"GROUNDING" FOR INTERSUBJECTIVITY AND LEARNING

Michael Baker

GRIC, CNRS & Université Lumière Lyon 2 (F)
mbaker@univ-lyon2.fr

Tia Hansen

Institute of Psychology, University of Århus (DK)
tia@psy.au.dk

Richard Joiner

Faculty of Education, The Open University (UK)
R.W.Joiner@open.ac.uk

David Traum

UMIACS, University of Maryland (USA)
traum@cs.umd.edu

1. Introduction

Recently, a number of researchers within Cultural-Historical Activity Theory (CHAT) have studied how discursive interaction unfolds between parent and child, as well as in the classroom (e.g. Matusov, 1996; Wells, 1996, Wertsch, 1985). Understanding such phenomena on the interpersonal plane is important given that the negotiation of intersubjective situation definitions is one of the vehicles of development (Wertsch, ibid). However, as Wells has pointed out:

> "… it is one thing to claim that … collaborative talk provides the occasion for learning to occur and quite another to explain *how* the successive moves that make up a conversational transaction might lead to a change in the knowledge of one or more of the participants." (Wells, 1993; third ordinary paragraph in the English version).

It appears, therefore, that within CHAT there is growing interest in understanding interactive processes on a micro-level.

The purpose of this paper is to explore the possible contribution of some recent research in the field of Language Sciences for CHAT conceptions of discourse in learning activity. Specifically, we focus on a model developed by H.H. Clark and colleagues (e.g. Clark & Wilkes-Gibbs, 1986; Clark & & Schaefer, 1989; Clark & Brennan, 1991), of the phenomenon of *grounding*.

Grounding is the name of the interactive processes by which *common ground* (mutual understanding) between individuals is constructed and maintained. This is a cognitivist model of

communication to the extent that the common ground is viewed as a set of *mutual beliefs* of conversational participants about the meaning of their utterances during conversation.

The reseach presented here orginated in work that was carried out by the authors within the European Science Foundation's *Learning in Humans and Machines* programme (Task force on *Collaborative Learning*). At that point the research was focussed on finding an appropriate theoretical framework within which the role of grounding in collaborative learning could be understood. We proposed that CHAT could fulfill that role, given that it provides the notion of learning as appropriation of tools, and thus enables us to understand the role of language in collaborative learning (Baker, Hansen, Joiner & Traum, in press).

In this paper we turn the question the other way around: how can research on communicative interactions (grounding) inform CHAT research on the dynamics of interactions in development of intersubjectivity and in learning? Clearly, these two areas of research depend on radically different theoretical assumptions (cognitivism and cultural-historical psychology) that can not be juxtaposed superficially. One of our principal longer-term aims therefore will be to explore these problems for integration at a theoretical level.

From a cognitive science point of view, the communicative processes of grounding involve information processing whereas, intuitively, information processing models are alien to cultural-historically conceived understandings of discourse. However, when describing the three levels of analysis conceived by CHAT (activities, actions, and operations, cf. Leont'ev, 1979), Lompscher (1989) chooses the term "information processing" for the level traditionally referred to as "operations" and states:

> "The information processing level is characterized by the search for and simulation of elementary operations, processes and components, of their structures, interrelations and influences, forming the basis of conscious activity, but being often unconscious themselves, executed in very short time, often in milliseconds. Their identification and analysis became and becomes possible by means of modern computer and other technology and corresponding theorizing, most of all in cognitive psychology." (Lompscher, 1989; p. 12).

Thus, our main proposal is that the grounding model can inform CHAT understanding of what takes place at the level of operations — and transitions between operation and actions — on the interpersonal plane of intersubjectivity, and hence inform understanding of discourse involved in learning and development.

We begin by selectively reviewing some recent CHAT conceptions of discourse in learning activity, with the aim of identifying the main points that relate to the grounding model. This is followed by a succinct presentation of the grounding model. In the third main section we critically compare the two approaches and describe implications for CHAT.

2. CHAT conceptions of discourse in learning activity

One of Vygotsky's central assertions is that development of cultural forms of cognition involves transitions from inter-personal to intra-personal functioning in the child/learner, as in the following oft-cited quote:

"Every function in the child's cultural development appears twice: first on the social level, and later on the individual level; first, *between* people (*interpsychological*), and then *inside* the child (*intrapsychological*)." (Vygotsky, 1978: 57).

According to Wertsch (1985), for a student this process involves negotiating an intersubjective situation definition with the tutor. Initially this will be performed on the basis of a primitive intersubjectivity with the tutor and then by going through a number of situation re-definitions until finally the child acquires a mature culturally appropriate situation definition, which provides the basis for self regulation.

In "Voices of the Mind", Wertsch (1991) draws on Bakhtin's dialogical theory of meaning as a way of describing the processes by which intersubjectivity develops and what is essentially at stake in that development (i.e. what sorts of things intersubjectivity is concerned with). Within Bahktin's approach, meaning is always multiple: the answer to the question "who is speaking?" is always "more than one voice". Meaning is inherently dialogical to the extent that any utterance is always set against the background of others; in speaking we are *ventriloquating* other utterances that are themselves situated within culturally developed *speech genres*. There is no such thing as meaning divorced from a *point of view* on the referential plane.

The following example, taken from Wertsch (1991), concerns a "show and tell" session in a lower middle class Chicago school. In such sessions, children are encouraged to bring things to school and talk about them before the whole class. Here we only reproduce parts of the negotiation of referential perspectives between the teacher and one of the children.

(1)	T	Danny (C1), please come up here with what you have. (C1, with a piece of lava in his hand, approaches T)
		<…>
(4)	C3	Where did you get it ?
(5)	C1	From my mom. My mom went to the volcano and got it.
		<…>
(11)	C1	I've always been, um, taking care of it.
(12)	T	Uh hum
(13)	C1	It's never fallen down and broken.
(14)	T	Uh hum. Okay, is it rough or smooth ?
(15)	C1	Real rough and it's … and it's … and it's sharp
(16)	T	Okay. Why don't you go around and let the children touch it. Okay ? (C1 takes it round). Is it heavy or light ?
(17)	C1	It's heavy
(18)	T	It's heavy
(19)	C1	A little bit heavy
(20)	T	In fact, maybe they could touch it and hold it for a minute to see how heavy it is

Table 1. Example of negotiation of referential perspectives (from Wertsch, 1991, pp. 113-115)

In the first part of the extract (lines 1, 4–5, 11–13), the child expresses his perspective on the referent, (a piece of lava), from the point of view of his everyday home experience. In line 14 the teacher introduces the speech genre of classroom discourse, that relies dualistic typologies (smooth/rough, heavy/light) grounded in decontextualised mediational means. Wertsch's work therefore provides a theoretical framework within which the nature of intersubjectivity, and some of the processes by which it functions, can be understood.

The work of Matusov (1996) also contributes to understanding the nature of intersubjectivity itself. According to this author, in research on intersubjectivity, agreement has been over-emphasised and disagreement de-emphasised. Disputes often involve close collaboration, and may be about "ownership" of decision-making, rather than "alternative ideas", or expected changes in them. Intersubjectivity can be viewed as the coordination of contributions in joint activity (activity directions), rather than as "overlap of understandings". The main questions to be addressed, according to Matusov are: "what are the dynamics of intersubjectivity?", and, "how are these processes embedded in bigger practices and community life?".

Finally, the question arises as to the *level of activity* at which the interactive processes involved in the development of intersubjectivity function. Wells (1996) has described a tool for analysis of classroom talk — a "discourse tool-kit" — based on systemic linguistics (Halliday). Teachers' real-time selection of follow-up moves in discourse must be at level of *operations.* However, by conscious reflection on their discourse operations, teachers can bring about changes in activities and nature of the classroom community.

In summary, within CHAT, intersubjectivity is concerned with factors such as referential perspectives (personal life, professional discourse, etc.), disagreement as well as agreement, coordination of contributions to joint activity, not just just overlapping conceptualisations, power relations, authority (e.g. "ownership" of decisions), etc. From the point of view of a dialogical theory of meaning, appropriation of culturally developed speech genres is an important process at work here. The discourse operations involved are operations in real-time discourse, that can become conscious objects of reflection, i.e. actions.

Having reviewed some key aspects of CHAT work on intersubjectivity that could be linked to the grounding model, we now turn to a brief presentation of that model.

3. Grounding and collaborative learning

Clark and colleagues' model of grounding (e.g. Clark & Wilkes-Gibbs, 1986; Clark & Schaefer, 1989; Clark & Brennan, 1991) needs to be understood within the background of previous models of dialogue. According to Clark & Schaefer (1989), previous research on logical models of dialogue had deemed it sufficient for a speaker to utter something under the right conditions in order for it to be assumed commonly understood and known: the information is added automatically and unambiguously to the *common ground.* Contrary to this, Clark and Schaefer state that mere presentation or accessibility of information is not enough: specific interactive processes are used to ensure mutual understanding of *contributions* that are added to the common ground.

According to the grounding model, speakers are attempting to achieve the following *grounding criterion*:

> "The contributor and the partners mutually believe that the partners have understood what the contributor meant to a criterion sufficient for the current purpose." (Clark & Schaefer, 1989, p. 262)

The principle is based on cognitive-interactional economy, i.e. that speakers will expend just enough effort as is necessary. It is cognitivist to the extent that it relies on the concept of speakers' beliefs about the beliefs of their interlocutors.

The following aspects of the grounding model are also important for our purposes here:

1. the unit of analysis of conversation is not the individual's utterance, but the "collaborative contribution" ;
2. such contributions (C) are collaboratively produced within an interactive process in conversation; every utterance (apart from the first in an interaction) can be both a presentation (Pr) of information, and an acceptance (Ac) of prior information (note that "acceptance" here does not mean agreement with what has been stated, rather, confirmation of perception and understanding of it to a certain degree);
3. conversational participants provide varying *degrees of evidence* for their understanding, which can be correlated in some way to the *type* of feed-back (verbal and non-verbal simple acknowledgements, relevant continuation of a topic, reformulation, repetition, maintained contact, and so on);
4. they do this within specific *contribution patterns* (for example, by successive repetitions of presentations of information by one speaker with various forms of feedback from the other, or by alternation of presentations of information between the speakers).

In order to compare the grounding model with our previous discussion of CHAT research, it is important to describe what can or must be grounded. In Clark's research, grounding is basically concerned with mutual beliefs with respect to meanings of linguistic acts. In other language sciences work, we find a wider range of aspects that can be grounded. For example, Allwood, Nivre and Ahlsén (1991) describe four basic communicative functions, on each of which grounding can occur: contact, perception, understanding, and attitudinal reaction (see figure 1 below).
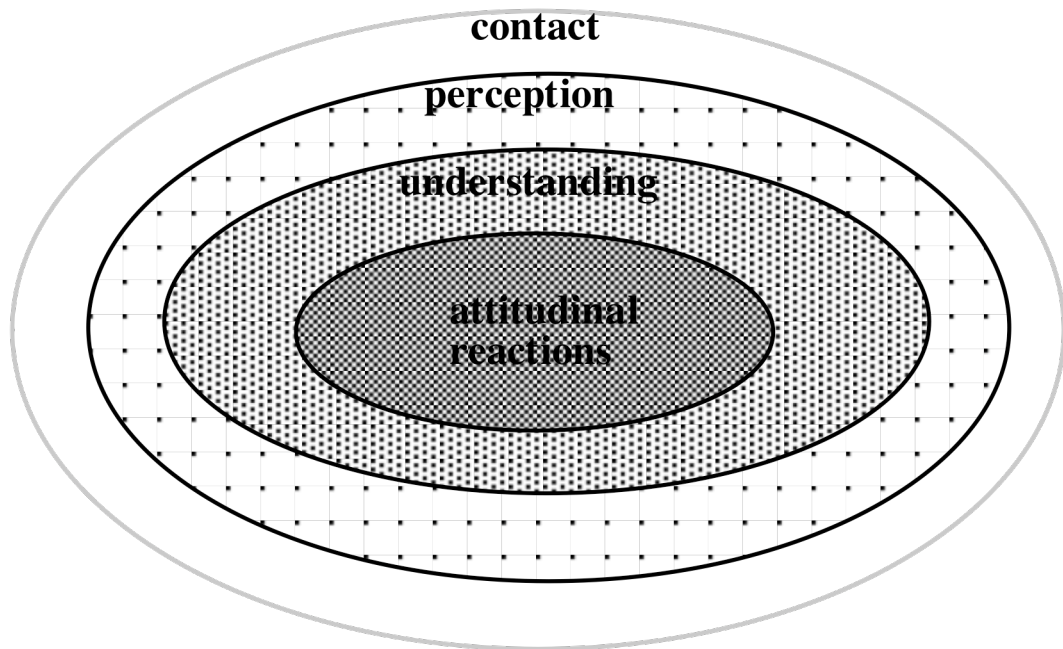

Figure 1: Basic communicative functions, derived from Allwood et al, 1991.

A number of researchers (e.g., Moeschler, 1985; Roulet, 1991) have described the interactive creation of common meanings as a process of *negotiation*. Moeschler defines different types of negotiation in terms of what is at stake in the interaction, what it is 'about'. For example, he distinguishes factual negotiation, which concerns the domain of reference, from meta-interactional negotiation, which concerns rights and obligations.

From the point of view of work on grounding and related phenomena, it is possible to hypothesise as to why these interactive processes might lead to collaborative learning. In the discussion of an experimental situation, Schwartz (in press) has stated that collaborative learning is associated with the *effort after shared meaning*. This idea finds a correlate in terms of the grounding model in the following way. In order for collaborative learning to occur (viewed as the learning that occurs in virtue of collaborative activity as such), the interactants must satisfy the criterion of 'sufficient degree of understanding' to a high degree, i.e., one that goes *beyond* the cognitive-interactional economy necessary for carrying on the interaction (Baker et al, in press). This can be viewed as a transition from attempting to understand the partner's communicative intentions (which we term *pragmatic grounding*) to a 'deeper' form of understanding in the task domain (*semantic grounding*).

Having briefly reviewed the two areas of research, we critically compare them and discuss implications for CHAT.

4. Discussion

One way of comparing CHAT work on discourse processes and the grounding model is to consider the types of analyses that each propose for the same extract from an interaction. For this purpose, we shall revisit the example from Wertsch described earlier.

Table 2 below shows a simplified analysis of Wertsch's example extract, using theoretical constructs from the grounding model, and other language sciences research, described earlier. The columns on the right show types of feedback and contribution patterns.

The interventions up to (13) correspond on one hand to presentation of the child's referential perspective (Wertsch), and on the other hand, to a "presentation by installments" in terms of the grounding model (Clark & Schaefer, 1989).

Essentially, the child presents his perspective, with positive linguistic feedback (fb+) from the teacher ("acceptances" in Clark's terms), working on the level of understanding (-U) or agreement (-A). The important point to note is that *the teacher does not participate actively* in the elaboration of the child's perspective, she simply leaves it to the child, whilst giving minimal kinds of feedback. (Although the teacher does not know that part of the child's life history, she could have participated more fully, for example by questioning the child, eliciting further specific information). The continuation of the dialogue suggests that this low level of participation on the part of the teacher, corresponding to a weak degree of commitment, makes it easier for her to present her own perspective.

N	Loc	Dialogue	Feedback	Contribution pattern
(1)	T	Danny (C1), please come up here with what you have. (piece of lava) <...>		
(4)	C3	Where did you get it?		
(5)	C1	From my mom. My mom went to the volcano and got it. <...>	fb+-U,A	) adjacency pair second) part
(11)	C1	I've always been, um, taking care of it.		)
(12)	T	Uh hum	fb+-U	) contribution by
(13)	C1	It's never fallen down and broken.		) installments
(14)	T	Uh hum. Okay, is it rough or smooth?	fb+-U	)
(15)	C1	Real rough and it's … and it's … and it's sharp		
(16)	T	Okay. Why don't you go around and let the children touch it. Okay? (C1 takes it round). Is it heavy or light?		
(17)	C1	It's heavy	relevant continuation	) co-elaboration)
(18)	T	It's heavy	repetition	)
(19)	C1	A little bit heavy	elaboration	)
(20)	T	In fact, maybe they could touch it and hold it for a minute to see how heavy it is		

Table 2. Grounding analysis of example from Wertsch (1991).

In what follows (second communicative act of line 14 — "is it rough or smooth" — to the end of the extract) the teacher presents the referential perspective of classroom discourse genre. In general, the contribution pattern here could be termed "co-elaboration", since *the child participates actively in the elaboration of the teachers perspective*, using elaborations and refinements (e.g., Teacher: "it's heavy" => Child: "*A little bit* heavy").

This brief analysis illustrates one of our basic contentions: *the grounding model describes the basic communicative operations by which negotiation of referential perspectives is achieved.* The argument goes as follows.

The grounding model and the CHAT work on the dynamics of discourse described earlier focus on different aspects of intersubjectivity. In the case of CHAT these include appropriation of culturally developed speech genres, referential perspectives, power relations, and so on. The grounding model is concerned with microanalysis of the negotiation of mutual understanding and agreement in the domain of reference.

A basic theoretical principle of much work on dialogue (e.g. Bunt, 1989) is that utterances are *multifunctional*: they simultaneously fulfil several communicative functions, with respect to understanding, dialogue management, interpersonal relations, etc. Take for example the teacher's utterance "Is it rough or smooth?". It is simultaneously, at least:

- a presentation, relating to grounding
- an "alternatives question" (speaker wants to know whether it is x or y)
- a "didactic question" (speaker wants to know what hearer thinks about whether it is x or y)

- a shift of focus (from what happened to the lava in the past to is properties)
- an indirect power bid (the teacher has the right the change the topic), and
- negotiation of referential perspectives

Some of these functions are achieved directly (e.g. the question functions) and others indirectly. Referential perspectives are negotiated indirectly here: the teacher does not topicalise the discourse genre itself, she does not even explicitly propose that she wants to change to talking about properties of the lava. We propose, therefore, that analysis of a restricted set of communicative functions with the grounding model highlights the indirect negotiation of other functions, such as referential perspective, and reveals the operations by which they are achieved.

So far we have compared the two approaches on the level of the phenomena dealt with. We do, however, need to address prospects for theoretical integration, notably the question as to whether it is reasonable to use such cognitive information processing notions within CHAT.

Clearly, many difficult epistemological and ontological questions are raised that we can not address here. Instead, we ask the following question: assuming that it is possible to make some integration, then to what level of activity, in Leont'ev's terms, would the communicative acts described by the grounding model correspond? There are several points to be made in answering this question. Firstly, assuming that such communicative acts involve information processing, according to Lompscher (1989), they provide insight into what happens at the level of operations. Secondly, Wells (1996) has proposed that the teacher's discourse in the classroom corresponds to operations — in real time, the teacher can not be conscious of follow-up moves — but that these operations can become actions. Thus teachers can reflect on their practice and realise actions that transform the classroom community. Thirdly, the idea that communicative acts can be unconscious or conscious is not incoherent with most models of communication, including the grounding model. In most communicative interactions, feedback will be quasi-automatic; it is only in special circumstances, such as the recognition of misunderstanding, followed by repair, that explicit and conscious attitudes will be formed.

5. Conclusion

We conclude by elaborating the main points raised in this paper, in response to the question "what is the possible contribution to CHAT?":

1. the grounding model provides a coherent framework for understanding some aspects of multidimensional co-elaboration of intersubjectivity;
2. grounding processes are operations that indirectly realise intersubjectivity along some dimensions studied by CHAT;
3. discourse operations can become conscious objects of reflection in interaction (misunderstandings) or become new actions whose goal is to effect changes in the community.

From a cognitivist perspective, the question remains as to why subjects would spend the extra effort *beyond minimal grounding* (i.e., pragmatic grounding) which the effort after shared meaning requires. CHAT may contribute to answering that question in terms of the motives of learning activity.

From a CHAT-perspective, on the other hand, the question remains as to *how* exactly such discourse operations realise learning activity. Recent research on this issue, drawing on the work of Bakhtin, Halliday and others, provides interesting theoretical insights into intersubjectivity. A precise analytical tool for identification and description of the microprocesses involved could also contribute to this endeavour. We believe that our research described here goes some way to providing such a tool. In our future work we intend to develop the tool further, in conjunction with the analysis of a wider corpus of learning activity interactions.

6. References

Allwood, Jens, Nivre, J. & Ahlsén, E. (1991). *On the Semantics and Pragmatics of Linguistic Feedback.* Gothenburg Papers in Theoretical Linguistics No. 64. University of Gothenburg, Department of Linguistics, Sweden.

Baker, Michael; Hansen, Tia; Joiner, Richard & Traum, David (in press): The Role of Grounding in Collaborative Learning Tasks. In P. Dillenbourg (Ed.): *Collaborative Learning. Cognitive and Computational Approaches.* Elsevier Science Publishers.

Bunt, H. C. (1989). Information dialogues as communicative action in relation to partner modelling and information processing. In M.M Taylor,. F. Néel & D.G. Bouwhuis (Eds.): *The Structure of Multimodal Dialogue*, pp. 47-74. North-Holland: Elsevier Sciences Publishers.

Clark, Herbert H. & Brennan, Susan E. (1991): Grounding in Communication. In L. B. Resnick, J. M. Levine & S. D. Teasley (Eds.): *Perspectives on Socially Shared Cognition.* USA: American Psychological Association.

Clark, Herbert H. & Wilkes-Gibbs, Deanna (1986): Referring as a collaborative process. *Cognition, 22,* 1-39.

Clark, Herbert H. & Schaefer, Edward F. (1989): Contributing to Discourse. *Cognitive Science, 13,* 259-294.

Leont'ev, Aleksei N. (1979): The Problem of Activity in Psychology. In J. V. Wertsch (Ed.): *The Concept of Activity in Soviet Psychology.* New York: Sharpe, inc. (Original in Russian, 1972).

Lompscher, Joachim (1989): *Personality Development and Activity.* Paper presented at the Eight International Human Science Research Conference, Aug. 18-22 1989, University of Aarhus.

Matusov, Eugene (1996): Intersubjectivity Without Agreement. *Mind, Culture, and Activity, 3 (1),* 25-47.

Moeschler, J. (1985). *Argumentation et Conversation.* Paris: Crédif-Hatier.

Roulet, E. (1992). On the Structure of Conversation as Negotiation. In H. Parret & J. Verschueren (Eds.): *(On) Searle on Conversation*, pp. 91-100. Amsterdam: John Benjamins.

Schwartz, Daniel L. (in press): The Productive Agency that Drives Cooperative Learning. In P. Dillenbourg (Ed.): *Collaborative Learning. Cognitive and Computational Approaches.* Elsevier Science Publishers.

Vygotsky, Lev S. (1978): *Mind in Society. The Development of Higher Psychological Processes*. Cambridge: Harvard University Press.

Wells, Gordon (1993): *Intersubjectivity and the Construction of Knowledge.* English version available at http://www.oise.utoronto.ca/~gwells/intersubjectivity.txt (printed version is in Italian; in C. Pontecorvo (Ed.): *La Condivisione della Conoscenza*, pp. 353-380. Rome: La Nuova Italia).

Wells, Gordon (1996): Using the Tool-Kit of Discourse in the Activity of Learning and Teaching. *Mind, Culture, and Activity, 3 (2),* 74-101.

Wertsch, James V. (1985): *Vygotsky and the Social Formation of Mind.* Cambridge Mass., Harvard University Press.

Wertsch, James V. (1991): *Voices of the Mind. A Sociocultural Approach to Mediated Action.* USA: Harvester Wheatsheaf.