



Sociocultural critique of Piaget and Vygotsky

Eugene Matusov, Renee Hayes

School of Education, University of Delaware, Renee Hayes, Newark DE 19716, USA

1. Introduction

Piaget has suffered a great deal of criticism that his theory of psychological development neglects the social nature of human development. Much of this criticism has come from researchers following a Vygotskian approach and comparing Piaget's approach unfavorably with that of Vygotsky. Smith (1995) refers us to Piaget's collected articles on sociology (Piaget, 1995) to argue convincingly that it is oversimplification and misunderstanding to assume Piaget's neglect of the social nature of human development. We want to offer our own critique of both Piaget and Vygotsky from a new, sociocultural perspective, recently emerging in several disciplines of social sciences (Heath, 1983; Latour, 1987; Lave & Wenger, 1991; McDermott, 1993; Rogoff, 1990).

We do not consider ourselves followers of Vygotsky's theory but of a sociocultural approach, despite the fact that the sociocultural approach is itself heavily built on and influenced by Vygotsky's work. For a while, a sociocultural approach was an invisible by-product of efforts by mainly US psychologists like Cole (1978), Wertsch (1985), Scribner (1984), Rogoff and Wertsch (1984) and others to reconstruct and continue Vygotsky's paradigm. Just as the medieval endeavor to bring a renaissance of ancient Greek art and culture gave birth to a new art and a new culture, we argue that the renaissance of Vygotsky has gradually produced a new theoretical approach — namely the sociocultural.

Initial critiques of Piaget from a Vygotskyian perspective came when the sociocultural approach was into the earlier phases of development, when “psychologists” ... were “increasingly interested in the effects of the social context of individuals' cognitive development” (Tudge & Rogoff, 1989, p. 17). In contrast, from a current sociocultural perspective, cognitive development is embedded in social contexts and their separation is considered impossible and, thus, cannot have “effects”. Like Smith, we claim that there is an overlooked similarity between Piaget and Vygotsky. However, from a recent sociocultural perspective, we associate these similarities with a shared failure to recognize the unity of cognition and social context. Our paper is primarily

aimed at developmental psychologists although peripherally we also consider some educational issues.

Piaget claimed that he was primarily not a developmental psychologist but rather an epistemologist using child development research to address questions of the origin and nature of the logic of scientific knowledge (Smith, 1995). In contrast, Vygotsky was interested in studying how people (e.g., children, people for traditional cultures, people with disabilities) become members of the historically advanced cultural community (i.e., Western intellectual community) (Matusov, 1998; Rogoff, 1990). He also was a methodologist concerned about developing a new holistic psychology (Zinchenko & Wertsch, 1995). What was similar in Piaget's and Vygotsky's interests is that for both of them, advanced development has only one direction and this direction has a predictable and given goal (the scientific logic for Piaget, and the Western "high" culture for Vygotsky). By no accident, both Piaget's and Vygotsky's definition of "advanced development" was shaped by the values and practices of the community they belonged to. We will discuss why, from our point of view, these theories appear in the first half of the 20th century and why by the end of the century a new approach emerges.

A sociocultural perspective has been developed in a dialogical opposition to these (and other) approaches to address the issues of multiplicity of developmental directionality and its socially constructive, relational, negotiable, and emergent character. From a sociocultural point of view, both Piaget's and Vygotsky's approaches to development seem universalist (i.e., claiming that there is only one advanced direction for development), decontextual (i.e., claiming there are general developmental mechanisms/skills that independent of the context of their use), ethnocentric (i.e., claiming deficits in values and practices of the other, not own, communities), and adultocentric (i.e., claiming deficits in values and practices of children when they are not comprehensible by adults).

2. The social character of human development

In this section, we will discuss how Piaget and Vygotsky address the social character of human development and provide critique of theories from a current sociocultural perspective. Both Piaget's and Vygotsky's approaches to development insist on the necessarily social nature of human development. It seems to us that it has been an unfair criticism of Piaget to claim that he neglected the social nature of development. Piaget focused more on relational while Vygotsky was interested in mediational features of development. Both features are recognized, acknowledged, and appreciated from a sociocultural perspective.

However, the differences between a sociocultural perspective and the approaches of both Piaget and Vygotsky remain. Both Piaget and Vygotsky saw development as a decreasing gap between mental structures/functions of individual's actions and norms (scientific logic for Piaget, and cultural mediation for Vygotsky) as defined within their respective particular society. They focused on what mental structures/functions an individual "brings to" and "takes from" an activity. This

unavoidably established an unbridgable dualism between the individual and the social. For Piaget, this dualism led to describe society as the “social environment” of individual’s activity that provides constraints and new “perspectives” for the individual. For Vygotsky, the dualism set up a mystery of internalization: how the “social plane” becomes the “individual plane” — in a sense, reflecting the holy ghost of Hegel’s Absolute Spirit embedded in Hegel–Marx dialectics used by Vygotsky. From a sociocultural perspective, the social is neither just an individual’s environment nor a plane of actions but the aspect of any human activity together with other aspects such as individual, cultural, and historical. As we show below, the recognition of how of these aspects specifically appear in the activity has a relational, negotiable, and emergent character. We argue that Piaget’s and Vygotsky’s view of development as the process of a decreasing diversity between the norms of the “advanced” community and an individual’s actions led them to their commitment to universalism, decontextualization, ethnocentrism, and adultocentrism.

Both Piaget and Vygotsky saw the social character as a necessary aspect of human development (Tudge & Rogoff, 1989). Piaget argued that high-level symbolism and reciprocity in thinking (and in affect) are not possible to reach developmentally without the cooperation of equal partners. This cooperation can give the child an access to another (or another’s) perspective, promote reflection and coordination of actions and perspectives, and help to resolve a contradiction between participants’ perspectives (the so-called “socio-cognitive conflict”). Resolution of the contradiction may lead the child to the new intellectual operation of reciprocity (e.g., my brother also necessarily has a brother, namely, me). He also agreed that the social and cultural world structured and defined the child’s action and environment, “Babies are born into a social environment and are, therefore, from the first nursing and the first diapering, subject of familial discipline and regularity (Piaget, 1995, p. 290)”.

However, Piaget claimed that until cooperation occurs allowing the child to access another perspective, the social world does not affect the structure of child’s actions but rather constrains them. In other words, according to Piaget, for quite some time (until almost about 7 yr old) the child is social mainly environmentally, by the content of his or her actions, and not by the structure of his or her actions. Piaget argued that

At birth, nothing has been modified by society and the structures of the newborn’s behavior will be the same whether he is nursed by a robot or by a human being. As time goes on, however, these initial structures are more and more transformed through interactions with the surroundings (p. 291).

... during the sensory–motor period preceding language, one cannot yet speak of the socialization of intelligence. In fact, it is only during this period that one may speak of anything like a purely individual intelligence. True, the child learns to imitate before knowing how to speak. But he only imitates gestures that he already knows how to execute by himself or of which he has acquired, by himself, sufficient understanding. Sensory–motor imitation does not, therefore, influence intelligence but is, rather, one manifestation of it (p. 143).

In a sense, through the social nature of the child's surroundings, the social and cultural world continues shaping the child's thinking but only by giving possibilities to exercise child's solo thinking.

In sum, Piaget argued that during the period from infancy to preschool years, children are essentially solo thinkers on the social, cultural, and physical world. Of course, society can impose actions and views on a child ("social constraint" in Piaget's terms) but this imposition is very similar to the child's own egocentrism and, in fact, the child adapts to the social imposition without reaching the genuine intellectual "equilibrium". In Piaget's words, the child "becomes socialized in the same way that he adapts to his external physical environment: he adds an increasing number of acquired mechanisms to his hereditary equipment, the only difference being that in the social domain these acquisitions are made due to the pressure of other individuals instead of only being due to the sole constraint of the things (p. 218)". Around the time of the development of concrete operations, the social world increasingly begins to penetrate the essential structures of the child's thinking through the child's engagement in cooperation (and cooperation) with equal partners.

Similarly to Piaget, Vygotsky argued that at some point (although much earlier than in Piaget's theory, around 2–3 yr old) the "natural" (i.e., biologically driven) development of child intertwines with social development. Vygotsky distinguished lower and higher level psychological functions. The lower level psychological functions are rooted in natural biological development, while higher level functions are grounded in sociocultural development and involve the reorganization of lower level functions using cultural signs and tools promoted by the society. According to Vygotsky, this transformation of lower level psychological functions into higher level psychological functions can be specific for each function and promoted by both biological and sociocultural development of the child,

Within a general process of development, two qualitatively different lines of development, differing in origin, can be distinguished: the elementary processes, which are of biological origin, on the one hand, and the higher psychological functions, of sociocultural origin, on the other. *The history of child behavior is born from the interweaving of these two lines ...* The developmental roots of two fundamental, cultural forms of behavior arise during infancy: the use of *tools* and human *speech* (Vygotsky, 1978, p. 46, italics in original).

Together with Luria, he argued that in some traditional societies some functions remain at lower, biological, level even in adulthood,

An Australian child who has never been beyond the boundaries of his village amazes the cultural¹ European with his ability to orient himself in a country

¹ We think that the Russian word "kul'turnii" should have been translated here as "literate" or "educated" rather than "cultural". In Russian, the word "kul'tura" has more connotation with art, literature, technology, education, and even quality (e.g., "vysokay kul'tura obsluzhivaniya" — high-quality service) than with ways of life, as the word "culture" usually connotes in English.

where he has never been. However, a European school child, who has completed just one class in geography, can assimilate more than any adult primitive man can ever assimilate in his entire lifetime.

Along with the superior development of *innate or natural memory*, which seems to engrave external impressions with photographic accuracy, primitive memory also stands out for the qualitative uniqueness of its functions (Vygotsky, Luria, Golod & Knox, 1993, p. 96, stress in original).

For Vygotsky, sociocultural development occurs in the so-called “zone of proximal development” (ZPD) of working with the more knowledgeable peer or adult or just working in a culturally advanced (for the child) activity (Vygotsky, 1978). In the zone of proximal development, using Cazden’s (Cazden, 1992) formulation, performance (i.e., the child’s participation in a sociocultural activity) goes before competence (i.e., the child’s full understanding of the activity).

At this point, Piaget might disagree with Vygotsky because, for Piaget, participation in an activity for which child is not ready with a more knowledgeable partner leads mainly to imposing the partner’s views and will not affect the structures of child’s actions (i.e., social constraint). As Piaget put it,

Regarding social constraint, it seems to us that one can argue that it makes no deep changes to individual thought. True, egocentrism is limited by the group, even when this group simply implies its authority on individuals from the outside, but then the egomorphism specific to spontaneous thought is simply transformed into sociomorphism. This sort of modification certainly changes the content of representations, but it in no way transforms their structure. The ‘self’ remains unconverted (Piaget, 1995, p. 228).

Piaget saw extreme examples of this social constraint in the practice of formal education based on a “transmission of knowledge” educational philosophy,

When a Durkheimian sociologist wrote that the truth schoolchildren attributed to the Pythagorean theorem did not differ from essentially from the kind of truth attributed by “primitive” youth to the beliefs with which they inculcated at the time of their initiation into the adult life of the clan and tribe, he expressed a state of affairs that is, unfortunately, relatively frequent. He also formulated, without wishing to do so, the most severe condemnation that could be voiced against certain teaching practices or against transmission of knowledge from the adult to the child (Piaget, 1995, p. 295).

Piaget focused on the nature of social relationships among participants in an activity and their consequences for the child development. However, we should be really careful not to misinterpret Piaget’s position. Piaget did not automatically equate any joint activity involving equal partners with cooperation. According to Piaget, cooperation should involve diverse individual perspectives, cooperative reflection of

individual experiences, critical dialoguing and “testing” participants’ positions, socio-cognitive conflict and its resolution, and finally development of operational reciprocity in the structure of the participants’ actions and perspectives. Nor did he necessarily equate an adult-child joint activity with social constraint. He also suggested that working with less-capable partner may promote equilibrium in a child,

Socialization, which is confused with what we just called an educational process in the broad sense, takes many forms. The action of previous generations on those that follow is just one aspect of it, presents itself in indefinitely varied ways. The child is socialized and “educated” through interactions with his contemporaries as well. This, too, is an authentic source of development whose importance is always sufficiently appreciated even though it leads to specific and fundamental results. The child can even be “educated” by his relationships with younger children. More than one socially maladapted youngster has recovered his equilibrium by assuming responsibility for younger children than himself ... (Piaget, 1995, p. 291–229).

In the 1980s, mainly in the US psychological research, efforts were made to test experimentally whether guidance with more capable partners (Vygotsky’s ZPD) or cooperation of equals (Piaget’s socio-cognitive conflict) produce learning and development (see (Rogoff, 1990) for a review of such research). Aside from methodological concerns with the conceptual validity of how children’s development was measured in regard to both Vygotsky’s and Piaget’s theories, in our view, one assumption of this line of research seems to be especially problematic. Although it seems to be true that Piaget might object to guidance from a more capable partner as developmentally appropriate, it is doubtful that Vygotsky would exclude the type of cooperation of equals described by Piaget from his notion of the zone of proximal development. As Göncü and Becker (Göncü & Becker, 1992) correctly point out, for Vygotsky, not only a more capable partner in a joint activity but also the activity itself can produce a ZPD for a child (e.g., play for preschoolers),

This strict subordination to rules is quite impossible in life, but in play it does become possible: thus, play creates a zone of proximal development of the child. In play a child always behaves beyond his average age, above his daily behavior; in play it is as though he were a head taller than himself. As in the focus of a magnifying glass, play contains all developmental tendencies in a condensed form and is itself a major source of development (Vygotsky, 1978, p. 102).

In real world activities, the partners are more competent individuals such as family members, friends or even peers. In pretend world activities, children may also have these partners. However, in most cases of pretend world activities children do not have partners, or the partners are equally competent peers. We focus on *these* pretend world activities because it is in them that, following Vygotsky, we find the particular role of pretend play in the children’s learning (Göncü & Becker, 1992, p. 147, the italics is original).

We argue that Vygotsky would include this type of joint activity involving equal partners (described by Piaget as “cooperation”), which leads to cooperative reflection, socio-cognitive conflict, exchanging perspectives, and development of reciprocity, in his examples of a zone of proximal development.

Vygotsky seemed to share many of Piaget’s concerns about formal education although their critique came from slightly different reasons. Piaget, anticipating Foucault’s critique of public institutions, including schools, primarily focusing on the power asymmetry in teacher–student relationship that can inhibit authentic learning and development,

Contemporary pedagogy, the “active school”, and innumerable experiences in this subject teach us that if something is not acquired by experience and personal reflection it is acquired only superficially, with no change in our thought. It is in spite of adult authority, and not because of it, that the infant learns. Hence it is to the extent that the intelligent teacher knows when to step down as a superior and to become an equal, when to engage in discussion and to require proof rather than merely to make assertions and compel morally, that the traditional school has rendered its services (Piaget, 1995, p. 204).

In his critique of the mainstream educational institutions, Vygotsky focused more on issues of meaninglessness and a lack of relevancy in many schools. In Vygotsky’s writings, one can find his critique of adult imposition of activities that are meaningless for children (especially evident in the practice of schooling) similar to what Piaget defined as “social constraint”. In criticizing Montessori schools for teaching children meaningless reading and writing only as a mechanical skill, Vygotsky emphasized the relevancy of the activity for a child,

We do not deny the possibility of teaching reading and writing to preschool children; we even regard it as desirable that a younger child enters school if he is able to read and write. But the teaching should be organized in such a way that reading and writing are necessary for something. If they are used only to write official greetings to the staff or whatever the teacher thinks up (and clearly suggests to them), then the exercise will be purely mechanical and may soon bore the child; his activity will not be manifest in his writing and his budding personality will not grow. Reading and writing must be something the child needs. Here we have the most vivid example of the basic contradiction that appears in teaching of writing not only in Montessori’s school but in most other schools as well, namely, that writing is taught as motor skill and not as complex cultural activity. Therefore, the issue of teaching writing in the preschool years necessarily entails a second requirement: writing must be “relevant to life” [of the children — EM & RH]... (Vygotsky, 1978, p. 117–118).

In sum, both Piaget and Vygotsky emphasized the roles of the society, culture, and institutions in child development. However, they put different accents of these roles: relational versus mediational. Piaget focused more on power relations of symmetry

and asymmetry as promoting or hindering individual development. Vygotsky focused more on semiotic and tool mediation as ways through which culture and institutions shape child's development.

From a sociocultural perspective, development involves transformation of the individual's participation in a sociocultural activity rather than a change in the structure of individual's action (like in Piaget's theory) or individual's growing mastery of tool, sign, and speech use (like in Vygotsky's theory). The notion of participation in a sociocultural perspective has not only an individual but also social nature. It involves negotiation of individual's contribution to the activity.

This contrasts with Piaget's approach privileging individual's point of view in a situation over other participants,

To the observer, from the external point of view, an infant in the cradle is a social being to whom one may, if one wishes, assign a social class according to the part of the city where he was born, etc. From the point of view of the subject, the question is simply to know whether the structure of his reflexes, conditionings, perceptions, etc., will be modified by social life in the same way that, later, his intelligence will be modified by language and acquired notions. ... At birth, nothing has been modified by the society and the structures of the newborn's behaviour will be the same whether he is nursed by robot or by a human being. As times goes on, however, these initial structures are more and more transformed through interactions with the [physical and social — EM] surroundings (Piaget, 1995, p. 291).

According to Piaget, for the child, the adult is simply a part of the child's environment upon the child is acting. The fact that the adult interprets child's actions as culturally and socially appropriate and meaningful is a simple misunderstanding that confuses the solo nature of child's activity.

Vygotsky would agree with Piaget that there is often a gap between child's and adult's understanding of the situation they both are involved. However, Vygotsky differed from Piaget in judgement of the consequences of this gap for child development. He argued that this difference, pointed out by Piaget, in understanding of what an infant does and how an adult sees the child's actions may be the very key for the child's socialization and development. Vygotsky (1978) introduced an example of how a difference in perspective among participants promotes psychological development in infants. He incorporated this observation into his analysis of the development of voluntary attention in infants from the index gesture. Vygotsky argued that the mother provides the infant with a zone of proximal development of the index gesture by constant misunderstanding of infant's actions. She erroneously interprets the infant's unsuccessful attempt to grasp a remote object as the child's command to the mother to get the object by using an index gesture and starts predictably bringing the object to the child. The child notices and utilizes mother's predictable behavior of bringing remote things desired by the child when the child stretches his or her hand toward the object. Throughout the events, there are gaps between the participants' perspectives on the activity and their contributions to the activity. From the mother's

perspective, she fulfilled the child's request to bring the remote object that the child desired. However, from the observer's point of view, her contribution to joint activity was different: she involved the infant in the sociocultural activity of index gesture.² Recently, several researchers have developed notions focusing on how the gap in understanding of a situation by different participants contributes to the activity and the participants' development "as if" (Lock, 1980), "prolepsis" (Rommetveit, 1979), "boundary object" (Star & Griesemer, 1989), "intersubjectivity without agreement" (Matusov, 1996), and "interobjectivity" (Latour, 1996).

The notion of transformation of participation differs from both Piaget's and Vygotsky's concepts because, unlike in their theoretical approaches, the assumption is that individual never leaves the flow of sociocultural activity. For Piaget, the development occurs when an individual "takes out" an equilibrium of accommodation and assimilation from an activity. For Vygotsky, the development occurs when the individual "takes out" mastery of tools and signs and self-regulation of behavior from the activity in the process of the so-called "internalization". According to a sociocultural approach, development occurs when participation transforms. For example, a child's beginning to ask the parents to read his or her favorite books is evidence that the child's participation in literacy practices has been transformed — now reading is initiated also by the child and not only by the adults. However, not every individual's change of participation in a sociocultural activity is development but only that which is recognized and valued by the community. Community values are not always stable but often have a dynamic, negotiable, and relational character where future events can redefine the past.

A sociocultural approach does not require that, as Vygotsky put it in his the so-called genetic law,

Any function in the child's cultural development appears twice or in two planes. First it appears on the social plane, and then on the psychological plane. First it appears between people as an interpsychological category, and then within the child as an intrapsychological category (Vygotsky, 1981, p. 163).

Rather than to consider that the individual's participation in a social activity (e.g., reading with others) transforms into a solo activity of the individual (e.g., silent reading alone), a sociocultural approach to development describes the transformation

² Vygotsky's explanation of development of index gesture faces with critique (e.g., Kaye, 1982) coming from recent findings that index-finger extensions can be observed in infants as young as 2 months old (Fogel & Hannan, 1985; Trevarthen, 1977) and seems to be developing in relative independence from grasping movements (Fogel & Thelen, 1987). It seems to be utilized by infant first for touching objects at about 6 months and then for an extension of the orienting response at about 11 months (Lempert & Kinsbourne, 1985). During the period between 8 and 12 months, pointing seems to shift from an exploratory to an indicating function (Fogel & Thelen, 1987). It seems that the Vygotsky's model of the development of index gesture might be still relevant for illustration of how misunderstanding between child adult guides child's development (Lock, 1980). See Veer and Valsiner (1991) for more discussion of the origin of this Vygotsky's example.

of the individual's participation in a sociocultural activity or practice (e.g., literacy). Silent solo reading is just another form of participation in literacy. What Vygotsky's called the "social" and "psychological" planes are two different forms of participation. Moreover, a sociocultural approach does not privilege participation in a solo sociocultural activity (i.e., "the psychological plane") as the pinnacle of individual development but rather as a type of development highly valued in many Western societies (Matusov, 1998). From a sociocultural approach, both Piaget's and Vygotsky's theories seem to be universalist, ethnocentric, adultocentric.

3. Universalism and ethnocentrism

Piaget and Vygotsky were universalists. They believed that rationality, logic, and principles of scientific thinking have "universal applicability for all developing individuals in all societies" (Smith, 1995, p. 5). According to both researchers, logic is not context specific to the activity but, on the contrary, is an abstraction from the context (or, as Vygotsky put it, a "deliberation" from the context). Logic is a specific activity of abstraction of the universal and necessary relations and structures from the activity. By claiming specific forms of human practice (i.e., their own, Western middle-class) as universal, Piaget and Vygotsky introduced a deficit model for communities with different cultural values and beliefs than their own. In this sense, they were ethnocentrist.

Piaget grounded his notion of universal logic on the existence of the laws of nature and society waiting to be discovered by individuals in coordination between their (physical and/or mental) actions and changes they cause in the world. Before this discovery Piaget argued that logic "does not exist" for the individual,

Logic is ... a mobile form of equilibrium (whose reversibility attests its equilibrium character) characterizing the peak of development, and is not an innate mechanism present from the beginning. Logic asserts itself, it is true, after a certain level of development, and with the consciousness of necessity, but this is the necessity of a final equilibrium toward which practical and mental coordinations necessarily tend, and not an a priori necessity. Logic becomes a priori, as it were, but only from the time of its achievement, and without having been present at the beginning! Without doubt, the coordinations between actions and movements, from which logic proceeds, themselves rest in part on hereditary coordinations (as we have insisted elsewhere), but these do not in any way contain logic in advance: they contain certain functional reactions which, once, abstracted from their context, are reconstructed in new forms during later stages (without this abstraction from previous coordinations of actions, not this reconstruction, representing any a priori structure). In order to understand, psychologically, the construction of logic, we must follow very closely the processes by which the final equilibration constitutes this logic; but all the stages before the final equilibrium are of a pre-logical character (Piaget, 1995, p. 82–83, italics in original).

Piaget described the final forms of equilibrium using formal mathematical rules, thus defining logic as the “formal logic” achieved fully by an individual in the “formal operations” stage when “reasoning on propositions presented solely as hypotheses” (p. 82). Based on cross-cultural research that could not find traces of these formal operations in some cultures (Ashton, 1975), Piaget started arguing that adults in some traditional societies do not reach this stage. He argued that, unlike the other stages of cognitive development, the formal operations stage is not culture and domain-free but depends on special practices like hypothesis testing in the science practices and school.

Piaget abstracted the logical structure of the individual’s actions and expressed them in universal context-free mathematical formulae. For example, he described “a total system of operations” based on coordination of so-called symmetrical relations among equalities: “ $A = B$; $B = C$; therefore $A = C$ ” (Piaget, 1964, 1968, p. 51). He illustrated how the universal logical operation unfolds in child cognition with the following example,

A particularly apt example of the composition of symmetrical relations is that [the notion — EM and RH] of “brother”. A small child of four or five years (let us call him Paul) has a brother, Etienne. When Paul is asked if his brother Etienne has a brother, he will frequently reply in the negative. The reason given is usually the following: “There are only two of us in the family and Etienne does not have brother”. Here we see clearly the intellectual egocentricity that characterizes intuitive thought. Not knowing how to get away from his own point of view so as to see himself from another person’s point of view, the child begins by denying the symmetry of the relationship of brother to brother because of a lack of reciprocity (i.e., symmetrical reversibility). By the same token, one can see how the logical or operational coordination of this kind of relationship is connected with an individual’s social coordination and with the coordination of the intuitive points of view he has experienced (Piaget, 1964/1968, p. 52).

From Piaget’s point of view, logical symmetry is inherent in the notion of “brother”, and the child’s thinking appears to be handicapped by not being able to consider this symmetry in the notion of “brother”.

However, upon closer examination, it becomes clear that the presence of the logical symmetrical reversibility (i.e., “I am a brother of my brother”) is not inherent in the notion “brother” but rather a possibility among other possibilities. For example, in the famous movie *The Godfather*, Michael Corleone tells his brother Fredo who had betrayed him that Fredo is not a brother to him anymore.

Fredo, you’re nothing to me now. You’re not a brother, you’re not a friend. I don’t want to know you or what you do. I don’t want to see you at the hotels. I don’t want you near my house. When you see our mother, I want to know a day in advance, so I won’t be there. You understand? ([http://us.imdb.com/Quotes?Godfater%3A + Part + II, + The + \(1974\)](http://us.imdb.com/Quotes?Godfater%3A+Part+II,+The+(1974)))

Thus, the notion of “brother” can be defined not by symmetrical reversibility, as it is done by Piaget, but by the quality of relations (among peers). In this case, a brotherless brother or being more brother than one’s brother is a possibility and not a logical mistake.

Like any objects, notions do not have one “inherent” function but rather afford many functions that participants are “free” to use at hand. A tomato can be a fruit for a biological classification and a vegetable for cooking (Whitson, 1988). The material and semiotic texture of the objects promotes a coordination and negotiation of its diverse usage for participants in a joint activity (Latour, 1996; Matusov, 1996; Star & Griesemer, 1989). A younger brother often has different responsibilities and rights in the family than an older brother. Symmetrical reversibility is only one practical possibility for use of the notion of “brother”. For some activities and practices, this reversibility makes sense but for some it does not (e.g., it would have been really strange if Fredo Corleone started insisting that his brother Michael was illogical by denying that Fredo is his brother). Hence, in the light of Piaget’s clinical experiment on the symmetrical reversibility in the notion of “brother”, at least three questions emerge: (a) what sociocultural activities and practices in Western (and other) cultures require the use of symmetrical reversibility in the notion of “brother”, (2) why are young children excluded from these activities (at least initially, as Piaget’s experiments show), and (3) how and when do children become involved in these activities and how do they learn them?

Piaget’s claim that children discover logic from their actions is also questionable. In many cases, children seem to learn logic operations not so much from their experiences but mainly from other people. Piaget’s research on conservation of liquid volume is a good example. Piaget demonstrated that young children do not think that the volume of liquid remains the same after the liquid is poured into a vessel with a distinguishably different form than the original one (e.g., from wide and short to narrow and tall) (Piaget, 1964/1968). Piaget argued that young children fail to grasp the logical operation of reversibility (discussed above).

However, this assumption of reversibility is also wrong both from scientific principle and from practice. In strict scientific principle, because of gravitation, the volumes of liquid poured into a narrow tall vessel gets smaller. The higher liquid level, the more gravitational pressure, and the less volume. Actions’ reversibility and other logical operations that Piaget described as conservation do not guarantee conservation in the physical reality!

It is possible to argue that for water on the Earth the difference in volume is minuscule and for practical reasons the volumes are the same. Nevertheless, in practice, it is almost never possible to pour water into another vessel without some drops being lost on the original vessel (sometimes these drops are important for what people do, sometimes that are not).

Thus, the conservation of volume implies absolutely firm and inseparable liquid. It is an idealization that is not rooted in “logical” qualities of individual’s actions manipulating with liquids. Common people (or “just plain folks” as Lave calls them (Lave, 1988)) often cannot afford to “test” for themselves and others whether volume of liquid can be considered conserved or not under specific circumstances. These

“tests” are done in sociocultural and practices (including science) often involving networks of heavily equipped institutions and efforts of many people distributed in space and history. The confidence about conservation of liquid volume for older children and adults does not come from their own experience with pouring water but from something else. Our hypothesis is that children learn this assumption about volume liquid conservation from participation in some practices and discourses, similarly perhaps to the process by which children learn science in school through specially organized talk (Lemke, 1990).

Piaget’s notion of logic and Vygotsky’s notion of scientific thinking are very similar. According to Vygotsky, scientific conceptualizing is also the final and highest form of intellectual development in the individual when the individual shifts from the immediacy of his/her own personal and others’ experience to the abstract, conceptual text. This environment is verbal, textual, and abstract (Vygotsky, Rieber, & Carton, 1987). In pre-scientific intellectual environments (e.g., childhood, traditional societies, people with mental handicaps), the so-called everyday or spontaneous concepts serve the role of an intellectual too — their existence is motivated by a concrete situation of everyday activities. In scientific intellectual environment, the so-called scientific concepts are the very fabric and objects of intellectual action (Vygotsky et al., 1987).

Scientific concepts have a different relationship to the child’s personal experience than spontaneous concepts. In school instruction, concepts emerge and develop along an entirely different path they do in the child’s personal experience. The internal motives that move the child forward in the formation of scientific concepts are completely different than those that direct his thought in the formation of spontaneous concepts. When concepts are acquired in school, the child’s thought is presented with different tasks than when his thought is left to itself (Vygotsky, 1987, p. 178).

Thus, *the foundation of conscious awareness is the generalization or abstraction of the mental processes, which leads to their mastery. Instruction has a decisive role in this process.* Scientific concepts have a unique relationship to the object. This relationship is mediated through other concepts that themselves have internal hierarchical system of [conceptual] interrelationships (Vygotsky, 1987, p. 178, italics in original, underlining is ours).

A scientific concept is detached from individual’s personal experience. For example, the spontaneous concept of brother (see above) can be motivated, defined, and influenced by the child’s family circumstances; however, the scientific concept of brother learned by a child in school is motivated and defined by the internal hierarchical system of abstract family relations.

According to Vygotsky, scientific conceptualizing based on detachment from personal experience and on the internal hierarchical system of interrelationships is a qualitatively new form of mind activity that can be learned in school.

Probably, the best example of Vygotsky’s reasoning about scientific decontextualization is Luria’s cross-cultural experiments in Soviet Asia in the early 1930s (Luria,

1976). Luria was a student and colleague of Vygotsky. He went specifically to Uzbekistan and offered not-literate Muslim Uzbek peasants different psychological tests including syllogisms like in the following example,

[Syllogism] In the Far North, where there is snow, all bears are white. Novaya Zemlya is in the Far North and there is always snow there. What color are the bears there?

1. P: ... We always speak only of what we see; we don't talk about what we haven't seen.
2. E: ... But what do my words imply? (The syllogism is repeated).
3. P: Well, it's like this: our tsar isn't like yours, and yours isn't like ours. Your words can be answered only by someone who was there, and if a person wasn't there he can't say anything on the basis of your words.
4. E: ... But on the basis of my words — in the North, where there is always snow: the bears are white, can you gather what kind of bears there are in Novaya Zemlya?
5. P: If a man was sixty or eighty and had seen a white bear and had told about it, he could be believed, but I've never seen one and hence I can't say. That's my last word. Those who saw can tell, and those who didn't see can't say anything! (At this point a young Uzbek volunteered, "From your words it means that bears there are white.")
6. E: Well, which of you is right?
7. P: What the cock knows how to do, he does. What I know, I say, and nothing beyond that! (Luria, 1976, pp. 108–109)

Luria noted that only when the nonliterate subject were asked to make judgements and draw the implied conclusions about their immediate practical experience, their reasoning and deduction followed perfectly the rules of the logic. On the basis of these findings Luria concluded that "the process of reasoning and deduction associated with immediate practical experience dominates the responses of our nonliterate subjects" (Luria, cited in (Wertsch, 1985), p. 35).

In the line of recent critique of the Vygotsky–Luria experiments on scientific reasoning, Scribner (Scribner, 1977) argued that the unwillingness of nonliterate people to treat syllogisms as logical problems should be not confused with their failure to think hypothetically. She quoted one nonliterate participant of her experiments who explained his reason why he could not answer a syllogism question, "If you know a person, if a question comes up about him, you are able to answer" (p. 490). Scribner argued that he reasoned hypothetically about the practical situation in denying the possibility of reasoning hypothetically about information of which he had no experience. Vygotsky did not deny spontaneous hypothetical thinking in children and nonliterate (or better to say pre-scientific) adults. Like spontaneous concepts, spontaneous hypothetical thinking is motivated by a concrete situation of everyday activities but not by an "internal hierarchical system of [conceptual] interrelationships" like in the case of scientific hypothetical thinking (Vygotsky, 1987, p. 178). What seems to be missing in the hypothetical thinking of Scribner's subject was an

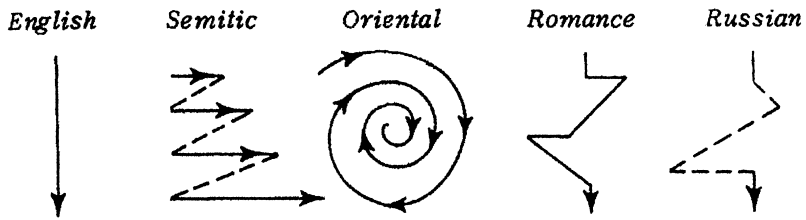


Fig. 1. Graphically represented cultural patterns of development of ideas in the academic texts (Kaplan, 1966, p. 15).

internal hierarchical system of [conceptual] interrelationships, suggested by Vygotsky in his definition of scientific thinking. However, Scribner (1977, p. 499) raised very legitimate questions about the genre of science in general and logical syllogisms in specific by saying, “We know very little about the social conditions which give rise to the logical genre, how cultures define the occasions for its use, through what experience individuals acquire its schema”.

Recent research has further problematized this notion of the “true” hierarchical system of interrelationships, suggesting that different communities have different ways of organizing their narratives and have different systems of interrelationships. Michaels and Cazden (1986) demonstrate that middle-class white children from European decent have different organization and style of storytelling than African-American children. Michaels and Cazden recorded elementary school children telling stories about their experiences during “sharing time”. They found that white middle-class children’s stories are focused around one topic while stories by the African-American children are more episodic. The researchers also found that the teachers much more often interrupted and corrected African-American children to push them to topic-centered organization of their stories. However, when the researchers recorded the children’s stories and offered them for judgement of the quality to the parents of the children, they discover that white middle-class parents preferred highly topic-centered stories while African-American parents preferred and judged higher episodically organized stories.

Similarly, Kaplan (1966) observed different cultural patterns of organization of academic text in different cultures (Fig. 1):

Kaplan argues that the origin of these patterns stems from religious beliefs and values of different cultural communities. For example, there is a deep suspicion of the written word in the Russian Orthodox Church. There is a religious belief that words in general and written words in specific distort the intended (God’s) meaning. That is why in Russian formal written presentations there is much more focus on the trajectory of the author’s arguments (which is often done via wordy detours from the main points) rather than on the economy and precision of word choice as it is often done in English.

Latour (1987) argues that the logic in science is grounded not in the structure of scientific argument but rather in the whole scientific discourse embedded in the

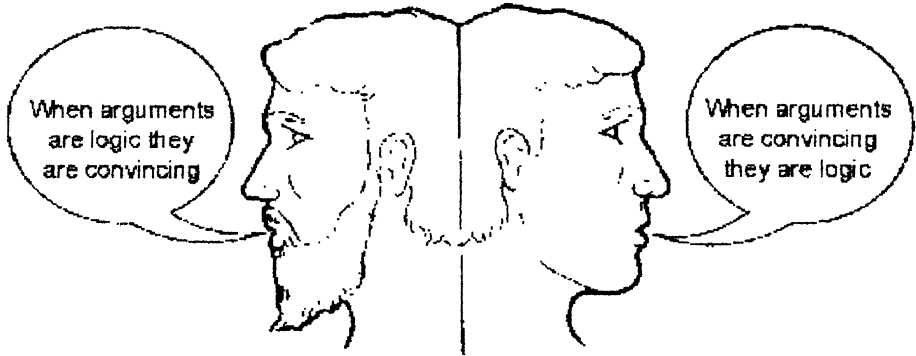


Fig. 2. Two-face Janus of science: the left face represents ready-made science, while the right face represents the science in-action (modified picture from the original Latour, 1987 #2686, p. 12, with permission from the author).

argumentative rhetoric of scientific publications, scientific equipment, process of obtaining and securing grant and funds, research programs, prestige among colleagues, and so forth — what can be called scientific practice, in brief (Fig. 2).

Latour provides the following example of the building of the model of the DNA molecule structure to demonstrate how the two-face Janus of science operates,

‘Of course’, says the left side of Janus, ‘everyone is convinced because Jim [Watson] and Francis [Crick] stumbled on the right structure. The DNA shape itself is enough to rally everyone’. ‘No, says the right side, every time someone else is convinced it progressively becomes a more right structure’. Enough is never enough: years later in India and New Zealand other researchers were working on a so-called “warped zipper” model that did everything the double helix does — plus a bit more; Pauling strongly supported his own structure that had turned out to be entirely wrong; Jim found biological significance in a like-with-like structure that survived only a few hours; Rosalind Franklin had been stubbornly convinced earlier that it was a three-strand helix; Wilkins ignored the keto forms revealed by Jerry Donohue; Chargaff’s laws were an insignificant fact they kept in the background for a long time; as to the metal atom toys, they have lent strong support to countless models that turned out to be wrong. All these allies appear strong once the structure is blackboxed [i.e., become non-disputable — EM and HR]. As long as it is not, Jim and Francis are still struggling to recruit them, modifying the DNA structure until everyone is satisfied. When they are through, they will follow the advice of Janus’s left³ side. As long as they are still searching for the right DNA shape, they would be better off following the right side’s confusing advices (p. 13).

³ In the original, it is mistakenly “right” — (checked with the author EM and RH).

Logic is not grounded in the internal hierarchical system of conceptual systems as Vygotsky argued and not in the structural form of the cognitive equilibrium as Piaget claimed but in the discursive process of changing modalities of the scientific statements and claims. Latour claims that scientists change modalities of statements made by other scientists either by undermining them and moving more toward artifact-like (i.e., toward a lower modality) or by supporting them and moving more toward fact-like (i.e., toward a higher modality). When the modality becomes high enough that the authorship of statement becoming erased (e.g., “The Earth rotates around the Sun”), the statement becomes blackboxed and non-disputed anymore in the (mainstream) scientific community. The high modality of black-boxed statements does not invite readers to ask questions about the statements’ authorship and origin: who said that the Earth rotates around the Sun, how did she or he know that, what led to this statement, what alternative statements were possible, why and how were these statements rejected? The logic of scientific argumentation is a footpath of the victors in the scientific discourse who have finally black-boxed a scientific statement (the left side of Janus).

Rather than discovering realities of science and logic that are “out there”, by interacting with the natural world, children in Western society where certain scientific practices are highly valued (e.g., decontextualized, syllogistic, black-boxed) discover these practices through interaction with members of the society. Western science is one way of thinking about the world (a brother always has a brother, a tomato is always a fruit), which has become in Western society a preferred way. “Science has often presented itself, intentionally or unintentionally as a “truer” or even *the true* way of talking about the world” (Lemke, 1990, p. 126). Children in Western societies are learning to “talk science” to use Lemke’s phrase, “They have to learn to talk and write and reason in phrases, clauses, sentences, and paragraphs of scientific language” (Lemke, 1990, p. 12). We feel that the ethnocentrism of Piaget and Vygotsky lies in their failure to acknowledge this. From a sociocultural approach, Western children who have learned to say, for example, that liquid poured from one container to another container remains the same, or that bears must be white in Novaya Zemlya, have learned something about how to talk science in their particular cultural practices.

4. Adultocentrism

One common line of criticism of Piaget’s research is of his adultocentrism, referring to his confusion of the researcher’s inability to understand and engage with the child targeted in the research in the activity with a cognitive deficit attributed to the child. A well-documented example of such critique of Piaget is Donaldson’s research (Donaldson, 1978) with “preoperational” children. She shows that when the task offered by the researcher makes sense for children they can successfully accomplish it. For example, in Piaget’s famous three-top mountain task young children couldn’t de-center from their own perspective on how the three-top mountain looked for them when asked how the mountain would look for people from different locations. Piaget

concluded that the children's thinking was egocentric because they could not imagine and acknowledge the perspectives of other people. However, when Donaldson modified the task keeping it cognitively isomorphic to Piaget's in a way that made sense for the children, the children's egocentrism disappeared for the great majority of the children. When the children were asked by the researcher to hide a toy thief from a toy cop on a three-dimensional model of a town, even very young children could do the task successfully even though it requires rather sophisticated perspective-taking from the children. It is possible to argue that what Piaget called the children's "egocentrism" was actually Piaget's adultocentrism of confusing the children's unfamiliarity and disengagement with the task as defined by the researcher and attributing to the children the cognitive deficit of egocentrism.

Here we want to extend Donaldson's criticism of Piaget to include Piaget's observations of young children's free playing that actually introduced the notion of "egocentric speech" (and "collective monologue" as its specific form) in the first place. Based on the first author's research of elementary school children's playcrafting (together with Baker-Sennett and Rogoff) and children-organized classroom activities with the invention theme (together with Rogoff), we come to the conclusion that Piaget might have confused "egocentrism" with his own (as the observer) disengagement from children's joint activities due to his cultural (i.e., white middle-class) adult bias of how joint activities should be organized, negotiated, and unfolded.

Piaget defined egocentric speech in his early book about his observations on young children's free play as, "When a child utters phrases belonging to the first group [i.e., egocentric — EM and RH], he does not bother to know to whom he is speaking nor whether his is being listened to" (Piaget, 1948/1959, p. 9). Piaget provided three forms of egocentric speech: (1) repetition when, "child repeats them [i.e., words and syllables — EM and HR] for the pleasure of talking, with no thought of talking to anyone, nor even at times of saying words that will make sense" (p. 9); (2) monologue when, "child talks to himself as though he were thinking aloud;" (p. 9); and (3) collective monologue when, "an outsider is always associated with the action or thought of the moment, but is expected neither to attend nor to understand..." — the presence of another "serves only as a stimulus" for talking (p. 9). Piaget also provided examples and categories for the so-called socialized speech (e.g., "adapted information", "criticism", "commands") when child's speech is intentionally directed to another person and modified to make it easy for him or her to understand.

From the standpoint of the current research on children's interaction, it appears that the ways in which Piaget defined "socialized speech" are too narrow dependent on the adult perception of social interaction, while the ways in which he defined "egocentric speech" are too broad and sometimes include "socialized speech". There seems to be biases in how Piaget defined different types of speech. We argued that the participants' ideas and actions can be coordinated in forms different from those Piaget described (Table 1):

Preliminary findings of Baker-Sennett, Matusov and Rogoff's (1999, in preparation) research on playcrafting and Matusov and Rogoff's, (1999, in preparation) research on children's classroom activities of inventing suggest that for many white middle-class adults (parents of the children) it was difficult to support and participate

Table 1
 Piagetian and non-Piagetian ways to define socialized speech

Piaget's markers of the social nature of child's speech	Alternative (additional) possibilities for children to coordinate their ideas and actions in social interaction
<p><i>Verbal structure of child's phrase</i> (e.g., question such as "Ez, do you mind helping me?" p. 28)</p>	<p>(a) <i>Non-verbal of action</i> (e.g., attracting partner's attention to an object) (b) <i>Genre change to adjust to the interlocutor</i> (e.g., as research shows, very young children tailor their speech when they speak with infants and toddlers by simplifying their speech, their grammar and using babyish exaggerated intonations, (Dunn & Kendrick, 1982; Sachs & Devin, 1976)</p>
<p><i>Contingency</i> (e.g., Leo is helping Geo to play Lotto: "I think that goes here." Geo points to a duplicate card. Lev: "If you lose one, there will still be one left." Then: "You've got three of them same," p. 20)</p>	<p><i>Non-contingency</i> (e.g., at one point of an inventing activity, one child made a suggestion to her partner to include a microphone in their joint invention of a musical instrument by showing a piece of equipment she was working to her partner and saying, "Mic is here". The partner continued to work on her own piece without direct response to the suggestion. The children kept working on their own pieces of equipment. After quite a few minutes, the second child went to pick up a mic in the equipment pile and asked the first child how to connect the mic with musical strings. Here, the collaborative exchange between the children was not sequential but separation in time by children's working solo on their own part of equipment in a division of labor manner.)</p>
<p><i>Development of ideas in a systematic (or near systematic) way</i> (e.g., Lev: "We ought to have a little water. This green paint is so very hard, most awfully hard" ... "In cardboard, don't you know? You don't know how to, but it is rather difficult for you, it is for every one." (p.23)</p>	<p><i>Development of ideas in a non-systematic, mosaic way.</i> It involves integration of ideas within the development of each collaborative activity direction; however, the <i>transition</i> between consecutive collaborative activity directions often seem to be idiosyncratic and arbitrary. There is a lot of "jumping" and "drifting" from one direction of the activity to another. Boundaries between collaborative topics are often clear and abrupt because topics almost interrupt each other by abrupt (almost incidental) shifts of attention where a <i>detail</i> becomes the focus in the new collaborative topic. (e.g., The activity involves Ed and Bob, second-graders, inventing their own board games. In a collaborative topic of discussing where on the board a player can start and finish Ed's game, Ed almost incidentally points out to Bob a pathline that leads from the start to the end. Bob reacts, "Whoa! That's gonna be hard!" Bob's reaction prompts Ed to initiate a <i>new collaborative topic</i> on the rules of character movements and plot of his game, which is supported by Bob. Further, Ed improvises a story about adventures awaiting players in his game: "And when you fall down, you'll fall right into chains ... (spreads his arms to demonstrate how the chain is big) and you'll hang there for the rest of your life." This makes him notice a game piece on table. Ed grasps the game piece and defines game characters signified by the game pieces immediately begins <i>another new collaborative topic</i> about his game: "See, with the black guy (picks the game piece up to show Bob) nobody could even see you there (demonstrates by holding black guy to the game board at a particular position). If you were the white guy (demonstrates as before). You'd still be falling (demonstrates)." Bob supports the new topic by attending to Ed and asking: "But you could see him (the white guy on the black tunnel to the chain room)" (Matusov & Rogoff, 1999, in preparation).</p>

(Table continued on next page)

Table 1 (Continued)

Piaget's markers of the social nature of child's speech	Alternative (additional) possibilities for children to coordinate their ideas and actions in social interaction
<i>Verbal exchange</i> (see above)	<p data-bbox="389 249 1037 437"><i>Entire flow of the activity</i> (e.g., in children's playcrafting activity Baker-Sennett, Rogoff, and Matusov (1999) noticed important aspect of children's collective improvisational planning that the researchers called "mindstorming". They define mindstorming as "improvisational exploration of ideas uncoordinated into [playcrafting] themes or details, with individuals or groups casually bouncing off each other's ideas or just trying ideas with little contact with other ideas. ...</p> <p data-bbox="389 450 1037 688">Near the beginning of "The Floating Swamp" the kids are all trying out ideas for their characters, with some brief exchanges involving one- or two-line suggestions of costume parts or the nature of a character, but with no sustained consideration of decisions. It is more like collective monologue and solo acting with occasional questions or directions at a detailed level which do not get involved with each other, and the ideas of one may relate to the ideas of with each other, and the ideas of one may relate to the ideas of another. But there is not sustained consideration of decisions:</p> <p data-bbox="412 693 1037 983"> B wants C to give him giant sunglasses. C says he needs to take off his pants, but B says no. R announces that she is the oldest sister. P comes up and says, "Where's me?" C announces that he is going to wear some pants because he is going to mix some of each color. R approaches B and tells her she can be the mommy (no response). B searches for the eye patch. R asks C if she looks like a mother, and he says yes, but she says, "I don't" and walks away ((Baker-Sennett, Matusov, & Rogoff, 1999, in preparation, p.10)) </p> <p data-bbox="389 997 1037 1128">Mondstorming, which the authors explicitly compare with Piaget's description of "collective monologue", provided germs of ideas for further development of playcrafting and was integral and apparently necessary part of children's joint creativity and productive playcrafting and extremely social in its nature.)</p>

in children-directed productive activities that heavily involved mindstorming improvisational planning and non-systematic development of ideas. Piaget's focus on separated phrases or verbal exchanges among children seems not to be always sufficient for understanding children's joint activity and judgements of coordination of ideas and logic. His attribution of cognitive deficits could be caused by his inability, as for many parents we observed, to engage and grasp the flow of children's joint activity in its creative and productive totality. In some cases, this totality develops over a significant period of time — hours, days, and even months. Children's ways of coordination and building on each other's ideas can be different (but nevertheless productive, as the research suggests) from what many white middle class adults expect.

Table 2
Sociocultural critique of Piaget's cognitive theory

Piaget's critique of thinking	Sociocultural critique of Piaget and possible reinterpretation of the phenomena	Methodological problem with Piaget's research according to a sociocultural approach
<i>Egocentrism</i> — imposition of an individual (arbitrary) point of view on the reality	<i>Adultocentrism</i> — confusing researcher's inability to understand and engage in children's activities with their deficits	Violation of <i>ecological validity</i> — designing research that does not make sense for indigenous targeted community
<i>Sociocentrism</i> — imposition of a socially dominant point of view on the other individuals	<i>Ethnocentrism</i> — confusing researcher's inability to understand and engage in another culture with their deficits	

A similar adultocentrism can be clearly seen in many of Vygotsky's empirical studies and examples because Vygotsky followed and referred to Piaget in describing young child's thinking in deficit terms "with two main features: egocentrism and primitivism" [Vygotsky, 1993 #2687, p. 151; the italics is original]. He described child cognitive development as a progressive acculturation and internalization of cultural tools for reorganization of "the natural" (read "purely biological") cognitive functions. Like in his and Luria's studies of thinking of illiterate peasants from remote villages in Soviet Asia, Vygotsky never empirically examines or took into account the ecology of activity systems of the studied children nor did he make efforts to ensure that the tasks the children were involved in made intrinsic/ecological sense for them. Ironically, here and there in Vygotsky's writing it is possible to find his insistence on the importance of such conditions for children's authentic learning in school (Vygotsky, 1978).

A sociocultural approach does not dismiss Piaget's studies as simply word games unfamiliar to young children but rather considers the tasks offered to the children to be a part of a network of adult Western practices that the young children are not often familiar with (Table 2). Thus, Piaget's studies raise interesting questions about the nature of the networks themselves and how children learn to participate in them. From a sociocultural approach, the ways in which people (including children) coordinate and organize their ideas are rooted in their participation in different practices and communities (Heath, 1983; Kaplan, 1966; Michaels & Cazden, 1986). To understand patterns of coordination of thinking it is necessary to examine practices and ways of participation rather than to apply any a priori structures to judge the quality of the coordination. Researchers' criteria for thinking are often grounded in their practices and communities, in which the researchers themselves participate and in which studied children may not have access or may have very limited access. Researchers should be cautious not to consider their specific criteria of cognitive quality

grounded in their specific practices as a universal definition of quality. They should also avoid the characterization of “others” (e.g., children, illiterate peasants from remote villages) as having deficits but rather to perceive that their own ways of thinking and doing are rooted in their own practices and values.

5. Conclusion

There seem to be deep historical reasons for similarities between the approaches of Piaget and Vygotsky, both of whom were entering the field of child development psychology in the early 1920s. Likewise, the emergence of a sociocultural perspective (or better to say a family of perspectives) was made possible by the changing intellectual and political climate. In the first half of the 20th century, decontextualized activities — exemplified by many of Piaget’s and Vygotsky’s experiments — victoriously monopolized the entire Western society when mandatory schooling was established for all children and industrial production was expanded into all spheres of human life. Moreover, the relationship between Western and non-Western cultures was changing from one of geographical colonization and mere economic exploitation of non-Western societies (i.e., “external colonization” of human and natural resources) to a new relationship stressing the transformation of a traditional lifestyle based on contextualized activities in non-Western societies into an industrial lifestyle based on decontextualized activities (i.e., “internal colonization” of sociocultural mind of traditional societies). International organizations and colonizer governments started establishing schools in colonies. Decontextualized-mediated action came to be seen as the feature of any rational, intellectually advanced thinking. The rapidly decreasing islands of lifestyle based on contextualized actions were left only to preschool children (to some degree), small rural communities involved in traditional craft-like production (peasants in remote villages), underprivileged minorities (and, thus, often less schooled and less involved in industrial production), non-Western cultures, people with mental problems, and, of course, animals.

The researchers of the first half of the 20th century focused on “peculiarities” of thinking based on contextualized mediated actions that appeared in the islands of non-industrial practices: Lévy-Bruhl (1910/1926) studied “a-logical” thinking of traditional Native American cultures in South America, Köhler (1927) focused on instrumental thinking of apes raised in a zoo, Piaget (Piaget, 1964/1968) investigated “non-formal” and “pre-operational” thinking of children (especially preschoolers) in an industrial society, Vygotsky and his colleagues (Vygotsky et al., 1993) studied thinking of young children and adults in traditional cultures and remote villages, as well as adults with mental problems in an industrial society. Very often in these studies, thinking based on contextualized mediated actions (e.g., mapless navigation of Micronesian navigators in an open sea) was described in terms of deficiencies (Hutchins, 1983).

In the second half of the 20th century, the expansion of decontextualized practices has been almost completed. Now, by the end of the century, it is difficult to find a place

on Earth that is not involved in industrial production or exchange in one way or another. The extreme degree of globalization of the market economy and communication leads to diffusion of goals and even power through decontextualized mediation. Moreover, the hierarchical top-down decision-making associated with industrial production becomes increasingly problematic in this huge network of distributed cognition. There has been a growing awareness in the modern post-industrial society that uncertainty, waste, lack of resources, chaos, disagreements, misunderstanding, confusion, and diversity of goals and values are meaningful and useful features of human communities that should be managed rather than minimized or avoided (Fullan, 1993; Hargreaves, 1994). In the social sciences, at the end of the 1970s and the beginning of the 1980s, the interest in contextualized-mediated actions and practices was vitalized and rehabilitated in a research agenda (see for example, Heath, 1983; Hutchins, 1983; Latour & Woolgar, 1979; Lave, 1988; Scribner & Cole, 1981; Suchman, 1985, see also Rogoff & Chavajay, 1995) for their historical account of such change). These new sociocultural approaches have come out of dissatisfaction by and in dialogue with Piaget's, Vygotsky's, and traditional cognitive paradigms. A sociocultural approach based on an assumption of multiplicity of developmental directionality poses new questions such as: who and how defines and redefines this directionality, what (and why) promotes and hinders individual's access and participation in sociocultural activities and communities of practices, and how newcomers contribute to changes in practices, institutions, and communities by their learning and development.

The emerging legacy of Piaget and Vygotsky for developmental psychology and education cannot be overstated. Piaget's focus on the individual as an actor and active learner, his critique of existing educational and social institutions that often hinder cognitive development, his claim that cooperation and dialogue of power-equal partners is necessary for individual cognitive development, his passionate advocacy for the democratization of schools, and, finally, his contribution to the development of a constructivist educational philosophy and movement ensure that Piaget will remain relevant for future psychologists and educators. Vygotsky's emphases on semiotic and tool mediation, activity, and guidance and his claim that history, culture, institutions and society are the key for understanding of the child's development keep attracting educators and psychologists. By now it has become clear that Piaget and Vygotsky were the most inspirational child development psychologists and theoreticians on learning. Without doubts this legacy will continue to be reinterpreted, reassessed, and reused.

Acknowledgements

We would like to thank John St. Julien, Zoubeida Dagher, Ralph Ferretti, Leda Echevers, Leslie Posner, and Robert Hampel for discussions of early versions for the paper. We also want to thank Leslie Smith for inspiring email discussions of Piaget's and sociocultural approaches.

References

- Ashton, P. T. (1975). Cross-cultural Piagetian research: An experimental perspective. *Harvard Educational Review*, 45(4).
- Baker-Sennett, J., Matusov, E., & Rogoff, B. (1999). Children's planning of classroom plays with adult or child direction.
- Cazden, C. B. (1992). *Whole language plus: Essays on literacy in the United States and New Zealand*. New York: Teachers College Press.
- Cole, M. (1978). Soviet developmental psychology: An anthology.
- Donaldson, M. C. (1978). *Children's minds*. London: Croom Helm.
- Dunn, J., & Kendrick, C. (1982). The speech of two- and three-year-olds to infant siblings: "Baby talk" and the context of communication. *Journal of Child Language*, 9(3).
- Fullan, M. (1993). *Changes forces: Probing the depth of educational reform*. London, New York: Falmer Press.
- Göncü, A., & Becker, J. (1992). Some contributions of a Vygotskian approach to early education. *International Journal of Cognitive Education and Mediated Learning*, 2(2), 147–153.
- Hargreaves, A. (1994). *Changing teachers, changing times: Teachers' work and culture in the postmodern age*. London: Cassell.
- Heath, S. B. (1983). *Ways with words: Language, life, and work in communities and classrooms*. New York: Cambridge University Press.
- Hutchins, E. (1983). Understanding micronesia navigation. In D. Gentner, & A. L. Stevens, *Mental models* (pp.). Hillsdale, NJ: Erlbaum.
- Kaplan, R. B. (1966). Cultural thought patterns in inter-cultural education. *Language Learning*, 16(1), 1–20.
- Köhler, W. (1927). *The mentality of apes* (2nd, rev.). London: Routledge & Kegan Paul.
- Latour, B. (1987). *Science in action: How to follow scientists and engineers through society*. Cambridge, MA: Harvard University Press.
- Latour, B. (1996). On interobjectivity. *Mind, culture, and activity*, 3(4), 228–245.
- Latour, B., & Woolgar, S. (1979). *Laboratory life: The social construction of scientific facts*. Beverly Hills: Sage Publications.
- Lave, J. (1988). *Cognition in practice: Mind, mathematics, and culture in everyday life*. Cambridge, New York: Cambridge University Press.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge England, New York: Cambridge University Press.
- Lemake, J. L. (1990). *Talking science: Language, learning and values*. Norwood, NJ: Ablex Pub. Corp.
- Lévy-Bruhl, L., (1926). *How natives think* (L. Clare, Trans.), London: G. Allen & Unwin. Ltd. (Original work published 1910).
- Lock, A. (1980). *The guided reinvention of language*. London, New York: Academic Press.
- Luria, A. R. (1976). *Cognitive development, its cultural and social foundations*. Cambridge, MA: Harvard University Press.
- Matusov, E. (1996). Intersubjectivity without agreement. *Mind, Culture, and Activity*, 3, 25–45.
- Matusov, E. (1998). When solo activity is not privileged: Participation and internalization models of development. *Human Development*, 41 (5–6).
- Matusov, E., & Rogoff, B. (1999, in preparation). Children's collaborative decision making in an innovative public elementary school.
- McDermott, R. P. (1993). The acquisition of a child by a learning disability. In J. L. E. Seth Chaiklin, *Understanding practice: Perspectives on activity and context. Learning in doing: Social, cognitive, and computational perspectives* (pp. 269–305). New York: Cambridge University Press.
- Michaels, S., & Cazden, C. B. (1986). Teacher/child collaboration as oral preparation for literacy. In B. B. Schieffelin, & P. Gilmore, *The acquisition of literacy: Ethnographic perspectives* (pp. 132–154). Norwood, NJ: Ablex Pub. Corp.
- Piaget, J. (1959). *The language and thought of the child*. (3d [rev. and enl.ed.] M.R. Gabain, Trans.) New York: Humanities Press (Original work published 1948).

- Piaget, J. (1968). *Six psychological studies* (A. Tenzer, Trans.) NY: London (Original work Published 1964).
- Piaget, L., (1995). In I. Smith, *Sociological studies* (2nd ed.). (Smith, et al., Trans.) London, New York: Routledge (Original work published 1977).
- Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context*. New York: Oxford University Press.
- Rogoff, B., & Chavajay, P. (1995). What's become of research on the cultural basis of cognitive development? *American Psychologist*, 50(10), 859–877.
- Rogoff, B., & Wertsch, J. V. (1984). *Children's learning in the "zone of proximal development"*. San Francisco: Jossey-Bass.
- Rommetveit, R. (1979). On the architecture of intersubjectivity. In R. Rommetveit, & R. M. Blakar, *Studies of language, thought, and verbal communication* (pp. 147–161). London: Academic Press.
- Sachs, J., & Devin, J. (1976). Young children's use of age-appropriate speech styles in social interaction and role-playing. *Journal of Child Language*, 3(1).
- Scribner, S. (1977). Modes of thinking and ways of speaking: Culture and logic reconsidered. In P. N. Johnson-Laird, & P. C. Wason, *Thinking: readings in cognitive science* (pp. 483–500). Cambridge, UK: Cambridge University Press.
- Scribner, S. (1984). The practice of literacy: Where mind and society meet. *Annals of the New York Academy of Sciences*, 433, 5–19.
- Scribner, S., & Cole, M. (1981). *The psychology of literacy*. Cambridge, MA: Harvard University Press.
- Smith, L. (1995). Introduction to Piaget's sociological studies. In J. Piaget, *Sociological studies* (pp. 1–22). London, New York: Routledge.
- Star, S. L., & Griesemer, J. R. (1989). Institutional ecology, 'translation', and coherence: Amateurs and professionals in Berkeley's museum of vertebrate zoology, 1907–1939. *Social Studies of Science*, 19, 387–420.
- Suchman, L. A. (1985). Plans and situated actions: An inquiry into the idea of human-machine communication. *Dissertation Abstracts International*, 46(4-A), 1018.
- Tudge, J., & Rogoff, B. (1989). Peer influences on cognitive development: Piagetian and Vygotskian perspectives. In J. S. B. E. Marc H. Bornstein, *Interaction in human development. Crosscurrents in contemporary psychology* (pp. 17–40). Lawrence Erlbaum Associates: Hillsdale, NJ, US.
- Veer, R.v.d., & Valsiner, J. (1991). *Understanding Vygotsky: A quest for synthesis*. Oxford, UK; Cambridge, USA: Blackwell.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological process* (Luria, Alexander R., Lopez-Morillas, Martin, Cole, Michael, Wertsch, James, Trans.). Cambridge: Harvard University Press.
- Vygotsky, L. S. (1981). The genesis of higher mental functions. In J.V. Wertsch, *The concept of activity in Soviet psychology* (pp. 144–188). Armonk, NY: M.E. Sharpe.
- Vygotsky, L. S., Luria, A. R., Golod, V. I., & Knox, J. E. (1993). *Studies on the history of behavior: Ape, primitive, and child*. Hillsdale, NJ, USA.
- Vygotsky, L. S., Rieber, R. W., & Carton, A. S. (1987). *The collected works of L.S. Vygotsky*. New York: Plenum Press.
- Wertsch, J. V. (1985). *Vygotsky and the social formation of mind*. Cambridge, MA: Harvard University Press.
- Whitson, J.A. (1988). The politics of "non-political" curriculum: Heteroglossia and the discourse of "choice" and "effectiveness". In W.F. Pinar, *Contemporary curriculum discourses* (pp. 279–330). Scottsdale, AZ: Gorsuch Scarisbrick.
- Zinchenko, V. P., & Wertsch, J. V. (1995). Cultural-historical psychology and the psychological theory of activity: Respect and prospect. In E. James, V. Wertsch, E. Pablo del Rio et al., *Sociocultural studies of mind*. (pp. 37–55). New York, NY, USA.