

# Chapter 4

## A Commentary on Incommensurate Programs

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### Introduction

In puzzling through what work this commentary might do, especially in light of the care with which James Greeno has framed and addressed his chosen task – to bring cognitive and interactional analytic traditions into a formal, theoretical alignment – I returned to some of the prospectus materials Tim Koschmann had submitted that brought this collection to press. Prospectus reviews are a kind of “institutional action” in which, in the end, what’s worth reading gets decided for the rest of us. In the particulars here, though the reviewers were to a person impressed by the collection of contributors, and though the weight of reviews was clearly positive, it wasn’t entirely so. The prospectus was taken to task for a few things, one of which seemed deeply obliged: How would the collection further our theoretical understanding of teaching and learning, and thus our resources for effectively designing them? A tough sell, I thought on Tim’s behalf, yet an unavoidable one. Educational research began with the promise of instrumental “goods.” This was part of its appointment as an applied science, and this instrumentalism has been with us ever since. On the other hand, this is precisely what James Greeno is promising to deliver.

So, one promise of the collection was that by reading into relevance major developments in the “social turn” of educational studies we might leverage new ground for our theoretical and design tasks. No one has taken up that responsibility more seriously or directly than James Greeno, not simply here, but across an extraordinarily productive career. Though theoretical in its presenting terms, one can clearly see that he is pressing for new and hopefully effective instructional design resources, as he has for more than 30 years. His paper, as we should expect, is finely woven and closely, effectively argued, and what I want to do in this commentary is sketch a way in which we might break into it and recover some alternative readings of

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various phrases and formulations – and thereby tasks and authorizations – that we seem to hold in common, and yet may understand very differently.

At least some of the resources he is pressing into service stand at some distance from the intellectual habits of educational study. Colonized from its very first days by materialist metaphors of mind, process–product designs, and the black boxes that accompany them, the social or social–practice or “linguistic turn” in educational research has easily been the most visible innovation of the last 25 years. It is both a conceptual innovation and, perhaps more significantly, a cultural one. By “cultural” I mean that analytic communities have their cultures, from archeology to test–item construction. Literatures, controversies and intellectual histories are attached, as well as best judgments about what good questions are, instructive analyses, new thinking and the rest. Part of my larger argument is that the social turn in educational studies has been taken up with a greater enthusiasm for its future – the possibilities of novel analytic returns – than for the histories and analytic cultures that deliver the “turn” for us to turn to. This part of my argument and commentary is quite interested, in that the work I do has everything to do with the analytic history of situated action.

Jim Greeno’s home is among the first generation who leveraged social science from computing science. He has been an innovator in cognitive studies nearly as long as cognitive studies have been with us, and in his position paper he is proposing further innovations for the field – an integrated theory of semantics and systemics – that would achieve a suture between cognitive science and interactional analyses in the domain of learning. How to do it is the question, and his title announces his chosen way, through the insights of a “situated perspective.”

This is of course the work that stands at some distance from the analytic cultures of educational research from Thorndike forward. It is sociological and ethnographic in the main, with strong attachments to philosophies of action, natural language and social science that are decidedly not “scientistic.” Early on, he cites the works of Jean Lave, Brigitte Jordan and Lucy Suchman as benchmarks. We can be assured that Lave and her colleagues were beneficiaries of prior literatures. They might include Dewey’s “epistemological behaviorism” (Garrison, 1994), Mead’s philosophy of the present (1932/2002), Polanyi’s studies of tacit knowledge (1967), Goffman’s “Neglected Situation” (1964), Geertz’s “thick description” (1973; via Ryle, 1949), and, perhaps especially, Garfinkel’s (1967) ethnomethodology of situated action, and Sacks’ (1992) sequential analysis of natural conversation (Sacks, Schegloff, & Jefferson, 1974).

On consideration of Jim’s acknowledgments to Lave et al., the relevance of ethnomethodology and sequential analysis for understanding the situated perspective may have particular weight. Brigitte Jordan was a graduate student at the University of California at Irvine when the late Harvey Sacks was developing his extraordinary work and collaborations on natural conversation, work cut short by his unbelievable death in 1975. She knew Sacks and his analytic program, including his on–going collaborations with Harold Garfinkel. As intellectual history would have it, Jean Lave was a junior faculty member in Anthropology at Irvine at the same time and a colleague of Sacks. My understanding is that John Seeley Brown was also on faculty

at Irvine at the time, and that he and Jean were aware of Sacks' initiatives and the work of Garfinkel and his students at Irvine and UCLA.

There's a puzzle with respect to Suchman's graduate curriculum, as there were no faculty in Berkeley at the time who were teaching either ethnomethodology or sequential analysis. And though John Gumperz knew Harold Garfinkel personally and professionally, and edited collections that included ethnomethodological studies, to my knowledge Suchman did not study with Gumperz. He joined her committee late in her graduate program, after the completion of the copier study as a project for Xerox PARC. Yet while the intellectual history may not be clear, what is quite clear is that *Plans and Situated Actions* (1987) is indebted to prior readings in ethnomethodology and sequential analysis on virtually every page. All of which is to say that when we inquire into the currency of the situated perspective in educational studies, we will be led to many places, but especially to prior work and formulations of situated action that are distinctively, even radically, sociological.

We can further observe, and it's quite unexceptional in intellectual history, that while Garfinkel's and Sacks' initiatives were caricatured as "West Coast Sociology" in the early 1970s, the early expressions of the "situated perspective" in educational studies quickly gained interest a decade later. They emerged from developments at Berkeley, XeroxPARC and Stanford that were more than coincidental with the arrivals of Jim Greeno, Alan Schoenfeld and Andy di Sessa at Berkeley in the early 1980s, the recruitment of kindred social scientists to Xerox, the founding of the Institute for Research on Learning (IRL), and the later arrival of Jean Lave.

Others know this history far better than I do, and it was by no means *only* a west coast development, as the intellectual histories of the contributors to this volume will show. In the late 1970s, for example, Fred Erickson and Brigitte Jordan were at Michigan State running a working group for the study of interaction in real time, the Interaction Analysis Lab.

There were other persons and places too, such as Aaron Cicourel and his education students at UC San Diego, Hugh Mehan and Robert MacKay principle among them, and also Ray McDermott's early work on both coasts. Ray's dissertation "Kids Make Sense" (1976) is perhaps the most widely cited dissertation study never published. His title is a virtual announcement of the "situated perspective." Perhaps the earliest institutional site of kindred thinking was the "Kiddie Lab" at Rockefeller University founded and administered by Michael Cole and George Miller in the early 1970s (Miller, 1977). Devoted to child language and cognitive developmental studies, it became a major cross roads for interdisciplinary study taken up with the primacy of action in social worlds, whose travelers included Lave, McDermott, Sacks, Schegloff and many more. I also want to make mention of Jenny Cook-Gumperz' 1977 journal article "Situated instruction: Language socialization of school age children," the series "Working Papers in Sociolinguistics" edited by Richard Bauman and Joel Sherzer and published by the Southwest Educational Development Laboratory in Austin, Texas, the editors of *Anthropology and Education Quarterly*, the work of Courtney Cazden, Marilyn Merritt and a host of others, all of whom were finding their resources outside of education, from

sociology, anthropology and linguistics, and bringing them to educational tasks and settings through the 1970s and 1980s. And of course the soup is thicker still; the insights of situated order, action and meaning have been developed in a great many places throughout the last century.

What I'm angling for here is two observations. The first is the great distance and traverse that brings the "situated perspective" to educational studies. The second is how many of the contemporary interpreters of the social turn in educational research have disciplinary homes and histories that are quite distant from the resources they interpret. The publication of "Situated Cognition" by Brown, Collins, and Duguid (1989) in the front-piece journal of AERA is emblematic of how "situatedness" has come to educational studies more recently through the lens of cognitive and computer science, though it owns an entirely different, even oppositional intellectual history. My commentary is on the question of how else it might be understood and what (else) we might want from it in matters of educational study, in the particulars of Jim's treatment of our corpus of study materials.

The issue is not one of a "registry" for ideas, but of analytic communities and cultures. The "situated perspective" is not only an unfinished commentary on the meaningful order of ordinary worlds, it's a commentary on what the study of such worlds might look like, and yield. In the end, "the situated approach" may offer to educational studies an entirely different, analytically incommensurate program of inquiry, complete with different aims, tasks, questions, measures of adequacy and, summarily, ambitions than our more familiar understandings of educational research. Holy grails may work very differently in each, and while no one can say inclusively just what the "situated perspective" is or how it should be read, from an ethnomethodological perspective a couple of things can be said that may be useful for what follows.

First is that it is a descriptive analytic program. There's much to be said in the philosophy of social science about the logics of explanation (and how the promise of causal links premises a social world organized that way) and those of description (cf., Dewey, 1929; Quine, 1960; Winch, 1990; Wittgenstein, 1958). My argument is more modest. It is only that if we posit a world of situated action, then we posit a competent world of social action. Competence is a delicate and/or garrulous term in the contemporary literature; endless competencies are implicated in the notion of "knowledge domains." But the competence I refer to here is a competence in, to, and as of interaction, or speaking and acting competently in concert. This competence is arguably the first one on the scene, and the first curriculum of childhood. We (professional analysts) encounter worlds already in place, already competent to their affairs, including the competence to teach and learn them. We can then speak of situated action and what is orderly about it as competent practice, wherein meaning – and thus order – is achieved by disciplined ways of speaking, listening and acting. Those practices – situated practices – are roughly what the phrase "ethnomethodology" points to and recommends for study. They are, in my view, what the situated perspective recommends for study.

If so, and second, the notion of situated action points in the general direction of a grammar of action, or how meaningful action is assembled in real time and thus

sequentially. Conversation, or talk-in-interaction, is the emblematic domain. It is, in Sacks' phrase, "non-disorderable": Utterances, turns, and sequences of them cannot be put together just any which way and make sense. Among a few of the things that sequential analysis has shown us in remarkable detail is how it is that conversation – and all that conversation achieves, including its "contents" – is then an analytic organization. The "analyses" here aren't those of professionals, but rather of cultural members; to be a competent member is to be an analyst of one's own talk and the talk of others (Garfinkel & Sacks, 1970). As one example, consider the ways in which a teacher's pause in next turn to a student's reply is routinely analyzed by everyone in the room as the portent of a disagreement or failed answer, and how things like pauses are produced in concert by everyone who witnesses them.<sup>1</sup> Or how the question "Are you doing anything tonight?" can be heard for a pending invitation in third turn and answered so as to make such an invitation relevant or not. Endless – genuinely endless – and sustained analyses of just these kinds constitute the orderly production of conversation as social action's most massive domain. To speak of "situated action" is to build descriptions of those first organizations on the scene.<sup>2</sup>

Such grammars of action are not "codes" played out on docile fields. They are rather the ordered productions of sensible fields, fields within which things like the "contents" of interaction – including informational contents – are assembled. They are enactments, in situ, and if this is the situated perspective we entertain, there are some further things that follow as matters of an analytic program fitted to it.

As suggested, it would be descriptive, local and ethnographic in its habits. To see how an activity is assembled is to describe it closely in terms of its endogenous production. By "endogenous" I mean that the descriptive language would be leveraged from the very affairs it describes. Classroom lessons, for example, show the activities of pointing, reciting, asking questions, answering them, deferring them, observing the answers of others, etc., all ordinary activities and common practices. That lessons – even sophisticated lessons – are built from them as situated enactments means that lessons *already* possess the terms of their description: their descriptions are none other than an account of their productions, a descriptive-analytic account of an assemblage-in-action.

Relatedly, the fields of activity that yield such things as classroom lessons would stand to what the lesson comes to not as a weighted set of causative structures or variables, but as the natural histories of grammatical productions. The analytic field is entirely different than what we imagine for process-product or central tendency models. Empirical in its insistence on cases-in-detail, the study of situated action warrants its findings in actual cases, and their reproducibility in next cases, rather than on empiricist accounts of tendencies in the aggregate that are unavailable in any actual case. (See Coulter, 1983 on the difference.) The study of cases *in situ* stands at some distance from an analysis of variables in the aggregate, or an understanding of social worlds organized that way.

Thus, in Garfinkel's parlance, the situated perspective stands as an alternate form of analysis, alternate to "formal analysis," meaning by the phrase the familiar professional analytic tasks of crafting formal representations and arranging them within

fields of principled and/or mathematical relations suitable for theorizing causatives, efficiencies or optimal design dimensions. He sums those tasks as tasks of “generic representational theorizing” (Garfinkel, 2002), and one needn’t affirm his critique to recognize the description.<sup>3</sup>

The situated perspective points then not only to an account of ordinary organizational things in everyday worlds; it has implications for how we would proceed to take interest in them, what we would do with those organizational things analytically, or methodologically, or even scientifically. But in my reading of Jim’s paper, he has recruited the situated perspective to a project that seems largely unchanged by the recruitment. The analytic program – a program of theorizing formal structures, hypothesizing their relations, and measuring the conjectures to the aims of general theory – is virtually unchanged. The project seems to be one of assimilation, instead, assimilating the notion of a “situated perspective” to the very tasks whose critique leveraged the innovation. We see it in various places in the paper and especially in some of its most concise programmatic formulations. I want to take up just a few of them, before turning to how else we might take interest in the corpus materials.

## A Formal Analysis

I want to begin with a central formulation in the very first paragraph of the position paper. It speaks to the aims of the paper and to a much larger program: “to contribute to the development of a theory of cognition and learning in interaction.” The formulation rings with intellectual history: two of the canonical topics of educational research, one dating to the first half of the twentieth century (learning theory) and the other to the second half (cognitive science) are joined to a very different and distant intellectual estate, interaction. Jim immediately sketches what would then be ideally achieved by it:

... a theory that explains dynamic aspects of interpersonal interaction with the same degree of rigor and specificity that are achieved by sociolinguistic accounts, and explains the informational contents of interactions with the same degree of rigor and specificity of information-processing accounts. (p. 41)

It is quite clear that in the measure, interactional accounts (the phrase “interpersonal interaction” seems redundant) will be disciplined to the rigors of a very different analytic discourse, just as it is clear that they are, by this account, not so disciplined now.

In this first passage and elsewhere, there are recurrent binaries that organize the developing theoretical model. “Binaries” have become something of a code elsewhere in the literature, presaging a deconstructive exercise. But it’s not that things might not come two-by-two. The question is rather how we understand their genealogical and analytic relations. In the particulars here we begin from the informational and the interpersonal.<sup>4</sup> They become differentiated and amended as the paper develops, yielding the semantic and the systemic, and come to stand on behalf of the cognitive-informational and the social-situated more generally. I want to briefly track the transformations and how they come to rest.

Though the paper allows that the more familiar cognitive programs that preserve the central place of individual cognition are feasible, Greeno is clearly proposing something different:

Instead, I am appropriating concepts and representations that have been developed in individual cognitive science and psychology and reinterpreting them as aspects of interaction in activity systems and social practice. (p. 43)

The passage can be fairly read as saying that the concepts developed from individual cognitive science are derivative of action, interaction, and social practices, insofar as they are “aspects” of them. This would be an agreeable reading in my view, consistent with recent studies and criticisms of the cognitive metaphor that see it substantially as a move within a natural language game. By those arguments, “mind” is very much an “aspect” of interaction; we find it as ways of speaking, grammars of language-in-use, taught and learned along with their occasions. When we say “I have a penny in my pocket” a world is attached wherein pennies are substantial things that can be located, collected, examined, tracked, and compared. We tend to hear the phrase “I have an idea” in a similar fashion, establishing, as of our natural language use, the “materiality” of thinking and the things thought and assigning them a place (cf., Costall & Leudar, 1996; Coulter, 1989, 1991; Coulter & Sharrock, 2007; Edwards & Potter, 1992 for different readings of the critique of cognitivism; the “penny” exemplar is borrowed from Hacker, 1999). On this account, interaction is the constitutive field of the cognitive discourse, and though Greeno says further that his project “aspires to a theory that is primarily about interaction in activity systems” (p. 43), I think he subsequently thinks better of it. In the end, the appropriation seems to work from the other side: Concepts are appropriated from the situated perspective and rendered as aspects of interpersonal systemics and informational semantics (see his p. 43).

In an early aside, the distinction between the “informational” and the “interpersonal” becomes that between the “semantic” and the “systemic,”

where semantic aspects involve the referential meanings of concepts and assertions that are made and relied on in activity, and systemic aspects involve the interactive processes of that activity. (endnote 4, pp. 67–68)

The passage sketches a venerable organizational divide where we have meaningful contents on the one side, and structure-without-contents on the other. These become the central poles of the model, and sensible action then becomes the product of the two. This in turn becomes the analytic task and puzzle: to work out their articulation in a formal way. The semantic comes to include things like cognitive schema and information representations, and the systemic–interactional largely becomes the infrastructure or mechanism that sets information, schemata and cognition in play, in activity.

The analysis develops at a steady pace, working from the outline of “levels of analysis of cognition in activity” laid out in [Table 3.1](#), turning to an extended review of prior classroom studies, and then coming to rest with the Wisconsin Fast Plants<sup>®</sup> materials. Each discussion leads to modifications and elaborations of the model, and further conjectures or hypotheses.<sup>5</sup> There is great order to the development, on the



one hand, and yet a sense of the ad hoc, on the other. Adjustments and elaborations are made as the materials are taken up, and the impression is left that there might be no end to it. The modifications seem to follow not only from the weight of the materials, but from a certain analytic discomfort that shows itself early on.

We can see in the same endnote Jim's dissatisfaction with the very structure of pairs that he's working from; they seem to run afoul of his sense of the unity of social practices. The pairing of "task organization and interactional organization" (proposed in Eric Bredo's commentary) doesn't seem quite right: "In my view tasks *are* social. What constitutes a task and which tasks are important for one to participate in are aspects of social practice" (endnote 4, pp. 67–68, emphasis added). The endnote discusses the alternative pairings of "the task and the social," the "informational and the interpersonal," and settles on the "semantic and systemic." As it develops, the model keeps all of them in play, doubts notwithstanding. What is not clear is how any of them, for example, the semantic and the systemic, is any more relieved of the dissatisfaction than the others, if indeed, as the situative perspective would have it, social practices are coherent things rather than paired structures. In light of the expressed dissatisfaction with these pairings, there must be other, analytically compelling reasons for preserving them. My best reading is that they are required by the exercise of crafting a formal model; models have their systemic requirements too.

Each pairing is a variation on a central, even cultural, alternation, variously expressed as the inside and the outside, form and content, process and product. Each shows an alternating structure that delivers the task of re-joining the identities that have been formally separated. The formal model stipulates the divide, and then writes the project of repairing the schism thereby created:

I hope that the analyses I review and present here are contributing to a more integrated theory that includes accounts of information structures that are the contents of interaction and the interactional processes in which those structures are generated. (p. 43)

The task thus becomes one of healing the rift that underwrites the model. But the first task entails setting in place the formal divisions that require such a project, and one can also see that work in the passage. The proposal borrows from the situative perspective the notion that situated action – interaction – is the generative site of meaning, but casts meaning as "information structures." What then holds the informational–interactional pair together across these several formulations is the notion of a larger "activity system." We see it early on, on page 43: "[The] research that I find promising involves considering information processing as an aspect of interaction in activity systems."

The aim seems very close to a theory of action, and though it doesn't receive too much development, the larger rubric of activity systems seems to house both fields, the systemic and the semantic. It also includes the great bane of every attempt to drill any particular action down into its foundational contents: "background knowledge." Background knowledge has been variously handled in social science as normative expectations, culture, context, and "what anyone knows," and Jim takes it up as the "common ground" of activity. The emphasis is placed on the "vastness" of its



material contents, whose contents become the home for “a more inclusive version of the cognitive idea of schemata” (p. 44). He continues:

To explain these constructions of meaning, we hypothesized several kind of schemata in the students’ prior common ground, including general schemata involving participation in conversational interaction, more specific schemata involving accomplishment of school-like tasks, schemata about the operation of physical systems, and schemata about numbers and arithmetic operations. (p. 45)

Presumably, only the constraints of space limit the list. Garfinkel (1967) takes up the related question of how “shared agreement” (the construction of meaning-in-common) is achieved in ordinary worlds, and proceeds in a very different fashion:

“Shared agreement” refers to various social methods for accomplishing the member’s recognition that something was said-according-to-a-rule and not the demonstrable matching of substantive matters. The appropriate image of a common understanding is therefore an operation rather than a common intersection of overlapping sets. (p. 30)

Moerman and Sacks (1971/1988) similarly address common understanding in natural conversation: Turn taking itself – the production of an appropriate next turn, on time – is the first evidence of understanding on the scene, whose organizations are devoted to securing understanding’s recurrent achievement. Common ground, on these accounts, has a praxeological foundation and fabric; it is an activity rather than a template, a competent practice rather than an (schematic) inventory of contents.

## Interaction as Social Psychology

In some way, in Jim’s account, it is in activity systems that informational semantics and interactional systemics find order and integration. And they do so, it seems, in the company of a certain re-casting of the “interactional.” By the situated perspective as I know it, interaction and meaning (or content) are joined quite closely at the hip. One could say that meaning is produced-in-interaction, in situated action, in a reflexive-production relationship (as in the meaning of a pause, whose meaning is leveraged by all who co-produce it). But the developing model here relieves the interactional of that work and relationship. Meaning is the province of semantics, represented as information; interaction is the province of systemics, variously represented as “process.”<sup>6</sup> Relieved of production work, interaction is then taken in two different directions. In the first and more direct one, interaction becomes a social psychology of “participation,” expressed as the “differences between individuals in their engagement in tasks . . . [and] as different ways in which individuals are positioned in their participation” (p. 43). Developed through subsequent notions of participation structure and agency, in my reading this participatory domain figures at least as centrally, if not more centrally, than the informational in the classroom analyses that follow.

We see it set to use later, when the notion of “the *positioning* of individuals in the participation structure of their classroom activity” (p. 45, emphasis added) is introduced. “Participation structure” is a well known and productive formulation dating

to early classroom studies by Erickson (1977), Mehan (1979), and Phillips (1972), among many others. In my view, however, it became less compelling for how it tends to leave the impression of a kind of autonomous structure that persons “fall into,” as though the structure *itself* possessed agency. By my reading of the situative perspective, such structures are instead glosses or accounts of situated action, a way of speaking of situated enactments. Indeed, the order of the classroom with all its endless familiarity and regularity – including formal, institutional structure – shows its situated accomplishment every time. As Payne and Hustler (1980) remark: “On each and every occasion of a lesson a teacher has to accomplish the order of that occasion. The order of any lesson is an occasioned order, contingent in its accomplishment, ‘there and then’, every time” (1980, p. 50). If so, we can wonder whose work is being referenced in the verb form “positioning.” In subsequent discussions of agency, authority and accountability, one can be left with the impression that these too are formal attributes or substantive “qualities” that can be weighed and parsed to enhance instruction and learning, perhaps even as design dimensions for activity structures themselves.<sup>7</sup>

As the paper turns to actual classroom materials rather than the work of model building, the interactional is formulated in terms of the central binary of the semantic and the systemic. That is, rather than constituting different domains or principles, the semantic and systemic become adjectives of interaction, and this is not surprising: If one is committed to the situated perspective and thus to naturalistic inquiry, interaction—not formal structures—is what one sees and finds.

The model then speaks of systemic and semantic principles of participation, the former having to do with social positioning, as one might expect, and the other, also a matter of relationship, but now “in relation [to] the concepts and methods of mathematics” (p. 47). The semantic becomes tied to Pickering’s (1995) “conceptual agency,” and subsequently becomes split again to distinguish “between two types of conceptual agency” (agency for problematizing and agency for reconciling). In the process, and perhaps unnoticed, “interaction” has been metaphorized: We have moved from *persons* interacting – human social interaction, or conversational interaction – to the “interaction” of agency and concept. We can understand the use of “interaction” perfectly well in both cases, but we may want to be clear that we are speaking in entirely different registers across them.

A review of prior studies leverages these conceptual developments. Prior studies also offer a comparative context for the discussion of the Fast Plants materials that are our common focus. And when speaking comparatively, it falls substantially to the social psychological aspects of the model to differentiate between the study settings, as in how it is that “the main difference was in the authority and accountability of students in these (Fast Plants) episodes, compared to the classrooms that we analyzed previously” (p. 55), how in the Fast Plant materials “an adult provided the authority needed to decide between the alternatives that were presented” (p. 55), and how, in the conclusion, we are advised to theoretically “differentiate the concepts of authority and accountability in the positioning of students, to include what students are authorized and accountable for” (p. 66). But note how this last recommendation – what are they authorized and accountable for – promises a list.

The situated perspective as I understand it points to fields of practical action and sequential coherence, *in situ*. The descriptions projected by each are likely to be very different.

The Fast Plants materials yield further conceptual elaborations and clarifications, as in the distinction between “problematizing” and “resolving” as “two aspects of discourse at level 3” (p. 54; also see Table 3.1). The earlier discussion of these two principles as “inherently interactive” (p. 49) is difficult to assess. Insofar as they are social activities in the world, yes, they are inherently interactional, not owing to any particular principle of formal logic, but rather because *all* such work in the world is social, situated and thus interactional. But perhaps what is meant is [again] *not* that “problematizing” and “reconciling” are interactive *qua* tasks of human social interaction. It is rather that they are formally, conceptually, structurally, *one to the other* “interactive.” The “interaction” here would have nothing to do with social action at all, but is rather a familiar usage from formal analysis: how one variable, concept, principle, etc. “interacts” with another. The relations are entirely formal–conceptual. But in that case, to “hypothesize that. . . successful reasoning include[s] detecting inconsistencies in the current information structure [the work of ‘problematizing’]. . .” (p. 48) isn’t a hypothesis at all. It is simply part of what we *mean* by “successful reason.” The hypothesis does no more than take up an activity – problematizing – that belongs to a class of activities called successful reasoning, and then conjecture that we might find the former in the presence of the latter. It is unclear what leverage such formulations offer, for either the model’s development, or the analysis of actual classroom materials.

In various places this other “formal interaction” shows up, though it’s the “real” one – the social–situated one – that the model promises to develop. To say that abstractions like problematizing and reconciling are “interactive” is to offer no more than a clarification of a usage that was owned at the outset; “reconciling” implicates something *to be* reconciled. We need only the words, and nothing of the world, to speak this way. The larger question from a situated perspective might be whether and how speaking this way furthers our description or understanding of “problematizing” or “reconciling” (or “semantics” or “systemics”) as actual work in the world on any actual occasion.<sup>8</sup>

## Of Holy Grails

Thus, alongside a largely social–psychological account of interaction in the classroom, “interaction” is also set to use as a term of art within the modeling exercise itself. It is the question of how the model’s parts will interact, as in the interaction between the informational and the social psychological. It is the central problematic for the model, as clearly seen in Jim’s forthright formulation of its “holy grail”:

The holy grail for this quest takes the form of analyses of interaction that require systemic principles of participation in activity systems and semantic principles of meaning and information *in combination* to explain significant aspects of activity. (p. 47, emphasis added)

Two things are clear: the grail is about explaining activity via analyses of the combinatorial interaction of two principles. Social interaction in real time (social action) will be understood only when a *prior* interactions between formal–analytic principles have been understood, and their symmetries revealed. There is also an equity play here, having to do with the informational and the interactional (or the cognitive and the social, the semantic and the systemic). In bringing together these disparate analytic cultures, we could say the question becomes “who takes the lead?” Turning directly to that question – what *kind* of combination they will show – he explains:

I expect we will find it most productive to consider activity to be jointly systemic and semantic “all the way down,” so that whatever the size of an event we choose to analyze, the appropriate analysis will include principles of both informational and interpersonal interaction that function at that gain size in order to explain the event. (p. 48)

There’s much to be said across these formulations, about the promise of explanation, the analytic symmetry of the principles, and also the formulation of “informational interaction.” We understand the promise of explanation well enough in the culture of science. That the situated perspective is being hitched to it may be the deepest innovation that Jim is proposing; explanation is not the kind of work studies of situated action normally do, or can do, in my view.

The innovation here is really to return us – and the situated perspective – to the normative analytic culture whose critique leveraged the insights of situated action from the beginning. Central to the innovation was the argument that there is no deficit of order in the “plenum” of ordinary worlds (Garfinkel, 1996, *passim*). We needn’t import exotic analytic engines in order to understand ordinary worlds; as of their on–going interactional production, they *already* own the terms of their analytic description. And it is description, rather than explanation, that will show us the order of these affairs. (As Ryle [1949] observed, fires have causes; people have *reasons*.)

As for “informational interaction,” we have a kind of pidgin phrase standing between two language groups.<sup>9</sup> Which “interaction” it is – the naturalistic or the formal–analytic – is again not clear, and may have something to do with how we have same principles organizing both real–worldly events *and* the theorized model that explains them. Congruence is thus assured from the outset. Analytically (and rhetorically) the “all the way down” formulation is quite central to the task of bringing the semantic and systemic into alignment. As further developed in a endnote,

The assumption that systemic and semantic principles function jointly. . . is weaker than alternative assumptions that are needed to justify treating either of them as a context for the other. For one of these sets of aspects to function as a context for the other, the two sets of aspects have to be factorable in a way that I believe is empirically unwarranted. (endnote 6, p. 68)

In this passage we glimpse the depth of formal structure – the culture of formal analysis – that is brought to the project, in a couple of ways. That these principles function “jointly” can lead us not to notice that as principles, they have a formal life–presumably in a frictionless theoretical space – prior to the occasions of their

joint functioning. The analytic field they inhabit first shows itself as a neo-classical field of “forms” rather than situated occasions.

Second, the standing of the formal pairing of the semantic and systemic – whether weak or strong – then turns on relations of potential factorability. I’m not sure what this means, or what such a demonstration would require and look like, or what kind of world is required to have it. In my view, we would need to think through these *conceptual* relations first, and when we do, the language of factorability may not be the apposite one at all. Instead, a praxeological or “reflexive” relation seems more likely, meaning that “information” – or meaning – is inseparable from its interactional production, in situ. Were it otherwise, we would be stipulating a new domain of *a priori*es – “informational *a priori*es” – and this would seem to send us in the reverse direction of all that the “situated perspective” and/or the social turn recommends. This perspective does not first parse the world into essential forms or principles, and then puzzle over how they might be functionally re-joined. Meaning is reflexively tied to social practices rather than autonomous structures, and the grail we find here – the task the paper sets for itself – would not seem to be one the situated perspective would recognize, or pursue.

## Some Alternative Analyses

On this central question of how the informational (semantic) and the interactional (systemic) articulate, and in preparing the ground for his treatment of the Fast Plant materials, Greeno turns to some prior classroom studies, “. . .to show that the operation of these principles at different levels of analysis are interrelated” (p. 48). This is his chosen task. My inclinations are quite different, and my aim in this commentary is to show how the work of making sense of classroom lessons is not at all a matter of coeval formal structures “linking up” across different levels and doing so “all the way down.” To suggest how we might proceed in a very different direction, I want to begin with a brief sequence from the Fast Plants lessons. It points to how else we could understand the informational and the interactional in the detail of what indeed the parties are doing, that is, in the produced coherence of their situated productions.

The sequence is quite preliminary to the lesson and the day’s work. We find it near the 3-minute mark of Day 26 (see [Excerpt 1](#) in [Appendix B](#)) where the teacher in charge – I think it’s Mark – has prepared on poster paper an initial lay-out of the plant data the students had previously measured and recorded, referred to as the “Day 19” data (see [Fig. 2.1](#)). The sequence develops from Debbie’s question about the display and reveals a misunderstanding that is entirely competent. At issue is how we are to see a data display, and thus how “information” turns on ways of seeing.

As will be seen in the transcript, Debbie sees the display in ways that were not intended, and we can usefully ask how she did that. Committed to naturalistic inquiry as the situated perspective is, in posing the question “How did she do

that?” we are not inviting formal hypotheses or conjectures to answer it. Nor do we set out to import formal analytic resources from elsewhere, on grounds that the setting itself, in its situated production, is insufficient to the question. (There are, of course, many *other* questions, e.g., psycho-analytic questions, questions of history or biography for which the setting may not be a sufficient resource for answering. But those aren’t *this* question.) Instead, we look to the setting for analytic resources, and immediately find them: We come to understand how she sees the display that way because *her* task is to demonstrate *what* she sees to the others in the room, so as to show the cogency of her questions about it. Explicating her question is not then our task first, it is hers: to instruct the teacher and everyone else in seeing the chart as she does. In the bargain, we’re instructed too. The transcript shows Debbie, the teacher, and an unidentified student.<sup>10</sup>

### ***Excerpt 1 [0:02:46–0:03:47]***

0:02:46 Debbie: I don’t get it at the top it says F six and then day an then nineteen an then (1.0) data an then=  
 0:02:53 teacher: =So this is F six (.) [and it’s al:so:: (1.0) high: lights:  
 0:02:53 student: [( ) F six since day nineteen (2.0)  
 0:02:60 teacher: So thez are tha two- those- those are tha two experiments tha we combined cause there’s rilly no different- uh- bu’ you agree that there’s no difference between those two? If they’r under tha same light (.) an we put six pieces of fertilizer in each one.  
 0:03:09 Debbie: Uhm hmm.  
 0:03:11 teacher: So those are tha two experiments tha we’re looking at, an its on day: (.) nineteen. (1.4)  
 0:03:16 Debbie: So: ( ) tha- tha numbers under day are rilly (.) from F6 an high lighting? (1.0) Cuz there’s- numbers under day.  
 0:03:27 teacher:→ Ths- these aren’t tha col- >are you thinkin these are column headings?<  
 0:03:30 Debbie: Yeah.  
 0:03:31 teacher: They’re not column headings. >Ths is<- F6 (.) an: high: lights: (1.0) frum day nineteen.  
 0:03:37 Debbie:→ Oh:, uhkay.  
 0:03:39 teacher: an: an thRL:- th- th- th- its all: in millimeters.  
 0:03:42 Debbie: Yup. (2.6)

0:03:45 teacher: Ya understand- ya understand what yer lookin' at now?  
 0:03:47 Debbie: Yeah.  
 0:03:47 teacher: Yeah.

I want to defer a close treatment of the transcript and the situated, sequential organizations whereby each instructs the other in how to see the chart. My remarks will be general: Mark – the teacher – shows us that he now sees what Debbie sees [0:03:27]. Beginning with her “Oh...,” Debbie shows that she now sees how else to see the display [0:03:37]. And if we examine the still frame image in Fig. 4.1, I think we can see what the students were seeing from the outset. They may be novices to statistics, but they are something more than novices to reading two–dimensional displays, and what they see makes very good sense.<sup>11</sup>

Borrowing on Gibson’s (1979) notion of “affordances,” I want to say the chart “invites” or “beckons” what Debbie makes of it. She *sees* a structure of rubrics and affiliating columns beneath them. The first line of text is written (as of its situated production) to afford such a seeing: words are spaced so as to align to “data columns” below them (see Fig. 4.1). And the students see this way because they are *practiced* in seeing this way. Seeing information *is* a practice; there is no alternation from the interactional to the informational. It is not two autonomous structures or processes “in interaction.” Whether navigation charts, radiographs, or texts on algebra (Button, 2008; Lynch, 1985; Sharrock & Ikeya, 2000), information becomes “information” *as* the practiced interrogation of a field; information – what we find – is reflexive to the practices for parsing it, and in this very direct sense Debbie’s misunderstanding is entirely competent. Indeed, the premise of her explanation to

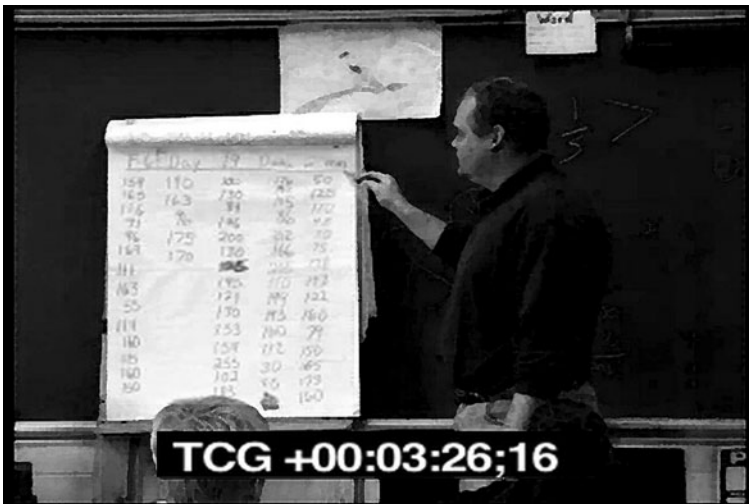


Fig. 4.1 Teacher: “Are you thinking these are column headings?” (Excerpt 1)



Mark and the very possibility that he might see it too is leveraged on the competent practices for seeing they share.<sup>12</sup>

The sequence potentially clarifies the order of relations Jim's paper is seeking, though it shows something quite different from what he finds. Here, the information is constituted *in* the seeing of the display, as a practical, evident seeing that can be taught, learned and also mis-sighted. "Information" thus must have the full complement of a competent community to show itself. Information, in this view, is an achievement or outcome of disciplined practices, as in "how we see a columnar display on the blackboard organized by rubrics, or not," all the way down; it has no prior standing for them or for us. It is a practice, rather than a principle prior to it.

There is a second Fast Plant sequence I want to consider, the one taken up as a "A Lesson in Abstraction" in Jim Greeno's lead paper. It has to do with how the group of Anneke, April, Jewel, and Wally make sense of what Rich – their Teacher – has to say about their initial layout of the plant growth data on graph paper. Roughly, the question becomes whether or not their display needs to identify the individual plants, or whether the "data points" themselves are sufficient as the analytic field. Jim briefly discusses what they, and we, might learn from it:

For the students, I believe there was a significant opportunity to learn about a semantic issue, selectivity, that is inherent in representation. . . . As for a lesson for us analysts: I believe this provides another example of an event for which it is useful to combine semantic principles of information processing and systemic principles of interpersonal interaction to explain what happened. An account of the group's use of ordered numerical intervals requires hypotheses about their knowledge of the number system, the containment of numbers in intervals, and conventions of graphical representation where locations refer to numerical values. . . . On the other hand, systemic hypotheses about the students' positionings in the participation structure and commitments to positions in the discussion also seem to be required. (pp. 58–59)

Treated as a "lesson in abstraction" the characterization is quite sensible within its project of seeking the ties between information, abstraction, representation, and interaction via a hypothetical method. The students are not dealing with plants here, but numbers that represent them. They (the numbers) do so as informational displays and representational mobilities. In this way the three cognates – the informational, abstract and representational – come to rest on the students' first, tentative organization of their Day 19 data, and we can then take interest in how they decide what their graph will abstract and selectively represent, as an informational corpus. I want to call this a formal account of "what the students are doing." A similarly formal and hypothetical account can be assembled of the operative principles of interaction.

To them, however, I want to juxtapose a situated account of what they are doing, paying close attention to what, indeed, as matters of their local, situated actions, they do. Rather than relying on propositional logics, I want to build a praxeological account of how they assembled the agreements and understandings that led to what things came to as a material field. By this alternative account, the lesson confronts the students with practical tasks and reckonings having to do with the 63 measures they have made and how they are to arrange their chart to account for and make use of them in a way that acquits their lesson's tasks.

On this account, the display space is less a “representational space” than a practical one, a material field of practical objects and their arrangements. Signs, displays and representations of various kinds (e.g., stop signs, box scores and radar screens) have their palpable, un-mediated presence too, and it seems to be on this kind of field – an evident, material field of objects and relations *in situ* – that the students are working to find and follow their instructions. The transcript is a long one, and rather than presenting all of it, I’ll present segments fitted to the discussion.

The first feature I want to point to is a commonplace of classroom instruction. It is that the sequence unfolds as an organization of the parties to the interaction. Canonically, classroom instruction shows two parties – the teacher and the class – and we see this organization in how the students collaboratively produce single turns, and/or amend and elaborate single utterances with multiple speakers, each replying to Rich as the teacher. The general organization of the talk is an alternation between teacher and students, as seen in the three exchanges below:

***Excerpt 5 [0:39:15–0:39:24]***

0:39:15 RL: I’m not sure I understand tha, (0.2) tha graph  
tha’ you made: (0.3) I see it goes up, (0.8)  
but [( ) ]

0:39:20 Jewel: [Okay:. (0.4) What- S’okay, I’ll explain

0:39:23 April: We’re not done yet.=

0:39:24 Jewel: =We’re not DONE with our graph yet.

***Excerpt 5 [0:39:43–0:39:56]***

0:39:43 RL: [So lemme- hep- help me out,  
by- I’m gonna have- I- I- see: something up  
there that’s a hundred and twenty one  
millimeters high. Where does that come in on  
yer graph. =

0:39:52 April: =Ah hunerd: [(hundred) an twenty one:  
(.) right [here.

0:39:52 Jewel: [Hunerd: an twenty one:

0:39:54 April: [(also *points to place on*  
*baseline*)]

0:39:55 Jewel: Aroun:d

0:39:56 April: Around there. =

***Excerpt 5 [0:40:05–0:40:11]***

0:40:05 RL: [Wh- What’s over here?

0:40:06 Jewel: >We’re gonna have tha< plant num:bers:. Er-  
like- =

0:40:09 Anneke: = We think. =

0:40:09 Jewel: = plant one, plant two, plant three, plant  
four, [plant five ( )  
0:40:11 Anneke: [But if it doesn't (really) matter.

The last sequence is of interest for both Jim's analysis and mine, as it is where Anneke first expresses some doubt about the unfolding account of her peers. She says in overlap of Jewel: "But if it doesn't matter . . ." [0:40:11]. In the continuing sequence we can see that it is a remark that goes un-rejoined – there's no uptake. An early transcript suggested that it wasn't heard, but that's a difficult assessment to make. "What the parties didn't hear" is not something we normally have access to, unless they tell us. We could, of course, hypothesize some feature of "position" to account for the non-response. Or we could consult the interactional order of its production.

Organizationally, or interactionally, Anneke's remark is distinctive in a couple of ways. First, we should note that it's not the first "qualifying" remark she makes; earlier [0:40:09] she appends "We think" to Jewel's assertion about "having the plant numbers." She thus builds uncertainty into their collaborative turn, to which Jewel seems undeterred in projecting their course of action [0:40:09]. And it's while Jewel is demonstrating how they are going to proceed ('. . . plant one, plant two. . .') that Anneke overlaps. Part of what is distinctive here is that for the first time in the sequence, a student is addressing her peers, and not Rich. The address is achieved entirely as a matter of its placement in overlap and in the token of disagreement that begins it: "*But* if it doesn't matter." It is within this local, situated environment that no one seems to reply.

Wally speaks next—"Cuz it's gonna look all weird." [0:40:13]—but it is difficult to hear which prior turn his turn is joining. (It may align to Anneke's objection; it may not.) More telling for our difficulty, no one orients to Wally as he speaks. What we can see is that Rich speaks next [0:40:15], starting up without gap or overlap, and replies to Jewel, with a question that becomes a next occasion for Anneke to express her doubts.

***Excerpt 5 [0:40:11–0:40:49]***

0:40:11 Anneke: But if it doesn't (really) matter.  
0:40:13 Wally: Cuz it's gonna look all wierd. =  
0:40:15 RL: = Oh you're gonna hav:e, um so you're gonna  
have sixty three different (0.5)  
[plants: here. =  
0:40:19 Jewel: [Plants.  
0:40:20 Jewel: = Yeah. =  
0:40:20 Anneke:→ = Does it matter? With tha- (things are).  
You're trying to figure out those: (.) tha:  
two answers. And it doesn't matter what the  
names of forty-six. the plants are: in those.  
So couldn't you just put (.) data from (.)  
like Day Nineteen? Couldn't you do that? =  
0:40:35 Jewel: = You hafta [organize your data.  
0:40:35 RL: [Sure, you can do anything

0:40:36 April: [you want ( )  
 |But then, but then, if you get it right here,  
 (1.1)

0:40:39 Anneke: Well if it doesn't matter. Cuz you know  
 there's a plant there and you know: that (.)  
 okay, you know there's a plant there, and  
 >then say there's another plant,< same height  
 right there, and then:, you keep going on with  
 [your data.

We could say Anneke was “fishing” in her first two remarks ([0:40:09] and [0:40:11]), seeing what uptake she might find, and from whom. Finding none, she repeats her remark as a question [0:40:20], and answers it herself in her extended turn: Given the two questions they're trying to answer, the names of the plants don't matter. She seems to be addressing Jewel, for how the formulation excludes herself: “*You're trying to figure out. . .*” But she looks directly at Rich in posing her closing question: “*Couldn't you do that?*” In next turn, however, and without gap or overlap, Jewel seems to counter Anneke's proposal, giving a rationale for proceeding as she (Jewel) has suggested, and April [0:40:36] seems to begin a counter too, that ends with a 1.1s pause following her unfinished turn. To them both, Anneke again asserts that it “doesn't matter,” and tells them why, and we now have the direct expression of a disagreement [0:40:39]. As for Rich, he seems to ply a studied neutrality. To Anneke's direct question in line 53, “*Couldn't you do that?*,” he quietly replies in overlap of Jewel, “*Sure, you can do anything you want . . .*” [0:40:35].

Working from Anneke's first embedded remark [0:40:09], we can see how the sequence develops as a different order of speaking from how it began. The students end up speaking to each other, and the difference is quite central to how the group is led to think about their chart – we could say, if we like, how “different information” became relevant. But it arrives not as an informational or semantic organization, but an *interactional* one. We have the developing interactional organization of a disagreement, wherein the matters talked about are inseparable from *how* they are talked about. In my view, neither statistics, abstraction, representation nor information, as professional–conceptual registers, has any purchase on the students' vernacular task as they – and we – find it here. Those registers – the formal ones – are themselves ways of speaking, and in their familiar analytic deployments, they displace our hearing of how the *parties* are speaking. The situated perspective, however, tends to hold its interests in what and how the participants are doing, whatever they are doing.

Anneke [0:40:20] is working from their two assigned questions (she turns and looks to the board when she references them), and it's a lovely question to ask how, as a matter of the interrogation of a question whose answer we don't know, we come to see the puzzle parts we may already possess, and which of them may be the most relevant ones. Their task at this juncture may have far more in common with solving other kinds of bricolage puzzles, like murder mysteries, board games, or the puzzles of following instructions per se (see Amerine & Bilmes, 1988), than with domain knowledge or hypothetical information structures. It is for them first and

foremost a practical task, rather than a theoretical or disciplinary one. They have to *do* something with all these numbers.

Before considering their disagreement and what becomes of it further, I want to make mention of what is sensible, reasonable, and competent about how the students have gone about representing their work so far. It's a difficult assessment to make insofar as we can't actually see the chart in the visual record. But we can note a few things from their talk about it. First is that the students have laid out the grid in a way consistent with their training and understanding of the task. They understand it as an organizational task and they have apparently produced an inclusive organization of the prior week's work. The chart has its axis-orientational properties, and they thoughtfully answer Rich's early questions about placements and procedures for using it. In various places they invoke their competence as resources to their accounts, as when Anneke explains what the "Xs" mean [0:39:39], or Jewel rejoins Anneke that "You hafta organize your data" [0:40:35], or April speaks on behalf of "how a line graph normally is" [0:41:15]. These are among the evidences of their learning so far.

We can also note, following Leona's "reflection notes" on her instructional work with the students, that the graph paper is already a coherent field. Mindful of our first sequence, the graph paper already has its affordances for finding and seeing organizations. As she says: "The graph paper, coming in close conjunction with the recent graphs of the wicking, may have pushed some of the kids in that direction." I want to say it "invited" them to produce and enact competencies that their lessons had already taught them. Those competencies are resources to their learning, and as the sequence unfolds the students *do* come to see their task – and how to organize the chart in a way that is responsive to it – differently. We are agreed on that. What I want to note about the transformation is that it follows from their practical, even vernacular operations on a material field, for which Rich is substantially responsible for putting the field in play. He does so in a couple of ways.

One entails leveraging the developing disagreement between Anneke and the others. Disagreements are witnessable things, and it is in the transformation of interactional organizations that a "change of minds" begins to show itself. We've followed it through Anneke's turn, where she pegs their task to "figuring out those two answers" [0:40:20], and to the explicit disagreement that emerges between her, April and Jewel [0:40:35–0:40:38]. Following Rich's initial neutrality, he now—in overlap of Wally—takes the turn space for a reply to Anneke's extended turn [0:40:39], and returns to Jewel's first counting of the plants [0:40:50]. There's a lovely ambiguity in his offer to "answer your question." Whose question? April's unfinished one [0:40:36], Anneke's pointed ones [0:40:20], or "the question of their disagreement?" We can note that when Rich thus returns to the counting of the plants, it is April and Jewel who respond and confirm that he's doing it as they proposed at the outset [0:41:04–0:41:05].

And *then*, with their disagreement in hand, he returns to, repeats and thus warrants Anneke's question: "How does it help you answer your question?" [0:41:05]. In returning to it, and in addressing April and Jewel, he weighs in on

the disagreement. This is not a matter of “information,” but of hearing interactional alignments and horizons: *That* he aligns with Anneke’s disagreement is a central resource for the others to hear Anneke’s remarks as something to which they might want to consider further, which they do: They turn the task to one that will be measured to their questions. They agree to the good sense of “seeing that way.”

### ***Excerpt 5 [0:40:39–0:41:15]***

0:40:39 Anneke: Well if it doesn't matter. Cuz you know there's a plant there and you know: that (.) okay, you know there's a plant there, and >then say there's another plant,< same height right there, and then:, you keep going on with [your data.

0:40:49 Wally: [(Did you take those off of [there)?

0:40:50 RL: → [(Okay let me) answer your question. Like let's say the first plant (.) I'll call it Plant One, and I look over I'm going to call one hundred and fifty nine, Plant One. And then I look over there: and I see: a one hundred and sixty-five, that's Plant Two?

0:41:04 April: Yeah.  
(1.0)

0:41:05 Jewel: Yeah.

0:41:05 RL: → How does it help you: answer your question,  
(1.0)

0:41:08 Jewel: Well but [you said-

0:41:09 RL: [if I call one Plant One and the other Plant Two?

0:41:13 April:→ It doesn't.  
(0.7)

0:41:13 RL: → It doesn't.

Were we to leave it at this – as a matter of disagreements and their alignments – we might have an unremarkable social–psychological account: Rich, as an “opinion leader,” transferred “capital” to Anneke’s position and gave the others reason to think better of it. He “weighed in” on the issue, and for all sorts of reasons he “weighed” the most. And indeed, something like that happened. Students do listen when teachers show alignments. But if this were the opening, how Rich then proceeded, and had proceeded from the outset, is an entirely different matter.

This point is tied to my hunch that there is a great deal about the professional practices of classroom teaching in its situated particulars that the instructional literature has yet to describe or begin to take interest in. In the particulars here, I want to say that the very best classroom teachers are very very good at giving “hints,” and that this is what Rich is doing throughout; giving hints and building the grounds for pursuing them, where hinting is a practical game of nurturing the conclusions of others. As it is exercised here, hinting yields agreement. It seems to go like this:

From the outset, he frames his comments and questions as difficulties for *his* understanding. He invites their instruction [0:39:15] and the gambit recurs across a series of questions about their subsequent answers and instruction (i.e., [0:39:37] and [0:39:43]). For the students, this entails “giving accounts” and then demonstrating the sense of them by making *use* of the display, where they jointly answer his question of where something “121 millimeters high” would find its place [0:39:52–0:39:56]. They answer with confidence, noting relevant sources of uncertainty and there are a series of questions like that (e.g., [0:39:56], [0:39:60], [0:40:02], [0:40:05]). To each of them they answer, and across each of these question–answer pairs he and they progressively “tame” the field of the paper. That is, they produce-in-interaction a field of locational ‘here’s and ‘there’s held in common (see, for example, [0:39:56–0:40:03]). These aren’t statistical ‘here’s and ‘there’s, nor abstract, nor representational, nor informational ones. They are rather practical locations *on the page*, found in and through their talk about it, that begin to fill in the chart as one they see the same way, point to in the same way, to same places, by similar reckonings, and thus navigate in a same way as thoroughly practical tasks and actions. In their collaborative pointings we see their competence to the topography of the chart, as a topography–in–use. These are among the organizational achievements of their situated actions (see Fig. 4.2).

What they achieve is a stable, navigable field. As an activity, we can call it “pinning down the bed sheet,” wherein we begin at one corner – my guess is that pretty much any corner will do – and proceed to the others until the sheet – the chart – is finally in place. Only then can we step back, take a look, and decide whether it’s well fitted or not. That’s the second piece of Rich’s work, contingent on the first. With the sheet in place – I want to shift metaphors and say with the Game Board in place – we can then begin to throw the dice, take our turns and see where we can go. Having gained their assent to his questions, thereby reflexively setting in place this local topography of “heres & theres,” what Rich does next is to organize a scenario for its use. As Anneke remarked, “you keep going on with your data” [0:40:39], Rich enacts the same theme: *Can* they “go on” with the layout as they have organized it so far?



**Fig. 4.2** Group 2’s collaborative point (Excerpt 5)



That is, he asks for and gets confirmation that they intend to have “63 plants here . . .” [0:40:15]. And then, he begins a mock-up of how they would “bring the plants to the chart” [0:40:50]: that they would look for Plant 1, and then look for Plant 2, and he does so as a way of pointing to an iterative sequence – counting by plants – to show, projectably, how it *cannot* proceed. And this is what Jewel sees in her agreement [0:41:04], in next turn to April’s, and evidences in her brief protest: “Well, but you said-” [0:41:08]. She and April have discovered a counting game that can’t go on *that way*. They see the horizon of moves Rich is pointing to as moves in a pointless game. And they see it in ways having nothing to do with number systems, ordered intervals, or any variant or form of formal logic. It *does* have to do with a local history of moves on the graph paper, but in an entirely practical, rather than disciplinary way. We don’t need hypotheses to account for it – hypotheses won’t account for it – but descriptions of what, indeed, they are doing, might.<sup>13</sup>

There is more to the sequence, but I want to conclude my treatment here. Rich and the students are not working on an abstract or representational field, but a material one. It is only *as* a material field that his instruction – his methodic questioning, hinting and practical demonstrations that lead to agreement – can work. They are not organizing an abstract formal structure, but a local field of places and reckonings, and are led to the practical activity of “counting” of a kind. Rich organizes it so as to show *in* their answers to his questions a practical topography and what can and can’t be done with it. This is what they are led to see, and agree to. Produced and discovered as of their situated interrogations of the field through their work together, what they see is joined at the hip to how they proceed. In every case, information has a praxiological foundation.

There is of course a logic at play here, but one that cannot dispense with the local organizations of these situated enactments. It is not the logic of “information” or “representation,” but of local grammars of action that are intimately, reflexively tied to a vernacular field. Working from within this local, situated assemblage, they discover and agree upon a way to proceed, and we can understand how they do so without recourse to binaries that set interaction on the one side, and information, or even cognition, on the other. The contrast to a formal analysis could not be more bright.

Are we witness to the play of formal structures of cognition, abstraction and information here, or to local orders of coherence produced in situated action? It is a very large question, on which a great deal, at least in the professional literature, turns. Wittgenstein (1967) offers a concise formulation of these analytic alternatives – and the pedagogies they own – in the form of a question. Depending on our answer, we will proceed in very different directions. And irrespective of how we answer, we can see an incommensurability between them, and an intimation of deep conceptual difficulties for any proposal to integrate them. The question is this:

Does a child learn only to talk, or also to think? Does it learn the sense of multiplication *before* – or *after* it learns multiplication? (§ 324)

The questions are turning the same ground, but the second question is more accessible. We can phrase it this way: Does a student learn the sense of statistics as matters

of mathematical logic, reason, abstraction, representation, and the rest, *before* or *after* she learns how to put together statistical displays and do things – normal things – with them? Clearly, if the answer is “before,” then educational research in its pursuit of “authentic” thinking, domain knowledge, conceptual change, formal reasoning, “thinking like a statistician/scientist/mathematician,” etc., is on the right path. Authentic practice is not only at the end of the curriculum, on this account, it must be from the beginning too. This has long been the prevailing wisdom of the literature in its calls for authentic practices all the way down. Among other things, this path has produced a remarkably resilient, and even moral, history of dissatisfactions. It leaves us, as Jim is, less than satisfied with the performance of these students, and perhaps the teacher too. His summary assessment of the Fast Plants sequence concludes:

On the other hand, the opportunity for conceptual agency was also limited. The concepts were illustrated in the discussion, and students participated in the discussion that included the concepts. However, meanings of the concepts seem to have been drawn out from the students, rather than having been initiated by them. Thus, their agency in understanding was primarily animating, rather than authoring. . . (p. 65)

If, however, the answer to Wittgenstein’s question is *after* – that novices of any and every stripe come to understand their practice, whatever it may be, *after* they have learned how to do it – then our entire vision of what these students are engaged in doing is changed, and our interest in and understanding of their pedagogy transformed. We see Rich’s work of “materializing the graph” as the work of setting in place a local curricular field in which students can see, produce, point to and remark on alternative schemes of use, having to do with actual, iterable moves within a cogent, situated horizon of moves, and then make assessments of “goodness of fit” to their practical tasks at hand. In this light, the lesson strikes me not only as a nice piece of work by Rich and by them, but an instructive piece of work for us, and for whomever would take interest in learning how to teach the actual, practical, even craft-based mobilities of simple statistical displays.

## Conclusion

In a very brief passage, Harold Garfinkel (2002) characterizes ethnomethodology’s program as “a program for the reform of technical reason . . .” (p. 93). He doesn’t say much more about it. Alternatively, everything he says – and has said – is about it, and it may be a very useful way of thinking about the situated perspective in educational studies.

“Technical reason” would have it that the students are, or should be, engaged in plying the formal, technical categories and cognitive operations of mathematical practice, including things like conceptualization, abstraction, representation, both the direct and indirect varieties, and their cognate formal practices. The project of technical reason underwrites educational research in the twentieth century. It is a cultural program as much as a technical one, promising to write a learning and/or

instructional theory that would clear a path from novice to practitioner in formally reproducible terms. It has been the holy grail of educational studies for a very long time.

To “reform” it would be to say that these things look quite different when we take up the ordinary work of the world on actual occasions. This is the central thrust of the situated perspective, and also what contemporary studies of science and the workplace are showing us as well. As Lynch (1993) observes of science studies in particular, when we begin looking closely, “The spectacles of science and technical reason are likely to dissolve into myriad embodied routines and diverse language games, none of which may be uniquely scientific” (p. 316). There is no “devalorization” here. Science is no less scientific for having described its situated productions. So too for each and every professional domain (math, history, writing, etc.).

On the other hand, and substantially moving in the opposite direction, I think the contemporary literature in math and science education is quite determined to write new descriptions of technical reason into the curriculum as the bases for effective instruction and design. In my view, this is the aim of Jim’s paper, what it hopes to achieve, and most especially what it hopes the “situated perspective” will deliver. I take interest in it as a proposal both familiar and novel, innovative, and yet also ambivalent to its own innovations. I find in it the confirmation of a larger impression about the literature in social cognition, that for having discovered the social, it tends to imagine that we can have it on the formal, technical and cognitive terms that the literature already owns. We see it in passages such as the following, where Jim is speaking of the Habitech materials on mouse populations.

Here we hypothesized ways in which aspects of moment-to-moment interaction can be explained in terms of students’ positioning and their processing of information. (p. 50)

The passage is in hot pursuit of foundations for moment-to-moment interaction, and the foundations (cognitive) are completely familiar.

But we can’t have it both (or any) ways. We can’t have it that it is the interactional-informational pair “all the way down,” or that “information is assumed to be constructed in the interactive process,” or that position is the systemic dimension of interaction, *and then* propose that interaction can be “explained” by positioning and information processing. That which interaction organizes, constructs and/or achieves cannot then stand as interaction’s *explanation*. Note further that what is to be explained is “moment to moment interaction,” as though it were a kind of epiphenomenon. Yet by ethnomethodology’s reading of situated action, at least, the organization of interaction in real time is the generative site of meaning, and thus of order, structure and recurrence. By this account, the description and understanding of moment-to-moment interaction *is* the “situated perspective.” The problem I am pointing to, however, is not so much a logical one, as a dispositional or grammatical one. The troubles I am pointing to are the kinds of infelicities that follow when we aim to integrate incommensurate understandings of how meaningful social worlds work.

The incommensurabilities enforce a choice. In the choice expressed in our position paper, “interaction” becomes a social-cultural coat hanger for the venerable

formulations of cognitive science: information, schema, motivation, memory, routines, etc. It becomes the place where these formal structures show themselves in public, and this tends to confirm the sense that it is not the cognitive that is being appropriated to the social, but quite the other way around. As Button (2008) remarks in his review of Hutchins' (1996) discussion of "distributed cognition," we have a move that offers no re-appraisal of the computational model of mind, but rather a demonstration

that the cultural world can indeed be handled in the very terms of cognitive science. Thus, showing that it is possible to re-describe the world in cognitive terms is to demonstrate the extendibility of cognitive science from descriptions of a supposed inner world, to descriptions of the outer world. (p. 95)

In trying account for how a discourse that affirms a "situated perspective" moves at once in the direction of formal, technical reason, I've come to think of it this way:

A parallel innovation in educational studies in the last 20 years has been the emergence of the metaphors of "knowledge domains" and "apprenticeship." We now understand that literacy, for example, and math and science, have their distinctive knowledge and/or competence domains, and thus to develop curricula and accelerate learning we are advised to consult how the "masters" do it. The advice is not new (see Duschl's [1985] history of science education), though our descriptions of what they do, rendered as formal structures of mature professional practice, are. Holding aside how these renderings may suffer from similar conceptual knots, these moves have yielded what I want to call a kind of "Whig Developmentalism."

The "Whig" here borrows from the formulation "Whig History" by Herbert Butterfield (1931) in his critique of how the history of science, among other histories, is practiced. The sense of the phrase in his context was this:

The Whig historian stands on the summit of the 20th century and organizes his scheme of history from the point of view of his own day. . . he will find it easy to say that he has seen the present in the past. . . when in reality he is in a world of different connotations altogether. (pp. 12–13)

By "Whig Developmentalism," I mean the program wherein we take the measure of what novice students are (or should be) doing by writing our accounts of them in the image of professional practice.<sup>14</sup> This is the "authenticity" discourse, wherein for whatever they are doing in the room, we see into, expect for, and measure their doings to canons of mature practice. We see them alternatively approaching or faltering on the path toward professional, disciplinary understandings and identities. We look for evidences, and then remedies, as though we were "seeing the future in the present," and fail to notice how *they* may live in worlds of "different connotations altogether." Thus the desire, expectation and disappointment when they fail to "think like a mathematician, scientist, writer," etc.

Aside from the fact that contemporary science studies are re-writing our descriptions of mature practice, the risk of Whigishness is that we may substantially *miss* what is cogent and competent about what indeed the novice students *and* their teachers are doing. The alternative understanding I'm suggesting – wherein organizations of common understanding re-specify those of technical reason, and thus teaching

and learning – trades on a very different reading of “situatedness” and “situated action.” This reading would lead us to inquire, among other things, into how we assemble and set in place practical, evident, vernacular worlds for children, worlds that are, *as of* their practical accountability, teachable and learnable to those who do not already know them, and that our inquiries into classroom lessons might usefully begin just there.

Such a program surely runs against the grain of the cultural and analytic commitments of the larger research community, against the grain of an explaining science, against as well the culture of theorizing formal structures and crafting new design dimensions from them. But perhaps most unsettling of all, it runs against the identifying appointment of the educational research literature, to design accelerating programs for the teaching and learning of children.

By the reading I am recommending, it is not the children who stand to be instructed by the situated perspective (though they may well be the beneficiaries of the instruction of others). It is rather the *adults* in the room. A pedagogy for *us* follows from these descriptions. By these descriptions we stand to reconsider some of our most familiar ways of seeing and speaking of educational tasks and settings and perhaps clarify some venerable conceptual confusions. My premise is that the close description of a practice is at once a *curriculum* in that practice, and a pedagogy for those who would learn how to do it. Such descriptions may be instructive for the community of professionals who work there, and perhaps also for the research community.

It is not simply that I want to pose an alternative to the understanding of interaction and situated action that we find in this position paper. I also want to point out how it falls victim to the larger program it pursues. The divide between the cognitive–informational and the social–interactional delivers the theoretical problematic that organizes the paper. How to integrate the pair is the grail; integration is the puzzle, whether weak, strong, factorable or not. But it is a puzzle of the analytic program’s own making. For having stipulated to the semantic and the systemic, it has created the problem it intends to fix. All manner of effort and consideration is then devoted to this task, as though it were a task that the world of classrooms in their situated enactments had offered up. It has not. Our understandings of classrooms as places where novices find instruction in the situated productions of their lessons will require a substantially different analytic program and vision. The notion of situated action has much to teach us. But we will lose the instruction if we render it in terms already familiar, already authorized, as though the situated perspective were an under–laborer in the service of certainties already owned.

## Notes

1. Pauses are very nice things for making sense of the “essential reflexivity” of practical action that Garfinkel elucidates (1967). Briefly, when witnessing an interactional pause, in all the ways in which such a thing can be meaningful (e.g., following an accusation, a proposal of marriage, an answer in class) we routinely do *not* witness our joint authorship of its production. A silence is anyone’s to end and everyone’s to produce, yet the pause

achieves an objective status, notwithstanding this praxeological organization. The pause as an organizational thing is reflexive to its methodic social production.

2. In a brief passage from his lectures where he is assessing what might be gained from the study of ordinary conversation and what kind of program would be required to handle it, Sacks (1984) speaks of it this way:

It is possible that [the] detailed study of small phenomena may give an enormous understanding of the way humans do things and the kinds of objects they use to construct and order their affairs...

We would want to name those objects and see how they work, as we know how verbs and adjective and sentences work. Thereby we can come to see how an activity is assembled... What we would be doing, then, is developing another grammar. And grammar, of course, is the model of routinely observable, closely ordered social activities (p. 24)

3. The tradition of formal analysis is of course the tradition of social science. We see something of the exercise in the table titled “Levels of analysis of cognition in activity” (Greeno, Table 3.1) as it outlines the programmatic differences between information theory and the situated perspective over a generically represented career path of developing competence. The coherence of the chart has no need for actual cases; cases in their constitutive detail would only and hopelessly complicate the chart’s (generic) articulations. We could say the chart offers a narrative structure of a kind; a kind of telling disengaged from the actual, real-worldly affairs it speaks of. This is no remark on how well it is done; it is done very well, that way.
4. There is also the sociolinguistic in this first formulation. It seems to have no further play in the paper.
5. There are a great many hypotheses in the paper, an analytic–rhetorical form one doesn’t often see in the situated perspective. When we seek explanations but have, as the natives do, only the “surfaces” of things to work from, conjecture (hypothesis) is an honored way of proceeding, however much it may lead us away from whatever those surfaces may have to tell us.
6. Though references to how interaction “produces” or “generates” meaning, information or informational structures recur, we don’t quite see it in the analyses that follow. Most especially, we don’t see the meaning–production or information–production work of interaction *in* the classroom materials.
7. It is one thing to observe how authority was distributed differently in the Fast Plants materials than in other settings (see Greeno, p. 66). One may even prefer one “distribution” over another on moral, professional, political, or cultural grounds. Yet it would seem to be quite another to say that students learn better *because of* one or another form. Attractive as it is, to suggest as much is to return us, by technical degrees, to the notion of “best” instruction, or even best “culture.” (See McDermott, 1977 for a convincing reminder of why we may not want to be thinking that way, again.)
8. Though I use the phrase a “situated perspective” in the singular, I hope that it is understood that I mean no single, unifying thing. Quite the contrary, there are many of them, each attached to an analytic community that owns a distinctive understanding of the order of meaningful worlds. The proliferation of “constructivisms” in social science is a recent example of this diversity (see Lynch, 1998).
9. An early passage is emblematic of the delicacies of hybridization: “The situative concepts refer to processes that are hypothesized to occur at the level of activity systems and joint participation in communities of practice” (p. 43). Though the phrases are recognizable, I doubt that anyone writing the literature of situated studies of social action would ever say such a thing. Situated action is not a hypothetical in the first instance, nor an aggregate of processes, nor a discrete level within a structure of levels. It is precisely this kind of formal parsing that the analysis of situated action critiqued and set aside (see Garfinkel & Sacks, 1970).

10. The transcripts presented here have been extracted from the longer and more elaborate excerpts found in [Appendix B](#). For ease of discussion, I have inserted arrows and added some timings. These changes remind us that there is no single, best transcript. No one is ever exhaustive, and all are built to serve analytic interests. For some, this is a theoretical matter. For me, and not unlike the students, it is far more practical.
11. Recent work by Goodwin (1996; 1997; 2003) has given us a series of analyses and demonstrations of how meaning and definite sense and reference are achieved in action. Whereas theories of schemata premise an “internal eye,” the information–seeing Goodwin describes is entirely practical and real-worldly, as it is in our sequence. See also Rogoff (1990) on the kinds of skills honed and honored in classroom instruction. The navigation of two–dimensional displays is central among them.
12. Note also how Mark’s effort to fix the display by underlining the “heading” to set it apart from the columns only furthers the good sense in which the two are seen as an ordered array (see Fig. 4.1). “Information” is difficult to contain; it dissolves into the grammars that give it shape, as in how an archeologist teaches a student to see a clump of stratified soil as information (Goodwin, 1996).
13. Analyses of situated action tend to take interest in “small” things that yield larger organizations of sequential order, structure, and thus meaning. As one small thing, note the 1.0 s pause following April’s agreement [0:41:04], prefacing Jewel’s agreement [0:41:05]. It marks Jewel’s agreement as “compelled.” That is, in the duration, Jewel sees and shows that she has no choice *but* to agree to Rich’s prior formulation that “that’s Plant 2,” and what she shows in her agreement is how the iteration it projects makes no sense. It is the central moment in which she discovers that her arguments cannot “go on.” She *sees* how this is so across the local spectacle of April’s agreement. Note further how she attempts a shift of responsibility for why they would ever have seen things that way, “Well but you said-“ [0:41:08]. Her protest can’t go on either.
14. One may counter that developmentalism is *of course* “Whiggish” – how *they* become like *us* is precisely the question. But the literature on “authentic practice” tends to write a version of the 17th century homunculus: They were like us all along; they are to be like us from the beginning. The resulting account is steadfastly, and morally, normative and self-referential.

## References

- Amerine, R., & Blimes, J. (1988). Following instructions. *Human Studies*, 11, 327–339.
- Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 18(1), 32–42.
- Butterfield, H. (1931/1965). *The Whig interpretation of history*. New York: Norton.
- Button, G. (2008). Against ‘distributed cognition.’ *Theory, Culture & Society*, 25, 87–104.
- Cook–Gumperz, J. (1977). Situated instructions: Language socialization of school age children. In C. Mitchell-Kernan & S. Ervin-Tripp (Eds.), *Child discourse*. New York: Academic Press.
- Costall, A. P., & Leudar, I. (1996). Situating action. *Ecological Psychology*, 8(2), 153–170.
- Coulter, J. (1983). Contingent and a priori structures in sequential analysis. *Human Studies*, 6(4), 361–376.
- Coulter, J. (1989). *Mind in action*. Oxford: Polity Press.
- Coulter, J. (1991). Cognition in an ethnomethodological mode. In G. Button (Ed.), *Ethnomethodology and the human sciences* (pp. 176–195). Cambridge: Cambridge University Press.
- Coulter, J., & Sharrock, W. (2007). *Brain, mind, and human behavior in contemporary cognitive science: Critical assessments of the philosophy of psychology*. Lewiston, NY: The Edwin Mellen Press.
- Dewey, J. (1929/1960). *The quest for certainty*. New York: Capricorn Books.
- Duschl, R. (1985). Science education and philosophy of science: 25 years of mutually exclusive development. *School Science and Mathematics*, 85, 541–555.



- Edwards, D., & Potter, J. (1992). *Discursive psychology*. London: Sage.
- Erickson, F. (1977). Some approaches to inquiry in school-community ethnography. *Anthropology & Education Quarterly*, 8(2), 58–69
- Garfinkel, H. (1967). *Studies in ethnomethodology*. Englewood Cliffs, NJ: Prentice Hall.
- Garfinkel, H. (1996). Ethnomethodology's program. *Social Psychology Quarterly*, 59, 5–21.
- Garfinkel, H. (2002). *Ethnomethodology's program: Working out Durkheim's aphorism*. Lanham, MD: Roman & Littlefield.
- Garfinkel, H., & Sacks, H. (1970). On formal structures of practical actions. In J. C. McKinney & E. A. Tiryakian (Eds.), *Theoretical sociology* (pp. 337–365). New York: Appleton-Crofts.
- Garrison, J. (1994). Realism, Deweyan pragmatism, and educational research. *Educational Researcher*, 23(1), 5–14.
- Geertz, C. (1973). *Local knowledge: further essays in interpretive anthropology*. New York: Basic Books.
- Gibson, J. J. (1979). *The ecological approach to visual perception*. Boston: Houghton Mifflin.
- Goffman, E. (1964). The neglected situation. *American Anthropologist*, 66, 133–136.
- Goodwin, C. (1996). Professional vision. *American Anthropologist*, 96, 606–633.
- Goodwin, C. (1997). The blackness of black: Color categories as situated practice. In L. Resnick, R. Salpo, C. Pontecorvo, & B. Burge (Eds.), *Discourse, tools and reasoning: Essays on situated cognition* (pp. 111–140). New York: Springer.
- Goodwin, C. (2003). Pointing as situated practice. In K. Sotaro (Ed.), *Pointing: Where language, culture and cognition meet*. Mahwah, NJ: Lawrence Erlbaum.
- Hacker, P. M. S. (1999). *Wittgenstein*. New York: Routledge.
- Hutchins. E. (1996). *Cognition in the wild*. Cambridge, MA: MIT Press.
- Lynch, M. (1985). *Art and artifact in laboratory science*. London: Routledge and Kegan Paul.
- Lynch, M. (1993). *Scientific practice and ordinary action: Ethnomethodology and social studies of science*. Cambridge: Cambridge University Press.
- Lynch, M. (1998). Toward a constructivist genealogy of social constructivism. In I. Velody & R. Williams (Eds.), *The politics of constructionism* (pp. 13–32). Thousand Oaks, CA: Sage.
- McDermott, R. P. (1976). Kids make sense: An ethnographic account of the interactional management of success and failure in one first-grade classroom. Unpublished PhD thesis, Stanford University, California.
- McDermott, R. (1977). Social relations as contexts for learning in school. *Harvard Educational Review*, 47(2), 198–213.
- Mead, G. H. (1932/2002). *Philosophy of the present*. Amherst, NY: Prometheus Books.
- Mehan, H. (1979). The competent student. *Working papers in sociolinguistics*, 61. Southwest Educational Development Laboratory, 1979.
- Miller, G. (1977). *Spontaneous apprentice: Children and language*. New York: Seabury Press.
- Moerman, M., & Sacks, H. (1971/1988). On 'understanding' in the analysis of natural conversation. In M. Moerman (Ed.), *Talking culture* (pp. 180–186). Philadelphia: University of Pennsylvania Press.
- Payne, G., & Hustler, D. (1980). Teaching the class: The practical management of a cohort. *British Journal of Sociology of Education*, 1, 49–66.
- Phillips, S. (1972). Participant structures and communicative competence: Warm Springs children in community and classroom. In C. Cazden, V. John, & D. Hymes (Eds.), *Functions of language in the classroom* (pp. 370–394). New York: Teachers College Press.
- Pickering, A. (1995). *The mangle of practice*. Chicago: University of Chicago Press.
- Polanyi, M. (1967). *The tacit dimension*. New York: Doubleday.
- Quine, W. V. (1960). *Word and object*. Cambridge, MA: MIT Press.
- Rogoff, B. (1990). The cultural context of cognitive activity. In B. Rogoff (Ed.), *Apprenticeship in Thinking* (pp. 42–61). New York: Oxford University Press.
- Ryle, G. (1949). *The Concept of Mind*. Chicago: The University of Chicago Press.
- Sacks, H. (1984). Notes on methodology. In J. M. Atkinson & J. Heritage (Eds.), *Structures of social action* (pp. 21–27). Cambridge: Cambridge University Press.

- Sacks, H. (1992). *Lectures on conversation* (Vols. I–II). In G. Jefferson (Ed.), Oxford: Blackwell.
- Sacks, H., Schegloff, E., & Jefferson, G. (1974). A simplest systematics for the organization of turn-taking for conversation. *Language*, 50, 696–735.
- Sharrock, W., & Ikeya, N. (2000). Instructional matter: Readable properties of an introductory text in matrix algebra. In S. Hester & D. Francis (Eds.), *The local education order* (pp. 245–270). Amsterdam: John Benjamins.
- Suchman, L. (1987) *Plans and situated action: The problem of human machine interaction* Cambridge: Cambridge University Press.
- Winch, P. (1990). *The idea of a social science* (2nd ed.). London: Routledge.
- Wittgenstein, W. (1958). *Philosophical investigations* (G. E. M. Anscombe, Trans.). New York: Macmillan
- Wittgenstein, W. (1967). In G. E. M. Anscombe & G. H. von Wright (Eds.), *Zettel*. Berkeley, CA: University of California.