EDITORIAL

Specifying the ethnomethodological "what more?"

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Although there exists an impressive array of research methods in science education, all of this research is such that it *specifies* methods, which, in and through this specification, are made to be something special, something that human beings do not normally employ. There is also a question about how to deal with difference, a question that is sharpened when investigated from the perspective of ethnomethodology. In this editorial, I reflect on both issues, beginning with fictional reflection on difference constructed on the model of Fyodor Dostoevsky's internal monologue[1] and then present the case of ethnomethodology as (radically) asymmetrically alternate, incommensurably different method.

On difference

"You're intolerant!" My colleague's words are ringing in my ears. We are discussing an article[2] that I had published in this journal under the editorship of Ken Tobin. "You're intolerant and you cannot accept difference!" I am flabbergasted. "Is there not precedence that the converse is true?" It is true, the article I have contributed to the field has raised the ire of some scholars in the conceptual change field. Have I not acknowledged the voice of the other in framing my radically incommensurable alternate to the conceptual change position? Cannot from my results be derived the results that conceptions and conceptual change research achieve, but the reverse is not possible? I hear my colleague again, "You

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[1] This internal monologue is fictional. Internal monologues can be fundamentally *dialogical*, as Bakhtin (1984) shows in the analysis of much of Dostoevsky's oeuvre; and dialogues can be entirely *monological*. Bakhtin supports his analysis by showing how an internal monologue can be represented as a conversation between the protagonist and his own voice reflected through the perspectives of others. I used the reverse procedure, writing a dialogue first and then transposing it into an internal monologue. In parts of this editorial, the literary 'I' and the author in the text are blended, but both are, following Bakhtin, literary figures and therefore different from the author in his everyday life. This is also and especially the case even for autobiographies (see, e.g., Bakhtin and Medvedev 1978).

[2] See Roth et al. (2008).

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are insensitive to difference and you cannot accept it but want to sleight the work of others." Why does the "You're intolerant" continue to ring in my ears as I think about the particular companion piece[3] I have written? In that piece I suggest the relation between the two kinds of research to be one of *incommensurability*. This is so because I specify *the work* that goes into the making of data and others report patterns drawing on a special method described in a dedicated section of the publication.

"My way of proceeding is asymmetrically alternate and therefore incommensurably different," I remember myself saying. "What I am doing is not just different; it is incommensurably different." I can still see my colleague's annoyance. "You should be accepting the work of conceptions researchers with a Garfinkelian 'what more?' attitude."

"But this is what Garfinkel[4] suggests," I remember having responded with a sense of desperation. "I am *doing* what Garfinkel suggests ethnomethodology does, provide an articulation of how people pull off the interviews and therefore provide the materials from which conceptions and conceptual change are extracted." "You are putting yourself on the high horse, you think you are better!" "I do accept difference," I remember having said in the attempt to help my colleague understand, "but it is not the same difference you are talking about." "You are not listening," he says, "you are not tolerant of difference. You are, as always, only re-iterating your own point." "But what I do is not the same," I insist, "and Garfinkel and Sacks have a way of articulating this difference. These authors articulate this difference by means of brackets, such as in {doing [interviewing according to a semi-structured protocol]}, to emphasize a pair, 'where expression, [], is prefaced with «doing» in order to emphasize that accountable-conversation-as-a-practical accomplishment consists only and entirely in and of its work'?"[5] I continue, "This work is entirely the interview participants' work. I am attempting to specify the *work*, not describe the structures that appear in brackets, [], descriptions of which formal analysis reports. All of *your* differences, in contrast, occur within the corpus of formal analysis." "I am getting angry, let's not continue with this conversation," he says. I cannot even tell him what I want to add, which is that conceptions and conceptual change researchers have to be competent users of the very misconceptions that they identify to be able to identify them, and that this is precisely what I thought my work was showing. I cannot tell him that stopping us cold is not dialogical—I respect him too much to rub him with yet another citation.

Formal analysis (FA) and ethnomethodology

Many areas in science education have achieved corpus status, including, for example, a corpus on students' and teachers' views of the nature of science, another one on these members' beliefs, and yet another corpus on conceptions and conceptual change. The corpus status of these literatures is undeniable, well known, and pointless to dispute. In the same way as ethnomethodology, science education can only gain when it follows ethnomethodology and focuses on "'What more' is there that users of formal analysis know and demand the existence of, that [formal analysis] depends upon the existence of for [formal analysis]'s worksite-specific achievements in carefully instructed procedures, that [formal analysis] uses and recognizes everywhere in and as its lived worksite-specific practices" (Garfinkel 1996, p. 6). Formal analysis is different from ethnomethodology precisely

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[3] See Roth (2008).

[4] See Garfinkel (1996).

[5] See Garfinkel and Sacks (1986, p. 172).

because of a difference in the methods. In formal analysis, quantitative or qualitative, methods are specified. If these methods were the everyday mundane *methods* of the people (*ethno-*) no such specification would be required: the methods would go without saying. Ethno-methodology is concerned with the specification of the methods of the people, the methods by means of which the structures of the world they inhabit come to be produced and recognized. In the specification of *its* methods—described more or less clearly and comprehensively—formal analysis makes evident that its methods *are* different. But ethnomethodology points out that underlying these different methods remain the competent methods of the people, which are a required competence on the part of analysts to have any chance of perceiving and understanding what people are doing.

We may ask the question about the nature of the "what more?" by considering the following instant of an interview conducted as part of a classroom-based study of conceptions and conceptual change concerning chaos theory conducted in 1995 in Kiel, Germany, together with Reinders Duit (who had co-authored the article on the conceptual change perspective in *Cultural Studies of Science Education* Volume 2, Issue 2), Michael Komorek (then a postdoctoral fellow), and Jens Wilbers (then a doctoral student). This, as the other interviews that we conducted, followed a unit on chaotic systems and was designed to produce the materials (transcripts) from which students' conceptions were to be extracted.

Formal analytic method and its results

The following excerpts from a research article that I co-authored (Duit et al. 2001) exemplify how formal analytic research proceeds in specifying its methods as something different from its results, which nevertheless require competencies that are not described. The descriptions are typical for the formal analytic methods, which, in their very specification, articulate that there is something different required in research than in the normal, mundane, and everyday way of talking about chaos theory and related phenomena. The method for interviewing the students was specified in this way:

> Interviews with 12 students and students' notebook entries during the unit completed the data corpus…. For the interviews which were conducted one week after completion of the unit, we selected 8 of the students from the videotaped groups, and 4 others who were willing and able to express their views and understandings on the topic (7 female, 5 males). The interviews were semi-structured. They were structured in that all interviewers followed the same topics, covering the chaotic systems from the unit and an additional one that they had not seen in class (protocols are available from the authors); they were open in so far as they allowed interviewer and interviewee to explore relevant issues in depth without an a priori structure. (The interview schedule and initial questionnaire were based on the results of earlier pilot studies…; these are available from the authors upon request.) (p. 291)

The method of analysis was articulated in this way:

> The authors met for daily discussions and interpretations of issues that arose during the data collection and transcription of the videotaped lesson and audiotaped interviews (transcriptions were completed by the authors). We began by reading and annotating all transcriptions independently and subsequently met for discussions and joint analysis. We recorded our meetings in field notes that also entered our database. From these meetings emerged initial assertions about student learning and learning processes

which we tested in the entire database. We arrived at the assertions stated below through repeated cycles of testing and refining (or abandoning) hypotheses. (p. 291)

We reported one of the results in this way:

For Kirstin the dominating feature of the descriptor "Mercedes star" was not the "sensitive zone of unstable equilibrium" but a mere geometrical appearance. This interpretation is supported by Kristin's apparent difficulties to explain how a dice works. Here too, she searched for something that could be described with the label "Mercedes star" (I = Interviewer; comments in brackets; figures in brackets give wait time in seconds):

I: What about the dice? You know what a dice is? You throw it, and you cannot predict which figure will come.
K: Yes (hesitant).
I: Do you know why this is the case?
K: No, but in some way for me that has nothing to do with the Mercedes star. (2) Sure, there are six permutations and then it has to decide.
I: OK, let us try not to think of the Mercedes star. Why is it not possible to predict which figure will come?
K: Well, also because of influences. And because one does not start in the same way and…
I: Why is this of importance?
K: Well, why not?

Although Kirstin began to reconstruct her knowledge of chaotic systems in mentioning characteristics of them besides the mere geometrical symbol Mercedes star (such as the impact of influences and the starting point) she did not explain, at this point, why the dice demonstrates stochastic behavior. But her explanation of the Galton board (Fig. 2), which was not used during instruction, provided her with insights that turned out to become a key element for constructing the features characteristic of all chaotic systems. On the Galton board, small balls are released and roll down through an arrangement of nails. Kirstin suggested that the nails are the "points of decisions." (pp. 295–296)

In the description of the analysis, we note *that* we were "reading and annotating the transcripts," but we do not describe the competencies required to do the reading and annotating in ways to make "conceptions," "conceptual change," and "reconstructions of knowledge" to emerge. What is it that allowed us to recognize that what Kirstin is doing in the transcript is not an explanation of "why the dice demonstrates stochastic behavior"? What are the competencies that allow us to identify (a) that "she was provided with insights," (b) that "turned out to become a key element," and (c) that this key element is one in "constructing the features characteristic of all chaotic systems"? Neither the interview description nor the description of the method of analysis articulates our competencies or describes *the work* specified in {doing [exhibiting/recognizing insight]}, {doing [exhibiting [turning out to become a key element]), or {doing [constructing the features characteristic of all chaotic systems]}. What we do not specify is the work of exhibiting learning so that it would be recognizable as a social fact by the research; and we do not specify in the methods the very competencies required to allow the interview text emerge from the interview setting for a suitable conceptions and conceptual change analysis. There is no doubt about the achievement of identifying conceptions and conceptual change. But the work and the

competencies involved in producing the materials from which conceptions and conceptual change are extracted are not specified. This gives legitimacy to the ethnomethodologists' complaint that the "[formal analysis] procedure ignores the enacted, unmediated, directly and immediately witnessable details of immortal ordinary society" (Garfinkel 1996, p. 8). This ignoration is clearly evident in the sequence of texts taken from our article on conceptual change that I mobilize here as documentary evidence.

What more is there? One response implicit in the actions of science education researchers has been to add different kinds of research, different in its methods and its theories. Because theories and methods shape the observations that a researcher can make, this other kind of research increases the number of descriptions of learning available to science educators. But these other approaches, differing in theories and methods, are specified in just as formal a way as the research to which it has reacted and provided an alternative to. It merely augments the panoply of methods available to formal analysis and it augments the descriptions of structures. But it still ignores the "enacted, unmediated, directly and immediately witnessable details of immortal ordinary society." It is more. No doubt. But it is more of the same. It is different, as we can see in the differences between the outcomes of research taking a conceptual change perspective and research taking a cultural perspective that the authors to this journal take. But in its difference it is more of the same, that is, research employing a method that has to be specified because it is different from what we already employ in our everyday lives. Ethnomethodology's answer is different. It is so because of its asymmetric and incommensurable nature. But in this, it constitutes a *radically* different approach. This difference consists in its specification of the work that underlies and makes possible *all* of the formal methods, quantitative or qualitative, psychological or sociological, individual or cultural. Let me specify some of the work and the competencies that the study we reported was built on and presupposed.

Ethnomethods at work

To specify the work and competencies at work in the research project described in the previous section, I returned to the original transcriptions of the research on students' conceptions and conceptual change in a unit on chaos theory and I read until I identified a moment of trouble. My point here is that the competency underlying the identification of the trouble and recognizing that and how it got resolved is precisely the competency that allowed the interviewer (here Jens Wilbers) and the student (Hauke) to identify and resolve the trouble. If it were not like this, I would not be able to see and describe the trouble or understand that and how they got themselves out. The participants themselves provide the resources for identifying and articulating trouble to each other and for each other's benefit. The same resources are available to me, a culturally competent individual. Because these competencies are exhibited in the materials and the analysis, no further specification is required in a section on methods of analysis that stands separate from the analysis itself. Even the fact of my multi-lingual competence is exhibited in the provision of both the original transcript and its translation, so that it, too, should require no further description. It is available objectively, as resource to any outside person to check my analyses. The competence is exhibited for others and thereby also made available for their critique.

The following fragment comes from somewhere in the interview. The crucial point for the present purposes develop out of an explanation of the movement of a (chaotic) pendulum (an iron bob on a string) above three magnets. The movement and ultimate resting point of the bob over one of the three magnets cannot be predicted. Hauke has been asked to provide an explanation why this is so. As he comes to an end, the interviewer (Jens) asks, "You say, the

magnets, they no longer have an effect. What then is there that has an effect?" Hauke responds, "Please? Again. What?" We can literally hear the trouble. The "please" is spoken with rising intonation, heard in the culture as a question, indicated by the transcriber by means of the question mark in the transcript ("?"). That this is a question also is marked by the "again," which is a short form for "can you say this again?" And another question, "What?", which we recognize both in the grammatical form, the interrogative pronoun, and in the intonation. Again, the culturally competent transcriber articulates his hearing the speech sound as embodying a question by placing a question mark at the end of the utterance. Not only did the transcriber hear the student question, he also heard the interviewer ask a question marked in the same way by means of a question mark.

1 H: Äh::m, na ja, also, das Pendel, äh, wird ja nun durch diese Magneten beeinflußt ((Klingelzeichen)) und wenn das beispielsweise über so'm Mercedesstern, ähm, da auf so'ne Linie kommt, da::nn wird es halt da, ist halt ein Kräftegleichgewicht der Magneten, da wirken nicht mehr die magnetischen Kräfte, sondern nur noch diese äußeren Einflüsse, dann hängt das halt von denen ab, ähm, in welche Richtung jetzt das Pendel praktisch weiterpendelt; ob nun zu dem einen oder zu dem anderen.
U::m, yea, so, the pendulum, uh, now is being influenced by the magnet ((school bell)) and when it for example above such a Mercedes star, um, arrives there on such a line, the::n it will be, is there a force equilibrium of the magnets, there are no longer magnetic forces, but there remain only these external influences, then it depends on them, um, in which direction the pendulum now continues to swing; whether to the one or to the other.

2 J: Du sagst, die Magneten, die haben keine Wirkung mehr. Was hat denn da eine Wirkung?
You say, the magnets, they no longer have an effect. What then is there that has an effect?

3 H: Bitte? Nochmal. Was?
Please? Again. What?

4 J: Du hast gerade gesagt, ähm, die Magneten haben keine Auswirkung mehr auf die Pendelbewegung sondern nur kleine Störungen von außen. Ähm, (1) Was war meine Frage? ((Beide lachen.)) Jetzt hab ich den roten Faden verloren. (.) Ja, genau; was hat denn nun genau am Ende einen Einfluß auf die Bewegungen, die das Pendel macht, wenn es nicht die Magneten sind?
You said just now, um, the magnets no longer have a bearing on the movement of the pendulum but only small perturbations from the outside. Um. (1) What again was my question? ((both laugh)) Now I lost my red thread. (.) Yea, exactly; what is it then in the end that has an influence on the movement, which the pendulum makes, if it is not the magnets?

5 H: Also, solange es auf den Linien ist oder so haben halt praktisch, na ja so gut wie alles, also was weiß ich, von kleinen Luftschwingungen über Temperaturänderungen, was weiß ich oder Erdanziehungskraft und das halt, so gut wie alle Einflüsse, die es halt so gibt.
Well, as long as it is on the lines or have it like this practically, or just about all, well, by small vibrations of the air over temperature changes, what do I know, or the attractive force of the earth, and that then, as well as all influences, that are then in existence.

Hauke exhibits the same cultural competence that also characterizes the transcriber. He is being asked a question that he is to answer. But rather than answering, he is asking a

question himself. He is asking a question about the question, "Please?" "What?" and requests the interviewer to repeat ("Again.")

Just as the transcriber, Jens, the interviewer, hears Hauke ask a question. Rather than waiting for Hauke to make further statements, Jens refers the student to his own utterance ("You just said"). He goes on, repeating almost identically his own preceding utterance in turn 2, "the magnets have no bearing on the pendulum movement," and he adds, "only small perturbations from the outside." That is, he hears the student to have questioned his previous query and now does what the student has asked him to do, to say "again." But if it had said precisely the same, little might have been gained. He said what he said again but he said it differently this time. He has translated what he had previously said into a new way of saying; and he has thereby translated at the very heart of the same German language. He has translated German into German. But already what he attributes to Hauke as having said is a translation of what Hauke really and witnessably has said (in turn 1). Part of the work of doing an interview therefore involves translation, and the translation of one utterance into another that says the same (ideally) without actually doing so (materially). But despite being a translation, the phrase is heard as rearticulating an object of talk that Hauke has introduced. The question that follows takes this talk as the object queried ("What then is there that has an effect?").

Jens then asks himself, and asks Hauke as well, what is question was, "What was my question?") Both laugh. Jens articulates not knowing what his question was, which is precisely the question that Hauke has raised in the preceding utterance, "Please? Again. What?" Jens raises a question about the nature or content of his question, and that he can be, and factually is, heard in this way is documented as the transcriber's competence in the transcript, as the presence of a question mark at the end of this utterance part. We already know that the interrogative pronoun "What" at the beginning of a speech segment with a rising intonation toward the end of the segment allows culturally competent individuals to hear the sound stream as a question rather than as a statement or something else. He then formulates what has been happening to himself, "I have lost my (red) thread." That is, he describes for Hauke what it really is that his question "What was my question?" has shown, namely that he has lost his thread, a loss that may be glossed as "having lost his train of thought."

There is a brief pause and then Jens lets Hauke know that he has found what he has wanted to ask, "Yea", and it is "exactly" what it was. His utterance comes to an end with a question, the question he immediately before has indicated as having forgotten, which is the question Hauke has requested him to say "again," and which is the question he has wanted to ask in the first place, "what is it then in the end that has an influence on the movement, which the pendulum makes, if it is not the magnets?" It, as other parts of his utterance before, constitutes yet another translation, because it corresponds to "What then is there that has an effect?" Hauke then provides what we can hear as an answer, but the fate of it shall not concern us here.

What then has happened here that the two have worked out and, in so doing, is telling us about what makes interviews possible in the first place? Clearly, the interview requires *mutual* understanding of *what* is being talked about and of *how* it is said. Concerning the former, the understanding of the content, it is usually assumed to exist, as can be seen from all those parts of the interview where questions and responses unproblematically follow each other. When a participant does no longer understand, this lack of understanding is marked publicly, understandably, and unremarkably. Culturally competent individuals, Jens, the transcriber, and I (the analyst), we all hear Hauke ask a question. If Hauke understands his utterance as a question, he will monitor the effect it has on his interlocutor

so that he can assess his response with respect to it. His utterance projects an answer, and if it does not come, Hauke may want to take another opportunity to figure out what the interviewer wants from him. We all hear Jens *attempting* to respond and then suggest that he has forgotten the question he has wanted to ask, and he makes it known when and that he has found the question again, and *exactly* so. The work of understanding requires translations, and translated versions are understood to be the same and if this is not the case, the individual to whom it matters will make the lack of understanding known. Otherwise, no conversation is possible at all. Translation points us to a competence both on the part of the translator as on the part of the audience. For the translation to work, both have to have the competence to recognize that source and target of the translation are both the same and different. When there is ambiguity about a particular part of an utterance—why would the interviewer have forgotten a question that only a fraction of a second before he completed asking?—then the speaker will explicate the state of affairs by formulating what has happened ("I lost my thread"). (This forgetting itself is a challenge to conceptions and conceptual change researchers that they have not addressed or resolved.)

Translation is particularly important as a process in interviews where researchers attempt to probe an interviewee's conceptual understanding. Looking through the transcripts, one can find that if students articulate a "correct" description, interviewers tend to pursue an issue much less than if there is something that the interviewer hears as "incorrect." Inherently, when students use inappropriate talk, then the researcher has assessed that whatever a student has said is not the way in which a scientist would have accepted as a correct statement. That this is so requires the researcher himself to understand what the student has said and understand it as not being acceptable within the discourse of science. More so, to probe students about something that they evidently have a misconception of means that the interviewer has to translate the topic into the students' language (vernacular) so that the latter may express, in whatever way they can, something about the phenomenon of interest. From this expression, competently deploying their language, the researchers subsequently, from their knowledge of proper and improper (mis-) conceptions talk, extract what they need to be able to say that this or that conception is at work.

Hauke also lets Jens know what is required for him to understand: "Again," or glossed, "say your question again." The work of maintaining mutual and participative understanding requires the work of making known the lack of understanding, where the existence of mutual understanding is the *presupposed* common ground. The work of making lack of understanding known lies in the competence of asking the appropriate question. That Hauke's question is appropriate can be seen from the fact that Jens, the interviewer, does precisely what the student has asked him to do: say it again. That is, the student is a pedagogue in the situation by helping the interviewer understand what it takes to help him understand. But saying *precisely the same, again* (which may be a possible solution in a situation where noise may be the culprit in having disrupted proper hearing), is not an option Jens has here in a quiet, empty classroom where the interview takes place. Hauke asks for the question again, but differently, and he confirms having understood the question in its new but different form by providing an acceptable response.

The point of ethnomethodology is that the same methods that underlie the competent pulling off of this interview, the methods of the ordinary everyday members to this setting, are at work in my reading and in my analysis. These methods are clearly and unambiguously exhibited in this analysis. No further specification of method therefore is

required. More so, for ethnomethodology the issue is not interpretation of social actions and practices to find their "meanings." Ethnomethodology does not consider itself to be in the interpretive business. It is in the business of exhibiting the contextual details in which the work consists of that produces the interview data and extracts conceptions from it.

Here I provide an alternative way in which the question "What more is there that formal analysis has not yet described?" can be answered. The alternative is in terms of a specification of the lived work by means of which the interview materials were produced that subsequently served as the (already structured) resources for our articles on conceptions and conceptual change. I thereby enact the ethnomethodological approach:

> Ethnomethodology's fundamental phenomenon and its standing technical preoccupation in its studies is to find, collect, specify, and make instructably observable the local endogenous production and natural accountability of immortal society's most ordinary organizational things in the world, *and to provide for them both and simultaneously as objects and procedurally, as alternate methodologies.* (Garfinkel 1996, p. 6, original emphasis)

Much to the chagrin of researchers such as the virtual colleague I have chosen in the opening part embodying the two ideas, the ethnomethodological alternates *are* incommensurable phenomena of order and they are so in an asymmetrically alternate way (Garfinkel 1996). The upshot of this is that an investigator "can use ethnomethodology to recover in phenomena ordered details—in a phenomenal field of ordered details the work that makes up, at the worksite, the design, administration, and carrying off of investigations with the use of formal analytic practices. You can't do it the other way around" (p. 10). Durkheim's aphorism states that the concreteness of social facts is sociology's most fundamental phenomenon. The takes of formal analysis and ethnomethodology on this aphorism are not only alternate, "they are asymmetrically alternate, and that they are asymmetrically alternate is itself a social fact" (p. 10). That is, "their takes are… incommensurably different" (p. 10). Formal analysis and its results can be obtained through ethnomethodological approach, but the reverse is not the case. The structures of immortal society can be obtained from the work by means of which the structures are produced and mobilized, but the descriptions of the structures cannot be used to get at the work. More so, the agents of this society so concert their activities such as to exhibit not only order but the "topics of order* as their activities' achieved *phenomena* of order* in and as real world settings, in real time, and therein as the most ordinary achieved organizational *things* in the world" (p. 11). Despite their asymmetry and incommensurable difference, formal analysis and ethnomethodology are nevertheless related, and they are so in inextricable ways.

Coda

As a result of my endeavor to understand the different answers to the "What more is there?" question, I have come to understand better the differences between formal analysis and ethnomethodology. It is in the exchange with different ideas that my own understanding evolved, thereby testifying to the dialogic process of learning. The analogy that has been occupying my consciousness for months now is that of another difference in educational research approaches that I have described in more detail in various places before: the difference between phenomenography and phenomenology.

Phenomenography and phenomenology: an analogy

Phenomenography attempts to establish a catalogue of the different forms of experience participants in some setting may have. For example, the adulterated Maltese cross (Fig. 1) can lead to different perceptual experiences. Some individuals first and instantly see an upright broad-leafed cross. Other individuals first and instantly see a cross that is oriented along the diagonals. Other possible perceptual experiences are that of a square circus tent viewed from above. There are certainly other things that might be experienced, including the perception of the emblem of the Order of St. Johns (in Germany) or an abstraction of the Iron Cross (either as emblem of the German army, the Bundeswehr, or as an iconic representation of the military decoration in the Prussian kingdom).

All of these are experiences of a phenomenon (Gr. τα Φαινόμενα [ta phaïnomëna], things that appear, appearances) that a phenomenographic approach would describe (Gr. γράΦ-ειν [graph-ëïn], to write). Phenomenology has a different aim in that it describes the underlying processes, the *work*, by means of which these different experiences are generated. To get at this work, a researcher might begin to attempt switching from seeing the upright to the diagonal cross as the salient phenomenon. This eventually leads to the recognition that the task requires the focus of the eye to move from a point within one cross to a point within the other. If the researcher achieves—not an easy task—to leave the focus on the same spot, the image will disappear. That is, it is the movement and focal point of the eye that makes the particular cross emerge and stabilizes it. The eye does, without our attention, do all the work required to see the upright cross or the diagonal cross. If it rests, that is, if the image of the lines remains on the same cells of the retina, then all crosses disappear. That is, whereas phenomenography (and perhaps other methods) contributes to the establishment of the catalogue of ways of experiencing and, in the reproduction of such research contributes to the establishment of a corpus of studies, phenomenological research is radically alternate and incommensurably so. From the work (of the eye) that is specified in phenomenological studies one can derive the different experiences that phenomenographers report. The work is glossed in the prescription "You choose the focus in a cross and allow the eye to stabilize it against the ground by continuously moving away and returning to the same focal point." This leads us to the experience of one or the other cross. From the experiences described in phenomenographic research one cannot derive the work (of the eye) that brings forth the *different* ways in which the phenomenon is experienced. From the description "I see an upright Maltese cross" one does not get to the work that makes the Maltese cross appear or disappear. The two forms of research therefore are

Fig. 1 The Maltese cross can lead to different perceptual experiences
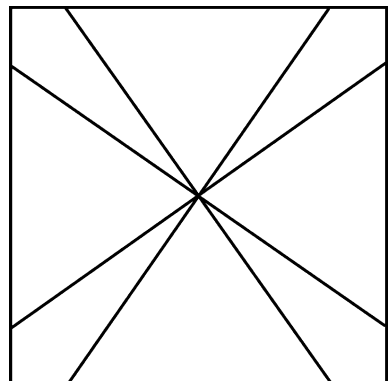
radically alternate and incommensurably so, yet they do, and this I emphasize, *constitute a legitimate pair*. To each formal analytic body of work and its results, here phenomenography, one can specify an ethnomethodological alternate, here phenomenology, that specifies the work required in making the formal analytic body of work and its results. Personally, I am not ashamed to admit that I have contributed to both the formal analytic approach (quantitative and qualitative) and to the ethnomethodological approach, all the while recognizing their asymmetrical relations.

The last word that refuses to be the last word

"You are intolerant! You're not accepting difference." My colleague's words are still ringing in my ears, requiring me to continue to come to grips with our differences. I am thinking by myself, "I do not understand him, I have accepted difference within and between paradigms." "You have to accept difference," I hear him exhorting me, "'what more' means accepting different forms of research on an equal footing with your own." I have continued to grapple with this accusation, and, by engaging with the ideas of my colleague, have come to understand the relation between the different responses that he and I provide in answer to the same question. Playing out different ideas against one another and allowing ideas to grow is what Mikhail Bakhtin (1984) calls dialogic inquiry.

> The idea beings to live, that is, to take shape, to develop, to find and renew its verbal expression, to give birth to new ideas, only when it enters into genuine dialogic relationships with other ideas, with the ideas of *others*. Human thought becomes genuine thought, that is, an idea, only under the conditions of living contact with another and alien thought, a thought embodied in someone else's voice, that is, in someone else's consciousness expressed in discourse. At that point of contact between voice-consciousnesses the idea is born and lives. (p. 88)

It is in the exchange with the charges, and in exchange with the idea that "what more?" means accepting the polyphony of voices in science education research that my own understanding of a very different response to the question emerged. This text itself indexes the work and result of the attempt to understand by allowing different ideas to engage and thereby transform each other. Like the word itself, the idea is dialogic. Monologue, such as the one within this text and the text within the community of researchers to which it is addressed, "is merely the conventional compositional form of its expression, a form that emerged out of the ideological monologism of modern times" (p. 88). I do accept difference and the polyphony of voices in educational research. But this is not my point. The point here is that there is a difference that is a "what more" itself, a difference that differs from the differences within the body of formal analytic approaches. Articulating and understanding this difference has been my pursuit. In and with my feature article about how conceptions are cultured (Roth et al. 2008), the very existence and results of conceptions and conceptual change research are accepted. More so, the very work and competencies required for producing the materials and deriving conceptions are specified. In this, my response to the question "what more?" differs from other answers that might give a cultural spin but still draw on specifically specified formal methods. It differs so radically, in asymmetrically alternate and incommensurable ways, because from the work of doing interviewing and analyzing, you can get to the results, conceptions and conceptual change. The reverse is not possible.

The lesson we can learn from this is that there is a radically different form of research that can produce results for science education that may truly make a difference. It is in and with this editorial that I call on research to ask the "What more?" question in a much more radical and self-transforming way than it has been asked in the past. To conclude, "for ethnomethodology the objective reality of social facts" is "sociology's fundamental phenomenon" (Garfinkel 1991, p. 11). It is so because the objective reality of social facts "is every society's locally, endogenously produced, naturally organized, reflexively accountable, ongoing, practical achievement" (p. 11). This achievement is, "being everywhere, always, only, exactly and entirely, members' work" (p. 11). This work is conducted in situation, "with no time out, and with no possibility of evasion, hiding out, passing, postponement, or buy-outs" (p. 11). The "objective reality of social facts… is *thereby* sociology's fundamental phenomenon" (p. 11). Formal analytic methods, employed by much of what constitutes the corpus of science education research, and the reflexive ethnomethodological approach are asymmetrically alternate, incommensurable approaches to this objective reality of social facts. The upshot and positive side is that there remains a lot of work for science educators in specifying the ethnomethodological alternates of the existing formal analytical corpus of research. I do accept the formal analytic approach. It in fact provides me with the material and topic to specify my alternate, an incommensurable and asymmetrical alternate. I celebrate the different approaches, I recognize differences, and I have come to recognize that the differences within formal analytic approaches are of radically different nature than the difference between formal analysis and ethnomethodology. *This*, I hope, is not the final world but should be taken as an utterance among utterances that allow science educators to make sense of their (research) lifeworlds. Let us give the last word to Bakhtin (1984), so that it may not be the last word: "When dialogue ends, everything ends. Thus dialogue, by its very essence, cannot and must not come to an end" (p. 252).

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