Heterogeneously Distributed Cognition

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Abstract

Advocates of distributed cognition argue that cognitive accomplishments rely in part on structures outside the individual mind – structures located in other minds or in artifacts that we think with. This paper argues that, in some cases, *interactional* structure can also make essential contributions to cognition. The data are transcribed classroom discussions, in which teachers and students use language to establish both referential and interactional patterns. The analyses use techniques from linguistic pragmatics, to uncover emergent interactional structure in the conversations and to show how this structure might make essential contributions to the cognitive value of those conversations.

As Goodman (1983) showed with his "new riddle of induction," instances do not unproblematically exemplify one category or another. People must draw on background knowledge to infer which of various possible categories an instance exemplifies. Understanding how this inferential process works will remain a basic problem in cognitive science as long as categorization remains fundamental to our theories of understanding and reasoning. What types of structure provide the relevant background that allows people to understand particular instances as unproblematic members of recognizable categories?

Traditional cognitive science located this structure within the individual mind (e.g., Johnson-Laird, 1983). Recent work in "distributed" or "situated" cognition suggests that part of the background structure which allows categorization to proceed unproblematically lies outside the individual mind (e.g., Hutchins, 1995; Kirshner & Whitson, 1997). Theories of distributed cognition argue that successful cognition depends on various interlocking structures, across more than one individual mind, which fit together in a system. Hutchins (1995) and Wertsch (1997) show how the structures essential to categorization and reasoning can include different pieces of background knowledge held by different members of a group, as well as aspects of the artifacts or "tools" that people use while thinking.

This paper describes how patterns at another level of organization can contribute structure to cognition. In particular, it describes a type of "emergent interactional structure" that speakers create in conversation. In creating this emergent interactional structure, speakers adopt roles and enact social events of the sort Goffman (1967) describes. This sort of verbal social action might at first seem unrelated to the cognitive accomplishments that can be facilitated by conversation. But I argue that emergent interactional structure can make essential contributions to the background that cognition depends on. This is the meaning of the "heterogeneously distributed cognition" in my title. I argue that structure essential to cognition is distributed not just across people and artifacts, but also across heterogeneous levels of organization like the micro-interactional level.

The argument centers around a particular type of speech event, that I have called "participant examples" (Wortham, 1994). I focus on examples because successful use of any example requires that people recognize the category that the instance exemplifies, and thus this type of speech event centrally presupposes the process of categorization. A "participant example" includes, as an example of some category, people participating in the ongoing conversation itself. Participants with roles in the example have two roles: one as hypothetical or actual characters in the example and one as participants in the conversation. Discussion of participant examples can function both to refer and to establish interactional organization in the conversation. For instance, giving an example of one's rival doing (supposedly hypothetical) foolish things, in the presence of that rival, might be interpreted as an insult and an interactional challenge. At the same time, the example might effectively establish some intellectual point. We generally assume that the cognitive structure established by an example comes exclusively from its referential value (and the background knowledge made relevant by referential value). This paper argues that the *interactional* structure established by participant examples can also make essential contributions to the cognitive structure that such examples help constitute.

Thus I am distinguishing between three types of structure: (a) cognitive structure in general, the largely implicit organization of knowledge, procedures and practices that allows people to understand experience as meaningful; (b) more local structure established through the *referential* function of language, that serves to pick out and characterize objects and relations; (c) emergent structure established through the *interactional* functions of language, which will be illustrated below. I am arguing that in some cases cognitive structure depends on *both* referential and emergent interactional structures.

The Study

The data for this study come from observations of ninth and twelfth grade English and history classes in an urban American school, made over three years. Wortham (1994) provides ethnographic background on the school and the particular classes studied. The primary data are eight hours

of transcribed tape recordings of classroom discussions. Half of the class sessions transcribed were selected at random from a year's worth of recordings, and the other half were selected because they contained lengthy discussions of participant examples. Wortham (1994) reports that, in this sample, speakers gave one example for every three to five minutes of classroom conversation. One of every three examples was a participant example. Half of all examples appeared in only one speaking turn, but one in four were discussed for more than ten speaking turns. Participant examples generated significantly more discussion than non-participant examples.

The transcripts with participant examples were analyzed using a technique I have called "deictic mapping" (Wortham, 1996). This technique takes advantage of a distinctive fact about deictics – those linguistic forms that depend for their referential value on aspects of the interactional context in which they are uttered. As Jakobson (1971) described, deictics (or "shifters," as he called them) simultaneously function to refer and to establish social positions in the interactional event of the conversation. *We*, for instance, refers to some group that includes the speaker. In order to understand what group *we* refers to in a given instance, we need to know something else about the social organization of the conversation (and perhaps the larger society). Any utterance of *we* also establishes or reinforces a particular interactional pattern – i.e., that the speaker and certain others belong to some recognized group.

The technique of deictic mapping systematically traces the use of deictics through a conversation, taking particular note of transitions – as, for instance, when a speaker has been including a particular participant as a referent of *we*, but then starts to refer to that same participant as a part of some group called *they*. A shift like this might indicate that someone is being excluded from an important social group. Deictic mapping was designed to reveal interactional patterns in conversation, by uncovering the groups that speakers align themselves with. By applying this technique to participant examples, however, we learn about both interactional and referential patterns because the interactional position of participants in participant examples contributes both to the social and the referential organization of the discussion. For those participants with a role in the example, an understanding of their interactional position within the example will help us understand the cognitive import of that example.

Note that deictics participate simultaneously in the referential and interactional functions of speech, *and their ability to perform each of these functions depends on the other* (cf. Silverstein, 1976). Use of a deictic like *we* can both establish and refer to the same social group. In such a case the interactional organization (of some group of participants in the conversation and/or the social world) makes an essential contribution to the referential meaning of the utterance. Thus deictics illustrate how interactional patterns might contribute structure that helps establish cognitive meaning. My analysis of deictic usage in participant examples has shown that the same thing can happen in participant examples. Participant examples can establish interactional organization among participants in the conversation, and this interactional organization sometimes mirrors (and contributes to) the referential pattern laid out by the example.

In other words, I am claiming that: (a) we must understand the interactional positions attributed to characters within a participant example, in order to understand that example; (b) the interactional positions of participants' characters within a participant example are often tied to the interactional positions of those same participants in the classroom interaction itself (i.e., there is sometimes a homology between the interactional positioning of characters within a participant example and the positioning of those participants in the surrounding interaction); (c) thus the interactional positions of teachers and students themselves can contribute to the cognitive content of the classroom discussion.

An Example

Wortham (1994) describes some of the social implications of this homology between the referential and interactional structure created by participant examples. Here I want to consider some of the cognitive implications, with reference to one example. The following example was given in a ninth grade discussion of Plutarch's "Life of Lycurgus." This text describes the Spartan political system, in which the welfare of the whole society was generally placed above the welfare of the individual. Sparta was ruled by a committee of elders, called "Ephors," who made decisions on behalf of the community. In this classroom conversation, the students object strongly to one particular Spartan practice: when a citizen had a baby, she had to bring the baby to the Ephors for judgment; if they felt the child was sickly, such that it would likely be a burden on the society, the mother was forced to leave the baby outside to die of exposure. A student named Jasmine argues against this practice, by presenting herself as an example of a hypothetical Spartan mother.

ST: if she had a baby and hers lived and I had a baby and mine didn't, we're not equal.
T: yeah you're right. you didn't produce a healthy baby.
ST: how do you know that. they just say that one ain't healthy, and then lookit, mine probably grew up to be taller and stronger.
T: because they're the Spartan Ephors who make a decision. the Ephors know what makes a good Spartan because they're sixty years old and they've seen an awful lot.

The student's example describes three roles: herself as a hypothetical Spartan mother forced to kill her child; another student ("she", a student named Erika) as a hypothetical Spartan mother who gets to keep her baby; and the Ephors who pass judgment. As the student intended, the relations between these three roles mirror those that the text describes for ancient Sparta: the relationship between the two hypothetical Spartan mothers (a relation between the unprivileged and the privileged); and the relationship between the

mothers and the Ephors (a relationship between the subordinate and the powerful).

Over the course of the classroom discussion, as it turns out, this three-part structure involving the powerful, privileged subordinates and unprivileged subordinates comes to organize the classroom interaction itself. That is, teachers and students step into these three roles in an interactional structure that emerges during the discussion. We can begin to see this in the following segment. Recall that, because of Jasmine's dual role as hypothetical Spartan and actual student, comments about Jasmine's character within the example have implications for Jasmine the student herself.

ST: if she had a baby and hers lived and mine died we not equal. and if they want it to be- everybody to be equal then I should get to keep mine too.
T: what- wait a second. you're baby's going to grow up and be this unhealthy runt. her baby's going to grow up and be healthy
ST: I'm equal to her then
T: yeah you're equal. but you know take it twenty years in the future. her baby's going to have to do what for your baby. your baby's going to do what. lay around.
STS: hahahahaha drinking beer
T: drinking beer. eating their bean soup.

If we read this simply for its referential value, the students and teacher here are elaborating the pro-Spartan argument. They articulate the Spartans' reasoning, by imagining how an unhealthy baby would become a burden on the society. If we examine implications for the interaction among teachers and students, however, a more disturbing pattern starts to emerge. What sort of person would stereotypically say "your baby's going to do what? lay around....drinking beer"? We would need more evidence to make firm conclusions, but this accusation indexically presupposes (cf. Silverstein, 1976) a recognizable social group—welfare critics, who often decry the alleged laziness of welfare recipients whom taxpayers must support. This indexical presupposition has the potential to shape the classroom interaction among teachers and students, if we remember that the students come from a social group often stereotyped as lazy welfare recipients (lower class blacks).

Wortham (1994) argues that as the class progresses the teachers do in fact align themselves with contemporary U.S. welfare critics. Furthermore, the passage above represents the beginning of a pattern in which the students' own social position becomes analogous to that of unprivileged Spartans. Through this analogy students' utterances come to index underprivileged welfare recipients. In the classroom and in contemporary America, just as in Sparta, we have relations between the privileged and unprivileged and between the powerful and the subordinate. Like Spartan mothers who must submit their children to be judged, students must submit to teachers' judgments. And, as Spartan society did to unhealthy babies, American society often turns its back on the students' social group (lower class blacks). Jasmine, in *both* her hypothetical and actual role, is unprivileged and subordinate. This analogy begins to develop in the passage above, when the teacher characterizes Jasmine's baby as naturally inferior (an "unhealthy runt"), unproductive ("lying around"), and intemperate. This narrows down the social identity the teacher is attributing to the child and its mother. Although she is overtly talking about Sparta, her characterization of Jasmine's baby as a lazy drunkard begins to sound like the contemporary American stereotype for some lower class black welfare recipients.

Wortham (1994) emphasizes that at this point the teacher is still either teasing the students or playing devil's advocate to defend the Spartan political system. The implications of their discussion for their own interaction are still only potential, and almost surely not conscious. But these implications are there, and they are in fact developed as the classroom conversation proceeds. The following segment occurs a few minutes later in the classroom conversation.

T/B: yeah but see you're- but that's the hitch isn't it? you've got this baby that's not healthy and you're afraid's going to go in the army, and why should the rest of us support your baby.
STS: hahahaha
ST: if they wanted them to be equal then even if my Child was retarded or whatever he should go into the army too

If we continue to examine the discussion for its interactional implications, one utterance in this passage stands out: the teacher's "why should the rest of us support your baby?" This, again, indexically presupposes welfare critics. Note the teacher's use of *us* in this utterance. For the first time, she includes herself in the example, in a group opposed to Jasmine's. She attributes a definite social identity to Jasmine's baby: he is an unproductive freeloader. Mrs. Bailey and her social group—whoever is included in *us*—are taxpayers forced to support such people. Here the teacher puts herself, and presumably other taxpayers, into a role analogous to the Ephors'. In both the text and the example the Ephors refuse to expend resources on unhealthy babies. Analogously, in the classroom conversation and in contemporary U.S. society, the teacher herself seems to resent spending tax money on "unproductive" children. Thus I argue that discussion of the example is becoming an implicit commentary on taxpayers (like the teacher) and welfare recipients (like many of the students).

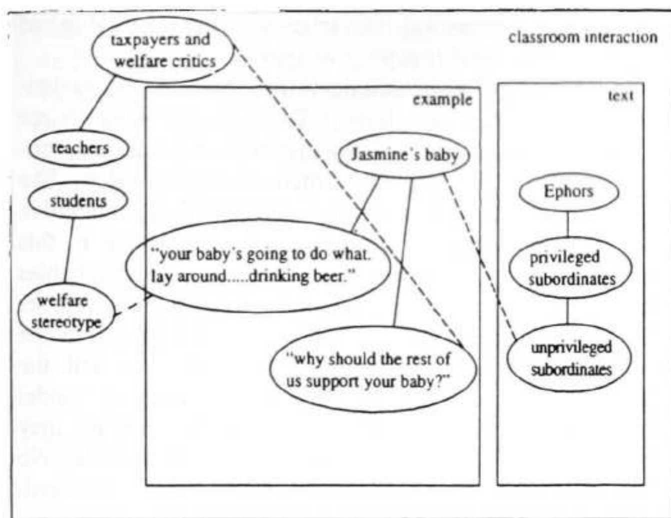

Figure 1. Interactional implications of the example.

Figure 1 represents this situation. The two inner boxes represent referential structure set up through discussion of the text and the example. Utterances from the last two excerpts, which the teacher uses to describe Jasmine's hypothetical baby, are included in the left inner box. The outer box represents teachers and students in the classroom interaction itself. As discussed above, the utterances used to describe Jasmine's baby indexically presuppose groups that both teachers and students recognize from their own society: welfare critics and stereotyped welfare recipients. In the last passage the teacher begins to align herself with the welfare critics, as an irate taxpayer. And the fact that most of these students are lower class blacks also makes it possible that they themselves are being aligned—through the too-common U.S. stereotype—with Jasmine's hypothetical, unproductive baby. Thus we begin to see the outline of an emergent interactional structure organizing relations among the teacher and the students. Note that this structure was not established solely through the referential function of language. It also depends on indexical presupposition and social groups familiar from the larger society. Teachers and students do not refer to these groups. They index and then inhabit or enact them.

The class continues to discuss Jasmine's example for half an hour. See Wortham (1994) for the transcript and further analyses of the interactional organization created in this discussion. We have space here for only one more excerpt from the end of the classroom discussion. In the following segment the topic shifts from the example to contemporary America. The class is discussing how our society might be strong like Sparta yet still humane to underprivileged members like Jasmine's hypothetical baby.

T: yeah prosperity is <u>mo</u>ney <u>rich</u>es wealth. OK. How do we become a <u>rich</u>, nation. a <u>p</u>owerful nation.
ST: work hard? <u>work</u> for it.
T: you've got to <u>work</u> for it.
ST: you need a good education
T: you've got to have a good edu<u>ca</u>tion. why.
ST: like some um. like some of them <u>A</u>sian women are taking over 'cause they are <u>smart</u>.
STS: Asians Asian girls hnh
T: because they work hard?
ST: they work <u>hard</u> but they <u>smart</u> too.
ST: they have to be smart to learn all them <u>signs</u>.
STS: hahahahaha
T: if <u>that's</u> the case because they're <u>smart</u> and they work <u>hard</u>, then because you're <u>not</u> smart you <u>don't</u> work hard maybe we should throw you in the glen early to give <u>them</u> the benefit?

Analyzed just in terms of referential content, this final passage fleshes out the concept of privileged, productive members of a society. It does so by establishing another realm, drawn from contemporary U.S. society, with social organization analogous to that found in the example. Asians, like Erika's healthy baby, will work hard and contribute to the society. Less talented and diligent students, like Jasmine's unhealthy baby, will not work as hard and will not contribute as much.

When we also consider the implications of this segment for relationships in the classroom conversation itself, it becomes clear that more is going on here. The passage contains several clues that the students' and teachers' *own* social positions – and more generally, issues surrounding race relations in contemporary America – are also at issue here. At the end of the segment the teacher clearly connects the relationship between these students and Asian students to the relationship between Jasmine's and Erika's hypothetical babies. She does this, for example, by talking about throwing these students "in the glen." Plutarch uses the same phrase, saying that unfit Spartan babies were left outside "in a glen." to die. The teacher makes clear that students like Jasmine are less well endowed: Asian students are smart and they work hard; other students are dumb and lazy. The "other" students are apparently the black students. The class contains fifteen blacks, three whites, and one Asian student, and all the students who speak in this discussion are black. The teacher also follows Lycurgus in claiming that society should turn its back on under-endowed children.

I argue that, when we examine the interactional functions of the speech used in this classroom conversation, we find that teachers and students themselves adopt roles as powerful decision-makers, privileged and unprivileged subordinates. Discussion of this participant example creates, in the classroom relations among teachers and students, the same two types of relationships described in the example and the text. An interactional structure emerges, in the relations among teachers and students themselves, that mirrors the three-part structure referred to in the example. Teachers, it becomes clear, are like Ephors. They have the power to decide which students succeed academically and which do not. One group of students is privileged, and will move ahead through educational success. As the class discussion proceeds, Asian students are assigned this role. Another group of students is unprivileged, and will not move ahead through academic success. Black students come to occupy this role in the

classroom conversation. Wortham (1994) provides evidence that these interactional patterns emerge among teachers and students, by examining in more detail the patterns of deictic (and other indexical) usage in the classroom conversation.

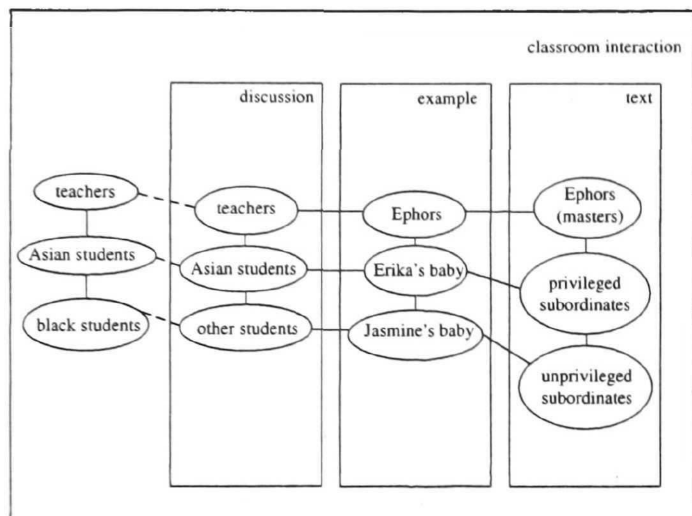

Figure 2: Structure in the text, example and interaction

Figure 2 represents the homology between role relations in the referential content and the interactional positioning. The three inner boxes represent role relations described (i.e., established through the referential function of language) in the text, the example and the discussion of Asian students. The outer box represents the classroom interaction. The three role positions in this box represent those enacted by teachers and students, using the interactional functions of language, in the classroom discussion itself. Classroom relationships are thus organized by the emergent interactional structure represented in Figure 2. Note that this interactional structure depends on, but cannot be reduced to, referential structures.

Conclusions

In their discussion of Jasmine's example, teacher and students *act out* the same roles that they describe in the example. (As documented in Wortham (1994) a small but robust fraction of classroom participant examples get enacted in this elaborate way). What are we to make of the homology between the described and the enacted roles in this classroom discussion? I claim that this sort of enacted participant example works in a way similar to deictic forms. To understand the interactional effect of *we*, we must know something about its referential value. But to understand the referential value of *we*, we must know something about the interactional organization of the conversation in which it is uttered. The referential and interactional functions cannot be separated. In an enacted participant example, referential, interactional and cognitive structures are intertwined as well. We could not appreciate the interactional positioning done in the Spartan babies example without understanding what speakers refer to in their classroom discussion of it. But the full cognitive value of the discussion itself partly depends on the emergent interactional structure established with the interactional functions of speech.

The analogy between deictic forms and enacted participant examples has one flaw. Deictics are what Peirce (1955) called "legisigns." They presuppose a rule that connects aspects of their context to their referential value. The connection between interactional, referential and cognitive patterns in participant examples is not normative in this way. Nonetheless, interpretation of what the Spartan babies example means, cognitively, depends in part on structure set up through the interactional functions of language. In the Spartan babies class all students have experience with the invidious, stereotypical contrast between Asians (a "model minority") and blacks. While discussing the example they enact this contrast, without fleshing it our referentially. No one ever *refers* to blacks as underprivileged or unendowed. But black students like Jasmine get *positioned* this way, interactionally. By enacting the stereotypical contrast between Asians and blacks, students bring into play an interactional structure that helps flesh out the larger cognitive structure that they are wrestling with (i.e., how best to understand the social relation between privileged and unprivileged in Sparta). Without ever being referred to, the emergent interactional structure contributes to students' understanding of the text and the example. I do not claim that the cognitive contributions of every participant example rely centrally on interactional structure in this way. But in some cases they do, and this establishes that at least sometimes interactional structure contributes to cognitive understanding.

I am using "understanding" broadly here, to include (in part) structure that is acted out but not (consciously or unconsciously) represented. Many of these students probably do not mentally represent the nuances of Asian-black relations, but they know how to act these relations out. In this case, by acting them out the students contribute enacted structure to the cognitive value of their example. One could of course argue that the interactional pattern simply derives from the referential – that hearers use referential patterns to develop mental representations of the text and example, and then act these patterns out. But this would not be a parsimonious explanation. Language functions (largely through deictics and other indexical signaling) to establish interactional structure. Many aspects of this structure are not referred to or represented at all, but simply enacted. People enact interactional patterns they do not mentally represent just as they walk without mentally representing all the complex movements required. In enacted participant examples, where the interactional and referential patterns mirror each other, aspects of the interactional pattern flesh out things the speakers refer to and thus contribute to the cognitive structure that makes those things meaningful.

I argue that this kind of emergent interactional structure, like the artifacts or tools described by Hutchins (1995) and Wertsch (1997), partly constitutes the cognitive accomplishments of the classroom conversation. In this case these cognitive accomplishments involve understanding an example, and thus require that the students determine what category the example represents. This example illustrates the

relation between Ephors and Spartans, and the more general relation between the powerful and the subordinate. The students identify and flesh out this category in part through the structure of their interactions. Thus I argue that we cannot solve Goodman's riddle, in some cases, unless we include emergent interactional structure as one component of distributed cognition.

Acknowledgments

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