DOCUMENT RESUME

ED 422 057 PS 026 620

AUTHOR	Henning, John
TITLE	Constructivism: The Art of Cultivating Thirdness.
PUB DATE	1998-04-14
NOTE	28p.; Paper presented at the Annual Meeting of the American Educational Research Association (San Diego, CA, April 13-17, 1998).
PUB TYPE	Information Analyses (070) -- Opinion Papers (120) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	*Cognitive Development; *Constructivism (Learning); Learning Processes; Learning Theories; *Piagetian Theory; *Semiotics
IDENTIFIERS	Developmental Theory; *Ecological Perspective; *Vygotsky (Lev S)

ABSTRACT

The persistence of the constructivist agenda within learning and developmental theory suggests that underneath the seemingly disparate views of Piagetian, socioculturalist, and ecological perspectives lie some unifying concepts that find their mutual expression in constructivism. The paper contends that semiotics provides the conceptual means to reveal those correspondences, and further, that semiotics, specifically Peirce's (1965; 1991) triadic relationship of thought, or triadicity, is able to serve as both a unifying and guiding conceptual tool for developmental theories because it addresses their most fundamental concern: how the quality of thought can change over time. The paper discusses the semiotic underpinnings of each of these three theoretical approaches: Piagetians and Neo-Piagetians, Vygotsky and the socioculturalists, and the ecological approach founded by James and Eleanor Gibson. Specifically, the paper discusses the equilibration and reflective abstraction within the Piagetian and Neo-Piagetian tradition, conceptual development in Vygotsky's work, and differentiation and integration in the perceptual learning theory of Eleanor Gibson. The paper concludes that all these theories serve the same idea: that students should constantly be encouraged to construct, discover, or perceive a multiplicity of meanings, and that educational practices should cater to this view. (Contains 41 references.) (EV)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

ED 422 057

John Henning
Kent State University
The Semiotics of Constructivism Symposium
Paper Presented at the Annual Meeting of AERA
April 14, 1998
J_Henning@dukes.stark.k12.oh.us

Constructivism: The Art of Cultivating Thirdness

Semiotic Underpinnings

Any valid theory of cognitive development must account for the means of change and growth; how to enhance change and growth is the province of every good learning theory. This symbiosis of developmental and learning theories is well illustrated by the constructivist vision of learning, which has its roots in the genetic epistemology of Piaget (1970) and which has continued to flourish with its hands-on, "learning by making" approach (Papert, 1991), even as succeeding lines of developmental research have emerged (e.g. the socioculturalist and ecological perspectives). The persistence of the constructivist agenda suggests - at least to me - that underneath these seemingly disparate views lurk some unifying conceptions that find their mutual expression in constructivism. It will be my contention in this paper that semiotics provides us with the conceptual means to reveal these correspondences, and further that semiotics - specifically Peirce's triadic relationship of thought - is able to serve as both a unifying and guiding conceptual tool for developmental theories because it addresses their most fundamental concern: how the quality of thought can change over time (Apel, 1981; Peirce, 1991; Merrel, 1995).

While developmental theories are myriad, this discussion will be limited to three classical lines - the Piagetans and Neo-

John E. Henning

Piagetans, Vygotsky and the socioculturalists, and the ecological approach founded by James and Eleanor Gibson (Case, 1992). What I will try to show is the semiotic underpinning of each of these three theoretical approaches; in other words, although these lines of research are perceived as distinct, at their most basic level each utilizes a description of cognitive change and development that fits within the framework of Peirce's conception of triadicity. Specifically, I am referring to equilibration and reflective abstraction within the Piagetan and Neo-Piagetan tradition, conceptual development in Vygotsky's work, and differentiation and integration in the perceptual learning theory of Eleanor Gibson.

To make these connections, we must necessarily begin with an account of triadicity. But the reader should be forewarned that Peirce spent countless pages explaining the triadic relationship from any number of perspectives, so the account that follows can not possibly embrace the richness of his total concept. Adding to the difficulty is Peirce's contention that none of the three relations - firstness, secondness, or thirdness - could really be understood in isolation from each other, referring to them as "tones or tints upon conceptions" (1965, p.179). With that in mind, here is a brief accounting of Peirce's three categories of thought.

According to Peirce, thought begins in firstness, which is a kind of wholeness, an undifferentiated feeling, a "kind of consciousness which involves no analysis, comparison, or any process whatsoever, nor consists in any whole or in part of any act by which one stretch of consciousness is distinguished from another" (p. 152). Firstness exists before any discrimination of

mind is made, a kind of theoretical state, hard to imagine because it is very close to preconsciousness.

When firstness encounters resistance in the world is where secondness begins, when we bump "up against hard fact" (p. 162), at the moment we become conscious of difference, of otherness. But although there is difference in secondness, there is also linkage; "not only have we brought the cognitive forces into play by distinguishing, we have also united them into one" (p. 169). It is, however, a union that exists before mediation, before reflection, before thought. Dyads (eg. identity and difference, cause and effect, persistence and change) consist of brute facts and specific cases.

Neither firstness nor secondness - alone or in combination - can fully describe thought: a third dimension is needed so that "generality, infinity, continuity, diffusion, growth, and, intelligence" can emerge. (p. 171-172). That dimension is the interrelationship between firstness and secondness, what Peirce called thirdness. One of the most familiar ways to define triadicity while illustrating thirdness is to say that thought begins with a sensual perception or a feeling (firstness), which engenders a sign or mental representation (secondness), both of which are mediated or linked by an interpretant (thirdness).

Another way to regard this triadic relationship - and one that is of importance to my purposes - is to see it as a neverending process of differentiation and integration. Firstness precedes distinctions, in secondness there is discrimination, and in thirdness unity is reestablished:

> Since there is a manifold of impressions, we have a feeling of complication or confusion, which leads us to differentiate

> this impression from that, and then, having been differentiated, they require to be brought to unity . . . the reference to an interpretant arises upon the holding together of diverse impressions. (p.28, 1991)

To better illustrate the idea of thirdness, or synonymously, an interpretant, I am going to take the liberty of borrowing a metaphor from John Deely (1990). Imagine two different living rooms filled with furniture. In the first room, the furniture is heaped haphazardly in the center of the room; in the second, the same furniture is harmoniously arranged for function and comfort. What accounts for the difference between the two living rooms is the interpretant - or the *interrelationship* between the pieces. That relationship is a generalization formulated from all previous furniture arrangements and is what gives this particular arrangement its "meaning."

A related and highly important point for both semiotics and development theory is that this particular generalization is not an endpoint. Interpretants are highly flexible and can operate on a sliding scale of abstractions towards ever more generalized relationships. For instance, the interrelationship previously limited to the living room furniture pieces could be extended to include the furniture in the rest of the house. In this case, the living room sofa must be shown not only to be in relationship with the two end tables on either side of it, but also the bureau in the bedroom - the latter relationship being more generalized than the former. Succeedingly more generalized relationships might incorporate the living room furniture of one house with all the furniture in all the houses in the neighborhood, the living room furniture in a typical American house, and the furniture in a

typical Japanese home. Again each relationship has become increasingly more abstract or generalized.

As you may have already inferred, an important subsidiary point is that this idea of an interpretant or thirdness is highly relative. Where an interpretant is located depends on the perspective of the observer. And since - as we already noted - the idea of firstness and secondness is inseparable from thirdness, we can conclude that these two conceptions are also relative. For instance, the relationships among my living room furniture pieces can be regarded as a sign to be compared with other signs denoting relationships - such as the relationships between my neighbor's furniture, the furniture in a typical American house, or the furniture in a typical Japanese house. Distinguishing differences between those relationships is secondness, integrating them into a common scheme is thirdness. As Peirce puts it, "The meaning of a representation can be nothing but a representation. . . . there is an infinite regression here" (p.171).

Hopefully, I have made it clear that it is Peirce's conception of thirdness that makes possible what Eco succinctly described as "unlimited semiosis" (1976). Firstness and secondness by themselves cannot account for generalization, thought, or intelligence. Neither is there a need to account for any greater number of relations (eg fourthness, fifthness). Peirce believed that in conceiving this threefold relationship, he had reduced thought to its essence - that any greater number of relations could be reached through a combination of triads, as I have tried to illustrate in the furniture metaphor above.

Up to now, I have tried to establish the following points as

a basis for comparison to the developmental theories which will follow:

1) The nature of the triadic relationship consists of firstness which is undifferentiated consciousness or preconsciousness; secondness, which is discrimination between different but related entities; and thirdness, which is their integration into meaning.
2) Thirdness is what makes generalizations, abstractions, and intelligence possible.
3) Semiosis is infinite.
4) These relationships are relative to the perspective of the observer.

Correspondences with Piaget's Theory of Development

As I discuss the following developmental theories my primary concern is their most fundamental description of cognitive growth and change. Therefore, Piaget's four stages of cognitive development will not be discussed here: first, because they do not apply to the topic at hand, and second, because they have been largely abandoned anyway, even by the Neo-Piagetans (Case, 1992, 1993). What I will address is Piaget's explanation for two of the cognitive processes responsible for cognitive development - "equilibration," which he regarded as "the fundamental factor in cognitive development" (1985, p. 15) and "reflective abstraction."

Just as Peirce's triadic relationship begins with firstness, Piaget's process of equilibration moves from an indivisible whole to differentiated parts or as he says: "In all biological and cognitive systems, the whole must be seen as primordial. Wholes do not result from putting together a bunch of parts; parts result

from the differentiation of the whole" (p. 20). This insight was due not only to the influence of the structuralist movement (1970b), but also from the results of his research which had shown Piaget "the mind is naturally more prone to focus on affirmations, or the positive characteristics of objects, actions, and operations" (1985, p 13). Disequilibria, or the perturbations that motivate an organism to seek equilibrium are "constructed only secondarily and laboriously" (p.13). But like Peirce, it was the process of integration of this disequilibria - or thirdness - that fascinated Piaget. "The proper task of a theory of equilibration" is to explain "the transition from disequilibrium to coherence" (p. 13).

Piaget's explanation of equilibration through assimilation and accommodation is well known. Assimilation occurs when disequilibria or perturbing elements to a cognitive scheme (eg. errors or lacunae) are assimilated - or in other words integrated. As disequilibria are integrated into a cognitive scheme, they change it - the process Piaget referred to as accommodation. This change or new construction results in a change in the relationships between all the elements of the scheme - both old and new. According to Piaget, assimilation and accommodation:

> represent two inseparable poles and not two distinct types of behavior, it is clear that the new assimilation resulting from accommodation involves construction in the sense of extending the domain of a scheme, introducing new articulations into a cycle, and so forth" (p. 33).

By "extending the domain of a scheme," I believe Piaget is making a reference to the same expanding scale of generality described earlier in connection with interpretants. If you recall,

in that example the domain was extended from the living room furniture to include the living room and bedroom furniture, then all the furniture in the neighborhood, etc. As discussed earlier, the relationships in the newly accommodated scheme must be more abstract in order to account for the increasing diversity of its elements. This ability to handle increasing levels of abstractions is - as we know - what marks a child's progression through Piaget's stages of development.

Piaget referred to a similar - but more conscious - process as reflective abstraction. Like equilibration, it also explains how cognition develops from concrete to more formal operations:

> Reflective abstraction includes two indissociable activities. One is 'reflecting' or projecting onto a higher level something borrowed from a lower level. . . The other is more or less conscious 'reflexion' in the sense of cognitive reconstruction or reorganization of what is transferred" (p. 29).

Again this could be applied to our furniture metaphor. When expanding beyond the relationships constructed between my living room furniture and my neighbor's, I might have to disregard certain qualities of his furniture that mine doesn't possess - like it is new, expensive, and made of walnut - so that his and mine can share a common relationship. Accordingly, I might attend to some qualities both our furniture possesses - like the pieces are all usable, constructed of wood, and purchased in a store specializing in their sale. Over time, change might compel me to reorganize this scheme through conscious reflection because one of those qualities - perhaps usable - no longer describes all of our furniture and therefore should be dropped as a characteristic

applicable to that level of relationship.

Two final points: first, the level at which reflective abstraction is practiced depends on schema development. Just as the use of interpretants is relative to an observer, in a Piagetan scheme generalizing upward depends on the previous constructions of the learner. Second, it was only for the sake of illustration that I chose a discrete metaphor to illustrate a continuous and unending process. Just as Peirce posits the notion of "infinite regression," Piaget insists that equilibration "in no way constitutes a stopping point":

> Effectively, therefore, no system ever constitutes an absolute end point of equilibration; new goals are always established by whatever equilibrium has been achieved, stable or unstable. Each end point, even if it is more or less lasting, remains pregnant with possibilities for further construction (p.26).

For the sake of clarity and convenience, I have summarized the important points about Piaget's theories so they can be compared directly to Peirce:

1) Wholeness (firstness) is disrupted by disequilibria (secondness) which motivate the organism to seek equilibration through assimilation and accommodation (thirdness).
2) Operations or relationships become the basis for operations on the next level.
3) Equilibration is infinite; there is no final stopping point.
4) The learner's understanding is determined by the previous schemas she has constructed.

From Piaget to the Socioculturalists and Vygotsky

Studies done by cross culturalists in the 1960's and 70's (Dasen, 1972; Rogoff, 1995) eventually led to the abandonment of Piaget's conception of universal stages of cognitive development. Unable to satisfactorily explain wide variations in stage development, Neo-Piagetans have instead embraced the idea of a central conceptual structure that has "a broad domain of application" (Case, 1993). But what has been preserved by the Neo-Piagetens is Piaget's formulations of equilibration and reflective abstraction:

> Each higher order structure is assembled out of lower order structures, which become differentiated and coordinated via a process that includes an autoregulative component (e.g. equilibration and reflective abstraction) and is activated by the universal human experiences of trying to make sense of, or abstract invariance from, the normal flux of human life. (Case p. 227)

Apparently, what was obviated by the cross cultural studies was not Piaget's fundamental conception of cognitive growth, but rather his oversight in ignoring the cultural influence on development. Accordingly, the cross culturalists turned from Piaget to Lev Vygotsky for theoretical inspiration (Rogoff and Chavajay, 1995). Whereas Piaget's conception of reflective abstraction portrays a thinker in isolation, Vygotsky emphasized the social and imitative aspects of learning. According to Vygotsky:

> Every function in the child's cultural development appears twice: first, on the social level, and later, on the

individual level; first, *between* people (*interpsychological*), and then *inside* the child (*intrapsychological*). This applies equally to voluntary attention, to logical memory, and to the formation of concepts. All the higher functions originate as actual relations between human individuals. (1978, p 57)

Vygotsky's emphasis on the social aspects of learning is reflected in his conception of two levels of development - one actual, in which the child is working in a kind of Piagetan solitude; the other potential, in which the child's problem solving capabilities are enhanced by "adult guidance or in collaboration with more capable peers" (1978, p.86). Out of the wake of this insight have emerged the socioculturalists with a body of research demonstrating the role of cultural contexts on learning (Bronfenbrenner, 1979; Lave, 1988, 1991: Rogoff and Chavajay, 1995; Wozniak, 1993).

This fundamental view that culture guides learning is also reflected by the concepts of tool and sign. Both of these aid cognition with an important difference - the tool is externally oriented, the sign internally. An example of a tool would be tying a string around a finger as a mnemonic aid; an example of a sign would be a word. The string will probably be removed from the finger after a small lapse of time; the word may influence thought indefinitely.

Language as a mediator of thought is critical to a Vygotskian perspective, because "thought is not merely expressed in words; it comes into existence through them" (1986). Further, Vygotsky argued that

the meaning of every word is a generalization or a concept. And since generalizations and concepts are undeniably acts of

thought, we may regard meaning as an act of thinking (p.212)

Vygotsky theorized that although the concept of "chair" may not be initially clear to the child, continued exposure to adult use would eventually lead to mastery of the "meaning" behind the chair. As evidence of his position, he cited Piaget's research showing that children didn't understand the meaning of "although" and "but" until long after they had used them (1986). Through interaction with adults then, the child is introduced to a *system* of language that both guides and regulates her thinking.

Vygotsky's emphasis on the cultural context of the child is significantly different from the Piagetan viewpoint. But the cognitive processes that context act upon have a number of similarities and are located within the Peircean triadic framework. For instance, Vygotsky's claim that words are concepts corresponds identically with Peirce's description of triadicity; the actual physical object chair is located in firstness, the word signifying "chair" denotes secondness, and the relationship between them or the meaning of "chair" is thirdness. (Also notice this analysis supplements my earlier description of the relationships among the furnishings in a living room. But in this case the chair by itself embraces the entire triadic relationship, a level down on the sliding scale of generality.)

Lets compare the triadic relationship just described to Vygotsky's description of a concept. Vygotsky located concepts "between the extremes of maximally generalized abstract conceptualization and the immediate sensory grasp of an object - i.e. degree of concreteness and abstraction" (p. 199). Again, the chair is the object (maximally concrete), the word chair is the sign (maximally abstract) and locating the concept between the two

is simply another way of referring to the relationship between concrete and abstract, what Peirce would call thirdness. Notice the correspondence with the following Peircean quote, "By the third, I mean the absolute connecting bond between the first and last" (1965, p 170). Vygotsky's conception of the "maximally concrete" and the "maximally abstract" is also mindful of Piaget's description of equilibration. If you recall, the assimilation of new elements (maximally concrete) into a scheme induces accommodation (maximally abstract) - and the greater the diversity of elements (i.e. the more singular or concrete they are) the greater generalization needed to retain them (or accommodate them) within a single scheme.

Also quite similar to Piaget's idea of equilibration - as well as our earlier description of triadicity - is Vygotsky's description of the interrelationship of speech and thought. According to Vygotsky, children's speech begins with undifferentiated thought (firstness) - or as he put it - "a dim, amorphous whole." It is through words that we are able to differentiate this whole into meaningful parts (secondness):

> Semantically, the child starts from the whole, from a meaningful complex, and only later begins to master the separate semantic units, the meanings of words, and to divide his formerly undifferentiated thought into those units" (p. 219).

And last, thought is reintegrated by combining words (thirdness).

Though the description above generally matches the Piagetan notion of equilibration, Vygotsky did discover a key difference that separated his formulation of concept development from Piaget's. It was based on the difference between what he called

spontaneous concepts - those concepts the child derives on her own from everyday situations - and scientific concepts - those concepts that the child is more likely to learn in a school setting. According to Vygotsky, scientific concepts serve as a source of perturbations - Piaget's word for what motivates a search for equilibrium:

> We can now reaffirm on a sound basis of data that the *absence of a system* is the cardinal psychological difference distinguishing spontaneous from scientific concepts. It could be shown that all the peculiarities of the child's thought described by Piaget (such as syncretism, juxtaposition, and insensitivity to contradiction) stem from the absence of a system in the child's spontaneous concepts - a consequence of undeveloped relations of generality. For example, to be disturbed by a contradiction, the child would have to view the contradictory statements in the light of some general principle, i.e. within a system (p.205).

Vygotsky's contention that the awareness of disequilibrium originates in culture highlights the fundamental theoretical difference between Piaget and Vygotsky. Even so, there is still a significant overlap in their respective positions on the nature of cognition. For instance, like Piaget, Vygotsky believed the thinking of children becomes qualitatively better as they mature. And although he didn't postulate formal stages of development, Vygotsky did believe that at "each new stage in the development of concepts brings with it a new, higher form of generalization" (p. 204), and that "Once a new structure has been incorporated into his thinking - usually through concepts recently acquired in school - it gradually spreads to the older concepts as they are

drawn into intellectual operation of the higher type" (p. 203).

A final point: Vygotsky believed that "generalizations are built on generalizations" indefinitely. According to his law of equivalence of concepts "any concept can be formulated in terms of other concepts in a countless number of ways" (p. 199).

Again, here is a summary of the major points I have tried to to establish about Vygotsky so they can be directly compared to the previous two traditions:

1) Thought begins as a whole (firstness), is differentiated into words (secondness), and reconstituted through language.
2) Generalizations are built on generalizations.
3) The law of equivalence of concepts states that any concept can be formulated in terms of other concepts in a countless number of ways.
4) Learning can be mediated or influenced by the presence of culture. Learners internalize thinking processes through the influence of culture.

The Ecological Approach to Perceptual Learning

The ecological approach to cognitive development emphasizes the natural environment in a similar way that Vygotsky and the socioculturalists have emphasized the cultural environment. From the ecological perspective, information can be perceived directly from the environment, a position that contrasts sharply with the Piagetan view of development, in which cognition is due solely to the presence of internal schemas or mental representations. Once again, despite these differences I hope a brief description of the premises of the ecological view of development will reveal their

common rootedness in Peirce's semiotic conception of thirdness.

The ecological approach originated with James Gibson (Gibson 1966, 1977, 1979; Reed, 1988), who maintained that animals have highly integrated perceptual "systems" especially adapted to perceive our environment. Gibson eschewed the traditional view of sensory perception, maintaining that in spite of the vast body of research which assumes the primacy of a fixed image, proper perception depends on movement. As animals move they are able to detect persistence and change (an excellent example of a Peircean dyad) in the optical array of ambient light. What doesn't change, i.e. what continues to persist under conditions of changing illumination, the changing position of the observer, or movement in the optical field is called an invariant. Because invariants are revealed through discrimination and are not ascribed with meaning by Gibson, I view them as located in secondness.

An animal's ability to perceive invariants is what enables it to detect affordances, which are the uses an animal is able to make of what it perceives. Examples ranging from simple to complex affordances would include "features of the terrain, shelters, water, fire, objects, tools, other animals and human displays" (Gibson, 1977, p. 67). To perceive an affordance is to perceive the function of an object specific to a particular animal or species.

There are several reasons to regard the idea of an "affordance" as an example of thirdness. First, it is relative to an animal; second, because Gibson intended it as a direct perception of "meaning" or "values" in the environment (1977); and third, because it means more than "what *has been* done" - this last a Peircean reference to a quality of secondness. In

contrast, Peirce has identified thirdness as "that which is what it is by virtue of imparting a quality to reactions in the future" (1965, p. 174). This quality denoting thirdness applies to affordances as Neisser has observed:

> *Affordances* as J.J. Gibson (1979) defined them are relations of possibility between animals and their environments. A particular environment has a given affordance, if and only if it makes a given kind of action possible, whether that action is actually executed or not. (1987, p. 21)

The ecological approach to perception proposed by Gibson has served as the foundation for Eleanor Gibson's theory of perceptual learning, a theory that assigns a primary role to differentiation and integration (1969, 1984, 1992). A quick survey of her theory is as follows: undifferentiated general responsiveness to stimulation (firstness), followed by differentiation of simple patterns and objects from background stimulation (secondness), and then the abstraction of distinctive features or invariant relations (thirdness).

As the perceiver becomes more skilled within a domain, the abstraction of distinctive features continues indefinitely, leading to "progressively more economical processing of features" (1969, p 161). In essence, this is Vygotsky's notion of building "generalizations on generalizations," only in this case these abstractions are perceived directly from the environment, based on perceptual practice. This idea has been supported by recent research on categories and expertise, which have shown clear differences between the perceptual abilities of experts and novices (Ericcson, 1994, 1996; Johnson and Mervis, 1997).

One last point on the ecological approach to development:

James Gibson's theory of direct perception is an interpretive approach to perception because it denies a one-to-one correspondence between stimulus and perceiver and acknowledges perception as relative to a particular animal. As Gibson states below, the possibilities for interpretation or generalization are limitless:

> The information in ambient light, along with sound, odor, touches, and natural chemicals is inexhaustible. A perceiver can keep noticing facts about the world she lives in to the end of her life without ever reaching a limit. There is no threshold for information comparable to a stimulus threshold. Information is not lost to the environment when gained by the individual; it is not conserved like energy. (1979, p. 243)

Points of direct comparison between the Gibsons' ecological approach and earlier presentations include:

1) Perception begins as an undifferentiated response (firstness), followed by the detection of simple patterns (secondness), and then the abstraction of simple features or invariant relations (thirdness).
2) Progressive differentiation occurs through abstraction as the perceiver learns to process more efficiently.
3) Information from the environment is inexhaustible.
4) The perceiving organism is an active seeker of information and finds it directly in the environment.

Perceptual versus Conceptual Learning

The commonalities between semiotic theory and the traditions

of developmental research I have outlined have revealed three essential features for cognitive growth - differentiation and integration, building generalizations upon generalizations, and unlimited potential for interpretation.

What is different among the three developmental approaches is their orientation to learning. While Piaget believed that the child "constructed" representations in his head, Vygotsky claimed they were mediated through the influence of culture, and the Gibsons have argued that children learn directly from the environment. Given the success of each research program it seems unlikely that any one of them is either completely right or wrong. Probably the best answer comes from James Gibson who said:

> To perceive the environment and to conceive it are different in degree but not in kind. One is continuous with the other . . . Knowing is an *extension* of perceiving. (p. 258)

Neisser has also said as much, suggesting that learning begins in perceptions, only gradually becoming more conceptual with development (1987). Certainly, these last two positions are probably the most compatible with Peirce whose "semiotic offers a middle ground, a rejection of dualism that nevertheless avoids the excesses of either materialism or idealism" (Hooper, 1991, p. 9). Seeking to avoid the trap of Cartesian dualism, Peirce did not regard thought as occurring either inside or outside of the body: "One must not take a nominalist view of Thought as if it were something that a man had in his consciousness . . . It is we that are in it, rather than it in any of us." (cited in Hooper, p. 11.)

Likely, Peirce is right. Still, the viability of these different traditions suggest there may be considerable benefit in making some sort of distinction between perceptual and conceptual

learning. It seems likely that each perspective may be more effective within a given context, perhaps the one from which the theory originally emerged. For instance, the Gibsons' approach to learning would seem to be the most vital for training aircraft pilots, whereas Vykotsky's ideas on thought and language may work best for my research in reading and writing. Yet even within these two related domains of language there are key differences. Reading is aided by a text, which helps students generate much more complex constructions as readers than they can as writers, because as writers they have to "recontextualize" thought from the abstracted decontextualized environment of writing (Wertsch, 1991). It seems likely that reading would benefit from a theoretical approach that acknowledges the importance of mediation, while writing might benefit from theories that emphasize the importance of internal constructions.

"Higher" Levels of Development and Heterogeneity

In each of the developmental theories discussed, the child's ability to generalize was directly related to her ability to differentiate and integrate information. If true, this means that the more highly evolved individual is the one capable of distinguishing the most singular aspects of a concept, something my current research on reading and writing is suggesting to me. What seems to be true of the readers and writers in my study is that those better able to differentiate the text into smaller conceptual parts (i.e. distinguish precise word meanings, different points of view, the author's intentions from their own reaction to the text) are also more likely to be aware of its larger structure.

I would also like to suggest that the more developed thinker is not only able to do a better job of discriminating conceptual differences but will also be distinguished by her flexibility and proficiency to interpret and reinterpret parts and subparts of a whole. Arheim has claimed this skill for artists (Cupchick and Winston, 1996), and cognitive research on reading has demonstrated that expert readers generate far more interpretations as they read than their less proficient counterparts (Gagne, E.D., Yekovich, C.W., and Yekovich, F.R. 1993). If so, then the learning theory best able to cultivate thirdness - or the student's capacity to formulate generalizations - on any level, is also the one most likely to generate a higher level of thinking. I believe the constructivist approach to learning facilitates this process, and that accounts, at least in part, for its continuation.

At the same time it is important to be cautious about what we term "higher." As the socioculturalists have successfully demonstrated, people think on a variety of levels, depending on the context in which a problem is situated. For instance, Lave has shown that shoppers do not use the formal mathematical operations taught in school to compare prices in a grocery store. Instead, they rely on a number of heuristic strategies specifically developed within that context (1988). In discussing this same issue, Wertsch related a study comparing the thinking strategies of European Australian children with aboriginal children. Contrary to typical findings the aboriginal children outperformed the European Australian children when the task did not favor verbal mediation strategies - something earlier studies had overlooked. So given certain contexts, the aboriginal children are truly better thinkers than the European Australian

children (Wertsch, 1991, p 31).

The study above suggests that heterogeneity in thought is more than just finely conceptualizing an idea from a variety of perspectives on a number of levels of generality. It implies that there are different forms of thinking and that these forms are privileged depending on the context. For instance, a Flower and Hayes study (1981) on the cognitive abilities of writers concluded that expert writers use a variety of modes of thinking (eg. imagistic, verbal, and textual) and are highly adept at shifting their thinking from one mode to the other. Further, Vygotsky (1986) has found that after children make a new generalization, they may later have difficulty differentiating the ideas they drew the abstraction from. Another empirical example of this same phenomenon is Flower et al's observation (1986) that the key difference between expert and novice writers is the amount of concrete detail in the writing of experts. Thus, in certain contexts, the ability to think on a lower level of generalization is actually a sign of development

It seems reasonable to believe that there are many forms of thinking that exist on many different levels and that abstract thought is not necessarily best for all contexts. If Piaget's (1967) biological definition of intelligence is accurate, then perhaps the best measure of cognition is its adaptivity to its environment.

Final Thoughts

My purpose in this paper was to demonstrate how semiotics makes a powerful heuristic to guide and unify thinking in the field of cognitive development. For although there are important

differences among developmental theories, I believe that the conceptual thread I have traced in this paper unites them around the core assumption of the constructivist approach. All serve the same idea: students should constantly be encouraged to construct, discover, or perceive a multiplicity of meanings. Reciprocally, I would suggest that educational practices should cater to this view. The art of cultivating thirdness is discovering new methods that encourage students to view relationships in a variety of ways, interpreting and reinterpreting, not with the goal of just making their thinking "higher" but with the goal of facilitating both their flexibility of thought and their ability to generate meaning.

List of References

Bronfenbrenner, U. (1979) The ecology of human development: experiments by nature and design. Cambridge, MA: Harvard University Press.

Case, R. (1985). Intellectual development: birth to adulthood. Toronto, Ontario: Academic Press, Inc.

Case, R. (1992). Neo-Piagetan theories of child development. In Robert J. Sternberg and Cynthia A. Berg (Eds.), Intellectual development. New York: Cambridge University Press.

Case, R. (1993) Theories of learning and theories of development. Educational Psychologist, 28(3), 219-233.

Cupchik, G.C. and Winston, A.S. (1996). Confluence and divergence in empirical aesthetics, philosophy, and mainstream psychology. In Morton P. Friedman and Edward C. Carterette (Eds.), Cognitive Ecology. San Diego, CA: Academic Press.

Dasen, P.R. (1972). Cross-cultural piagetan research: a summary. Journal of Cross-Cultural Psychology, 3(1), pp. 23-39.

Deely, J. (1990). Basics of semiotics. Bloomington, In: Indiana University Press.

Eco, U. (1976). A theory of semiotics. Bloomington, IN: Indiana University Press.

Eco, U. (1984). Semiotics and the philosophy of language. Bloomington, IN: Indiana University Press.

Ericcson, K.A. (1996). The acquisition of expert performance. In K. Anders Ericcson (Ed.), The Road to Excellence. Mahwah, NJ: Lawrence Erlbaum Associates.

Ericcson, K.A. and Charness, N. (1994). Expert performance: its structure and acquisition. American Psychologist, 49, (8), 725-747.

Flavell, J.H. (1963). The developmental psychology of Jean Piaget. Princeton, NJ: D. Van Nostrand Company, Inc.

Flower, L. & Hayes, J.R. (1981). Images, plans, and prose: the representation of meaning in writing. Written Communication, 1, 120 - 160.

Flower, L., Hayes, J.R., Carey, L., Shriver, K. & Stratum, J. (1986). Detection, diagnosis, and the strategies of revision. College Composition and Communication, 37, 16-55.

Gagne, E.D., Yekovich, C.W., and Yekovich, F.R. (1993). The cognitive psychology of school learning. (2nd ed.). New York: Harper Collins College Publishers.

Gibson, E.J. (1992). How to think about perceptual learning: twenty-five years later. In H.L. Pick, Jr., P. Van Den Broek, and D.C. Knill (eds.). Cognition: conceptual and methodological issues. Washington, DC: American Psychological Association.

Gibson, E.J. (1984). Perceptual development from the ecological approach. In Michael E. Lamb, Ann L. Brown, and Barbara Rogoff (Eds.), Advances in developmental psychology, Vol 3. Hilldsdale, NJ: Lawrence Erlbaum Associates.

Gibson, E.J. (1969). Principles of perceptual learning and development. New York: Meredith Corporation.

Gibson, J J. (1979) The ecological approach to vision. Boston, MA: Houghton Mifflin Company.

Gibson, J. J. (1977). A theory of affordances. In Robert Shaw and John Bransford (Eds.), Perceiving, acting, and knowing. Hillsdale, NJ: Lawrence Erlbaum Associates.

Gibson, J. J. (1966). The senses considered as perceptual systems. Boston, MA: Houghton Mifflin Company.

Hooper, J. (1991). Introduction. Peirce on signs: writings on semiotic by Charles Sanders Peirce. (James Hoopes, Ed.), Chapel Hill, NC: The University of North Carolina Press.

Lave, J. (1988). Cognition in practice: mind, mathematics, and culture in everyday life. Cambridge: Cambridge University Press.

Lave, J. and Wenger, E. (1991). Situated learning: legitimate peripheral participation. Cambridge: Cambridge University Press.

Merrell, F. (1995). Peirce's semiotics now: a primer. Toronto, On: Canadian Scholars' Press.

Neisser, U. (1987). From direct perception to conceptual structure. In Ulric Neisser (Ed.), Concepts and conceptual development: ecological and intellectual factors in categorization. New York: Cambridge University Press.

Papert, S. (1991). Situating constructionism. In Idit Harel and Seymour Papert (Eds.), Constructionism. Norwood, NJ: Ablex Publishing Corporation.

Peirce, C. S. (1991). Peirce on signs: writings on semiotic by Charles Sanders Peirce. (James Hoopes, Ed.) Chapel Hill, NC: The University of North Carolina Press.

Peirce, C.S. (1965). Collected papers of Charles Sanders Peirce (Vol. 1). (Charles Hartshorne and Paul Weiss, Eds.) Cambridge, MA: Harvard University Press.

Piaget, J. (1985, 1975). The equilibration of cognitive structures: the central problem of intellectual development. (Terrance Brown and Kishore Julian Thampy, Trans.) Chicago: The University of Chicago Press.

Piaget, J. (1970a). Genetic epistemology. (Eleanor Duckworth, Trans.) New York: Columbia University Press.

Piaget, J.(1970b). Structuralism. (Chaninah Maschler, Trans.) New York: Basic Books, Inc. (Original work published 1968.)

Piaget, J. (1967). The psychology of intelligence. (Malcolm Piercy and D. E. Berlyne, Trans.) London: Routledge & Kegan Paul LTD. (Original work published 1947.)

Reed, E. S. (1988). James J. Gibson and the psychology of perception. New Haven, Ct: Yale University Press.

Rosch, E. (1978). Principles of categorization. In Eleanor Rosch and B.B. Lloyd (Eds.), Cognition and categorization, (pp. 27- 48). Hillsdale, N.J.: Lawrence Erlbaum Associates.

Rogoff, B. (1982) Integrating Context and cognitive development. In Michael E. Lamb and Ann L. Brown (Eds.) Advances in Developmental Psychology, Vol 2. Hillsdale, NJ: Lawrence Erlbaum Associates.

Rogoff, B. and Chavajay, P. (1995). What's become of research on the cultural basis of cognitive development? American Psychologist. 50 (10), 859-877.

Vygotsky, L.S. (1986). Thought and Language. (Alex Kozulin, Trans.). Cambridge, MA: M.I.T. Press. (Original work published in 1934 as Myshienie i rech).

Vygotsky, L.S. (1978). Mind in society: the development of higher psychological processes. (Michael Cole, Vera John-Steiner, Slyvia Scribner, and Ellen Souberman, Trans.) Cambridge, MA: Harvard University Press.

Wozniak, R. H. and Fischer, K. W. (Eds.), (1993). Development in context: acting and thinking in specific environments. Hillsdale, N.J.: Lawrence Erlbaum Associates.

context: acting and thinking in specific environments. Hillsdale, N.J.: Lawrence Erlbaum Associates.