What more is there in and for science education to do in terms of researching science lessons? A lot, the author suggests, if research turns away from studying science education extracting social facts using special methods, which journal articles require to state, to studying the work and methods by means of which participants themselves create their structured world of science lessons. This book presents, with concrete materials from an inquiry-oriented physics course, a way of doing science education research that radically differs from existing approaches. This book articulates this approach for a science education audience, where this approach is by and large unknown, and where the primary literature is often experienced as impenetrable and as requiring years of work to gain entry. Consistent with this different approach, those materials are used that constitute the way in which the reflexive production of social order is observed by the actors (teachers, students) themselves.
WHAT MORE IN/FOR SCIENCE EDUCATION
Mathematics and science education are in a state of change. Received models of teaching, curriculum, and researching in the two fields are adopting and developing new ways of thinking about how people of all ages know, learn, and develop. The recent literature in both fields includes contributions focusing on issues and using theoretical frames that were unthinkable a decade ago. For example, we see an increase in the use of conceptual and methodological tools from anthropology and semiotics to understand how different forms of knowledge are interconnected, how students learn, how textbooks are written, etcetera. Science and mathematics educators also have turned to issues such as identity and emotion as salient to the way in which people of all ages display and develop knowledge and skills. And they use dialectical or phenomenological approaches to answer ever arising questions about learning and development in science and mathematics.

The purpose of this series is to encourage the publication of books that are close to the cutting edge of both fields. The series aims at becoming a leader in providing refreshing and bold new work—rather than out-of-date reproductions of past states of the art—shaping both fields more than reproducing them, thereby closing the traditional gap that exists between journal articles and books in terms of their salience about what is new. The series is intended not only to foster books concerned with knowing, learning, and teaching in school but also with doing and learning mathematics and science across the whole lifespan (e.g., science in kindergarten; mathematics at work); and it is to be a vehicle for publishing books that fall between the two domains—such as when scientists learn about graphs and graphing as part of their work.
What More in/for Science Education

An Ethnomethodological Perspective

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SENSE PUBLISHERS
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Preface

The first rule and the most fundamental is to consider social facts as things. (Durkheim 1919: 20, original emphasis)

Has science education covered all avenues for doing research on topics of its interest? What more might there be available in the methodological domain that would open up (radically) new possibilities for research topics? For years, I thought that there was little else to be explored and that our methodological tools were well developed. I only realized rather recently that despite cultural-historical and sociocultural turns in science education, very little has changed in the way we look at learning and that the very research methods are inappropriate for making claims about the social nature of facts and the thing-like nature of social facts in everyday conduct. This is so because, for example, the analysis of conversation is guided by psychological perspectives, which emphasize what one individual says and how another individual responds. The unit of analysis is the individual so that the social is theorized to emerge from the collaboration or interaction of individuals. But this is reducing social events into the sum, addition, or interaction of psychological events rather than treating social events as irreducible phenomena sui generis. The second major phenomenon I came to recognize is the absence of theories that can take into account social and life processes from the inside. Educational theories tend to theorize states – knowledge before and knowledge after a science curriculum unit; and the transition between these states is somehow caused by forces outside that which has changed. For example, students are said to ‘construct’ ‘knowledge’, ‘conceptions’, or ‘meaning’ where the nature of the things involved and the relations between them – subject of knowing and constructing, transitive activity that changes, and object being acted upon – are not articulated.

There exists a form of sociological research that not only has yet-to-be-explored possibilities but also constitutes a radical, ‘asymmetrical alternate’ to existing forms of research, both quantitative and qualitative: ethnomethodology (e.g., Roth 2009b). Researchers in the social sciences see their work to consist in extracting Durkheim’s patterned social facts by drawing on this or that formal analytic appa-
Ethnomethodology re-specifies Durkheim’s aphorism presented in the introductory quotation in the sense that it exhibits how those who staff social settings actively and endogenously produce and orient to this order. That is, ethnomethodology understands social structure very differently from the way standard quantitative and qualitative research treat it. Whereas in these forms of research, special methods are required to reveal the structures in social phenomena, ethnomethodological studies assume the social structure to be accountably produced, made visible, taught, and otherwise explicitly addressed by the members of society themselves. That is, the members themselves draw on, recognize, and deploy for each other the methods for producing social structure. However, despite its decided potential for making contributions to the social sciences, ethnomethodology is probably the least understood, most misunderstood, and most difficult approach in the social sciences generally and in science education specifically. I know about this personally, for recently one editor returned a manuscript to me asking the ethnomethodological part to be taken out prior to entering the manuscript to the review process; and in mathematics education, an article was accepted because/although the editor recognized its innovative way of describing mathematical learning and its difficult/unaccustomed way of writing. To assist in reading, a glossary at the beginning of the book contains the main technical terms.

Yet the ethnomethodological approach presented here has something to offer that would be of tremendous advantage to the development of science education research. In part, the difficulties derive from ethnomethodological texts, which require more than superficial readings. These texts require different writing and reading practices. One has to be familiar with such texts to understand them; but to become familiar with such texts, one has to read them understandingly. There is therefore a dialectical tension, because the only way to become familiar with these texts is by reading them; and their reading requires this familiarity, which the texts presuppose. The purpose of the extended study of science learning presented in this book is to bring ethnomethodology and the affiliated conversation analysis closer to science educators. I provide an account of where the approach has come from and its fundamental position. Materials from a science inquiry lesson are then used to articulate concretely how ethnomethodological analysis works, what sort of phenomena it targets, and what may be obtained using this approach to the understanding of social facts.

What should make ethnomethodology interesting to science educators is the fact that it can be used in conjunction with Vygotsky’s cultural-historical project of founding a concrete human psychology, which is entirely based on irreducible human relations and the constitution of society. To Vygotsky, all higher psychological functions are soci(et)al relations prior to the instant that we may want to ascribe these functions to individuals. Analysts do not therefore attempt to get into the individual human mind. They do not have to, for mind is in society to the extent that society is in the mind. In growing up, we contribute to the endogenous production of societal relations whereby everything needed to exhibit order and orderly things is done so that anyone can observe them right then and there in situ where they need it. The approach presented here is also consistent with the Marxist sociological approach to language, which considers systems of ideas, ideologies, to be...
available to speakers of natural language acting in concrete situations (Vološinov 1930). The co-occurrence of references to these bodies of work in this book therefore is not coincidental.

The Australian Research Council Discovery Grant DP0984394 (PI S. Ritchie), on which I was an international collaborator funded the research reported in this study. Ken Tobin provided an extensive reading of an early fragment of this text, which led me to realize that a much expanded version is required to answer the question ‘What more?’ in and for the context of science education. I was inspired to write this book especially because of his comments about readability of research and my reply about the contradiction of innovative language, which may be rejected precisely because it jars with common ways of describing and explaining phenomena of interest to science educators. Stephen Ritchie also read and provided feedback on the first text in which the overall themes for this book were articulated. My thanks go to him for providing access to these materials and the transcription assistance provided by his graduate students.

In this text, I draw on and quote texts published in languages other than English. Unless marked otherwise, all translations are mine. I explicitly draw on the original texts, where available, and on my own translations because the problems inherent in translations. The Italian language has a diction that names and describes the problem: traduttore traditore – translator traitor. This is so because all translation requires interpretation, as no two natural languages can be mapped onto each other in a one-to-one fashion. Translators make choices according to their ways of understanding the world; and these choices frequently are inconsistent with the fundamental theoretical, epistemological, ontological, and axiological underpinnings of the original work. My translations, while being subject to the same problematic, at least render in English my reading of the original rather than someone else’s reading. My reading is consistent with the theoretical framework underpinning this book.

Victoria, BC
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Glossary

**Accountable.** People act in ways that they can subsequently describe and explain when they are held to account for their actions. That is, they can provide reasons for what they have done. For example, one person may note that she is insulted by what her counterpart said, who, in saying that ‘he was only joking’ provides an explanation of what he was really doing.

**Bracketing.** This term denotes the act of the social scientist to put at bay their own preconceptions that might come into play trying to understand a phenomenon. Thus, rather than accepting ‘power’ as a social construct, the brackets in the expression ‘{power}’ indicate that the investigation concerns the very production of conduct that leads social scientists to use the term ‘power’. That is, bracketing orients the social scientist to study the work that makes ‘power’ an observable social fact.

**Conversation analysis.** This is the name for a particular analytic method that Harvey Sacks originated and developed. It is *not* simply the analysis of conversations, as novices in the field of educational research often assume. That is, conversation analysis always is the analysis of conversation, but not all analyses of conversations in fact do conversation analysis. Conversation analysis takes the turn pair as its minimum unit. This decenters the analysis from the psychological to the *social* level.

**Documentary method.** The documentary method was introduced by Karl Mannheim and subsequently used by Harold Garfinkel to explain how, based on concrete examples from our lifeworld, we get a sense of something like a ‘worldview’ or a ‘queue’. Concrete incidences are taken to be documents of something, like a ‘worldview’ or ‘queue’, which, though general, only exists in and through the manifold concrete experiences that we have with events that deserve these names. Neither addition nor synthesis nor abstraction can explain the relation between the concrete document and the whole of which it is a document.
Dope (cultural, psychological). The term is used to denote the human being in the way it appears in the psychological and sociological literature, ‘who produces the stable features of society by acting in compliance with preestablished and legitimate alternatives of action that the common culture provides’ (Garfinkel 1967: 68). In sociology, school performance is explained by socio-economic status; and in (Piagetian) psychology, schemas explain what a person sees and does. Thus, the person’s reasoned and justified/justifiable evaluations, judgments, and decision-making are treated as epiphenomena.

Durkheim’s aphorism. The ‘father’ of sociology, Émile Durkheim, established what we now know as sociology in stating that the first rule and the most fundamental is to consider social facts as things. As things, social facts therefore are observable. Ethnomethodology is concerned with the work involved in making social facts observable and accountable to every member to the setting.

Endogenous. From the inside. The term is used in ethnomethodology to insist on the fact that actors themselves produce conduct in such a way that produces the social facts and social conditions that in turn determine what they do. The social facts are not abstract schemas, rules, or practices. They are the results of performances that the actors hold each other accountable for.

Ethnomethodology (EM). Literally the science of the methods everyday folk use to accountably produce social facts and situations.

First-time-through. The adjective ‘first-time-through’ is used to characterize a form of analysis where the researcher takes the perspective of the members to the setting (or cohort, staff of the phenomenon) studied. That is, researchers then have no way to use future states, the outcomes of actions, to analyze earlier happenings in a teleological fashion. This changes the way in which researchers can work, for it is no longer possible, for example, to say what a statement does, because what it will have done is apparent only through its effects available in and from subsequent talk and actions.

Formal analysis (FA). All forms of social research that have to specify the special (scientific) methods of how they identified the reported social facts fall under this category. Studies using formal analytic methods differ from ethnomethodological studies in the sense that the latter employ and demonstrate competence of precisely the same methods that are used to produce social facts. Formal analysis and ethnomethodology therefore are asymmetrical alternates with respect to the study of social facts. The former focus on facts, using special methods to extract them from data, whereas the latter study the actual work that produces what formal analysis identifies. Knowing the ethnomethods always will allow us to get at the social facts, whereas formal analytically identified social facts do not get us to the ethnomethods that produced them.

Formulating. Speakers of natural language frequently formulate what they are doing with language. For example, a speaker might say ‘Let me ask you this, “How …?”’ Here, the actually intended question is prefaced by the note that a question is forthcoming rather than a statement, invitation, or order. The speaker has formulated an aspect of the ongoing conversational work.
**Glossing, glossing practices.** In the ethnomethodological literature, this term is used to refer to the fact that speakers always ‘mean differently’ than they can say in so many words. After many years of absence from Hattiesburg, MS, where my alma mater is located, I was invited there to give a talk at the 100th anniversary of the school. While driving through the center of town, I say to my host ‘It certainly has changed since I was here’, and my host responds, ‘Yes, they revitalized the entire city center to bring people back here’. In this situation, the first sentence is treated as a gloss and in the second sentence my host elaborated what I was really saying without having said so.

**IRE.** This acronym stands for ‘initiation, reply, evaluation’, a sequence that describes a particular way of taking turns in classroom talk. In this sequence, teachers tend to take the first and third position (initiation, evaluation) and students take the second, middle position.

**Lebenswelt.** This term denotes the world as it appears to us and that we inhabit. It is the self-evident, inherently shared world given to us in our experience. It is not a world that we construct, because construction (e.g., using language) is possible only as the result of inhabiting and evolving in/with a Lebenswelt. Much of the initial research concerning the Lebenswelt was done by the German philosopher Edmund Husserl during the 1920s and 1930s. Alfred Schütz extended this work into the sociological field. Harold Garfinkel, the founder of ethnomethodology, recognizes the contributions of both to his own work.

**Members (to the setting).** Ethnomethodological investigations concern the endogenous work by means of which social structures are observably and accountably produced. Because the phenomena are social, they are independent of the particular individuals (or cohort) that ‘staff’ the phenomenon in any particular case. Thus, although a researcher may use the queue in front of a movie theater as an example, the phenomenon denoted by the gloss {queue} is independent of the particular cohort presently observed.

**Method.** The way in which something is actually done.

**Methodology.** This term often is used in the sense of method, even though, in structural equivalence with all other sciences that include the word ending -logy, methodology is the science of method. Ethnomethodology is such a science, because it is concerned with the different methods used in everyday situations to produce the order of things. The term is misused in scientific journal articles, which state methods rather than engage in the work of ‘doing {methodology}’.

**Phenomenology.** Literally the science of phenomena, focuses on the work that makes the phenomena appear in the ways they do, that is, the work by means of which phenomena phenomenalize themselves. The term is often mistakenly used to refer to the study of personal (psychological) experiences rather than to the fundamental processes of phenomenalization that lead to this or that experience. Thus, we might see this or that cube looking at a flat drawing (experience). Phenomenology is not interested whether we see one or the other cube or something else altogether. Rather, it is interested in the underlying processes – a matter of eye movement in individuals (Roth 2012) or a matter of complex social representation
practices in the case of science (Roth and Bowen 1999b) – that lead to one or the other experience.

Sheffer stroke. The Sheffer stroke ‘|’ is used in logic to denote the logical conjunction ‘not and’ or NAND. In a truth table, the ‘not and’ conjunction of two logical variables, each of which can be true or false, is true only if at least one of the two variables is false. This allows the construction of concepts with inner contradictions. For example, the dialectical concept ‘margin | center’ embodies an inner contradiction, which is equivalent to saying that it embodies difference, or movement. When analytically applied in static fashion, a situation manifests itself as marginal, central. When applied in a dynamic fashion, the concept points to and theorizes continuous change, which may also be one that manifests itself in transitions from centrality to marginality and vice versa.

Staff. Ethnomethodological investigations concern the endogenous work that accountably produces, for participants themselves, the surrounding social situation and its facts. Because such phenomena are widespread, those who figure in a particular example are but staff that in any this case bring the phenomenon to life. Any other situation would involve different staff but the same social phenomenon. A good everyday example is a queue. We find queues ‘everywhere’. Science lessons, independently of who teacher and students are, constitute another case. We can walk into a classroom and know/see that there is a science lesson independent of its current staff. Ethnomethodological studies ask, ‘What is the endogenous work that makes a lesson recognizably a science [rather than mathematics, reading, social studies] lesson?’

Sympraxis. An expression Lev S. Vygotsky and Alexei N. Leont’ev borrowed from the linguist Karl Bühler to point to the irreducible joint labor of producing social praxis. Bühler used this expression to underscore that a conversation is a social phenomenon requiring at least two voices. Like a two-handed clap, which is the interplay of two hands from which something new emerges rather than the addition of two single-handed claps, the conversation cannot be understood as the addition of two voices.

Umwelt. A word that has entered the English language from German, where it literally denotes the world (Welt) surrounding (um-) an organism. The Umwelt inherently implies the world as attended and relevant to the organism. Thus, a pine beetle, a bird eating pine beetles, and a human climbing pine trees relate to the bark in very different ways. That is, the bark of a pine tree is very different and has different roles in the Umwelt of the pine beetle, the bird hunting its prey, and the human being (who may use the rough bark as handholds).
We ask what it is about natural language that permits speakers and auditors to hear, and in other ways to witness, the objective production and objective display of commonsense knowledge, and of practical circumstances, practical actions, and practical sociological reasoning as well? What is it about natural language that makes these phenomena observable-reportable, i.e., account-able phenomena? For speakers and auditors the practices of natural language somehow exhibit these phenomena in the particulars of speaking, and that these phenomena are exhibited is itself, and thereby, made exhibitable in further description, remark, questions, and in other ways for the telling.

The interests of ethnomethodological research are directed to provide, through detailed analyses, that account-able phenomena are through and through practical accomplishments.

(Garfinkel and Sacks 1986: 163)
Ethnomethodology in/for Science Education

In science education, as in most other fields of social science inquiry, special quantitative and qualitative methods are used to extract structure from situations of interest. For example, one recent study – which investigates and theorizes discourse during the writing of analogies in chemistry (Bellocchi and Ritchie 2011) – specifies how a fine-grained analysis identified the ‘hybridization of everyday discourse and chemical discourse’ and how the researchers arrived at identifying the ‘fluidity of meanings, signs, symbols, and practices’ in this way:

We began by listening and reviewing all audio and video material and artifacts either on the day of the lesson or within a few days after observations for each student group. Audio and video data that offered insights relevant to our research question were immediately transcribed. Starting from the hybridization of everyday and chemical discourse, we coded the data sources. As common themes emerged from each student group, comparisons of the three student groups allowed the refinement of our coding categories; for each group, transcripts and artifacts were re-coded based on the new themes. (ibid: 778)

The fact that the researchers offer this description of method points us to its special nature; they would not have to describe method if what they were doing had been done by the routine, everyday, unremarkable methods people use to endogenously produce everyday situations. If the method by means of which the ‘hybridization of everyday discourse and chemical discourse’ is specified, then there is a reason for this textual move in the research article. It might be that the phenomenon, the hybridization of two different forms of discourse, would not be visible other than by means of the special method. An analogy would be the staining procedures microbiologists use to make visible the presence of certain kinds of bacteria (Gram positive, Gram negative). In this case, the question would be this: ‘Does the identified pattern matter in the production of the social situation that these researchers observed?’ That is, do the research participants actively orient to the production and presence of the pattern? If they do not, what is the role of such a pattern? How are the authors’ ‘coding categories’ related to the social situations they observed – i.e.,
the conversations among students in a chemistry class? Do participants act according to such patterns (i.e., to the categories that emerged from coding) without knowing it, just as human beings are said to act out certain ‘schemas’ without knowing that they act according to these ‘schemas’? If this were the case, then human beings would be no more than psychological or cultural dopes, acting out schemas that they themselves are not aware of. Human beings – students, teachers, and even researchers – would be nothing other than animals who act without knowing why they do what they do. Human beings would be no more than machines acting according to innate or learned psychological and sociological programs – i.e., invisible psychological and sociological schemas – that drive what they do. But is this the case?

The fact that we do things with and for reason is observable in the specification of special social science methods that are found in research articles. The researchers in the quotation listened and reviewed the data because they were interested in patterns, because they were interested in understanding the hybridization of different discourses, and because they were interested in the ‘common themes’ that they anticipated to ‘emerge from each student group’. But it is not only researchers who behave in ways so that they can provide reasons and rationales for it. All human beings – unless handicapped in this or that way – act in accountable ways: They are able to provide, when asked, accounts for their actions. This is so even for younger children, who will have a reply when asked ‘Why did you hit your brother?’ by saying, for example, ‘He hit me first’ or ‘He took my teddy’. Actions, because these have intended outcomes, can be accounted for in terms of what they were to achieve and why.¹

The exergue of this book presents a different approach to the analysis of social phenomena. It states as the driving question: ‘what it is about natural language that permits speakers and auditors to hear, and in other ways to witness, the objective production and objective display of commonsense knowledge, and of practical circumstances, practical actions, and practical sociological reasoning as well’.

‘What is it about natural language’, the authors of the text in the exergue question, ‘that makes these phenomena observable-reportable, i.e., account-able phenomena?’ To sketch some first tentative answers to questions such as these, let us take a look at a lesson excerpt to identify the difference between what people actually do and what researchers say they do. The following excerpt and its analysis are provided in the same study from which the quoted description of methods was taken.

Everyday discourses did feature in the other observed lessons. For example, during one episode when the class was solving stoichiometry problems, Trev’s group was working on a solution to a problem. As Trev was looking over Mal’s shoulder, he noted that Mal had incorrectly spelt the word ‘whether’. Trev intervenes as seen in Extract 1 to correct Mal’s spelling. This led to a brief exchange with a play on the word whether as also meaning a sheep.

¹ There are serious problems with the cause–effect reasoning, which has not been found in nature but has been invented based on the observation that human actions are related to effects: an observation made after the fact (Nietzsche 1956). The gap between plans and situated actions can be traced to cause–effect fallacy, which is based on teleological reasoning.
The full exchange consists of six turns relating to the sheep. The discussion on the spelling ends after Turn 42 and the topic of sheep does not feature again in the remainder of the exchanges. (Bellocchi and Ritchie 2011: 779)

In their text, these authors provide a reading of the conversation that is separate from what the overheard student group actually does and what the participants to the setting make available to each other and to themselves. This begins with the transcription that does not render what is available on the tape – e.g., the sounds – but the authors’ hearing rather than the hearings of the participants. For example, there is a capital ‘H’ in turn 37 enclosed in quotation marks. Did Trev produce a sound that the International Phonetics Alphabet transcribes as /'eɪtʃ/ (like ‘age’) or as /'hətʃ/ (like ‘hage’)? The latter pronunciation of the letter ‘h’, while being non-standard in many Anglo-Saxon countries, is a feature of Irish-English. In fact, in Northern Ireland it is a shibboleth, a feature distinguishing Protestants from Catholics, where the schools of the former teach the pronunciation /'eɪtʃ/ whereas the latter teach the pronunciation /'hətʃ/. It could have political implications with repercussions on the events in the classroom. In Australia, where the study was conducted, an estimated 60% of the population uses the latter pronunciation. The question of pronunciation would tremendously matter if the conversation were to orient towards it.

That pronunciation and its relation to writing matters clearly is at issue in this excerpt where the researchers transcribe the same sound-word /'wedər(r)/ as both ‘wether’ (turn 41) – a male sheep, ram, especially when it is a castrated male sheep – and ‘whether’. In fact, the transcription of turn 37 appears to be incorrect, for Trev would not have said ‘shouldn’t that whether have a “h” after the w?’ if the word ‘whether’ had been spelled as shown in the transcription. Rather, the issue arose because the spelling likely was ‘wether’, so that asking whether there should be an ‘h’ is a plausible, reasoned thing to do in the situation. Trev could have provided a reason for asking the question – i.e., he could have provided an account for his discursive action – that any one present would have understood as a legitimate reason. In the following paragraphs I provide an initial analysis of the transcript from the perspective of the conversation, which is a social phenomenon. I achieve taking this perspective by taking the turn-pair as the minimum unit of analysis. In

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2 We know and in fact experience daily that conversations are social phenomena that exceed, that is, transcend, individual intentions. For example, in a department meeting, a meeting of a tenure and promotion committee, or meeting during which research proposals are assessed, the decisions made collectively exceed the sum total of what individuals bring to the meeting. If it were not like this, the meeting would be unnecessary. Members to a committee could send in their individual appraisals and some algorithm would compute a final result. However, I personally have sat in meetings where an initially favorable sum total of recommendations about a research grant turned into a rejection; and an initially unfavorable sum total of recommendations in a tenure decision turned into a favorable recommendation for tenure and promotion.
so doing, I transcend what one individual says and how another ‘interprets’ or is otherwise affected by it.

The authors claim that ‘Trev … noted that Mal had incorrectly spelt the word “whether”’ and that the ‘full exchange consists of six turns relating to the sheep’. We have to ask whether these claims matter to understanding the unfolding of the event and whether there was a six-turn discussion of the topic of sheep. The authors also state that the discussion ends as if there was a mysterious event that brought itself to a close independent of the social relation and independent of the sympractical work of the participants to the setting. What is it that these participants orient to, make available to each other, and thereby accomplish in the setting? What is it that drives this event qua social event, that is, something that is first and foremost a collective phenomenon produced in and through collectively accomplished work?

The student did orient toward a matter of grammar, here, of orthography, that is, the spelling of the word phonetically transcribed as /ˈwɛðə(r)/. In this situation, turn 37 is heard as an issue of grammar (turn 38); and this hearing constitutes the nature of the preceding turn. Or more abstractly, rather than talking about speakers, we may ask how one turn treats the one preceding it. We can then ask questions about how two speaking turns related to each other and how, in fact, two consecutive turns reify each other. Thus, although the authors placed a question mark at the end of turn 37 – their interpretation of what has been done here – turn 38 is not actually a reply to a question. From the perspective of the conversation, a statement has been made about grammar; and this nature of the statement (turn 37) is available only in the next turn. For this reason, the two turns are mutually constitutive, the former preceding and giving rise to the latter, but the latter determining what the preceding turn has done. I therefore use the Sheffer stroke ‘|’, which marks both conjunction and negation typical of dialectical terms that embody an inner contradiction.

A proposal | rejection pair of turns follows: the statement of an issue of grammar is not to be worried about (turn 38) is followed by the statement that ‘it should’ (turn 39). The beginning of turn 39 employs a contrastive connective ‘but yes’, which both sets up and emphasizes the different orientation to the presence or absence of ‘h’ following the ‘w’ in the ‘wether’ that appears on the page in front of Mal. A proposal | acceptance pair follows taking the form ‘yes it should’ | ‘cool’, the first part constituting an assertion that grammar should matter and the latter its acceptance. In contrast to the authors’ claims, there is nothing about sheep up to this point. What matters in and to the situation, collaboratively exhibited as such in the members’ actions, is the role of grammar in chemistry. There is then a statement | rejection pair: ‘a wether is a male sheep’ | ‘no that’s a ram’ (turns 41 | 42). The first part of this pair, itself a second part of a preceding pair, in fact is a reply to the ‘wether’ on the paper. Grammatically, ‘wether’ is the subject of a statement and ‘is a male sheep’ the predicate. Predicates tell us something about the subject. The second part of the turn pair makes the preceding predicate problematic, ‘no, that’s a ram’ (turn 42). The rendering problematic, the negation, is achieved by means of a negation, ‘no’, the statement of the subject using the pronoun ‘that’ to denote what just has been mentioned, the ‘male sheep’, and the statement of a new predicate. In this turn pair, two alternative statements are offered, which may be
glossed in this way: ‘a wether is a male sheep’ and ‘a male sheep is a ram’. There
are therefore only two turns or, more precisely, only one turn pair that is concerned
with sheep.

In the present instance, as the authors write, there are no further statements that
they hear as being related to the issue. There is an apparent contrast between the
two statements that is not taken further by the conversation. The contrast therefore
is a non sequitur, is not being taken up and, therefore, does not shape the conversa-
tion in its future unfolding. In fact, the two statements can be heard as complemen-
tary rather than as contrast: Both statements are valid simultaneously: ‘a wether is
a male sheep’ and ‘a male sheep is a ram’. From the perspective of the conversa-
tion, any speculation is mute, as ‘non sequitur’ means that there is no follow up,
there is a break between the statement and what follows.

In this analysis, we therefore see that the authors have imputed aspects to the
events that are irrelevant to this conversation in its unfolding and, therefore, to the
members to the setting. To understand a conversation, that is, to understand its
unfolding and its trajectory, the authors’ interpretations are irrelevant. Their meth-
od does not reveal what the members to the social settings actually do and the
ways in which they render their public the accountable nature of their actions.
What really matters is made thematic in a question stated in the exergue: ‘What is
it about natural language that makes these phenomena observable–reportable’? We
have to ask, ‘How does natural language exhibit phenomena in the particulars of
speaking?’ ‘How are phenomena made exhibitable in the further descriptions, re-
marks, questions, and in other ways of telling that the speakers mobilize for each
other?’ The alternative hearing I offer follows the social process and, therefore, the
ways in which accountable phenomena – accountable on the part of the actors that
the research follows through their lives – are through and through practical ac-
complishments. This alternative hearing is based on the assumption that social
actors behave in reasonable and reasoned ways, who can always state what they do
and why. The alternative reading takes the perspective of the social actors who, at
a particular instant in time (e.g., turn 37), do not know what will happens only sec-
onds hence (e.g., in turn 38). Thus, in turn 37, these actors provide no indication
that the conversation is about sheep. Even if one or the other actor were silently
thinking about sheep, it would not matter to the social situation from the perspec-
tive of the social, that is, from the perspective of an analytic unit that is social. The
sheep are articulated and oriented to only in turns 41 and 42. My reading follows
what the actors exhibit to each other and, therefore, how they understand this
conversation and the manner in which it unfolds. Thus, in this conversation, turn 37
comes to be treated as a statement rather than as a question that the researchers
mark it to be (by using a question mark). The response does not indicate that a
question has occurred but rather that a statement about grammar has been made.

The kind of reading I provide has evolved for me, in its particular form, from
my engagement with a literature not commonly referred to in science education:
ethnomethodology. As a field, ethnomethodology belongs to sociology, concerned
as it is with the way in which it orients to commonsense knowledge, and of practi-
cal circumstances, practical actions, and practical sociological reasoning. But it
practices sociology in a very particular way, a way that is a radical alternate to go-
ing quantitative and qualitative, ‘formal analytic’ approaches. Whereas the latter
report and take as fact social order, the preoccupation of ethnomethodology ‘is to find, collect, specify, and make instructably observable the local endogenous production and natural accountability of immortal familiar 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: 6).

That is, ethnomethodology is concerned with how social situations are structured endogenously, from the inside, so that the social structure as much as its production becomes visible to the actors themselves and to the social scientists, who use this or that method for extracting structure. Although these scientists specify a different, formal method for doing so, their own seeing of structure in a social situation requires the same competencies that allow social actors to perceive and act towards it. This is so because ‘the ur-materials of the first sense-formation, the ur-premises so to speak, exist prior to all science in the world of life, which is not merely material Umwelt but already shaped cultural Umwelt’ (Husserl 1939: 219). That is, what is scientific and logical in both natural and social sciences has its origin in the pre-logical, fundamental experiences of the world. This first world that we encounter before making contact with any formal science is the irreducible condition for any scientific knowledge, practice, and understanding. Thus, ‘everything “logical” emerges from a pre-logical sphere, which has its own rationality, its own, everything bearing/carrying truth’ (Husserl 1993: 154). This pre-logical world is the only true world, ‘the only one that we can talk about, into which each new science grows and fits itself, just as any other praxis and its newly generated formations’ (ibid: 140).

Garfinkel, in one of his last texts, credits Husserl for helping him understand the foundational function of our everyday lifeworld. This leads us to the fundamental methodological issue and to the watershed between formal analytic and ethnomethodological approaches: ‘The point: Formal methods – formal analytic methods of generic representational theorizing – do not adequately and evidently describe the methods and practices of social analysis that identify in their discipline-specific worksite details ways in which human knowledge makes instructable, witnessable contact with an objective world in the sciences, natural or social’ (Garfinkel 2007: 48). But those actors do not employ special methods: they use the methods that every competent member of society is learning and has learned by participating in the daily production of social order. Because this method of the people is so ordinary, their ethno-method, it does not have to be specified. This method is available in the very ways in which social settings are organized and produced from the inside. This does not prevent the existence of determinations over which social actors have no control. Thus, for example, a sociologist who understands herself as a single mother and participates in the relevant discourse of the ‘single parent family’ and the problems thereof is subject to an ideological determination that penetrates her lifeworld from the outside, so to speak (Smith 1990).
Ethnomethodology and Science Education

Ethnomethodology’s standing task is to examine social facts, just in every and any actual case asking for each thing, what makes it accountably just what that social fact is? (Garfinkel 2002: 251)

Very little work has been conducted in science education from the perspective of ethnomethodology, which may be in part attributable to the fact that the science education community does not readily accept and appropriate the methodological stance and in part of the disinterest the members of the field of ethnomethodology have shown for traditional concerns of science educators. In fact, issues such as open-inquiry and the pursuit towards more ‘authentic’ forms of science education have become the explicit critique from the perspective of ethnomethodology (e.g., Sherman 2004). One study that did take the approach reanalyzed a set of data that had originally led to claims about convergent conceptual change, but were used later to exhibit how, from the participants’ unfolding transaction, the discovery of the relation between velocity and acceleration in a simulation environment was discovered (Koschmann and Zemel 2009). The authors show – comparing this discovery with that of the audiotaped discovery of the first optical pulsar – how the object discovery can be located within the ongoing talk itself. They further show that the discovery is not something preordained but rather constitutes an occasioned production that the participants themselves treat as something new. The second study, also pertaining to physics education, exhibits how the lessons constitute ‘familiar, observable, and routinely organized activities that exhibit, for participants and analysts alike, how science can be produced through a manipulation of ordinary objects’ (Lynch and Macbeth 1998: 269). The emphasis here is on how these activities exhibit for participants how science can be produced. These participants do not have the formal analytical technology, quantitative or qualitative, that science education journals display. Rather, they ‘merely’ have their ethnomethods; and it is these ethnomethods that produce the order that other research, with its formal analytic technologies that methods sections in journal articles specify, reports and theorizes in ways irrelevant to the social actors.

The interest of such work lies in how social structure generally and those pertaining to science specifically are produced within the activity itself, that is, in and as part of (i.e., endogenously) the integralit of the ongoing affairs. This then leads to very different thinking about existing science education topics, such as conceptual change, which can be shown to arise from the way in which interviews themselves are structured to produce misconceptions even when there is evidence that a person has not ever thought about an issue before and cannot have a conception (Roth 2008b; Roth et al. 2008). Such ethnomethodological work can then be used

3 By articulating the need of specifying scientific method, by holding authors to account for the methods they used to arrive at the social facts they report, social scientists in fact are ‘administering an in-principle difference between common sense knowledge of social structures and scientific knowledge of social structures’ (Garfinkel 1988: 104). The application of special methods presupposes that there is no endogenous order and that ‘there is no orderliness in concrete activities’ (ibid: 105). In this way, ‘real immortal society is only specifiable as the achieved results of administering the policies and methods of formal, constructive analysis’ (ibid: 106).
in designing settings so that conceptual change is allowed to emerge from sets of existing, naïve practices that embody all the competencies required to make change accountably visible rather than relegating it to invisible mental processes (Macbeth 2000). Such studies may show how, for example, knowledgeability is up for grabs, where those in the institutional positions of ‘teacher’ may turn out to be less knowledgeable than those who are in institutional positions of ‘students’ so that the roles become actually reversed (Roth and Middleton 2006). The ethnomethodological approach is suited ideally for investigating the work that brings about such role inversions and how those who staff an instructional setting endogenously produce the event.

Inquiry has been a mainstay of science education at least since the 1960s, when there was an increasing interest in ‘hands-on’ experience subsequent to the impact of Jean Piaget’s work. Most hands-on experience tended to be in the form of prepared laboratory tasks, whereby students implemented experiments for which they had received detailed instructions. The purpose was to get students develop some (‘basic process’) skills in manipulating laboratory equipment and materials, to develop an orientation towards appropriate laboratory behaviors, to collect data such that they could be analyzed to exhibit the known scientific laws or illustrate major scientific concepts. Thus, for example, students might do an experiment with carts moving on a slightly inclined air track to verify that acceleration is constant, velocity increases linearly, and distance traveled increases quadratically with time. The same laboratory task could be used to verify that there is a relation between the acceleration and the angle of the incline such that the maximum acceleration would be at 90° and would equal that of free fall. Students could thereby find out something about Galileo’s effort to understand motion and learn about the history of science.4

The ethnomethodological orientation is different in that it seeks to understand how participants themselves discovered or learned, and how such noticing itself is a product of the locally produced, witnessable, accountable phenomenon of order in the setting. Whereas some ethnomethodological scholars argue that there are radical differences between laboratory science and school science – e.g., with respect to conceptual change (Greiffenhagen and Sherman 2008) – others show that there are numerous similarities between the two fields, for example, in the way that discoveries emerge from the endogenous organization of the activities themselves (Koschmann and Zemel 2009). For instance, in both instances initially vague ‘its’ evolve into definitive objects – a pulsar, the velocity of an object – in and through the situated inquiry of the parties involved. The authors thereby overcome the dichotomy between the work of scientists (who are said to do science authentically producing ‘hot discoveries’) and the work of students doing laboratory exercises (producing ‘cold discoveries’). This research approach therefore acknowledges the tremendous, generally hidden order-producing work accomplished in the realization of laboratory exercises (Lynch et al. 1983). This work is no less authentic than the one of scientists. Given that there already exist some important and widely cit-

4 However, see Garfinkel (2002, chapter 9) on the many things that students will not find out about the work of Galileo, for example, all those things Galileo has done or might have done when he lost his phenomenon.
ed ethnomethodological investigations of scientific laboratory practices (e.g., Lynch 1985), there is a wide open field for cognate investigations in science education that could lead to an elaboration of the similarities and differences between the practices and structures of work in the two settings.

Throughout this book, I use examples from an episode in an inquiry science lesson. Science educators became somewhat disillusioned with ready-made laboratory tasks, because students and teachers tended to take this part of the science course as motivational and less serious than the normal lessons characterized by teacher-dominated lectures. Even though ‘laboratory activities appeal as a way of allowing students to learn with understanding and, at the same time, engage in the process of constructing knowledge by doing science’ (Tobin 1990: 405), students often fail to understand why they are manipulating equipment in certain ways; and fixing the data to get the anticipated results and therefore good grades predominated over taking whatever was measured and trying to make sense of it. The approach often was denigrated as ‘cook book science’.

In an explicit attempt to give students opportunities to experience the vagaries of a discovery science and to learn about the nature of science in the ways it plays itself out in everyday scientific laboratories, some science educators began to promote, implement, and research ‘open-inquiry’ approaches (Roth 1995). In open inquiry, students designed investigations of their own interest, collected data, interpreted what they had collected, and reported their findings back to the collectivity (peers, teacher). In the process, students learned powerful data fitting procedures based on the least-square method, evaluated their findings with respect to those of other students doing similar experiments, and explained any deviations from anticipated findings by making reference to experimental design, data collection, or other sources of systematic error (e.g. Roth and Bowen 1994). One study that compares open and guided inquiry shows significantly higher performance levels on such factors as changes during inquiry and procedural understanding, whereas no differences were detected on other variables such as learning as a process and affective points of view (Sadeh and Zion 2009). In the face of high-stakes testing, with a primacy on recall and paper-and-pencil formats, which require competencies for success that are very different from those that are required for success in open inquiry science, it is not surprising that teachers and school exhibits little preference for this format of science learning.

An important finding of such research tends to be that motivation does not have to be introduced as an external factor in explaining what students do and teachers do not have to do to motivate students. This is so because having chosen a particular motive for an inquiry, students experience a high degree of ownership over the research problem, process, and outcome as well as over the difficulties encountered. Students who often do not well in other approaches to learning tend to do well in open-inquiry, as shown in several studies where students who were desig-

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5 As one research study among undergraduate students showed, trying to fix the results are experiences that may shape what people do when they enter more advanced studies, such as conducting independent research for honors projects (Roth and Bowen 2001). Fibbing’ and coming up with ‘creative solutions’ may become a way of life.

6 In cultural-historical activity theory, the motive is a characteristic of collective activity; by participating in the activity, the individual subject subscribes to the motive (Roth 2004a; Roth and Lee 2007).
nated and treated as ‘learning disabled’ were among the most successful (e.g., Roth and Barton 2004). Thus, those students who do poorly when instruction and assessment emphasize written forms tend to do well when dealing with uncertainty, access to social and material resources, ownership over nature of problem and solution finding process are at a prime. In one open-inquiry physics course for upper elementary students – sixth- and seventh-grade students – five of the nine ‘learning disabled’ students ended up in the top quartile of the 25-student class in terms of their conceptual understanding as evaluated across different assessment formats (written, interview, discussion, practical) (Roth et al. 1999).

In many jurisdictions, inquiry is as an important dimension of the science curriculum. Because there is also a focus on learning specific content, the physics syllabus of Queensland, for example, also states that the students do not identify and define their own problems but ‘negotiate’ problems with the teacher, or students are asked to pursue research questions that the teacher designs. According to the syllabus, teachers ‘must’ provide scaffolding ‘to help students complete the assessment’ (QSA 2007: 22). However, ‘the scaffolding provided should not specify the physics, or lead the student through a series of steps dictating a solution’ (ibid: 22).

**Bracketing**

To construct a scientific object also demands that you take up an active and systematic posture vis-à-vis ‘facts’. To break with empiricist passivity, which does little more than ratify the preconstructions of common sense, without relapsing into the vacuous discourse of grand ‘theorizing’, requires not that you put forth grand and empty theoretical constructs but that you tackle every concrete empirical case with the purpose of building a model. (Bourdieu 1992: 233)

In the introductory section, I point to the fact that the everyday attitude and the everyday world surrounding world is the precondition for any science to emerge. It is therefore not surprising that preconstructions, expressions of a natural attitude, are pervasive in the sciences concerned with the everyday world (Bourdieu 1992), which it enters in the forms of preconstructions that the social scientist is not even aware of that it constitutes the pre-constructed. One of these pre-conceptions is to take the science teacher as imbued with ‘power’ ‘over’ students. Holding teacher accountable for a lesson, as if they, individual participants, were the causal determinants of what a living curriculum produces, is but another one of the pre-conceptions that a scientific science education has to question rather than accept. Preconstructions are dangerous because they become ‘instruments of construction’ (p. 233).

To practice a really scientific science of the natural world – the science classroom for science educators – the natural attitude has to be bracketed (Husserl 1976; Vygotskij 2005). Bracketing involves holding in abeyance the researcher’s ‘natural attitude’, beliefs, experiences, understandings, and assumptions. It stops science
educators short from using pre-constructed concepts without questioning them in the attempt to understand some aspect of the world of interest: the science classroom. The researcher continues to accept what is being bracketed – e.g., ‘teacher power’, ‘student motivation’, or ‘interest’ – but does not use it when attempting to understand and explain some aspect of the natural world. Once bracketed, the researcher focuses on how this or that aspect of the world phenomenalizes itself, that is, becomes a phenomenon such that his or her natural attitude or natural concepts include and index it. In this way the world is not negated, but the method merely counteracts the functioning of the natural attitude by rendering it temporally inoperative.

In the following, I provide a historical background of bracketing, explicate the ethnomethodological re-specification of Durkheim’s aphorism about the thingy nature of social phenomena, provide a tutorial example exemplifying the ethnomethodological approach, contrast and compare formal analytic approaches and ethnomethodology, and articulate some phenomena science educators might want to bracket to specify the ‘what more’ there is to order in science classrooms.

**Historical Origins of Bracketing in Phenomenology**

Concretely, when science educators research events in a classroom, they accept the desks, chairs, chalkboards, writing implements, computers, or equipment as part of the natural world, as the background to anything that belongs to teaching science. But they also tend to accept the presence of other ‘things’ that are not quite as tangible: {knowledge}, {intentions}, {beliefs}, {power}, {motivation}, and the likes. All these ‘things’ are taken as really existing and explaining a world. To understand this world ‘better and more completely than is possible in any way we see it by means of the naïve conception of experience’ (Husserl 1976: 61), we require something like a ‘science of the natural attitude’ (p. 61). This science has to bracket, eliminate, the presuppositions that come from and with the natural attitude towards the situations that researchers tend to take for granted when they spend time to understand what is happening in science classrooms.

Even the natural sciences have their grounding in the Lebenswelt (Husserl 2008) or lifeworld. Bracketing therefore has to be applied to what the (social) sciences might have said about this phenomenon: ‘So I eliminate all of the sciences relative to this natural word, as well as they are founded for me, as much as I admire them, as little as I think about objecting the least to them; I make absolutely no use of their validity. I appropriate not a single proposition that belongs to them, even if there is perfect evidence for them; I use none of it, do not take it as a ground. … I may only accept it after having dealt with it in the brackets’ (Husserl, 1976: 65, original emphasis). Here, as before, the results of the natural sciences, social sciences, and philosophy are accepted as other social facts: but not as explanatory resources. For Husserl the distinction between the different forms of consciousness and what to do to conduct really scientific research on the phenomenalization of the world in consciousness is so important that he returns at length to the issue of bracketing and why it is necessary.
In the natural attitude, people simply act in and towards a world. It is a form of everyday, unreflected, ordinary perceiving and experiencing the world. The character of the things that populate this lifeworld is that of things that are ‘really’ ‘present at hand’ (Husserl 1976: 107). People do not doubt those things that are given to them and serve them well in everyday life. The natural sciences and philosophy can be distinguished from the natural attitude in the sense that they produce logically ordered acts of thought; but, the objects of scientific research are the realities given in the natural attitude are determined and researched in a rigorous way. These realities therefore are disclosed in new ways to the inquiring spirit. The sciences, philosophy, and the natural attitude, therefore, share the way in which they accept the presence of the world in and to consciousness. They differ in the way they seek to understand this naturally given world.

Phenomenology, which is a radically different approach to a very different problem, begins by bracketing and locking out as a matter of principle the ‘effectuation of all cogitative theses’ (Husserl 1976: 107). That is, those theses that have already been accomplished in the natural attitude and the natural sciences are not allowed into the new science. Rather than living in these theses, rather than reproducing these theses, phenomenology engages in acts of reflection with these theses as their intentional object. Any explanatory device that serves the natural attitude and even the sciences – e.g., the notions of ‘power’, ‘agency’, ‘structure’ – are excluded, merely taken as other facts that the natural attitude and the sciences have produced. In his essay on the crisis of psychology, Vygotskij (2005) entirely sides with Husserl both on the nature of the problem and its resolution: ‘I undertake to prove … that only Husserl’s and Feuerbach’s formulas give a consistent solution to the problem’ (ibid: 163).

**Bracketing in Ethnomethodology**

Throughout his work, Husserl was concerned with questions of consciousness, and, because of his focus on intentions and ideas, has been referred to with some legitimacy to be a metaphysical philosopher. However, his program of establishing a science of the natural attitude all the while bracketing it (its concepts) has found its way into sociology in a lineage that includes Husserl → Schutz → Garfinkel and has led to the emergence of ethnomethodology (Garfinkel 1967). Whereas Husserl’s (1976) examples of phenomena are those of the natural world – his desk and the objects that are placed on it, his office/library – ethnomethodology takes Durkheim’s aphorism as its point of departure and then proceeds with the social facts in a manner not unlike Husserl with material things. Just as Husserl bracketed the natural attitude with respect to investigations of our consciousness with respect to the things in the natural world, ethnomethodology brackets the natural attitude with respect to social facts by re-specifying and working out Durkheim’s aphorism (Garfinkel 1991). Just as Husserl bracketed the natural attitude in his research of human consciousness, ethnomethodology brackets the natural attitude in the way it can be found in the everyday world and in the social sciences.
Ethnomethodology has emerged as a phenomenologically grounded reaction to the formal analytic approach in sociology. An important accomplishment in the theorizing of social phenomena that accompanied sociology, in its inception, is the recognition of social facts as phenomena sui generis that cannot be reduced to the individual. ‘A thought that can be found in all particular consciousnesses, a movement that repeats itself in all individuals, are not because of that social facts’ (Durkheim 1919: 11–12). Doing so would be confusing the manifestation of social facts in the individual person. Social facts are constituted by tendencies and practices of some group or community ‘taken collectively’ (ibid: 12). Social phenomena sui generis and their refraction in individuals are two things of very different kind. Social facts thereby ‘take in this way a body, a sensible form that is particular to them, and constitute a reality sui generis, very distinct from the individual facts that manifest them’ (ibid: 12, original emphasis). The point then is to describe, theorize, and understand social facts as such, not to reduce them to a composite of individual facts. The *documentary method* – designed to capture the ‘interrelatedness of the different’ and the ‘existence of unity in the differences’ (Mannheim 2005: 127) – accomplishes precisely that goal.

Ethnomethodologists refer to the work in the social sciences that identifies and explains social facts using quantitative or qualitative methods, the accomplishments of which are gathered under the notion of ‘Formal Analysis (FA)’ (Garfinkel 2007). FA technology describes and explains social facts. These are undisputed and accepted. However, ethnomethodology ‘is proposing and working out ‘What More’ there is to the unquestionable corpus status of formal analytic investigations than formal analysis does, did, ever did, or can provide’ (Garfinkel 1996: 6). Thus, ‘[e]thnomethodology’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 familiar society’s most ordinary organizational things in the world, and to provide from them both and simultaneously as objects and procedurally, as alternative methodologies’ (ibid: 6).

By means of the adverb ‘procedurally’, ethnomethodologists do not indicate their interest in process but their emphasis on the actual labor and living work that produces the phenomenon. This focuses us on important issues not generally taken into account in current science education research. Thus, a study may focus on the ‘merged discourse’ (Bellocci and Ritchie 2011) that chemistry students displayed in their lessons. Whereas the researchers used their special methods – as per the above-quoted methods description – to identify ‘merged discourse’, they do not articulate the work of merging discourses or communicating by means of merged discourses or how participants’ discourses when novel mergers are produced. To use an even simpler example, the same study states that ‘the discussion on the spelling ends after Turn 42’ (ibid: 779). But if the discussion, qua conversation, is a social phenomenon that social actors produce, then work is required to bring the event to an end. In fact, the researchers note that there is an beginning and an end, but there are no indications in the transcript fragment that the social actors themselves oriented to something like a beginning or an end. If there were an end from the perspective of the conversation, then it would be possible to specify the work that produces the ending; but if actors themselves do not orient towards an end,
then it will be impossible to specify any work precisely because it has not been done. A legitimate beginning and end is produced when, for example, a teacher requests a student to take his turn and, once the student has completed the task, he is asked to take a seat and the next student is called upon (Roth and Thom 2009). In this case, the ‘episode’ is entirely identified, started, conducted, and ended endogenously, that is, from the inside. Not only did the student have a turn but that it is his turn is clearly demarcated from the preceding and following turns and in the way the transaction ritual of his turn unfolds (e.g., he responds before anybody else may respond to a teacher question).

In ethnomethodological studies, bracketing is effectuated by explicitly excluding ‘the use of mental mechanisms, psychological actions, clinical psychological biographies, signed objects, and hermeneutics’ (Garfinkel 1996: 13). Bracketing has been formally described in the following way. As example, we take what might be glosses on the part of formal analysis or based on the natural attitude on the parts of those who visit the science classroom under investigation throughout this book. Researchers or science teachers might gloss what they see by saying ‘students are investigating a phenomenon by means of self-directed inquiry’, they may observe an instance of ‘a teacher using the triadic dialogue form’, they appreciate ‘the teacher’s effort in helping a weak student’, or they might observe that ‘Jane, she is only interested in making a nice Chinese lantern but not in learning physics’. It is indisputable that existing science education research has established a large and steadily growing body of work of this kind. To understand what it has not done, by and large, can be better understood after the following example of bracketing related to the stated glosses. Thus, whether a gloss is or has been made by a layperson or a researcher, it is formalized in the following way using one of the preceding glosses:

‘doing {investigating a phenomenon by means of self-directed inquiry}’

Here, the gloss is placed in brackets; it constitutes a natural account (‘notational particulars’) (Garfinkel and Sacks 1986). ‘Doing’ refers us to the actual, living, collective, sympractical labor from which the social fact named in the gloss emerges. What is it people do in a science lesson, I ask, so that the members in the setting as much as observers see that students ‘investigate a phenomenon by means of self-directed inquiry’. What is it the collective work of a teacher–student pair so that ‘a science teacher using the triadic dialogue form’ is a gloss that science educators might use to denote the situation. That is, bracketing does not mean that we make the contents that appears between brackets disappear; it does not mean that it is disputed. Rather, the question concerns the ‘collective doing’, ‘collective labor’, or ‘sympractical work’ from which whatever appears in the gloss emerges as an observable fact to which social actors orient themselves. Thus, in the mentioned study concerning the beginning and ending of a turn, beginnings and endings of a turn are produced in accountable ways: everyone present can hear the teacher’s ‘thank you’ and see the student’s returning to his seat, which co-occurs with the teacher’s naming another student, who gets up and takes his turn. Ethnomethodology is interested in the collective ‘doing’, that is, the natural methods by means of which phenomena are produced and recognized by participants and observers.
Fig. 1.1 Queuing for movie tickets is an example of an endogenously organized social event. A newcomer (grey) may be confused about the end of the line for one rather than the other movie.

The nature of the queue is problematic: we do what it takes to get into line frequently without becoming aware of our doing. In such cases, we might ask, ‘Is this the end of the line to movie X or movie Y?’ or ‘Are you waiting for …?’ Similarly, when the first person in line is not walking up to the counter, the teller might repeat the call, ‘the next one please!’ or someone further back in the line might say ‘there is an open one’. Those who staff a queue see and know when someone is attempting to ‘cut in’, whether an excuse is or may be legitimate or not (e.g., ‘my plane leaves in a few minutes’). Those who staff a social phenomenon recognize when a newcomer is unaware that there is a lineup in the works, for example, in the local fishmarket (Fig. 1.2), and might tell the person to ‘You got to take a number’. That is, the queue is a social phenomenon, requiring collective work, and this work provides the features required for recognizing the factual nature of what it brings about. That is, the work of queuing is naturally and endogenously accountable in and through its locally achieved product: the queue. The ‘persons arrange themselves to exhibit the line that appear as the real existence of an order of service’ (Garfinkel 2007: 15). They exhibit an orderliness that is ‘produced and exhibited by all parties to the line that appears’. We can further see the social nature of the queue from the fact that it works even though within a few minutes or parts of an hour its staff has been completely exchanged. Moreover, a passer-by may note the ‘same queue’ in front of
the blockbuster movie ticket window or at the cash register that they had seen when passing by or when entering the supermarket. That is, the queue has a life of its own, which has led to the expression of the ‘immortal society’, which continues in its ways even though its staff (i.e., citizens) are more or less completely exchanged within a certain number of years. ‘Now we are getting into the WHAT MORE of the exhibited order of service’s properties than that it is transcendental; specifically, that it is exhibitedly prior to and independent of any method or lexical device that is used to describe it. The existence of an order of service exhibits itself as the objective reality of the queue’ (Garfinkel 2002: 254).

**Formal Analysis Versus Ethnomethodology**

The relationship between the labor that produces endogenously recognizable social patterns, social science methods, and social facts is displayed in Fig. 1.3 (e.g., Garfinkel 2002). Science educators, as other social scientists, report social facts. They employ special methods (Fig. 1.3, column 3) to tell readers how they arrived at the facts they describe (Fig. 1.3, column 4) from the data that they have collected (Fig. 1.3, column 2). Ethnomethodologists operate differently. They take the natural attitude and ethno-methods as all is required to recognize the endogenous work that underlies the endogenously produced pattern. That is, ethnomethodologists never leave nor claim to leave column 2 (Fig. 1.3). They assume that social order is endogenously produced and made available by the participants themselves (note the ‘=’ signs crossing the brackets versus the brackets appearing alone in column 4). This is also why they are not required to specify methods, because the very methods they describe are those that are used in producing and recognizing the local order. Social science methods need to be specifically described because the nature of the social facts reported in scholarly journals depends on the methods used; but these methods of producing order differ from those that the people studied themselves use. Issues such as ‘reproducibility’, ‘quality’, ‘reliability’, of the social fact and its prevalence depend on what social scientists do, because the social facts, to be observable, often depend on precisely what has to be done to re-
produce an observation. The important point is that to employ social science methods requires the competencies mobilized in situation, a fact that is not generally acknowledged by formal analysts (Garfinkel 1967). For this reason, ethnomethodological studies, focusing on the actual endogenous order-generating work, produce ‘incommensurable, asymmetrically alternate phenomena of order’ (Garfinkel 1996: 9).

Formal analyses assume that the structures (patterns, themes, concepts, and categories) reported in scientific research articles are not self-evident or, to use a phenomenological term, ‘apophantic’, standing out and showing themselves from themselves. Rather, special methods – indicated in Fig. 1.3 by means of ‘→’ signs – are required to identify patterns and, in their methods sections, social scientists specify what needs to be done to ascertain that the patterns reported can reliably be seen if the descriptions provided in the methods section are followed. The assumption is that ‘only methods of constructive analysis could provide – only and entirely – for any and every orderliness whatsoever, for every one of the endlessly many topics of order, meaning, reason, logic, or method’ (Garfinkel 1988: 106). Moreover, these ‘topics of order*’ had to be ‘prepared for inquiry by formal analytic’ (p. 106) methods and theory. Ethnomethodology, which includes conversation analysis, in contrast, begins with the observation that everyday practical affairs are “naturally organized ordinary activities”’ (p. 107), which not only produce order but also exhibit this order to participants. The phenomena of order, therefore, ‘are immortal, ordinary society’s common place, vulgar, familiar, unavoidable and irremediable and uninteresting “work of the streets”’ (p. 108). The phenomena ‘cannot be recovered with a priori representational methods. They are not demonstrable in the established terms of classical studies’ (p. 107). They can only be observed in the details of the actual concrete achievement of the order itself, as available to, and used by, the members to the setting (or those who staff the social phenomenon in any particular case). In the ethnomethodological approach, therefore, Durkheim’s social facts are ‘society’s locally, endogenously produced, naturally organized, reflexively accountable, ongoing, practical achievement, being everywhere, always, only, exactly and entirely, members’ work, with no time out, and with no possibility of evasion, hiding out, passing, postponement, or by-outs’ (Garfinkel 1988: 103). The social phenomena cannot be recovered from psycho-

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<th>Abstract pattern</th>
<th>Social science methods</th>
<th>Social facts ('researcher construction')</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example 1: Social fact</td>
<td>→ queuing</td>
<td>ethnography</td>
</tr>
<tr>
<td>Example 2: individual consciousness</td>
<td>→ following instructions for a laboratory task</td>
<td>Interpretive method, describing how pattern was extracted</td>
</tr>
<tr>
<td>Example 3: Social fact</td>
<td>→ telling Jane that we’ve changed her topic</td>
<td>( )</td>
</tr>
</tbody>
</table>

**Fig. 1.3** Relationship between ethno-methods, social science methods, and social facts.
For Garfinkel (1996), the lesson of ethnomethodological studies is clear: to lose your phenomenon of order, all you have to do is use formal analytic methods. ‘And in order to assure their loss in any actual case, do so with the methods of generic representational theorizing’ (p. 18). Thus, rather than attempting to get at the general through abstraction of cases from their context, doing counting of the prevalence of their occurrence, and using abstract general descriptions, the ethnomethodological approach displays the making of order in the actual, concrete case of their application. Ethnomethodology is different, because it draws on the natural attitude, the natural competencies people deploy in the production of such things that social scientists denote as ‘queue’, ‘power relation’, ‘excuse’, ‘interest’, ‘motivation’, that is, the ethno-methods required for producing and recognizing the phenomenon of interest. For ethnomethodology, the recognition of the social fact and its production are but two manifestations of the same social phenomenon. Queuing, finding the end of the queue, taking one’s turn, cutting in, pointing out an empty service slot etc. all are based on the recognition of the queue as queue or troubles in the queue. No additional method is required for understanding the work that phenomenalizes the queue. Knowing the structure of the work will allow us to know, in any particular case, what will be observed as a social fact. Knowing the social fact, however, does not allow us to understand the work that has led to its production (phenomenalization). We may gather all the different ways in which queuing might be observed, in all the variations of the irreducible social phenomenon, but all of these observations together do not get us at the work that makes queues come about and expressions of which staff members use in the maintenance of the queue.

What Science Educators Might Want to Bracket

A ‘natural way’ to think about what science educators (teachers, professors of science, science educators) may talk about what they do in their classes, irrespective of their epistemologies, could include ‘trying to get a point across’. Bracketing means literally placing this gloss in brackets, ‘{trying to get a point across}’, and asking questions about the work that is being done so that any one in the lesson or vicarious observers of a videotape thereof can see that ‘trying to get a point across’ is currently happening.

For science educators, the things of the natural world are unquestioned. When an oscilloscope is hooked up to a particular electrical circuit and exhibits a sinusoidal signal, constructivist science educators might talk about the signal constituting a representation or particular construction of whatever natural phenomenon there is. But they do not tend to question the presence of the signal itself. In the social sciences, the situation is different because social phenomena are not present in the same way as natural phenomena. Yet – and this is one of the foundations of sociology – the natural attitude does accept social phenomena as things.
Saying that some phenomenon is socially constructed does not implement Durkheim’s notion of the social fact sui generis, and it does not focus on the collective work that is being done to make whatever is glossed a social fact. This is what ethnomethodologists understand as the ‘What More?’ to which its field orients over and above what every other formal analytic methods orients, whether these other studies are of the quantitative or qualitative kind. The distinction between EM and FA approaches further appears in the fact that FA approaches have to specify the method by means of which they reliably extract patterns from their data, whereas in the EM approach, the very natural attitude that allows us to see the social phenomenon is accepted as the only method required. Because it is the method of the people, emerging from the natural attitude, no further methodological specification is necessary.

Research Policies

This book is designed to look at social facts in/of science classrooms sui generis, that is, that inherently are of a collective nature and therefore cannot be explained beginning with the individual as the unit of analysis such that their contributions are added up or made to somehow inter-action to get out of the trap of individual and individualistic intentions. In such research that studies interactions, the individualistic perspective has already been accepted; and research begins with individual actions that somehow are brought together to produce a social phenomenon. Conceiving of social phenomena where the minimum unit of analysis is social requires an approach that studies transactions (Dewey and Bentley 1949/1999). In transaction, the parts cannot be identified independent of the whole and, therefore, one part cannot be understood independently of the other. We cannot therefore begin research by identifying something that will be a part of a whole (social) that could be isolated and understood in isolation. If we accept a conversation to be a social phenomenon, then we require a social unit of analysis to understand it. The individual speaker is not such a unit. The minimum unit of a conversation, to be social, requires at least a pair of turns at talk; and this pair of turns must be irreducible if the unit is to be a social one.

Both conversation analysis (Levinson 1983) and dialogical analysis (Vološinov 1930) make the turn or adjacency pair the minimal unit of analysis. Adjacency pairs or more complex forms of sequentially organized turn taking cannot be reduced to the individual speaker because each part of a pair (whole) requires the other and is intelligible only as a part of the whole. For example, in the following excerpt from the transcript (see Appendix B), there are four turns but only three full sequentially organized turn pairs. The first turn never is a true beginning but rather already constitutes a replique to a conversation in a historical context (Chré-tien 2007). The first turn pair (turns 129–130) constitutes a question | reply unit, where the reply actually constitutes an affirmation of the assertion co-articulated in the locution (‘I turn it off’). That is, we cannot know the nature of the locution in turn 129 until its ‘social evaluation’ in the situation is known, which comes with the next turn that also implicitly or explicitly (takes up) reports the preceding locu-
tion (Vološinov 1930). Similarly, we do not know the function of the second turn in a pair outside its relation with the preceding locution or situation, by which it has been addressed and to which it is a replique. At the same time, turn 130 also constitutes the opening of the next pair, which here is an assertion | question. Turn 130, which may be glossed in the expanded form as ‘yes, you turn it off’, constitutes the first part of a unit where the second part questions part of the preceding one. The question can be glossed as ‘You turn it off after you add the air?’ The next adjacency pair (turns 131 | 132) is again a question | affirmation. (Transcription conventions are provided in Appendix A.)

Fragment 1.1

129 J: do I turn it off you turn it off
130 C: yea.
131 J: after you add the air?
132 C: yea.

Adjacency or turn pairs are units that meet Durkheim’s requirement of social facts to be irreducible ‘things’. Adjacency pairs then cannot be viewed as being staffed by specific individuals but, as units, are social things. Turn or adjacency pairs constitute a reality that exceeds that of the individual; and these have the further advantage in that the dynamic of life is contained, for the unit is diastatic: spread across time and people.

Using the turn pair as unit also takes into account that the interlocutor currently not speaking is also active rather than inactive (e.g., Roth 2013). Take turn 129 as an example. For there to be a reply, Carrie has to actively attend to, listen to, Jane to be affected by the speech in order to appropriately reply. In fact, while listening, there is an active take-up in inner speech, whereby the words of the speaker are received (witnessed), commented upon, and retorted to simultaneously as the opening, forming part of the outward reply in the subsequent turn (Vološinov 1930). That is, Carrie is not inactive while Jane is speaking in turn 129. Her own locution in turn 130 is only the (external) expression of the complete response. Even though it contains only one word, turn 130 therefore implies reported speech and reporting context. Between these two exist a ‘complex and tight dynamic relations. Without taking this into account, it would be impossible to understand one thing of the problem of reported speech’ (ibid: 117). Similarly, for Jane to take an appropriate next turn requires attending to, listening, receiving, commenting, and ‘retort’ (add) to the locution so that in the course of turn 130, she is as active as Carrie. The turn pair therefore meets the requirement of capturing the sympractical work. Each locution is joint work rather than the work of only one person. Each word belongs to all interlocutors rather than only the speaker.

An immediate upshot of this discussion is that we cannot ever say what an individual locution is, for – as any part is always a part of a whole – locutions specify each other in a pair-wise fashion. Take the following turn from the latter part of the inquiry science lesson analyzed throughout this book:

Fragment 1.2a

150 J: kay, but wouldnt that heat the air thats around the outside?=
Because it has the grammatical structure of a question and because it is intonated in the way questions frequently are, researchers might be tempted to suggest that Jane asked a question and develop all sorts of implication from this. Attending to the intonation and other prosodic cues is important to the analyst, for these are the ways in which speakers provide their audiences with information about how a locution is to be taken: as quotation, literal speech, metaphor, commentary, critique, analogy, and so on (Vološinov 1930; Vygotskij 2005). Therefore, even if, as in the same example that these two authors discuss, the same word is said six times in a row, its function is never the same – not in the least because each new instance is heard against all the preceding ones as the indexical ground. To understand the internal dynamic of this conversation, we have to hear the word in the ways that the participants hear it. Consistent with our interest in social facts, the turn has to be considered as part of the minimum analytic unit of social phenomena. In the case of a conversation this minimum unit is a turn pair (Schegloff 2007). As the turn pair shows, the second part treats the forgoing as an ‘interesting point’ (turn 151). From the perspective of the conversation, therefore, turn 150 makes the point that is acknowledged in turn 151. This then is the new state of affairs that the conversation has to deal with rather than an individual.

Fragment 1.2b

150 J: kay. but wouldn’t that heat the air thats around the outside?=
151 C: ^NN. thats an interesting pOINt you mIght lIke to (. ) commENt on that.

In this book, I am concerned with exhibiting the ethnomethodological approach with empirical materials, for which we seek to provide an ethnographically adequate description (McDermott et al. 1978). This means that I ‘must articulate the same hesitant and momentary contexts that the natives are displaying to each other and using to organize their concerted behavior’ (ibid: 246). In the present instance, ‘the natives’ are members of a physics classroom, staffing the particular social phenomenon that we, qua science educators, are interested in. Social phenomena of order exist in and are the retrospective result of transactive, sympractical, collective work that makes explicit everything required for noticing both order and devi-ation from it. The same competencies underlying the production of order endogenous to social phenomena are required competencies for us, qua analysts, who then ‘can use the ways members have of making clear to each other and to themselves what is going on to locate to our own satisfaction an account of what it is that they are doing with each other’ (ibid: 247, original emphasis). The intent is to provide descriptions and explications that allow readers to take our analyses and, for every instance described, find the same order producing work in the science classrooms that they have access to.

A lot of (science) education research currently is caught up in detailing the special methods by means of which researchers develop patterns – i.e., (social) structures – from their qualitative data. The methods need to be detailed because they are assumed to be different from those that the research participants themselves use in making sense of, orienting towards, and acting in their lifeworld. A secondary problem immediately arises, for when these methods differ from those that participants themselves use, then a method can be judged adequate or inadequate to the
particular research question that drives the research. In ethnomethodological work, this question does not appear at all, because the methods of the research participants for structuring the social events are the same that they use for perceiving them. When researchers use the same methods, then there no longer is a need to specify it, for the very research project exhibits the methods in use. There no longer is a question of the authenticity of research findings, whatever the type of authenticity.7

This approach is sometimes charged with objectivism. But this is not so. Rather, the researchers do everything so that the work that structures practical action is exhibited in and by research so that the specification of method becomes unnecessary because it is available in the account itself. The account is no more and no less objectivist than the research object, which is the work by means of which participants exhibit structuring work and its results – social structure as sociology’s fact – in and through their own actions.

How, from within this framework, should we understand language as it is displayed in the science classroom not only for the other but also for the speakers themselves? In what consists mastery of natural language, where this ‘mastery’ is to be understood at the level and through the eyes of the participants? From an ethnomethodological perspective, natural language consists in this: ‘In the particulars of his speech a speaker, in concert with others, is able to gloss those particulars and is thereby meaning differently than he can say in so many words; he is doing so over unknown contingencies in the actual occasions of interaction; and in so doing, the recognition that he is speaking and how he is speaking are specifically not matters for competent remarks. That is to say, the particulars of his speaking do not provide occasions for stories about his speaking that are worth telling; nor do they elicit questions that are worth asking, and so on’ (Garfinkel and Sacks 1986: 165, original emphasis, underline added). The ‘particulars’ that the authors refer to are {glossing practices}, that is, the ‘methods for producing observable and reportable understanding, with, in, and of natural language’ (ibid: 164–165). These glossing practices serve to ‘exhibit-in-speaking’ and ‘exhibit-for-the-telling’ that speaking is understood and how it is to be understood. Thus, it is in speaking that the what Jane has said is exhibited as being an ‘interesting point’, and, it is exhibited-in-the-telling in the sense that I (or anyone else) can now report (‘tell’) that ‘Carrie remarked on Jane’s idea as an “interesting point”’.  

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7 Constructivist research has to pose the question of authenticity (e.g. Guba and Lincoln 1989), because there cannot be a guarantee that members to a setting find anything recognizable in research results. This is so because research methods are different from the methods people use to produce social phenomena.
Glosses and Glossing Practices

[T]alk itself, in that it becomes a part of the selfsame occasion of interaction becomes another contingency of that interaction. It extends and elaborates indefinitely the circumstances it glosses and in this way contributes to its own accountably sensible character. (Garfinkel and Sacks 1986: 165)

In science education, the predominant way of considering language is to look at its content, that is, what some saying is about. In chapter 1, I discuss the example from an Australian classroom where a student comments on a word spelled as ‘wether’, where an ‘h’ is missing to make it ‘whether’. A typical analysis focuses on the spelling or on ‘the play of words’. Accordingly, language is about spelling, about the fact that students talk about sheep in a chemistry classroom, or about using everyday language to make play on words. But language first and foremost is a means to conduct social intercourse (Vygotskij 2005). In the course of conducting such intercourse, language itself becomes part of the occasion. This is shown precisely in the episode, where the spelling of a word becomes an issue. The unhearable difference between /ˈwɛðə(r)/ (‘whether’) and /ˈwɛθə(r)/ (‘wether’), one that could have been extended to include /ˈweðə(r)/ (‘weather’), not only is another contingency of that transaction but itself a topic of discussion. Whether /ˈwɛθə(r)/ is to be heard as ‘wether’, ‘whether’, or ‘weather’ does not tend to be a problem in competent natural language use, for it is not the sound-word that ‘means’ but the situation as a whole. It is the situation itself that makes for, allows, and affords the distinctive hearing. What the researchers do, in their paper, is this: they work up an analysis designed to overcome the indexicality of the language. They write, for example, that Trev … noted that Mal had incorrectly spelled the word “whether” (Bellocchi and Ritchie 2011: 779). But this, as I suggest in my brief re-analysis of the extract in chapter 1, is not what Trev notes or does. Grammatically there is a query about whether there should be an ‘h’ after the ‘w’, which is heard as a ‘worry about grammar in chemistry’. It is that worry about grammar in chemistry that becomes an issue from within the situation rather than the spelling that the re-
searchers are writing about. We may therefore take the authors’ analysis as a gloss of the kind that tends to characterize qualitative research generally and ethnographic research specifically (Have 2004).

**On Glossing**

Glossing is not something specific to researchers; we use glosses every day and all of the time. However, it is not the contents of the glosses that is of interest to ethnomethodological studies. Rather, everyday glossing practices themselves are the central issue in and research interests of ethnomethodology. The term glossing is used to denote the fact that we cannot ever state in so many words, that is, directly, what we mean to say. In fact, as readers we make out what a text says even when and precisely because the text does not actually say it. For example, a reader of an early text of mine introducing an ethnomethodologically oriented study noted ‘There is something about the text that seems to communicate that most folks are not aware of ethnomethodology and those who are aware of it have not used it correctly’. That is, the reader communicated to me that there was ‘something about the text’ that ‘seems to communicate’ what it did not itself state: ‘most folks are unaware of ethnomethodology’ and ‘those who are aware of it have not used it correctly’. That is, something in the text was such that that reader could attribute all sorts of attitudes and intentions. In fact, authors of such statements recognize this possibility of the disjunction between intention and their own impressions: ‘You may not intend this and you might not be surprised that I am reading it this way’. The fact that we always say more than we mean to say, more than what we intend to say, can be seen from this last quotation. Thus, its author also communicates that I know him/her sufficiently well so that it makes sense to state that I would not be surprised that s/he was reading my text in the way s/he read it.

We learn from these examples that social actors use words to denote states of affair but precisely what the words denote is clarified to some extent through the extended use of the word. In the ethnomethodological literature, brackets are often used – here ‘{…}’ – to enclose such terms.

Etymologically, the term derives from the ancient Greek γλώσσα [glôssa] and Latin glôssa, tongue, language, foreign language, a foreign or obscure word. One of its present-day senses is precisely that: an obscure word. In another sense, gloss denotes a word inserted on a page (between lines, in the margins) that explains, translates, elaborates, or otherwise renders a difficult or foreign word of the text. In a more extended sense, gloss may denote a comment, explanation, or interpretation. Formulating what is happening, has happened, or will happen in social events constitutes one way of employing glosses. For example, in Fragment 2.1, Carrie does not just begin to talk to Jane but she formulates that talking to Jane is the event, which, in this case, is supposed to be happening: ‘I better talk to Jane first’ (turn 001).

**Fragment 2.1**

| 001 | C: okay. (0.24) OH; ({moves toward Jane}) i better talk to JAne first. (0.24) oKay:. (1.63) changef plA:Ns. |
Here, there is a future orientation in the formulation even though grammatically the future tense is not employed. In part, this move may have been occasioned by the fact that Carrie actually moves from the back of the classroom towards Jane, who is oriented to the front and side (Fig. 2.1). But this formulation is part of the sym-practical and transactional work accomplished by the two participants that opens a classroom episode, marked as such by the members to the setting themselves. That is, the ‘episode’ is not defined as such by an excerpt that the researchers extract from their data sources but rather, the episode is defined by the members themselves. As shown below, the teacher (Carrie), the student (Jane), and the researcher present each provides a gloss of what has happened after the two have closed out this segment of the lesson.

There is a pause and then a statement: ‘change of plans’ (turn 001). This may elaborate the ‘better’ that has preceded, because – if heard as an announcement of future things to come, that is, as a change in what has planned apparently in reference to Jane – what the latter would be doing during this lesson that just started would change. Carrie not only articulates what is anticipated to happen, here realized because, after the fact, we can say that it actually happened, but also says ‘I better talk to Jane first’. What she says by using ‘better’ is not evident in the saying itself. But it may be disclosed in the talking that happens, or in a gloss (description) that Carrie might provide after everything has been said and done. Even without taking recourse to subsequent parts of the events – illegitimate in and for the process of establishing a first-time-through account – we may want to try and anticipate what might be coming by investigating the next few seconds. Following a brief pause (turn 002), there is an interjection (‘u::mm::’), the second part of a turn pair that expresses the social evaluation of what has preceded.

**Fragment 2.2**

003  J:  U::M::: ((head sideward, gloss: disappointment on
The pitch begins with a high value of 408 Hz and, after being sustained for a while, descends to 194 Hz. The transcriber noted that the interjection can be heard as ‘disappointment’. In fact, the next speaking turn responds both to the change of plans, providing a reason for it, and a reply to the interjection: ‘to make life easier’. That is, what the formulating gloss in Turn 001 really says, in describing that the talk to Jane ‘better’ occurs ‘first’, might anticipate a possible disappointment; but it also anticipates the ‘change of plans’, which, the earlier it is enacted, the better it is for Jane, because, as the subsequent talk shows (see chapter 3), Jane would not be ‘losing more time’ on something that ‘has been decided that it is too difficult’ (turn 005).

Ethnomethodology is less interested in the particular glosses used than it is in the work that glossing practices achieve in the setting. That is, in this approach, glossing practices are a topic of research. Glossing practices, therefore, are recognized to be integral aspects of practices by means of which social structure is produced and recognized, and these practices, as the introductory quotation to this chapter shows, become part of the situation as but another of its contingencies. In the present situation, it is part of the opening of a talk about a change of plans. This glossing talk ‘extends and elaborates indefinitely the circumstances it glosses’ (Garfinkel and Sacks 1986: 165), that is, there is a reflexive nature in that the gloss both is about the circumstances and (becomes) part of the circumstances. In so doing, the gloss ‘contributes to its own accountably sensible character’ (ibid: 165). Thus, for example, the statement ‘I better talk to Jane first’ not only formulates what is to come but in itself becomes part of the context for whatever comes next. This is consistent with the sociological approach to language that has arisen in the Bakhtin circle, whereby a word, when repeated, no longer ‘means’ or functions in the same way as during its first articulation in the situation (Vološinov 1930). This is so because, in having been uttered for a first time, the word, in its second occurrence, can be heard as a second rather than a first occurrence: the context now includes the first occurrence so that the very fact that the word is uttered for a second time becomes significant.

Glosses may be used to point to complex processes and events. For example, when asked later about some aspects that stood out to her in the lesson, Carrie explicitly referred to the exchange with Jane: ‘I had to tell Jane that we’ve changed her topic’. This phrase glosses what had been an exchange between the two that lasted over 5 minutes. Below, following a brief description of the setting, I provide and elaborate on the glosses that different members to the setting – teacher, student, and researcher – provided afterwards.
Setting

The social facts described in this book were derived from 16 video-recorded lessons (2 hours each) of one 11th-grade physics class in which individuals and paired groups each worked at completing one from about six possible extended experimental investigations (see chapter 8 on some of their specification in the state syllabus). The statement for each extended experimental investigations was deliberately general and open to interpretation. For example, the rising bubble extended experimental investigations simply stated: ‘A vertical tube is filled with a viscous fluid. On the bottom of the tube there is a large air bubble. Study the bubble rising from the bottom to the surface’. Students were asked to design a set of experiments that was expected to lead them to a deeper understanding of the phenomenon, in this case, the conditions under which an air bubble would rise to the surface of the fluid, and the details of its trajectory to the surface. They had to write and submit a report of their extended investigation at the conclusion of the 10-week term. The grade they received would be the only form of formal assessment for the entire term.

The class in which the video recordings were made was one of three physics classes at this grade level in the school. All members of this class from an independent school for girls had encountered a similar, though less demanding, form of open inquiry in their previous year of general science. Their teacher Carrie was a beginning teacher in her first year at the school. She was a former research engineer with considerable commercial product-development experience in Australia and Europe.

Even though the final reports varied in quality, the physics teachers who shared responsibility for assessment decisions across the classes judged all but one report from this class to be satisfactory. In this book I focus on the exchange between this student (i.e., Jane), her teacher (i.e., Carrie), the researcher, and other students to show how bracketing is effected in studies that invoke ethnomethodology. Jane selected the lantern investigation, which required students to ‘Design and make a [paper] lantern powered by a single tea-light that takes the shortest time (from lighting the candle) to float up a vertical height of 2.5 m. Investigate the influence of the relevant parameters. (Please take care not to create a risk of fire!)’. The major reason for selecting Jane’s exchanges with the teacher and peers was that her extended experimental investigations was modified just two weeks into the project due to unanticipated complications with burning candles required to raise the lantern, as experienced in the other classes, and the work done by the teacher and student in these transactions was observable. At this early stage, Jane had not yet attempted to elevate her lantern design, despite purchasing materials to build a lantern. The episode selected for analysis focuses on an exchange between Carrie and Jane that begins with Carrie breaking the news of the modification required.
Participants’ Glosses

The analyses reported and elaborated in the subsequent chapters of this book concern one 5’11” episode as defined, produced, and later pointed to by the members to the setting as something that had stood out for them. The direct (rather than vicarious) witnesses talk about it as the ‘change of plans’ from the original to a revised task definition for a self-directed inquiry project. After having approached Jane from behind (Fig. 2.1), Carrie sits next to her at the laboratory table on which there are many of the materials that the student had prepared (and bought) for her investigation (Fig. 2.2). Throughout the event, the two sit in this way, face-to-face, talking about what Carrie formulated as a ‘change of plan’. In this section, I present different glosses that are associated with these events, including that the teacher (Carrie), the student (Jane), and the researcher provided. I add a fourth type of glossing for parts of the event, which were produced by the person producing the raw transcript. In the subsequent account of the event, which takes a first-time-through approach, these glosses are explicitly bracketed, that is, eliminated as having any explanatory value and existing merely as social facts next to all other social facts within and surrounding the episode. The analysis then specifies the lived work by means of which the order described in the after-the-fact provided glosses has been achieved. Each gloss, though pertaining to the same sympractical work, constitutes a concrete index to the event that is experienced and manifests itself in different ways.

Gloss 1: ‘I had to tell Jane that we’ve changed her topic ... and Jane did balk at it all’

Following the lesson from which the fragment to be analyzed was extracted, the researcher had an interview with the teacher. In response to the question whether ‘anything stands out from that session’, Carrie responded, as stated above, ‘I had to tell Jane that we’ve changed her topic’. The researcher and teacher then engaged in a conversation in which this gloss of the lesson segment was elaborated. Carrie explained what she was doing and why in the following words:

Jane is sort of, towards the bottom of the list as far as physics achievement in that class goes. [So what would that be?] Scraping a sound. Technically Linda has a lower mark but she was ill and almost didn’t do a piece of assessment but did it. So discounting that, which was sort of abnormal, Wanda and Jane are lower down. So Jane is really just scraping through. And she’s doing physics because her dad wants her to do physics, I think, really and she struggles with it, which is, I always thought that that topic wasn’t the best for her because it’s not as straightforward and the other groups doing the same topic in other classes have also had a lot of trouble getting anything to work at all. They’re meant to be making a lantern rise through light candles. We have simplified the problem and adding hot air to the lantern, seeing how quickly it can rise. … Andrew [department head] changed [the wording of
the problem] because there’s a dozen other classes doing that problem who haven’t been able to get anything done so Andrew decided that something had to be done about it, so changed the kind of direction of it all. Yes it was very specific what now is the direction and her variables are still up to her. Whether she changes the volume of the lantern or the shape of it or the temperature which she gets the air to before she lets it go or whatever. … So adding hot air through a hairdryer or something like that. Or heating it by passing air over a hot element which is a hairdryer. We haven’t specified using a hairdryer but how else do you heat air without using a flame. … So and Jane did balk at it all. As much as it’s making life easier for her, she wants to do her own thing so hopefully it doesn’t put her off too much and she does get on with it. She’s also not working with anyone. … I don’t think she is as interested in physics as she is in singing, music and … when she does do a little bit of something she’ll let you know, ’cause it’s rare. Anyway so that was probably a fairly important thing that happened today and yes, I’ll try and give her more guidance to try and get her doing things so she can get to … It appears to me that she doesn’t want to be seen to not know things. This is the whole point, they don’t know things and they’re meant to be trying to find things out and the other girls will say, I don’t know. Whereas she spouts all these words that, when you add them up, don’t say much at all. I was, I sort of knew that she wouldn’t be particularly happy with it and I guess I approached her with the idea that I wanted her to feel that it was a good thing rather than meaning she’d done all this work and it was wasted etc. … That was the aim of the conversation to let her know that this was what was happening but have her feel that it was okay.

In the end, Carrie summarized and glossed the notable character of the event by saying: ‘Yes, it was different to the run of the mill kind of trouble shooting type things that are going on’. Elsewhere during the interview, she also said about the
exchanges she has had with Jane: ‘I guess I feel, I feel a bit more aware of making sure I say things that won’t, I guess, upset her in a way, whether it’s how I say it or how I try and put things to make sure she doesn’t get off track. … Not so much upset Jane, but not have Jane upset’.

I take this to be a natural, after-the-fact account of what has happened, as one of the two participants and witnesses provided it. Neither the phenomenological nor the ethnomethodological approach criticizes members for their accounts. In neither approach do researchers belittle or ironize members for the contents or the methods of their accounting. Thus, researchers do not evaluate a student statement as being a ‘misconception’ or states what a student or teacher should have done. This kind of research, in phenomenology or ethnomethodology, simply brackets such accounts seeking to understand what the structure of the labor (practical action) is that goes into producing the episode that the teacher here accounts for in her natural-attitude based discourse. These are precisely the kinds of descriptions in the social domain that Husserl (1976) develops a method for researching at the level of the individual. Carrie tells us a lot about intentions, understanding, knowledge about the students, presuppositions, guesses, and the likes that ‘underlie’ doing what she had to do: tell Jenny that we’ve changed the topic.

This kind of account is not uncommon. In fact, I watched the video first with the researcher and graduate students working on the project, the researcher, who had videotaped the classes and interviewed teacher and students, used the same kind of explanations for what happened and why. In the analyses I advocate and employ here, nothing of the things that appear in the glosses can be used to construct an explanation. ‘Everything’ has to be subject to be placed in brackets, and, thereby, taken out of playing a role in the analysis other than being among the range of facts in the case. Even ‘teacher’, ‘student’, ‘power’, or ‘identity’ cannot be used as explanatory resources, for, in an approach that takes social facts sui generis, any unit of analysis cuts across these categories. This is why they require bracketing.

Gloss 2: ‘Is that back to the drawing board for you?’

The researcher, who had videotaped the exchange, expresses his understanding of the episode he had just witnessed in the question he posed to Jane immediately after the teacher has left. He asked, ‘Is that back to the drawing board for you, Jane?’ He subsequently offers an assertion and question, ‘You can still do it at home, can’t you?’, which affirms as possibility to continue the project but that comes with some unstated drawback. The original assertion and question is in fact a social commentary (Vološinov 1930), a response to the witnessed scene. That is, in this situation and in the language of the teacher (Carrie) and student (Jane) there is something that provides for the possibility of hearing and seeing the scene as one that has consequences circumscribed by the gloss ‘going back to the drawing board’. This description is ‘authentic’ in the sense that Jane replies by providing an affirmative. The descriptions turns out to be recognizable within the situation and as an account of an event that multiple members to the setting have witnessed and do/can provide accounts for.
If we had had the opportunity to ask the researcher afterwards what he had meant by the statement ‘going back to the drawing board’, or, rather, what in the situation was such that he – and in fact Jane and he – found it appropriate to use the expression, then he might have elaborated further, told us about the ‘change of plans’, about ‘Jane trying to continue with her project’, and so forth. When we watched the videotapes together, he did talk about Jane {doing poorly}, about {not really wanting to do physics}, or about {being more interested in how things look rather than in the physics concepts}. That is, he did provide something of the ‘more’ that he did not originally say in the expression ‘going back to the drawing board’. But this ‘more’ has been in the form of more glosses to elaborate an initial gloss. We can clearly see how even researchers use everyday ways of talking to do what we might gloss as {lay sociology} or {lay psychology}. In fact, natural language provides us with all the resources required to do just that. But, and this is a central point in this book, to move towards a more rigorous form of research, we might bracket for a while this or that gloss and investigate what the work is by means of which members to the setting make available to others, for example, that they {do not really want to do physics} or that they are {more interested in how things look rather than in the physics concepts}.

Gloss 3: ‘Yea, it’s back to the drawing board, I don’t know what to do now’

When the researcher asked Jane, immediately following the exchange with Carrie, whether that is back to the drawing board for her, Jane noded. We might render what Jane said during the interview in this way:

It sucks. … It’s really annoying, because I had everything planned and I knew what exactly I wanted to do. And it’s like when I first got it, I was like ‘Yes this is the one that I want to do out of all of them’, and now it’s sort of, you know, but … [the main problem] was trying to get the right weight so that the candle could lift it off. And I found something that would do it last night but – I mean, mum and I went shopping and bought all these stuff, and it was fun and like, yea. [You can still do it at home, can’t you?]. Ea, like, now that it’s sort of you know, I don’t know. I have to come up with a good reason for a science experiment so, I mean I can do it at home but like I just – I don’t know what to do now, so.

In this gloss of the situation, Jane describes to/for/in-the-language-of the researcher the impact the meeting has on her project, that she has found a solution and designed an experiment, that she already had bought the equipment and materials needed. There clearly is an emotional quality in her description, too, disappointment not being able to do the experiment that she wanted to do out of all those offered. We find the articulation of coming up with a good reason for the science experiment, and such a reason appears to have existed in her initial project, such as finding the right weight so that the lantern could lift off with the candle.
Whereas the gloss sort of gives us the gist of what was said, it does ascribe what was said to Jane, which actually has not been the case. As any social situation, the one in which the researcher talks to Jane is the result of the sympractical engagement of members to the setting. That is, the gloss ascribed to Jane is the result of an transactionally produced relation with the researcher (R) the full transcript of which is given in Fragment 2.3.

Fragment 2.3
001 R: is that back to the drawing board for you jane.
002 J: ((nods.))
003 R: how is that.
004 J: its sucks.
005 R: how does this make you feel.
006 J: its really annoying because i had everything planned and i knew what exactly i wanted to do, and its like when i first got it i was like YES this is the one that i want to do out of all of them and now its sort of () you know () but
006 R: what was the main problem.
007 J: well i was trying to get the right weight so that the candle could lift it off
008 R: ah yea yea yea
009 J: and i found something that would do it last night but i mean, mum and i went shopping and bought all these stuff, and it was fun and like yea
010 R: i guess you can still do it at home cant you.
011 J: yea like now that its sort of you know i dont know i have to come up with a good reason for a science experiment so i mean i can do it at home but like i just i dont know what to do now so
012 R: you know they have a lantern festival in taiwan ((Stop of tape.))

Jane did not just dump some contents of her mind onto a sheet of paper or recorded, through her voice, on a tape. Rather, what is attributed to Jane has been occasioned by questions, which again had been occasioned by the preceding events. This account, here, clearly is the product of a social relation – a researcher and a student who had signed up for the research. What is being said and how it is said, in each of the two interlocutor’s case, is for the other. It is not Jane’s talk independently of the researcher’s talk. There is one conversation with two voices, and what and how these voices speak is a function of the relation, the social situation rather than one voice making the other voice articulate what is in the mind behind it. This relation is produced simultaneously together with the talk about whatever the topic is. The text of the talk also produces the context of the talk.

The talk is initiated by what chapter 4 discusses under the heading of formulating. The researcher, in saying ‘is that back to the drawing board for you’ formulates the conversation that just has occurred. That is, it provides the ‘gist’ or ‘essence’ of a conversation in a conversation, which here, directly extends and is about the one preceding it. The point is not just that the researcher articulates this formulation but that it is formulated for Jane, the recipient. The formulation therefore exists for both (it is in-the-telling and for-the-telling); and the nod that is produced in reply is but the confirmation of an active reception of this formulation. Although the phrase comes from the researcher’s vocal cords, from the perspective of this conversation, the formulation is a joint production as it involves an offer of
a formulation and an acceptance. The formulation, from the perspective of the conversation as a social phenomenon exists only in and through the offer | acceptance pair and, therefore, is diastatically spread across and separated by that pair. Each part, offer and acceptance, is but a manifestation of the higher unit, which is the formulation as a social phenomenon.

Gloss 4: Transcriber’s Comments

We actually find another type of gloss in the data: the transcriptions themselves. This begins with the original, raw transcript in the way that the graduate student employed on the project provided it. Even though the speakers do not employ commas, periods, and question marks, such forms of punctuation indicate just what the transcriber, apparently competent in the natural English language, hears (and sees) as going on. Thus, for example, at the end of the first speaking turn, we read ‘Ok?’ The question mark indicates that the transcriber has heard a question. Similarly, there are question marks in the third turn, which, following standard grammatical conventions of the written English language mark the presence of a question.

C: Ok, Oh, I better talk to Jane first. Ok change of plans Mmm to make the life easier, it has been decided that it is too difficult. Ok?
J: I just found out a way to do it.
C: Er … but so it might still work for the change of plan. It’s on Moodle, the new statement but it is to do with having a lantern with hot air added to it by means other than using a flame, such as, can you think about anything? Hot air (pause), where do you get the hot air from?

We have to ask, just what is it in the talk itself that allows the transcriber to hear a question. Whereas this might be more obvious in the third turn, where the grammatical structure of two phrases ended by this punctuation form is that of a question (i.e., ‘Can you think about anything?’ ‘Where do you get the hot air from?’), it is much less evident in the case of the first question mark: ‘Ok?’ Competent speakers of natural language know that a rising intonation (pitch) tends to be heard as a question whereas falling intonation in the course of a phrase tends to be heard as a statement. The two ways of marking the phrase go together, because the intonation of a phrase such as ‘Where do you get the hot air from?’ often falls toward the end (Roth 2010). This means that the grammatical structure of the phrase is that of a question but the intonational structure is that of a constative statement. On the other hand, a constative statement that is offered as a replique to a question statement may be followed by a question mark indicating rising intonation. In this case, a statement is made all the while a question is raised: depending on the next turn, this may be heard as the student being uncertain about her response (see discussion of turn 012).

The glosses are also present in the transcriptions that I produced for the purposes of this book. These glosses appear in my transcripts literally bracketed: in double parenthesis and italicized or triangular brackets (chevrons), when there are
markers as to the quality of voice. The transcriber, using everyday language, hereby provides descriptions of what the persons can be seen to be doing. There is very little to be doubted about these glosses, for these are of the nature that most or even any other observer would agree upon that this is what can be seen and heard. Such glosses pertain to facial expressions (e.g., gaze is averted, pensive) or ways of hearing a voice (e.g., assertive, subdued). Readers should take these descriptions for what they are: natural language glosses that mark a particular manifestation of the totality of the episode.

There were other markers of glosses, which have been changed in the production of the full transcript as presented here. For example, the transcriber of the initial, raw, word-for-word transcript used punctuation to structure the text. That is, a comma marked that something has been heard as a clause, a question mark is a gloss that something of questions, a period marks the end of a statement. All of these are glosses, because what we have in fact is an uninterrupted soundtrack; and, when there are voices, there are no punctuation marks. The transcript used here, on the other hand, marks what can be indisputably seen and heard because punctuation merely marks prosodic features (unless marked as a gloss).

**Researcher’s Formulations of Work and Glosses**

In the preceding section, I present three glosses and a description of the glossing practices that transcribing embodies. But there is more to glossing practices, which are, in fact, the standard approach in social scientific research. For example, when ethnographers describe situations using a range of literary devices – which themselves change in the course of the history of ethnography – then they use glosses (Hay 2004). The texts provided in Gloss 1 and Gloss 3 are of a specific form. They appear as narratives *as if* the participant herself had said these words and in this way, even though the researcher’s questions are inserted in parentheses. The ethnographer may also write that a particular excerpt exhibits the ‘opening of the bringing of “bad news”’ or that in a particular segment of the videotape and transcript, the participants ‘elaborate a change of plan’. These are perfectly legitimate ways in which standard ethnography reports is findings and denotes the phenomena it observes. Glosses and glossing practices, therefore, are integral parts of the resources available to ethnographers in their everyday work.

Ethnomethodological approach does not contest such practices or their validity. In fact, ethnomethodologists acknowledge the tremendous accomplishment of traditional social sciences in producing a corpus of studies that provide professional researchers glosses of the everyday world. Ethnomethodology is not interested in the function of glosses as resources. Rather, ethnomethodological inquiry makes these glosses its topic. In fact, such inquiry may mark some phrase as a gloss, by placing it in glossing marks ‘{…}’, and then elaborate in just what the work consists that allows events to be seen and understood by means of the phrase. In chapter 1, I provide a tutorial example of {queuing}, where something in the everyday world recognized as an instant of ‘queuing’ is specified in terms of the mundane work that actually produces this order that we denote by the term ‘queue’. Even
though members of a queue may find it useless to describe the work (e.g., how they scan the counters in a bank to see whether there is an opening that would signal that it is their turn in the order of service), their very actions of competently queuing exhibit their practical understanding of how a queue works.

In chapter 3, where I exemplify an analysis of a brief classroom episode that participants had picked out and identified as something important. The teacher, Carrie, had glossed the event as one in which she ‘had to tell Jane that they’ve changed her topic’ and, in the event itself, she had announced in an anticipatory way as ‘I better talk to Jane first. Okay. Change of plans’. She thereby announced that she would be talking to Jane and that a ‘change of plans’ was in the making. Taking into account a participant’s own words, I render the event by the gloss {change of plans [in student-centered inquiry science]}. As such, this phrase is but a name or label for a complex event sequence. This gloss does not provide us with an account of the sympractical work by means of which the change of plans comes about. ‘Sympractical’ here denotes the fact that the change of plans in this situation is a collective achievement that arises from the mutual engagement of the participants. The adjective sympractical points to the fact that there is a joint orientation in the social situation, accomplished through their joint work rather than being instituted by one person (e.g., the teacher). This joint work does not arise from the addition of individual work, such as ‘Carrie asks’ and ‘Jane responds’. Rather, the sympractical nature of the work is marked by the fact that the minimum unit of analysis irreducible includes both: “Carrie asks” | “Jane responds”. This unit constitutes the joint work, requires both parts to be realized.

In my presentation of the events, I use glosses in the way an ethnographer might do, but only to give a provisional descriptive label to what a stretch of transaction might look like to an observer. The analysis itself focuses on the sympractical work, which, consistent with the descriptions in chapter 1, exists in the ‘doing’ of the figure ‘Doing {change of plans in student-centered inquiry science}’.

The question becomes, ‘How do the members to the setting together achieve the change of plans?’ ‘By what means is the change of plans enacted?’ ‘What are potential obstacles to the change of plans?’ Rather than saying that the participants ‘negotiated’ this or that we are interested in the work by means of which a stretch of talk comes to be recognized and produced as a {negotiation}.

For the purpose of the presentation of the classroom episode in chapter 3, I (rather than the participants) broke the episode into 9 sections:

- {opening the bringing of ‘bad news’}
- {elaborating change of plans}
- {disallowing experiment with waxes}
- {arguing for and against maintaining the original plan}
- {pleading and closing out topic}
- {changing topic to talking theory}
- {reasserting plan and getting compliance}
- {changing topic for elaborating possibilities in changed plan}
Each of these ethnographic descriptions is marked as a gloss, which in itself is not very interesting. What is interesting is the work—denoted by the verb ‘doing’ that precedes each gloss—that produces something that we recognize as ‘opening the bringing of “bad news”’, ‘elaborating change of plans’, or ‘ending a meeting’. Thus, the emphasis of the inquiries in the chapters that follow is in the doing of whatever is visible and recognizable as the ‘opening of a meeting’, ‘closing of a meeting’, and so on. Not only is there something visible and recognizable but also that we can teach it—the phenomena are instructably what they are. Just as we can teach a novice what is or should be a ‘foul’ in a game of soccer, and why it is so, we can teach, and do so in and as part of everyday situations, how to recognize that {pleading} is going on or that a {closing out [of] topic} has occurred.

Although these glosses are produced on the part of an ethnographically oriented researcher (me), they do so in ways that the participants themselves could have and even might have used when talking about the event to other people. For example, Jane might have told her mother explaining why she no longer needed all the materials that they had bought together that she ‘begged the teacher’ to let her go on so she was not allowed to do so. She might also say that she really tried her best to argue for and convince the teacher to let her stick with the original plan. Thus, in choosing these glosses, I oriented towards descriptions that the actors themselves might use or would recognize as describing what they have done.

Traditional interests in science education include ‘power’, ‘identity’, ‘third space’, ‘misconceptions’, ‘negotiation’, or ‘cognitive development’. In the research praxis described here all of these terms would be taken as glosses. What is the work by means of whatever these notions refer to is produced by the members to the setting? What is it in any particular situation that allows us to witness—see and hear—that there is a {power differential}? What is it in any particular situation that allows us to witness—see and hear—that there is a particular form of {identity} being played out, ‘constructed’, or performed? What is it in any particular situation that allows us to witness—see and hear—that there is a {third space}?

The Tutorial

In 2002, during a research stay with Ken Tobin at the University of Philadelphia, I told him about conversation analysis and the kinds of findings people report in that field. One day as we were going to his office, I was telling him about the work that the listener produces while attending to the speaker. As we entered the building, there was a work area for students. I asked Ken to take a look and observe the person listening to someone else, to note the head nods, to observe body orientations, to watch for rhythmic (beat gestures) and the like. He told me that he had never thought about or observed that this was happening—the listener was integral to the work of the conversation. Going further towards the office, we passed another place where students worked, and Ken pointed out that the students were doing the same. Over the next few days, he repeatedly remarked that he was seeing the trans-
actional work being conducted in quite a variety of settings, restaurants, schools, and other places where we say people in conversation.

Whatever I had done on that first instant, it had been a tutorial. It allowed Ken to observe, for the first time, the contributions of listeners to the transactional work required to pull off a conversation. Moreover, whatever it was that I had said and done, it allowed him to identify the work in other places as well even though these differed from the first instance where the tutorial had taken place. He identified these behaviors in our own conversations in ways that became part of these conversations: he formulated these contributions to our transactional enterprise.

Notable about this situation is that Ken did not have to take a course on methods. Whatever he had brought to the situation and everyday explanations sufficed for him to notice and subsequently to find over and over again the contributions of listeners to the transactivational work of talking. In this book, my reporting of phenomena should be thought of in the same way. Thus, for example, in chapter 3 I describe, among others, the work denoted by the glosses {opening the bringing of ‘bad news’}, {elaborating change of plans}, and {disallowing experiment with waxes}. In each case readers should think of the text as a tutorial – not only for finding the work in the materials presented here but as a tutorial for finding the phenomena in every this place, that is, in any concrete (rather than imagined) science classroom situation. We can conclude that ‘from all this we have “a first observation” of tutorial problems. They are this-worldly settings wherein order productive parties so collaborate as to exhibit “just what a social fact is that makes it accountably just that”’ (Garfinkel 2002: 250).

Ethnomethodological studies differ radically from those practicing formal analytic approaches. This is so because formal analytic approaches specify special research methods that are required to extract the structures from the data sources that the research reports. In ethnomethodology, the methods of interest are those that the members to the setting themselves employ in identifying, producing, or accounting for structure, that is, the work from which emerge the objectively available social facts of their everyday lives. In this research, therefore, any report is something like a tutorial. In the context of a study of the work of teaching undergraduate chemistry in lecture format, the purpose of the reporting text is this.

The reader is urged to attend a lecture … In that setting read the article’s descriptions of the lecture hall as doings as instructions with which to find them, locate, recognize, follow, further observe, and the rest.

When the described doings of the article’s text are read in this way they make the work of lecturing instructably observable as concerted and endogenously produced, naturally accountable ordinary activities. When the article is read in that way, the article is about {Lecturing’s work}. The article then consists of a collection of tutorial problems. It reveals events of lecturing’s work in the aspect of their achievedly coherent production just in any actual case. (Garfinkel 2002: 219)

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8 It is for this reason that ethnomethodologists, following Duns Scotus, use the term **haecceity** (Lat. haecceitas, thisness): social facts always exhibit themselves in concrete situations, as concrete ‘this-es’.
Readers will note that the author is describing an analogous situation to the tutorial I had given Ken Tobin and to how I understand my own descriptions of the work in/of science education. Just as Ken took my instructions ‘to locate, recognize, follow, further observe and the rest’ the listeners’ contributions to the transactive conversational work, Garfinkel understands his article’s descriptions as instructions ‘to locate, recognize, follow, further observe, and the rest’ of the work that he had observed, including {taking and holding places}, {paying attention}, {[being] late}, and {interruption}’. Just as my tutorial has made the listeners’ contributions to the conversational work instructably observable ‘as concerted and endogenously produced, naturally accountable ordinary activities’ to Ken Tobin, Garfinkel expects his descriptions to make the work of lecturing instructably observable and the descriptions provided in this book make instructably observable the work producing such social facts as {opening the bringing of ‘bad news’}, {elaborating change of plans}, and {disallowing experiment with waxes}.

Formal analytic approaches operate in the same way in the sense that each research report constitutes a tutorial for finding particular orders when observing a segment of society at work. However, in contrast to ethnomethodology, formal analytic approaches require special methods for identifying what they gloss. These are specified in methods sections, which themselves are tutorials (for what to do to observe the social facts reported). These not only account for what the authors had done to identify and extract the orders they report on but also instruct the reader in what to do to reproduce the findings. Ethnomethodology has to do with procedures and has a procedural emphasis: ‘By procedural, [ethnomethodology] does not mean process. Procedural means labor’ (Garfinkel 1996: 6). At issue here is not the structure or an indifference to structure. Rather, ethnomethodology aims at providing procedural descriptions of – i.e., descriptions of the work producing – social structure as an endogenously achieved, witnessable and witnessed phenomenon of order from within the event.