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MEANING AND INTERPRETATION IN COLLABORATION

Abstract. Because collaborative learning takes place through processes of shared meaning-making, CSCL must be concerned with the nature of meaning and social meaning-making practices. Philosophic analysis suggests that meanings are necessarily shared; they persist in linguistic and physical artifacts in our culture and situation. However, these meanings must be interpreted by individuals. There is a dynamic relationship between shared meanings and individual interpretations: In order to engage in collaborative activities, people must come to recognize meanings of artifacts, and interpret these meanings from their own perspectives. The interplay between meaning and interpretation has implications for CSCL research methodology and for CSCL technology design.

1. CSCL AND MEANING-MAKING

In his keynote talk at CSCL 2002, Koschmann identified the concept of *meaning* – as it is discussed in the philosophic tradition – as dwelling at the fundamental core of CSCL (Koschmann, 2002a). Arguing from a close reading of Dewey, he proposed,

> CSCL is a field of study centrally concerned with meaning and the practices of meaning-making in the context of joint activity, and the ways in which these practices are mediated through designed artifacts. (p. 20.)

Despite Koschmann's careful crafting of this programmatic statement, it remains open to ambiguous interpretation. As can be seen from the discussion following the keynote (Henderson & Wyman, 2002), it is possible to interpret *meaning-making* as a psychological process that takes place in individuals' minds and to understand the reference to *designed artifacts* as narrowly referring to CSCL software systems.

In my *Introduction* to the *Proceedings* that include the keynote, I indicated a possible alternative reading of this definition of the field of CSCL (Stahl, 2002c). I suggested that meaning-making can be treated as an essentially social activity that is conducted jointly – collaboratively – by a community, rather than by individuals who happen to be co-located. In addition, the mediation of meaning-making by artifacts can be seen more generally than just as the transmission of personal opinions through the communication channel of a technological artifact.

That is to say, the meaning-making practices do not merely take place *within* a "context of joint activity," as actions might take place within the four walls of a room. Rather, the context of joint activity *is* those practices – the practices form the context. Similarly, the meaning is not merely transferred from mind to mind by the activities, but the meaning is constructed by and exists as those activities. Similarly, artifacts are not simply instruments for conveying independent meanings, but are themselves embodiments of meaning. Of course, people are necessarily involved in meaning-making as interpreters of the meaning, but this does not imply that the meaning only exists in the isolated heads of the individuals. These are some of the issues to be addressed in this paper.

In my own contribution to a theoretical framework for CSCL at the 2002 conference, I presented four themes that I found helpful for conceptualizing foundational issues of CSCL: collaborative knowledge building, group and personal perspectives, mediation by artifacts and interaction analysis (Stahl, 2002b). In the present paper, I would like to build on Koschmann's statement and on my four themes from CSCL 2002 in order to propose a way of thinking about meaning and interpretation in collaboration. I hope to thereby clarify my alternative reading of Koschmann's characterization of CSCL. I will propose that – particularly in contexts of collaboration – *meanings* exist in the *intersubjective* world and that they are *interpreted* from *personal* perspectives.

2. THE PHILOSOPHIC TRADITION

The nature of meaning has been a hot topic in the 2500-year-long conversation that we call Western philosophy, since its origin in Socrates' dialogues. In our generation, this conversation has spread into the theoretical reflections of the human sciences. It is increasingly filtering into reflections on CSCL. For instance, in his featured paper at ICLS '02 delivered half a year after his CSCL keynote, Koschmann explicitly proposed that the history of philosophy (particularly the period from Kant to Hegel) was relevant to the learning sciences (Koschmann, 2002b). In particular, he cited a paper by Packer & Goicoechea that argued that ontology as well as epistemology are central to sociocultural and constructivist learning sciences (Packer & Goicoechea, 2000). This paper focused on how Kant and Hegel had worked to overcome the mind-body dualism introduced by Descartes, where meaning, as something purely mental, is ontologically distinguished from and epistemologically divorced from the physical world. Contemporary learning theories reflect implicit (often unacknowledged) philosophic commitments defined at different stages in the history of philosophy, representing different responses to this dualism.

As a discussant to Koschmann's ICLS paper, I presented a chart of philosophic relationships among the philosophers and learning theories that Koschmann, Packer and Goicoechea discussed (see Figure 1). I tried to suggest that the timely issue is not so much overcoming the dualism of Descartes, but moving beyond his exclusive focus on the *individual* as thinker (the mental *cogito* as seat of cognition and meaning). This is where a non-idealist reading of Hegel proves to be pivotal.

Hegel shows how consciousness emerges through activity in the social and physical world (Hegel, 1807/1967). In tracing the historical and personal genesis of mind from the most elemental perceptual awareness to the most sophisticated and acculturated knowledge, Hegel describes the emergence of self-consciousness from within the process of mutual recognition of self and other. In particular, it is the worker, who produces an artifact in the physical world at the bidding of an other, who is then able to perceive his labor as externalized and made persistent in the artifact; his self-consciousness emerges through his activity in the social and physical world, where he comes to see himself in his products and through the eyes of others:

> Work *gives form* to its object. The worker's transforming relationship toward the object is transformed into the object's form and becomes something *persisting*, because for the worker the object gains self-sufficiency. This transforming mediation – the *activity* of

forming – is also the *individuality* of consciousness or the pure being-for-itself of consciousness, which in the work process now steps out of consciousness and takes on the character of persistence. The consciousness of the worker thereby arrives at a perception of the self-sufficient artifact as a perception *of his self.* (p. 238, my translation.)

For Marx, the artifact that is produced by the worker's labor and that externalizes his self within its social relations to other people is transformed within settings of capitalist production into a commodity (an artifact produced for sale on the open market) (Marx, 1867/1976). The worker's self-consciousness is alienated because the commodity is no longer his (but the capitalist's who sells it) and because his social relations to potential users of the artifact is transformed into the abstract monetary value of the commodity. The meaning of the labor that went into forming the product undergoes multiple complex transformations as it is externalized into an artifact, the artifact enters commodity relations and is reflected back to the worker as his boss's monetary value.
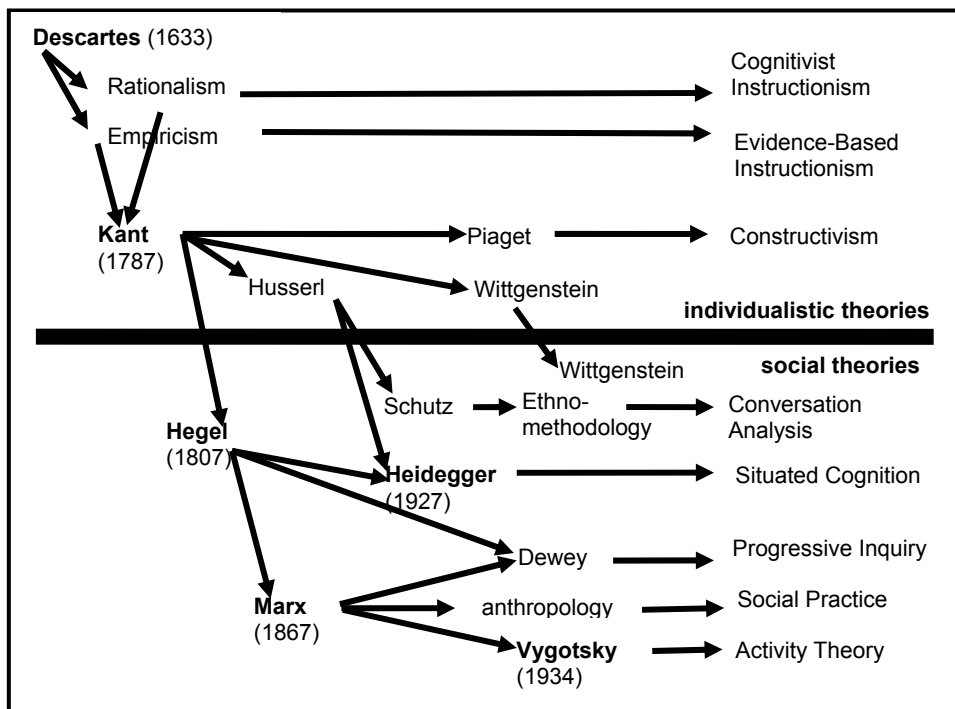

Figure 1. Philosophic influences on individual and social theories of learning.

Marx and Heidegger explicated Hegel's view, showing how meaning is socially produced and situationally interpreted. (We shall discuss Heidegger's approach below.) Their followers developed it further and applied it in many realms, eventually leading to the diverse theories of learning that are influential in CSCL today (as indicated in Figure 1). Although it seems rather clear at a theoretical level that meaning is socially constructed, when it comes to investigations of learning –

even in collaborative settings of CSCL – it is difficult for researchers to stop looking for learned meanings in the heads of students. This is partially a consequence of folk theories that have not kept pace with philosophy (Bereiter, 2002; Dennett, 1991), but partially also caused by a lack of clarity about the role of interpretation of meaning by individuals. This paper will attempt to clarify the relationship of meaning and interpretation in collaborative activities, showing that although the interpretation of a meaning may be tied to the individual's subjectivity, the meaning itself is shared and observable in the world.

3. VYGOTSKY AND MEDIATED COGNITION

We start with Vygotsky's programmatic attempt to show how the individual mind – naively considered to exist "in the head" – is grounded in activity within the physical and social world. His description of the genesis of the pointing gesture illustrates a typical first experience of meaning for a small child; it shows how this meaning is created in the intersubjective world and only then incorporated (internalized) in the child's own sense-making repertoire (Vygotsky, 1930/1978):

> We call the internal reconstruction of an external operation *internalization*. A good example of this process may be found in the development of pointing. Initially, this gesture is nothing more than an unsuccessful attempt to grasp something, a movement aimed at a certain object which designates forthcoming activity. . . . When the mother comes to the child's aid and realizes this movement indicates something, the situation changes fundamentally. Pointing becomes a gesture for others. The child's unsuccessful attempt engenders a reaction not from the object he seeks but from another person. Consequently, *the primary meaning* of that unsuccessful grasping movement *is established by others*. . . . The grasping movement changes to the act of pointing. As a result of this change, the movement itself is then physically simplified, and what results is the form of pointing that we may call a true gesture. (p. 56; italics added.)

Here we see the *genesis of the meaning* of a pointing gesture. The gesture is an artifact: it embodies meaning in the physical world. The meaning is a reference to that which is pointed at. The baby intended some object; the mother recognized that the baby intended that object; the baby recognized that the mother recognized this. The multiple mutual recognition entails that the baby and the mother recognize each other as people who can have intentions and who can recognize intentions of other people. This is a first glimmer of self-consciousness, in which the baby becomes conscious of his own and other people's intentionality. (Of course, the baby cannot yet express this self-consciousness in any verbal or conceptual sense, but only behaviorally.) The key point for us is not the birth of intentionality, social recognition or self-consciousness. It is the creation of an artifact: the pointing gesture. This gesture embodies its meaning in a physical way. As a deictic (pointing) gesture, it already embodies a reference to the intended object as the artifact's very meaning. So we have the first step toward a symbolic artifact representing an intended object. In the origin of the gesture we already see the basis for intersubjective *shared understanding* of the meaning, because the pointing gesture is premised upon the mutual recognition of the underlying intention.

Pointing has a clear evolutionary advantage. It establishes a fundamental social bond by shared orientation to a common intended object. It immediately coordinates the orientation of the people involved into the same direction within the world. It thereby provides a practical basis for *collaboration*. It is probably so fundamental to

human social experience that it is found in all cultures, although it is not a result of biological instinct and is not shared with non-human mammals. Vygotsky argues that this gesture is used in two general ways that lead to our extensive repertoire of symbols, artifacts, cognitive skills, external memories and cultural systems: it is used to control behavior and it is internalized.

In the original enactment of pointing, the baby achieves *control* over the mother's behavior. He gets the mother to retrieve the intended object that he wanted but could not reach. It is only through success at achieving this control that the baby learns that his failed reach can be recognized by the mother as an intention. As the baby's repertory of gestures and artifacts grows, he begins to use them to control his own behavior as well. We can see this in the behavior of young children playing and drawing, for instance. At certain stages in their behavior, they negotiate or adopt rules and meanings that structure their behavior in ways that may prove useful.

Language grows out of gesture, and is then *internalized*. Names reference objects in a way that extends the pointing gesture. Not that language consists only of names; rather, many linguistic functions extend other kinds of embodied behavior – and then other linguistic tools may be built on top to perform purely syntactic or pragmatic functions (Halliday, 1985). According to Vygotsky's theory, language begins as spoken communication among people. Clearly, that is how people learn language. At a certain age, when children have learned the fundamentals of a language, kids engage in "self-talk" or "ego-centric talk." This is where they speak aloud to themselves (or to imaginary friends, dolls and other artifacts). Similarly, early readers initially read aloud. This self-talk evolves into silent internal talk. Internal talk is an important component of what we call "thought." Thinking often involves talking to ourselves, for instance rehearsing what we plan to say (and controlling our future behavior that way), recalling what took place in the past or carrying on the kind of conversations that we have aloud with other people, silently with ourselves. Through this evolution, primal gestures have been transformed into speech, and speech into thought. Meanings and references to things in the world have been internalized into mental forms that still embody some of the functions that they originally had as physical artifacts or bodily gestures.

4. EXTERNALIZATION IN PHYSICAL AND SEMANTIC ARTIFACTS

As we see in the Hegel, Marx and Vygotsky stories, meaning may start as an emergent property of activity in an intersubjective physical setting. It begins as an aspect of a collaborative interaction, and is then successively transformed into a phenomenon of its own. The worker's effort to prepare something for someone else or the infant's thrust toward something that requires mother's help takes on a shape that persists or reoccurs. It adopts an increasingly well-defined and shared meaning, ultimately perhaps even becoming a symbol of that meaning.

The object that embodies shared meaning can be further transformed, for instance named. Then that object or word can be used to mediate future activity. The infant can use the gradually stylized gesture to indicate things he wants or things that he wants the mother to give him, mediating his interaction with the mother by means of this gesture. The mother, in turn, can use the gesture to associate names with the thing pointed to, so that both will then use the word with the same meaning. Vygotsky generalized the term "artifact" to include symbols like names as well as

man-made physical objects. He then showed how human activity (as opposed to purely instinctual, biological, animal-like behavior) is generally mediated by artifacts in complex ways.

When we say that in Vygotsky's theory meaning is *externalized*, we do not imply that some kind of meaning first existed in someone's head and that it was then expressed, represented or otherwise made to take on a physical existence. To the contrary, the meaning fundamentally emerges in the external, observable, intersubjective world of other people and physical objects. As we will see below, the external meaning can secondarily be internalized. In later developments, internalized meanings can be (re-)externalized. By the time we reflect on the nature of meaning as adults, the origins of meaning in our infancy have long since been covered over in complex layers of successive transformations that we can only reconstruct through careful observations of collaborative interactions and theoretical reflection. That is why we often confuse the origins of cognitive phenomena.

As we have seen in the analyses of Hegel, Marx and Vygotsky, the creation and use of an artifact (e.g., a product, commodity or gesture) may follow these stages:

- People are involved in some collaborative activity involving their interpersonal relations, social context, physical objects, etc.
- Some object, bodily gesture or word becomes associated with this meaning and acts as a persistent externalization of the meaning.
- The artifact can later be used as an embodiment of the meaning that was created in the previous stages.

In this way, through consistent, intentional use by a group of people engaged in activity together, something – a gesture, a sound, a shaped physical object – becomes a meaningful artifact. Such artifacts intimately combine meaning and physical existence. Through its use in a collaborative activity, an object is meaningful; without having a physical appearance, the meaning could not be shared and participate in the activity. The very nature of the artifact overcomes Descartes' problem by integrating the conceptual and the physical. It also transcends the individualistic view of meaning by locating its origin in social interaction.

5. INTERNALIZATION AS COGNITIVE ARTIFACTS

Further transformations can take place, constituting what Vygotsky (Vygotsky, 1930/1978) calls internalization:

> An operation that initially represents an external activity is reconstructed and begins to occur internally. . . . An inter-personal process is transformed into an intra-personal one. . . . The transformation of an inter-personal process into an intra-personal one is the result of a long series of developmental events. . . . They are incorporated into this system of behavior and are culturally reconstituted and developed to form a new psychological entity. . . . As yet, the barest outline of this process is known. (p. 56f.)

Although Vygotsky uses Descartes' metaphor of internal (mental) and external (physical) activities, there are essential differences. First, he does this precisely to overcome the divorce between the two worlds, showing how behaviors can migrate from one realm to the other. Second, Vygotsky gives the temporal priority to the external, whereas for Descartes and his followers, activity is first planned in the mind and then executed in the physical world. Third, Vygotsky emphasizes the inter-personal (or social) as the origin of psychological phenomena, rather than taking the

thoughts of the individual as the fundamental activity and as the unquestionable basis for all analysis.

Vygotsky did not succeed in completely fleshing out the analysis he proposed in *Mind in Society*. However, one can imagine an analysis of human mind as a complex assemblage of what we might call *cognitive artifacts*: internalized forms of culturally developed artifacts. The term 'cognitive artifact' – even in the writings of Norman and Hutchins – is open to a Cartesian reading, where the artifact is a physical object (like a string on one's finger) that is somehow used by an individual's mind to accomplish some cognitive action (Norman, 1991; Hutchins, 1999). Here, on the contrary, the term is being used to indicate an "internal artifact" that had its origin in the interpersonal world but has since been internalized as a psychological function.

The pointing gesture illustrates how cognitive artifacts might start to form in the activity of an infant, advancing from instinctual movements or learned behaviors to symbolic gestures that involve qualitatively novel ways of interacting with other people, the world and oneself. Through the mutual recognition that is part of the shared intentionality of pointing, the infant gradually starts to become aware of the distinction between herself and her social and physical environment. As she gets a little older, the child learns language, the primary form of human social interaction. Spoken language leads to (vocalized) self-talk and finally to (silent) internal speech. The ability to talk to herself proves to be a powerful tool for controlling her actions and for internalizing the influences of others.

As a core element of thought and self-reflection, internal speech provides a sense of self-consciousness. It also transforms memory processes, which have already been drastically expanded from the basic inherited memory functions. The child learns to follow and tell stories, eventually internalizing narrative as a cognitive artifact (Bruner, 1990). She can then collect memories of her behavior and internalize other people's views of her, constructing a sense of identity as a person and as a mind with internal dialog. The concepts of the individual and the mind are not biological givens, but emergent cognitive artifacts.

Vygotsky's vision reveals a "society of mind" of dynamically developing and interacting cognitive artifacts, rather than of Minsky's computational agents (Minsky, 1986). Mind is not a pre-given cognitive capability (Descartes), a universal schema for structuring reality (Kant), or a biologically developing set of facilities (Piaget), but the result of internalizing and transforming artifacts that arise in social interaction. This view of human mind as a cultural spin-off of collaborative activity in the social world has implications for how we conceive of meaning and its interpretation.

6. SITUATED WITH MEANINGFUL ARTIFACTS

The way to avoid the dilemmas of the mentalist and individualist position of Descartes is to recognize that human activity – including contemplative thought – has its origins in our life-long involvement in a social and physical world that we share with other people and that is imbued with cultural meaning. The term for this is that we are *situated*. The word "situation" does not refer to a simple description of the physical surroundings. Dewey, as quoted in Koschmann's keynote, put it this way (Dewey, 1938/1991):

> What is designated by the word 'situation' is *not* a single object or event or set of objects and events. For we never experience nor form judgments about objects or events in isolation, but only in connection with a contextual whole. The latter is what is called a *situation*. (p. 72.)

Note that the situation provides a context within which *meanings* are determined, within which we "form judgments about objects or events."

Contemporary theories of situated action trace their philosophic origins to Heidegger, as shown in Figure 1. Heidegger's *Being and Time* was a systematic attempt to formulate a non-dualistic philosophy of situated human being-in-the-world. According to Heidegger, our primary experience of physical objects is as meaningful artifacts (Heidegger, 1927/1996). The meaning of an artifact derives from the complex network of artifacts that form our situation:

> For example, the artifact at hand which we call a hammer has to do with hammering, the hammering has to do with fastening something, fastening has to do with protection against bad weather. . . . What significance artifacts have is prefigured in terms of the situation as a totality of relationships of significance. (p. 78, my translation.)

Heidegger discussed the situation as source of meaning of artifacts in terms of our social being-with-others, but he failed to draw the consequences of this the way phenomenologists since him have, like ethnomethodologists (Heritage, 1984). Unfortunately, having overcome dualism, Heidegger reverted to a fundamentally individualistic approach by relating the meaningful situation to the "authentic" individual rather than the community. He thereby failed to take advantage of the understanding of social phenomena in the tradition of Marx (Stahl, 1975a, 1975b). His later philosophy suffered from not analyzing how meaning is interactively achieved and then externalized and institutionalized. Nevertheless, he was able to lay the foundations for hermeneutics, the philosophy of interpretation (Gadamer, 1960/1988).

7. INDIVIDUAL INTERPRETIVE PERSPECTIVES

Human understanding, according to Heidegger, is based on a tacit background pre-understanding of one's world as a cultural situation consisting of a totality of meaningful artifacts. When one is born or when one opens one's eyes in the morning, one is immersed in a meaningful world that one understands. This world was created by social activity in the past, in which meaning was interactively constructed, externalized and preserved as the common culture of a community. This culture includes both language – that includes countless symbolic artifacts with complexly interdependent and nuanced connotations of meaning – and tacit social practices. Our contemporary world is composed of indefinitely many overlapping cultural heritages.

Each person has their own unique situated pre-understanding. They interpret their world and features of their on-going activity from this perspective. Interpretation, according to Heidegger, is simply the elaboration of one's pre-understanding. Interpretation is often prompted by a breakdown of one's pre-understanding: for instance, I tacitly expected my hammering to pound down the nail, but it did not, so I now explicitly interpret the hammer as "too small" or "broken." Here, the meaning of the hammer as a tool for pounding nails is given in the world, as part of the culture of carpentry and the equipment of the workshop. But

my interpretation of the hammer as not only a hammer, but as a small or broken hammer is given from the perspective of my circumstances of having failed to pound a nail and my activity of trying to construct a particular new artifact.

A fuller analysis of interpretive perspectives and possibilities of computer support for them is beyond the scope of this paper (Stahl, 1993a, 1993b; Stahl, 2001). Here I have just tried to indicate how meaning – particularly in collaborative contexts – can be taken to be given in the socially shared world, while interpretation is from an individual's personal perspective. Of course, there is not a sharp divorce between the social and the individual. Groups have interpretive perspectives too. And social meaning is just the persistent externalization of meaning-making conducted by interacting individuals. Since neither the distinctions between mind and world nor those between individual and group are absolute and insurmountable, we would not want to claim that the distinction between meaning and interpretation is more than a generally useful analytic artifact, especially for discussions within CSCL.

8. IMPLICATIONS FOR CSCL RESEARCH AND DESIGN

Because shared meaning exists in the observable world and collaborative meaning-making necessarily unfolds there, CSCL researchers can *make learning visible* by interpreting these meanings and practices. As I have argued elsewhere (Stahl, 2002a, 2002d), collaborators must make their understandings of what they say, hear and see public in order for their partners to work together with them. Of course, this does not mean that everything is made explicit. However, collaborating people give frequent feedback to each other through subtle word choices, inflections, gaze, bodily orientations and gestures. When possible breakdowns occur indicating a divergence of interpretation, explicit discussion will often ensue to the extent needed to restore a sense of shared understanding. One can see this in the details of discourse, for example in the analysis by Roschelle cited in Koschmann's keynote (Roschelle, 1996). The clues for making visible the learning that took place during a collaboration can generally be found in the externalizations and artifacts created then. Of course, the researchers must be able to interpret these meanings – e.g., through micro-ethnography or conversation analysis. That requires that the interpretive horizons (historical and cultural worlds) of the researchers and their subjects overlap sufficiently (Gadamer, 1960/1988). Hermeneutic theory emphasizes the historical context that conditions interpretation. CSCL is necessarily a human science, both in the sense that it requires interpretive acts on the part of the researchers and in the sense that it is concerned with the interpretations of the subjects. The basis for possible scientific objectivity lies in the nature of meaning as shared and in the methods of rigorous interpretation that ensure intersubjective validity.

There are also implications of the foregoing view of meaning for the design of CSCL technologies. A computer environment to support collaborative learning is not a character-less channel of communication, but is itself a complex designed artifact that embodies its own cluster of meanings. Users must be able to interpret its affordances, to realize how it is intended to be used. Again, there must be an overlap of interpretive horizons – between the design and use communities (Stahl, 2002d).

Koschmann's keynote argued that even the most valuable and paradigmatic

CSCL studies can and do succumb to statements that frame their findings in terms of concepts like "conceptual change," "shared understanding" or "common ground" – concepts that are open to interpretation in terms of mental contents of individuals. Clarity about the distinction between intersubjective meaning and its interpretation from personal perspectives can avoid that confusion and increase the precision of discussions within CSCL.

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