece come and gradually join together in his mind; then the soul getting warmed to the work, the thing grows more and more, “and I spread it out broader and clearer, and at last it gets almost finished in my head, even when it is a long piece, so that I can see the whole of it at a single glance in my mind, as if it were a beautiful painting or a handsome human being; in which way I do not hear it in my imagination at all as a succession—the way it must come later—but all at once, as it were. It is a rare feast! All the inventing and making goes on in me as in a beautiful strong dream. But the best of all is the *hearing of it all at once.*” (v. I, p. 255)

In his exposition of Husserl's phenomenology, Natanson (1973) comments that If the clue to understanding Mozart's gift of hearing lies in a psychological or neurological analysis, then we must relinquish any hope in the present context of grasping what it is to hear “all at once.” We are thrown back on the earthly ground of perception in which ordinary men come to wholes by way of parts. Yet even that statement needs clarification. (p. 38)

The clarification that Natanson proceeds to offer is a phenomenological account of the perceptual recognition of a familiar human face:

. . . . The aspect seen is “part of” the face in the sense of presenting the unity “face.” . . . The part shows itself, then, but as directed toward the whole it, for the moment, represents. . . . To say that these anatomical fragments add up to a human face because we somehow put them together by some conceptual-perceptual arithmetic or because we are “conditioned” by past experience to expect hair, skin, and enamel to go along with men and women is to negate the force of the natural attitude, whose truth is that we do not perceive fragments but each other. (pp. 38-39)

St. Julien (1990) uses an infant's recognition of it's mother's face as an example in his argument for a connectionist view of perception and learning, and its importance for practice in education, an argument in which he urges that memory and perception “are but a single process” (an argument that is being elaborated in his dissertation, in preparation at Louisiana State University). St. Julien sees both memory and perception as instances of what connectionism describes as processes of pattern completion.

In this, St. Julien is not merely reiterating what the *Oxford English Dictionary* (1991) apparently now recognizes as a commonplace understanding in

mainstream psychology, that “memory and what is traditionally known as perception cannot be distinguished by any but the most arbitrary of rules” (quoting R. N. Haber, *Contemp. Theory & Res. Visual Perception*, 1970). The *O.E.D.* defines “perception” (Sense 9. *Psychol.*) as “the neurophysiological processes, including memory, by which an organism becomes aware of and interprets external stimuli or sensations.” St. Julien, like Clancey and Roschelle, would insist that human perception (involving memory) must be understood as an indivisibly neurophysiological *and social* process that is quite different from the processes presumed by many cognitive scientist who would accept the *O.E.D.* definition. As Clancey and Roschelle (1991) explain:

Most cognitive modeling research claims that representations are stored in human memory, retrieved and recombined to solve problems, and than modified and stored away after learning*. The schema-based view is fundamentally flawed because neural structures and processes do not have the persistent form epitomized by the nature of computer memory*. Human memory is not a place where *things* can be stored*. . . .

In the situated cognition model, processes of perceiving and acting are created on the fly, as a composition of what we have perceived and done in the past. . . . Habits, ways of talking, and categories are stable behaviors, not generated from stored descriptions, but continuously reconstructed, albeit strongly biased by previous perceptual-motor compositions. . . . What we have taken to be the inner stuff of cognition—grammars, scripts, strategies—are observer-relative descriptions of patterns of behavior, stable interactions between the agent and his environment which develop over time. (p. 3 [*citations omitted])

It might seem that the generally agreed position between St. Julien and Clancey and Roschelle provides the formulation that we need: i.e., that recognition of the desired value as half-a-cup of cottage cheese (and other comparable cognitive performances) would be accomplished as a process of perception, or a more general kind of process that includes both memory and perception as processes of pattern completion. I think we need the more general formulation, and I think we need to generalize it a bit more:

It seems to me that we are dealing with a range of cognitive processes that cannot, without confusion, be referred to as “perceptual.” I find the arguments quite plausible for believing that the range of cognitive activities involve the kinds of neurological activity described in the connectionist accounts of perception (rather than the rule-based calculation models). But recall that, as in the *O.E.D.* definition, “perception” commonly is used in reference to something that we do with “external stimuli or sensations.” (The *American Heritage Dictionary* defines “perception” as “3. *Psychology.* a. Recognition and interpretation of sensory stimuli based chiefly on memory. b. The neurological processes by which such recognition and interpretation are effected.”) While I would be the last one to favor abiding by established usage as a matter of deference to traditional authority (In this case, for example, I agree that we must challenge the presumption that neurological activity can be extracted from the social and still be identifiable as an intact “process” of perception.), I think it probably makes sense to limit our usage of “perception” to processes in which sensory input from the environment is involved. This is only in part to avoid unnecessary confusion that might result from the departure from established usage. I think it also makes sense to recognize a broad class of mental functions, including perception, which seem to involve common or similar neurophysiological processes—but without prematurely presuming an identity among those functions such that they all could be subsumed under any one of them.

Recalling the Mozart example, we can assume that his “hearing” of a composition “all at once” was not a matter of all the notes (and their rhythmic intervals and harmonic resonances) somehow impacting his eardrums at the same time. His “hearing” was more like “conception” than “perception,” at least in this respect (cf. the 25¢ example on p. 39 above)—although “conception” in this sense is clearly closer to “perception” than it is in analytical or formalist accounts of “concepts.”

after recognizing the value as one that could be expressed equally as either $\frac{3}{4}$ of $\frac{2}{3}$ or as $\frac{2}{3}$ of $\frac{3}{4}$. Moreover, I am obviously taking advantage of the fortuitous convenience of the specific fractions that happen to be involved in this example. With these specific fractional amounts, Just Plain Folks with a conceptual grasp of the relationships could see the solution in just two steps of recognition (first, recognizing $\frac{3}{4}$ of $\frac{2}{3}$ as $\frac{2}{3}$ of $\frac{3}{4}$, and then recognizing $\frac{2}{3}$ of $\frac{3}{4}$ as $\frac{1}{2}$). This might, indeed, be regarded as a simple algorithm, or as a rule-governed procedure. Less convenient fractional quantities might require a procedure involving more than just two steps. Although conceptually-grounded recognition does not totally obviate such procedures, however, the solution process cannot be accounted for simply as a rule-conforming process, since the key steps in the process consist of non-algorithmic “recognition” processes.

An appreciation of the situated character of real, practical cognition does not require us to dogmatically repudiate the use of algorithms, or to concede that algorithmic procedures might provide a useful fall-back that we can resort to if our preferred situated approach does not succeed (See page 44, above). Few, if any, situated cognitive performances will be completely non-algorithmic. What we need to understand, rather, is the orchestration of algorithmic and non-algorithmic processes within

Now we have perception, memory, what I have referred to as “conception,” plus whatever it is that Mozart claims that he was doing. I am convinced that these functions involve similar if not common processes, which are importantly different from the processes presumed in the models criticized by Clancey and Roschelle and by St. Julien. I do not know if there are other functions that should be included along with these, or what differences there might be among processes involved in the performance of such functions.

My own response to this situation is to adopt “recognition” as a general term for whatever functions and processes belong within this framework. While leaving the door open for future discoveries and theoretical developments within the framework, I believe that “recognition” clearly does mark a difference between these processes and others that involve rule-governed information processing or calculation; and it also preserves the sense of new constructions being continuously generated in a way that is significantly shaped by the history of prior cognitive constructions. Last (and perhaps least, at least for non-philosophers), this use of “recognition” invokes a legacy of understanding human cognitive activity that extends to us from long before Descartes, Locke, and modern analytical theorists, from at least the time of Heraclitus and others who already understood such things as perception and conception in terms of “re-cognition” (*γινώσκειν*, or *gignōskein*).

cognitive practices.²⁸

I have argued that the difference between situated cognition and abstract de-contextualized formalisms is not that the latter are algorithmic while the former are not. Instead, I have argued that the formalistic algorithms are attempts to function adequately without the substantive conceptual understanding that enables the ad hoc invention of the situated algorithms—and that this is a difference between rote learning and conceptual development (cf. page 46, above). Considering what we have learned from Walkerdine about how she has seen the distinction between “rote learning” and “conceptual development” used in discourses and practices that systematically disparage the real intellectual achievements of female, minority, and working class students (see page 24, above), it is necessary for me to explain how I think my usage differs from what she has seen in those oppressive discourses. That explanation will begin the final section of this paper, which will consider implications of the semiotic framework for issues of critical reflection and transcendence in cognition as a situated social process.

²⁸An impressive example is provided by Newman, Griffin, and Cole (1989, pp. 90-113 [with Andrea Petitto]), in their discussion of what they observed in classroom learning of long division.

IV. Critical Reflection and Transcendence

Recalling Walkerdine's discussion of how a differentiation between "rote learning" and "conceptual development" has been used invidiously in the suppression of female, minority, and working-class students, it is incumbent on me now to reconsider the distinction that I have just been making, in light of her sobering observations.

The first point is that although I may be using the same terms, the distinction I am making is not the same as that which she observed. "Conceptuality" in the discourse Walkerdine reports does in fact refer to the imagined abstract, analytical and formalistic context-independent "concepts" that are the farthest thing from the kind of richly embedded, substantive, social-and-physiological, situationally developed conceptual triadic signs that I have been discussing.

At the same time, I would not want to dodge Walkerdine's more fundamental point: The invidious distinction here is only one of the examples she is using to make more general points about how our discursive practices—including those of educational researchers and theorists as well as practitioners, policy makers, and the general public—do not just represent reality, but actually engender the realities that they presume to signify. Moreover, Walkerdine (1998, 1992a) has also demonstrated how our discursive practices are driven by dreams, desires, and fantasies that can be wildly unaccountable to any kind of an objective reality.

I am impressed by Walkerdine's demonstrations, and I am convinced that the phenomena she demonstrates are real (even if her discourse is itself fueled by her own desires and fantasies). For my part, I have no wish to deny the role of dreams, desires, and fantasies in the generation of my own discourse, nor would I want to lose sight of how these processes may compromise my quest for valid understanding. This assumes, as I do believe, that the differentiation between valid and invalid representations of cognition (in the case of this symposium) makes more sense than

Walkerdine might recognize.²⁹

I want to argue, in fact, that one of the great virtues of the Peircean approach is the basis it reveals for understanding critical, reflective, and even transcendent practice as a potential that is *intrinsic* in the fundamental processes of semiosis. I believe that this is true of both the semiotic processes of cognition, and of our processes of inquiry into cognition; and I believe that it is not only a valid point, but also an important one.

I would like to briefly discuss some of the importance of this point, before arguing more extensively for its validity. I will begin by relating these concerns expressed by Hugh Petrie (Dean of the Education Faculty at SUNY-Buffalo):

A lot more work needs to be done on “constructivist theories of learning” before we can be certain that they will be anything more than the latest educational fad, perverted beyond their meaning by superficial educationists (who did the same thing to Dewey, Piaget, Kohlberg, etc.)

It is understandable if people of color are even more conservative than I am about the promise of “the new learning and teaching.” We do not know whether these will ultimately be helpful in combatting the isms. Their contention is that just when folks of color figure out what they need to do to make it in the power structures, and they start teaching their children how to pass standardized tests and get into college, the white folks change the rules of the game and tell them they've got to do “whole language” or “constructivism,” which may or may not get them into the power structure.

The problem with that approach, to my way of thinking, is that it implicitly assumes that not only are there no absolute versions of knowledge (after all, we all know that absolutist positions have been used to justify oppression for a long time), there are also no judgments of better or worse with regard to knowledge claims. That is, claims of a “better” conception of teaching and learning are NOTHING MORE than different political claims. So you end up saying that it's all just about political power anyway, and evidence and argument are irrelevant.

This leads me to what I have come to believe is another fundamental division in our intellectual lives—between those who start with a psychological approach and those who start with a sociological approach. To oversimplify only a little, psychologists talk about classroom teaching and learning; sociologists talk about organiza-

²⁹See Agre (1992) on how Walkerdine's Foucauldian stance differs from Lave's more marxian approach, in which it is more meaningful to criticize a discourse as being “ideological” in the sense of expressing systematically “false” consciousness.

tional structures and power relations, which in their judgment completely overwhelm any individual teaching and learning that might go on. Indeed, they often reduce everything, including cognitive psychology, to yet another political ideology.

For their part, the psychologists tend to ignore the fact that very often, although perhaps not always, the social factors do constrain what we can do for individual children and do influence even the conception of how individuals teach and learn. The constructivist versions of teaching and learning, especially when they focus on the social construction of meaning, give us some hope of bridging the gap, but we are by no means there yet. . . . If we are to make real progress, we need to make the psychologists and sociologists talk to each other. (1992, pp. 19-20)

Dean Petrie's comments intersect with our discussion at a number of points. To begin with, his concerns about the potential uses and effects of “constructivism” are not unrelated to what Walkerdine has witnessed in the English schools. The contrast that he draws between the sociologists and the psychologists may be reflected in a contrast between the socially and culturally oriented discourses of Lave and Walkerdine on the one hand, and the apparently more psychologically oriented discourses of Clancey and Roschelle and of Brown, Collins, and Duguid on the other hand—despite the fact that all of us are arguing the need for an approach that is at once both psychological and social, to the extent that we no longer see any psychological or social processes as such, but only human processes that can be analyzed (but only violently) in terms of their psychological or social aspects, moments, or elements.

I believe that what we see here is an overwhelming inertial or gravitational influence of the hegemonic³⁰ discourse which is built upon a system of dichotomies, reflected in that between the psychological and social.

Consider Lave's (1992) compelling answer to the question with

³⁰See Whitson (1991b) for my interpretation of the Gramscian concept of hegemony. Briefly, I see the distinctive value of Gramsci's usage in its focus on the way disparate elements are structurally linked or “articulated” within a hegemonic system. Thus, the system finds a place for even the most oppositional elements, and incorporates them within its own constitution. The most committed oppositional struggles can actually reinforce such hegemonic systems; to be truly *counter-hegemonic* (and not just oppositional), it is necessary to dismantle and replace the ways that oppositions are articulated, and not just to support the disvalued or suppressed elements within those oppositions.

which she begins her contribution to this symposium: “Why bother pursuing a social, situated theory of learning?”:

In the broadest and baldest terms: 1) Theories of cognition, knowing, thinking, learning, etc., have traditionally taken the individual as the unit of analysis. 2) There are deep social inequalities in our world, in which socialization processes, including schooling, are deeply implicated. 3) Theories of the individual in the end are reduced to blaming the individual for the very social ills they suffer. 4) If such theories are incomplete and inadequately conceived in the first place, we have double reasons for reconsidering learning as part of social existence and as broadly as possible. (p. 1)

I would not disagree with Lave's argument here, which is carefully crafted to avoid being reduced either to a social or a psychological argument. Despite the explicit terms of her position, however, I am still concerned that the hegemonic discourse may be strong enough to translate her express arguments into readings which construe her discourse as a plea for situated cognition as an approach that is recommended for its attractiveness to those who share social or political commitments—as if approaches to the understanding of cognition and learning are matters of ideological “choice,” to be chosen on the basis of “ideologies” viewed positivistically as arbitrary “value preferences” (as suggested in the concerns expressed by Dean Petrie, above).

This illustrates one of the reasons why I personally feel that it is important to argue for an approach which recognizes the socially situated nature of cognition and learning in a way that resists suggestions that the superior validity of such an approach is not contingent on such positivistically-construed political agendas or ideologies. One virtue of the Peircean approach is that it reveals a basis, in the fundamental constitution of signs and sign-activity, for a critical realism (both in cognition and the study of cognition) that is not reducible to the hegemonic discourse of positivistic subjectivism. What is at stake here, I believe, is nothing less than recognition of the basis for a critical potential that is inherent in the basis of all our semiotic practices, and not merely contingent on “values,” forces, or influences that are extrinsic to such practices.

The issue is particularly important in discussions of situated

cognition, I believe, because situated cognition theory is in some ways especially prone to such positivistic mis-appropriations. The same thing can be said of semiotics, and for the same reasons, as we can begin to see in a comparison of Peircean and non-Peircean approaches. Derrida, for example, presents Peirce's formulations as superior to both Saussure's structuralism and Husserl's phenomenology.³¹ The points he makes in comparing Peirce with Saussure and with Husserl are valid and precise. But Derrida is trying to present Peirce using a Saussurean vocabulary, thus falling into the hazards that Deledalle has warned us to avoid (see page 3, above). It is Saussure who takes “the arbitrariness of the sign” as the fundamental starting point for his semiology. As we have seen, this is not the same thing as what Peirce speaks of as

³¹Derrida (1967/1976) describes Peirce as “more attentive than Saussure” to what Derrida describes as “the irreducibility of the becoming-unmotivated” of the sign (p. 48). After quoting the passage that I quote above on page 33, Derrida continues:

Peirce complies here with two apparently incompatible exigencies. The mistake here would be to sacrifice one for the other. It must be recognized that the symbolic (in Peirce's sense: of “the arbitrariness of the sign”) is rooted in the nonsymbolic, in an anterior and related order of signification: “Symbols grow. They come into being by development out of other signs, particularly from icons, or from mixed signs.” But these roots must not compromise the structural originality of the field of symbols, the autonomy of a domain, a production, and a play: “So it is only out of symbols that a new symbol can grow. *Omne symbolum de symbolo.*”

But in both cases, the genetic root-system refers from sign to sign. No ground of nonsignification—understood as insignificance or an intuition of a present truth—stretches out to give it foundation under the play and the coming into being of signs. . . . (p. 48)

Peirce goes very far in the direction that I have called the deconstruction of the transcendental signified, which, at one time or another, would place a reassuring end to the reference from sign to sign. . . . The difference between Husserl's and Peirce's phenomenologies is fundamental since it concerns the concept of the sign and of the manifestation of presence, the relationships between the representation and the originary presentation of the thing itself (truth). . . . According to the “phaneroscopy” or “phenomenology” of Peirce, *manifestation* itself does not reveal a presence, it makes a sign. . . . There is thus no phenomenality reducing the sign or the representer so that the thing signified may be allowed to glow finally in the luminosity of its presence. The so-called “thing itself” is always already a *representamen*. . . [that] functions only by giving rise to an *interpretant* that itself becomes a sign and so on to infinity. The self-identity of the signified conceals itself unceasingly . . . (p. 49)

From the moment that there is meaning there is nothing but signs. We *think only in signs*. . . . One could call *play* the absence of the transcendental signified as limitlessness of play, that is to say the destruction of ontotheology and the metaphysics of presence. (p. 50)

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a “sign.” It is true that, in Peirce's semiotics, there is no “signified” that “may be allowed to glow finally in the luminosity of its presence.” But in Peirce, the sign was not a dyadic relationship between a signifier and a signified to begin with.

It is the motivated triadicity of signs that both allows their ongoing, generative potential on the one hand, while preventing them from getting lost into a completely indeterminate chain of arbitrary signifiers, on the other. Derrida correctly notes that, unlike Husserl, Peirce does not see the sign as guaranteed by any foundational grounding in nonsignification—that is, by an originary “thing itself.” But in his concern to distinguish Peirce from Husserl in terms of how they understand the origins or the “genetic root-system” of signification, Derrida forgets that Peirce's sign is always a *triadic* affair, motivated not by a *genesis* in any continuously dominating originary signified, but by the ongoing tension between *genesis* and *telos*. There is no “transcendental signified” in Peirce, but there are transcendent possibilities inherent in the sign by virtue of the sign's *teleological* (rather than *genetic*) motivation. In my interpretation (see Figure 3.c., page 11), it is the interests, concerns, or other teleological factors that determine a sign's orientation to the object, which motivate the production of an interpretant in responding to the representamen *as a sign of the absent object*, i.e., an object which is not immediately present, and does not govern this and subsequent interpretants as would a “transcendental signified.” The motivating orientation to the object is not lost, however, but remains implicit in the triadic signification of the object in relation to the interests, ends, purposes, concerns, etc. which motivated its signification in the first place.³²

³²An example of one kind of semiotic transcendence consistent with my argument is provided by Natanson (1973), in his phenomenological comments on recognizing faces. As he continues from the passage quoted above (in footnote 27, page 51):

There are times, of course, when the part as part is attended to for special purposes. Doctors, beauticians, morticians, and those engaged in sensitivity training may at times scrutinize moles as moles. Within the flow of everyday life, however, we respond to faces, to fellow men. And in perceiving the part we are transported to the whole. . . .

This does not presume a humanist position in which all is beholden to conscious or voluntary existentially self-determining purposes. To the contrary, it is Peirce whose definition of the sign avoids limiting semiosis to the scope of human agency. He does this, however, by invoking his notion of a “scientific intelligence” as anything (be it a process, system, agency, etc.) capable of modifying its production of interpretants on the basis of their success or failure as significations of the object to which the sign is oriented. This “success” is relative to the pragmatic and teleological motivation of the sign (it does not require “Re-Presentation” in the sense of somehow making the object fully present). A sign represents not only its object, it also represents itself to be sufficient to its office as a sign of that object; and any insufficiency can be reflectively responded to in modifications of the habits or practices in which the object is signified through the production of further interpretants.

This reflectively critical and potentially transcendent *corrigibility* is fundamental to Peirce's conception of semiosis, and stands in sharp contrast to the Saussurean conception, carried over into the post-structuralist semiotics of Derrida, Lacan, and others. Derrida's unbounded “play of signifiers” parallels the Lacanian chaining of signifiers that we saw in the semiotic processes described by Walkerdine (pages 17-20, above). I do not doubt the serial representations described by Walkerdine, but I think that there is something missing from the Lacanian framework in which they have been described. Neglecting the triadic motivation of semiosis within ongoing human practices, this framework leaves the determination of the sign-activity to be explained in terms of forces or processes located somewhere outside of the semiotic practices themselves. It is as if semiotic chaining were an

Just as the face carries with it its own transcendence, . . . so the diverse profiles through which reality presents itself bear their own form of transcendence. They point always beyond themselves to the hidden frame of unity they participate in or disclose. Faces are the commencement of persons presenting themselves to the world. Whatever they reveal or hide is indicative of all human signification: the pointing beyond itself which establishes any adumbration of the human being as expressive of his own identity and unity. (p. 39)

instrument that could, without resistance, be pressed into the service of any governing social, political, or economic determination, so that social, political, and economic theories are required to explain how the trajectory of a particular series of dyadic significations has been determined from outside the chain itself.

The problem lies in an instrumentalist or functionalist view of signs, which the structuralist (and, by default, the post-structuralist) framework shares with some formulations of situated cognition. Recall, for example, how Brown, Collins, and Duguid (1989a) have invited us to consider conceptual knowledge as something similar to “a set of tools”:

To explore the idea that concepts are both situated and progressively developed through activity, we should abandon any notion that they are abstract, self-contained entities. Instead it may be more useful to consider conceptual knowledge as, in some ways, similar to a set of tools.* Tools share several significant features with knowledge: They can only be fully understood through use, and using them entails both changing the user's view of the world and adopting the belief system of the culture in which they are used. (p. 33 [footnote omitted])

Again, this is a salutary correction to the conceptions of cognition that these theorists are arguing against. We should note, however, how closely their conception of situated cognition parallels this description of “*bricolage*” by the structuralist Claude Levi-Strauss (1962/1966):

The ‘bricoleur’ is adept at performing a large number of diverse tasks; but, unlike the engineer, . . . his universe of instruments is closed and the rules of his game are always to make do with ‘whatever is at hand’, that is to say with a set of tools and materials which is always finite and is also heterogeneous because what it contains . . . is the contingent result of all the occasions there have been to renew or enrich the stock or to maintain it with the remains of previous constructions or destructions. (p. 17)

The parallel between bricolage and situated cognition theory is more than a superficial coincidence of language,³³ and the relationship between bricolage and Saussure's structuralist theory of

³³See Turkle and Papert (1991) for an explicit use of “bricolage” in arguing for a situated “constructionist” approach to human cognition. Cf. also Berry and Irvine (1986). Levi-Strauss' concept of bricolage is probably best known to cognitive psychologists through Gardner (1981). It is more familiar to folks in literary studies and philosophy through sources such as Derrida (1978).

signs is also more than coincidental.³⁴

One consequence of the way “bricolage” has been defined in contradistinction to “science” or “engineering” is that the bricoleur is concerned only with an instrumental or functional adequacy in responding to technical problems with the set of tools and materials at hand in the immediate situation, and stops short of any critical questioning of the general situation within which that situation is embedded:

It might be said that the engineer questions the universe, while the `bricoleur' addresses himself to a collection of oddments left over from human endeavors, that is, only a subset of the culture. (Levi-Strauss, 1962/1966, p. 19)

Levi-Strauss is explicit in relating his distinction between bricoleurs and engineers or scientists back to the more fundamental Saussurean way of distinguishing between “concepts” and “signs.”³⁵ I see these as examples of the kind of articulations in which oppressive hegemonic discourse is sustained. Unfortunately, I see potential articulations between “JPFs” [Just Plain Folks] and others as risking such assimilation to the hegemonic discourse. Levi-Strauss admits that, in reality, the actual working conditions of scientists and engineers put them in a position much

³⁴Cf. Levi-Strauss (1962/1966): “It would be impossible to separate percepts from the concrete situations in which they appeared, while recourse to concepts would require that thought could, at least provisionally, put its projects (to use Husserl's expression) `in brackets'. Now, there is an intermediary between images and concepts, namely signs. For signs can always be defined in the way introduced by Saussure in the case of the particular category of linguistic signs, that is, as a link between images and concepts. In the union thus brought about, images and concepts play the part of the signifying and signified respectively” (p. 18).

³⁵“Both the scientist and the `bricoleur' might therefore be said to be constantly on the look out for `messages'. Those which the `bricoleur' collects are, however, ones which have to some extent been transmitted in advance — like the commercial codes which are summaries of the past experience of the trade and so allow any new situation to be met economically, provided that it belongs to the same class as some earlier one. The scientist, on the other hand, whether he is an engineer or a physicist, is always on the look out for *that other message* which might be wrested from an interlocutor [i.e., “nature” or “the universe”] in spite of his reticence in pronouncing on questions whose answers have not been rehearsed. Concepts thus appear like operators *opening up* the set [of intellectual and material resources] being worked with and signification [i.e., “signs,” as opposed to “concepts”] like the operator of its *reorganization*, which neither extends nor renews it and limits itself to obtaining the group of its transformations.” (Id., p. 20)

more like that of bricoleurs than is recognized in their idealized definitions; but he does not talk about occasions for his bricoleurs also to “question the universe.” In the same way (as we are reminded by Roy Pea, 1990, p. 31) we cannot presume that Just Plain Folks are only interested in functionally satisfying the demands of their immediate situations, or that they have no more than such functionalist expectations for their own schooling or the education of their children.

As Lave (1992) explains,

We might not want to take the study of learning to be first and foremost the study of knowledge people are acquiring, though theories of learning have traditionally been based in epistemological analysis, in the philosophy of knowledge and knowing, hence on conceptions of the knowing, contemplating, (representing, problem solving . . .) person. In contrast, learning, viewed as socially situated activity, must be grounded in a social ontology that conceives of the person as an acting being, engaged in activity in the world. Learning is, in this purview, more basically a process of coming to *be*, of forging identities in activity in the world.

In short, learners are never only that, but are becoming certain sorts of subjects with certain ways of participating in the world. (p. 3)

The fact that our own personal and social beings are formed within our semiotic activity precludes us from determining such activity exclusively according to the measure of pre-specified instrumental or functional requirements of absolutely local situations, as if those situations were inhabited by beings whose identities and related needs, interests, and concerns were fully given in advance. This is one basic principle in the distinction between “technical” and “practical” activities and capabilities,³⁶

³⁶One consequence of this distinction that is most relevant to discussions of situated cognition, as opposed to rule-based approaches to cognition, can be seen in the difference between instrumental or analytical senses of “application” and the kind of hermeneutical “application” that Gadamer (1960/1982) explains as fundamental to any and all human understanding (See Whitson, 1991a, pp. 233-237). When Clancey and Roschelle 1991 explain that “to behave according to a pattern is not to be following a template-thing,” (p. 3), it is the instrumental sense of “application” that they are rejecting. No matter how creatively a tool (or a rule or template) is applied in the performance of a technical task, it remains an inert technical instrument. This is not how words, concepts, or other signs are hermeneutically applied in practical activity. Hermeneutical application is a dialogical affair, in which both the sign and the practical endeavor (as well as the person acting) will be open to development as they are applied to each other—in much the way that we have been seeing conceptual

which is taken up by Walkerdine and Lave in their ongoing efforts to help us understand “cognitive” activities within the social practices in which they are embedded.

Referring to the work of Bourdieu (1977, 1990), Lave provides a needed warning against falling back on overly humanist theories of practice which neglect the processes and relationships that escape our consciousness and our control. I think Bourdieu is right in his expectation that phenomenologically intentional activity takes place within the broader scope of processes and structures that we are generally unaware of, and over which we exercise no conscious control. But the capability of triadic sign-activity to modify itself on the basis of ongoing results also extends beyond the limits of our conscious subjectivity. This provides a basis for critical reflection in our cognitive activity which, although always situated, enables some transcendence of that very situation. In this and other ways, I believe that a Peircean semiotic framework has something to offer in our quest to understand human cognition as processes and achievements of situated social practices.

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