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Group Meaning / Individual Interpretation

For the CSCL 2003 conference, I wanted to present something of my theory of group cognition. I took the theme of meaning and interpretation from the previous chapter and tied it to the topic of meaning making that has been identified as defining of CSCL. I deepened the analysis of meaning and interpretation, arguing that the former term applied to shared products of knowledge building while "interpretation" corresponded to the individual perspective on such meaning.
Because collaboration and collaborative learning take place through processes of shared meaning making, CSCL and CSCW 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 reciprocal 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 research methodology and for technology design of support for collaboration.

Meaning Making and the Study of Collaboration

Keynote talks at the last three international conferences on Computer-Supported Collaborative Learning—Paul Dourish at Euro-CSCL 2001, Timothy Koschmann at CSCL 2002 and Roger Säljö at CSCL 2003—all emphasized the centrality of the analysis of meaning making to the study of collaboration. In his presentation, Koschmann identified the concept of *meaning*—as it is discussed in the philosophic tradition—as dwelling at the fundamental core of CSCL. 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. (Koschmann, 2002b, 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 (see chapter 11). 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 located *within* a "context of joint activity," the way an armchair philosopher's mental cogitations might take place physically within the four walls of his library. Rather, the context of joint activity *is* those practices—the practices form the joint activity, which constructs the meaning. The meaning is not merely transferred from mind to mind by the activities, but the meaning is constructed by and exists as those activities.

The practices of meaning making are acts of discourse or interaction; these acts propose, negotiate, display and define what are to count as the salient features of the setting, the occasion, the social norms. Neither the context nor the meanings are objectively given in advance, but are collaboratively constituted or brought in.

Artifacts are not simply instruments for conveying independent meanings, but are themselves embodiments of meaning. The process of embodying meaning in artifacts mediates or transforms that 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 chapter.

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 (chapter 11). In the present chapter, I would like to propose a way of thinking about meaning and interpretation in collaboration by building on Koschmann's statement and on my four themes from CSCL 2002. I hope to thereby clarify my alternative reading of Koschmann's characterization of CSCL. I propose that—particularly in contexts of collaboration—*meaning* exists (as the meaning of artifacts) in the *intersubjective* world and that it is *interpreted* from *personal* perspectives. That is to say, the meanings of meaningful expressions and objects are intersubjectively established, although they may be interpreted differently by different people. Therefore, meaning should not be reduced to its interpretation by specific individuals; it is not just a content of individual minds.

The Philosophic Tradition

The nature of meaning has been a hot topic in the 2,500-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—especially the period from Kant to Hegel—was relevant to the learning sciences (Koschmann, 2002c). In particular, he cited a paper by Packer & Goicoechea that argued that ontology as well as epistemology are central to socio-cultural 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, and 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 reviewed the philosophic relationships among the philosophers and learning theories that Koschmann, Packer and Goicoechea discussed. 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. 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 another, 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*. (Hegel, 1807/1967, p. 238, my translation)

In Hegel's paradigmatic parable of meaning making here, the meaning of the artifact—the form imposed on the material object—is created in the activity of the worker, which is an intersubjective activity essentially defined within the interaction of worker and master. The meaningful artifact, however, assumes a self-sufficiency in which it is henceforth distinguished from, and to that extent independent of, the worker and his perception of it. The meaning-making process that takes place in the material and intersubjective world endows objects with human meaning that persists with the persistence of the artifacts, and thereby distinguishes itself from the momentary intentions and interpretations of the individuals involved. The identity and self-understanding of the individuals are, in turn, determined by the meanings that they then confront in their world as independent and objective meaningful artifacts.

For Hegel's most important interpreter, Marx, the artifact, which is produced by the worker's labor and that externalizes the worker's self by 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 and as the artifact enters commodity relations and is reflected back to the worker as monetary value belonging to his boss. This fetishism of the

commodity is a real social process in capitalist society, and not merely a psychological illusion: the commodity takes on a value and meaning independent of the people who produced it and the social relations in which it was produced. In Marx's analysis, the dominant form of meaning making today (commodity production) is one that hides its own social origin and nature.

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 (see figure 14-1 in chapter 14).

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 (according to Bereiter, 2002; Dennett, 1991), but it is also partially caused by a lack of clarity about the role of interpretation of meaning by individuals. This chapter 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.

Vygotsky and Mediated Cognition

We start with Vygotsky's programmatic attempt to show how the individual mind—often 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 early 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:

> 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 (Vygotsky, 1930/1978, p. 56, italics added).

Here we see the *genesis of the meaning* of a pointing gesture. The recognized, practical and formalized gesture becomes an artifact: it embodies meaning in the material 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 here 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 paradigmatic 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. The pointing gesture is premised upon the mutual recognition of a projected underlying intention.

While there is a mutual assumption of intentionality—that in pointing the child intends to direct shared attention to a certain object—note that this does not imply that the child already had some kind of internal mental representation of the object and is expressing externally a reference to what corresponds to that representation. We know nothing concerning the existence of mental states of the child. By observing the child's physical grasping and pointing behaviors, we know that the child has sufficient perception, attention and recall skill to interact with physical objects as persistent and as potentially graspable. But Vygotsky's working hypothesis is that the higher, specifically human psychological functions have yet to be developed by the child. The child's intentionality is here purely a matter of physical activity in the world.

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. Vygotsky argues that this gesture is used in two general ways, which lead to our extensive repertoire of symbols, artifacts, cognitive skills, external memories and cultural systems: it is used to control the pointer's own 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. The rules and naming originally came after the activity, in reaction to the externalization, but are later used in advance to evoke, structure and control the activity. For instance, a toddler might draw on paper and when asked what she drew retroactively say it is a dog. When she is older, she will intentionally set out to draw a dog.

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, silently with ourselves, we rehearse what we plan to say (and control our future behavior and interaction that way), recall what took place in the past or carry on the kind of conversations that we have aloud with other people. 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.

Externalization in Physical and Semantic Artifacts

As we see in the preceding 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 an object 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, it can be named. Then, either that object or the word that names it, 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 her 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 reference. Vygotsky generalized the term "artifact" to include symbols like names as well as man-made material objects. He then showed how human activity (as opposed to purely instinctual, biological, animal-like behavior) is generally mediated by such 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. On 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 can only be reconstructed 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-making activity and acts as a persistent externalization of the constructed 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 community 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 exist, be shared and participate in the activity. The very nature of artifacts overcomes Descartes' problem by integrating the conceptual and the physical.[1] It also transcends the individualistic view of meaning by locating the origin of meaning in social interaction, its persistence in artifacts and its transmission in culture.

Internalization as Cognitive Artifacts

Further transformations can take place, constituting what Vygotsky 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 (Vygotsky, 1930/1978, p. 56f).

Although Vygotsky uses Descartes' metaphor of internal (mental) and external (physical) activities, there are essential differences. First, he draws the distinction 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

[1] The analysis of the artifact eliminates the need to hypothesize the neo-Platonic "third world" objects attributed to Popper (1972), in addition to physical and mental objects. There is only one world, consisting of various kinds of meaningful artifacts and people who interpret their meanings. The fact that something like a theory or a musical composition can have a *meaning* that transcends any particular *interpretation* or instantiation of it merely reflects the nature of meaning as a distillate or emergent Gestalt that abstracts from the sum of its concrete manifestations. As shared within a community, meaning exists at a different level of analysis than its interpretation by individuals, but not in a different world.

social) as the origin of psychological phenomena, rather than taking the thoughts of the individual as the fundamental activity and as the unquestionable starting point 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 the 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 (Norman, 1991) and (Hutchins, 1999)—is sometimes used in a way that 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. 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, a toddler 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 adopting or internalizing the influences of others.

As a core element of thought, learning 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 many dynamically developing and interacting cognitive artifacts, rather than of Minsky's (1986) computational agents. 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 is 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. It also grants a certain prominence to the role of collaborative learning in the intellectual development of people and human societies.

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:

> 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*. (Dewey, 1938/1991, 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 can have their philosophic origins traced to Heidegger, as indicated in figure 14-1 of chapter 14. Heidegger’s *Being and Time* was a systematic attempt to formulate a non-dualistic philosophy of situated human being-in-the-world. According to it, our primary experience of physical objects is as meaningful artifacts. 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 (Heidegger, 1927/1996, 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 done, 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 (Nancy, 2000; 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 develop a philosophy of human being as the on-going interpretation of meaning-in-the-world (Gadamer, 1960/1988), and describe an evocative artifact-centered view of the situation (see chapter 20).

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 opens their eyes in the morning, one is immersed in a meaningful world that they already understand. 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, which includes countless symbolic artifacts with complexly interdependent and nuanced connotations of meaning, and tacit social practices. Our contemporary world is composed of an indefinite amount of overlapping cultural heritages.

Each person has their own unique situated pre-understanding. They interpret their world and the features of their on-going activity from this perspective. Interpretation, according to Heidegger, is simply the elaboration of one's pre-understanding, and it is often prompted by a breakdown of that pre-understanding: for instance, I tacitly expected my hammering to pound in 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.

The chapters of part I of this book discussed the role of interpretive perspectives in collaboration and of possibilities of computer support for them. This chapter has tried to indicate how meaning—particularly in collaborative contexts—can be taken to be given in the socially shared world, while interpretation stems 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. Because 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 useful for clarifying discussions within collaboration theory.

Implications of Theory for Analysis 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 argued in part II of this book, 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, people collaborating face-to-face give frequent feedback to each other through subtle word choices, inflections, gaze, bodily orientations and gestures. People collaborating through computer mediation must find other ways to share understandings and orientations (see chapter 14). 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 (1996) cited in Koschmann's keynote, as well as in the analysis of chapter 12. The clues for making visible the learning that took place during collaboration can generally be found in the externalizations and artifacts that were created.

Of course, the researchers must be able to interpret these meanings—e.g., through micro-ethnography or conversation analysis (Garfinkel, 1967; Sacks, 1992). This 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. Collaboration science 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—including the agreement of interpretations by multiple researchers from their personal perspectives, developed through professional and methodological training.

There are also implications of the foregoing view of meaning for the design of collaboration 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. Computer support for collaboration transforms the interpersonal interactions and the nature of the constructed meanings—for instance, changing the patterns of communication and the formats of textual constructions.

The Relation of Meaning and Interpretation

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 being construed 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 the theory of collaboration.

This chapter has tried to understand how meaning is constructed, drawing upon the framework in chapter 15 and the four theoretical contributions proposed in chapter 11: collaborative knowledge building, artifacts, perspectives and conversation analysis. The process of meaning making was seen as taking place through collaborative interactions that build group knowledge. The new knowledge was made persistent by being embodied in symbolic and/or physical artifacts, including discourse and inscriptions. The meaningfulness of objects in the world must be brought to life by human interpretation, which takes place from personal perspectives situated in people's current activities, goals and backgrounds. As we saw in chapter 13, people often must learn how to interpret the meaning embodied in artifacts. For researchers, methods based on conversation analysis can be used to make visible the process of group meaning making, the cultural meaning of artifacts, the personal interpretations and the learning that goes into making and understanding meaning.

The analysis in this chapter stresses the intersubjective nature of meaning and argues that it cannot be reduced to a matter of mental representations in the heads of individuals. It is true that the meaning making is carried out by people and that the constructed meanings only make sense to people. However, the collaborative meaning-making process itself takes place intersubjectively and is mediated by physical artifacts which grant it its essential persistence in the shared world. Complementing this intersubjective meaning of meaningful artifacts is the psychological process of individual interpretation of the meaning from personal perspectives. Although the interpretive perspectives are, of course, derived from shared, culturally transmitted views, they also reflect both the

individual situations of the individuals and their personal attitudes, histories and responses to the artifacts of meaning.

Drawing the distinction between intersubjective meaning and individual interpretation from personal perspectives suggests implications for the theory of mind that go beyond the scope of this chapter. Traditional views confounded meaning, thought, expression and interpretation, reducing them all to mysterious and inaccessible mental contents. The view presented here identifies thoughts with their expression in meaningful symbolic artifacts like words, gestures and images. It is not as though meanings already existed as some kind of content in people's heads and were then formed into thoughts that could almost arbitrarily be expressed by symbols used to convey the ideas to other minds. Rather, the thoughts are themselves formed in the very process of being expressed in meaningful words. Having thoughts and expressing them are both aspects of a single meaning-making process. This is a discourse or communication theory of mind (Harre & Gillet, 1999; Wells, 1999). In a collaborative setting, the discourse of thought can take place publicly in a group, or it can take place internalized in the silent dialog of an individual. In either case, the thought, idea, expression or meaning is one thing, and its interpretation is another.

Sfard and McClain make the point that this view implies the importance of how one designs artifacts like groupware to mediate the meaning-making and interpretation processes:

> Within the communication approach, it is thus rather senseless to make such statements as "the same thought has been conveyed by two different means" (that, however, does not mean that we cannot interpret two expressions in the same way, with *interpretation* and *thought* being two different things). If thought is discourse, and if the discourse is inseparable from its mediating tools, there is no "cognitive essence" or "pure thought" that could be extracted from one symbolic embodiment and put into another. This conclusion, as philosophical as it may sound, has important practical entailments. One of them is that the nature and quality of thought is a function of the nature and quality of the mediating artifacts, just like the nature and quality of our physical action is a function of the nature and quality of the material tools we use (Sfard & McClain, 2003, p. 355, italics in original).

Analyzing the discourse of a group of students doing mathematics together, Sfard and McClain argue that the meaning-making process is a collective effort in an essential way that cannot be reduced to the sum of independent individual contributions: "No individual step in the process would be possible without those made earlier by other interlocutors, and, as a result, nobody in particular is entitled to claim an exclusive right to the invention" (ibid., p. 347). A given utterance in a collaborative knowledge-building discourse refers back and responds to previous utterances and to the negotiated sense of the discourse as well as anticipating, projecting and calling for future responses (see chapter 12). Thus, it is not just the discourse as a whole and its conclusions, but every contribution to it that is a group accomplishment and whose meaning is a group construct.

To assess the degree of collaborative interaction in group discourse, Sfard (2002, pp. 39-41) has developed an "interactivity flowchart" that represents which utterances respond to other utterances or invite a response. Arrows show the interrelations among the utterances, with separate representations of each individual's "personal channel" and

the overall group interaction. Of course, such a diagram only summarizes the primary thrust of each utterance, and cannot show the detailed web of connotations, terminological references or shared indexing that can be brought out by conversational micro-analysis.

The discursive view of collaboration goes back at least to the theory of symbolic interactionism (Blumer, 1969; Mead, 1934/1962). Blumer is quite explicit about the distinction between social meaning and individual interpretation. For him, meaning is constantly negotiated by the group whereas interpretation is an individual internalized discourse process:

> The meaning of a thing for a person grows out of the ways in which other persons act toward the person with regard to the thing. Their actions operate to define the thing for the person. Thus, symbolic interactionism sees meanings as social products, as creations that are formed in and through the defining activities of people as they interact… The use of meanings by the actor occurs through *a process of interpretation*… The making of such indications is an internalized social process in that the actor is interacting with himself… The actor selects, checks, suspends, regroups, and transforms the meanings in the light of the situation in which he is placed and the direction of his action (Blumer, 1969, p. 4f, italics in original).

Blumer is clear about the distinction between the joint action of a group and the individual contributions to that joint action by the group members: “A joint action, while made up of diverse component acts that enter into its formation, is different from any one of them and from their mere aggregation” (ibid., p. 17). The joint action has a shared meaning. As a sociologist, Blumer relates this to a theory of social institutions. For instance, a marriage, a stock trade, a war, a governmental debate or a church service are actions that have public meanings. These social actions are dependent upon individuals taking individual actions and making individual utterances, but the social meaning transcends and informs those contributions. In the discourse that goes into instantiating a meaningful social event, the participants negotiate (usually tacitly) that they are engaging in such an event. When a student says, “How did you get that answer?” she is not only asking someone to respond with an answer, she is also negotiating a joint engagement in the activity of doing mathematics—depending upon the group context, the sincerity of her utterance, etc. Other students do not simply understand her question as a request, but also interpret it as part of a social activity in which they are engaging and whose meaning they have more or less learned through previous participation. Earlier in this chapter we saw a similar example in Vygotsky’s analysis of the infant grasping. Through various moves by the mother and child, the joint action of a child pointing out something for his mother is established as a meaningful gesture.

The relationship of meaning and interpretation is central to an understanding of the mediation of small-group collaboration. This chapter has tried to clarify that relationship with insights from philosophy, social theory and social research. Small-group processes of collaborative knowledge building can construct meanings of symbolic and/or physical artifacts like words, gestures, tools or media. The meanings of these meaningful artifacts are group accomplishments resulting from social interaction and are not attributable to individual participants. The artifacts retain intersubjective meaning, which can be learned

or re-negotiated later. The meaningful artifacts are interpreted by individuals from within the current situation or activity.