

Students' Everyday Experiences as Resources in Whole-Class Conversations

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Abstract: This paper reports on a study of whole-class conversations in science education, with a specific focus on how students' everyday experiences can be used as resources for exploring scientific concepts. The empirical basis is a genetics project involving secondary school students and their teacher. A combination of quantitative methods, in the form of frequency counts of structural features of whole-class conversations, *and* detailed microanalyses of student–teacher interactions are employed. Findings are that, when the teacher orchestrates whole-class dialogues in which students are positioned as active partners in the conversations, more references to everyday experiences are made. In addition, the analysis shows that the mobilisation of everyday experiences enables the students to reason about complex issues related to genetics as well as enables the teacher to display this complexity and coexisting perspectives. The findings are discussed according to possible implications for instruction and dialogic whole-class activities.

Introduction

Even though whole-class conversations have been described by many scholars as problematic because they often are associated with the triadic initiation–response–feedback (IRF) structure (Nystrand, 1997), scholars have shown more productive aspects of such conversations (Wells & Arauz, 2006). According to Mercer (2004), teachers in whole-class settings can provide conceptual support, such as elicitation of students' understanding, contextualisation, and rephrasing of students' utterances through the application of more scientific terms. The importance of facilitating learning spaces in which students are enabled to participate as authoritative and accountable persons has been emphasised within the Learning Sciences community (Greeno, 2006). One way to provide opportunities for students to become authoritative and accountable participants is to include students' *everyday experiences* in classroom learning. By everyday experiences we mean knowledge and experiences that are relevant in some of the practices in which students participate outside school. Everyday experiences, for example, can be knowledge about celebrities in popular culture, characteristics of family members, knowledge gained from watching documentaries on TV or the internet, and characteristics of the students' local community. Scholars have shown that mobilising students' everyday experiences in conceptually oriented classroom conversations can support learning (Silseth, 2018; Warren, Ballenger, Ogonowski, Rosebery, & Hudicourt-Barnes, 2001). For instance, Warren et al. (2001) found that, when language minority students were encouraged to use their first language and to use everyday experiences when verbalising their reasoning in a science project about metamorphosis, it resulted in a supportive learning space as well as invoked multiple perspectives on the scientific topic.

In this paper, we explore the relationship between designing talk in whole-class conversations and the mobilisation of everyday resources. The data consist of videotaped student–teacher interactions during a science project in a lower secondary school. We employ a sociocultural approach to the study of meaning-making in which learning is described and analysed as a social and contextual process involving students' active understanding in a practice that is created by people and cultural tools (Mercer, 2004). The following research questions guide the analysis: RQ1: What structural features characterise the whole-class conversations? and RQ2: How are students' everyday experiences used as resources in the whole-class conversations?

Research context

The data were produced during a science project about genetics, and the participants were one class of 38 lower secondary school students, aged 15–16 years, and their science teacher. The genetics project comprised several thematic subunits, such as the genetic material (chromosomes, DNA, and genes), cell division (meiosis and mitosis), environment, and heredity. In addition to the whole-class sessions, the project contained both group- and individual activities. The teacher was not given any specific instructions regarding his role as a teacher in the science project nor how to carry out the sessions, and he was fully responsible for implementing the instructional design without interference from the observing researchers.

Methods and data analysis

The science project was carried out during 11 school lessons (each of 60 minutes). Five and a half hours of the total 11-hour long project involved whole-class conversations. The main data material applied in the study constitutes the five and a half hours of transcribed video recordings of all student–teacher interactions that took place in the whole-class conversations. Ethnographic observation notes taken during classroom observations provided supplementary contextual data for the analyses of the participants’ interactions. A combination of quantitative methods in the form of a) *frequency counts* of structural dialogue features and b) *microanalyses of student–teacher interactions* were used (cf Furberg, 2016; Hmelo-Silver, 2003). The frequency count analysis involved coding and categorising the student–teacher interactions that took place in the whole-class settings. The applied coding scheme is based on an adaptation of selected categories from a more substantive coding scheme developed by Wells & Arauz (2006). Of particular interest for the current study are conversation sequences identified as “triadic” and “true discussion”. Triadic sequences are characterised by a structural feature commonly referred to as the IRF structure. Two forms of triadic sequences were identified: 1) triadic sequences initiated by a teacher, followed by a response by a student, and then succeeded by teacher feedback (coded as (T)Triadic); and 2) triadic sequences involving the teacher and *one* student, where the initiations were provided by the students (coded as (S)Triadic). True discussion sequences are speech-units defined by “the free exchange of information among at least three participants, with or without the inclusion of the teacher” (Wells & Arauz, 2006 p. 391). The coding allows for a two-fold approach to the corpus of whole-class dialogues; first, it allows for an identification and quantification of dialogic patterns within the total corpus of student–teacher interactions within the whole-class settings and, subsequently, how the identified dialogic patterns link with the occurrence of references to students’ everyday experiences. In order to explore how the teacher and students invoked everyday experiences in conversations about complex scientific concepts related to genetics, as well as how everyday experiences were used as learning resources, excerpts of teacher–student interactions were selected for detailed analysis. The applied analytical procedure was interaction analysis involving a sequential analysis of the talk and interaction between interlocutors (Jordan & Henderson, 1995). A sequential analysis implies that each utterance in a selected excerpt is considered in relation to the previous utterance in the ongoing interaction. As a result, the focus is not on the meaning of single utterances but on how meaning is created within the exchange of utterances.

Findings

The identification of conversation sequences shows that the whole-class conversations were dominated by triadic conversation sequences—conversation exchanges involving the teacher and *one* student. More specifically, 61% of all identified conversation sequences were in the form of triadic sequences following the (T)Triadic IRF structure. Furthermore, 20% of the identified dialogue structures constituted reverted triadic conversation exchanges—student-initiated exchanges between *one* student and the teacher. Only 19% of all conversation sequences were identified as those involving the exchange of information among at least three participants (i.e., “true discussions”) (cf Wells & Arauz, 2006).

Table 1: Observed frequency (and total percentage) of conversation sequences

Conversation sequences	Frequency	Percentage
(T)Triadic	166	61%
(S)Triadic	54	20%
True discussion	51	19 %
Total	271	-

The frequency count analysis also enabled a quantification of accounts coded as *initiations* (i.e., accounts where students or the teacher introduce new but related topics, issues, or focus during a conversation). The analysis shows that, in conversation sequences identified as triadic (i.e. (T)Triadic and (S)Triadic sequences), 68% of the initiations originated from the teacher, whereas 32% originated from the students (see Table 2).

Table 2: Observed frequency of initiations made by teacher and students according to conversation sequences

Conversation sequences	Initiations	Teacher	Students
Triadic ((T)Triadic + (S)Triadic)	290	196 (68%)	94 (32%)
True discussion	240	88 (37%)	152 (63%)

In sequences identified as true discussion, 63% of the initiations originated from the students, whereas only 37% were put forward by the teacher. Concerning *references to everyday experiences*, the vast majority of such references (both made by the teacher and the students) were made within conversation exchanges identified as true discussions. More specifically, 61% of all conversation sequences identified as true discussion contained references to everyday experiences, whereas only 12% of all (T)Triadic and 22% of (S)Triadic sequences contained references to everyday experiences. These findings indicate that, in dialogues identified as true discussions, the students were more often provided with opportunities to influence the topic, content, and focus of the conversations, implying that the students' own interests, challenges, and inquiries were put to the fore.

Based on the frequency count analysis, all dialogue sequences identified as true discussion containing references to everyday experiences were analysed. In order to illustrate some central findings from the microanalysis, we provide a detailed turn-by-turn analysis of one episode in which everyday experiences were mobilised. In the following episode, the participants engage in a discussion about whether different human characteristics, in this case, "short hair," are a result of heredity or the environment. There are conflicting opinions among the students. Most argue in favour of the environment, but a few argue for heredity. The teacher decides to linger on the different positions. We enter when the teacher invites Frode to share with the class:

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| 1 | Frode: | Yes, there is a soccer player who doesn't, yes, who used-- He doesn't get longer hair than this, this long. ((shows with his fingers)) |
| 2 | Teacher: | Yes, like this. ((shows with his fingers)) |
| 3 | Erik: | Rooney? |
| 4 | Frode: | Yes, Rooney doesn't get longer hair than this. |
| 5 | Arne: | It has something to do with age. |
| 6 | Tom: | He used, like, implants. |
| 7 | Arne: | Perhaps it has something to do with age. |
| 8 | Frode: | Yes, he used implants. It can't be just because. He doesn't do that on purpose; then he would have used a lot of money on implants. Then, it has to be because of heredity. |
| 9 | Teacher: | It isn't just because he has small frizzy curls? |
| 10 | Frode: | No. No, he has, like, these small stubbles on his head. |
| 11 | Teacher: | Mm, yes, perhaps age is involved here? |
| 12 | Frode: | He is 26, 27 or something. Don't know; something like that. He has never had much hair on his head, never. |
| 13 | Teacher: | Twenty-six, yes. He's not older, no. It's an interesting case. This is not as clear as we perhaps might think. Else did you have some inputs? |
| 14 | Else: | Yes, I was about to say that. It depends on where you're from. Like, for example, in India, you get really long hair because the hair is so strong, but others, like, grow, but it gets very worn, so it doesn't get much longer. |
| 15 | Teacher: | Yes? |
| 16 | Else: | It has to do with heredity too. |
| 17 | Teacher: | So, if we think, if we nuance a little bit how long the hair gets, then a heredity factor is present, but if we just think short hair, like Truls or Erik, right, then we agree upon that we are here ((points to the word "environment" that appears on the blackboard)). |
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When Frode brings up Wayne Rooney as an example of someone who is not able to grow hair, several students enter the conversation. Arne adds that hair length can be related to age (lines 5 and 7), something that is nuancing the discussion. Backing up Frode's heredity position, Tom brings in the issue of hair implants (line 6), and Frode then argues that, since Rooney is spending a considerable amount of money on implants, having short hair cannot be an act of Rooney's decision (i.e., related to environment) but must be a result of heredity (line 8). As a response to the students' input, the teacher points out the complexity of the topic they are discussing, and then nominates Else to contribute. By referring to people living in India supposedly having strong and long hair, Else argues that the ability to grow long hair depends on the quality of the hair, which in turn depends on where you are from (line 14). Else's argument indicates that she takes a heredity position. However, her account in line 16, "It has to do with heredity too" (our emphasis), shows that she argues in favour of both an environmental and a heredity position. In line 17, the teacher wraps up the conversation by revoicing what they have discussed, thus appropriating the different voices and ideas and explaining that the question of environment and heredity is related to the perspective you adopt when addressing the issue and that these things are dependent on context. While doing this, he uses the students as examples to make his points more concrete.

The microanalysis displays two important aspects of true discussions involving everyday experiences. The first aspect concerns how the participants engage in this type of conversation. With the analytical focus on the teacher in these settings, he provided more open-ended questions, refrained from providing the "correct" answer, invited more students into the conversations, and prompted the students to respond to other students' input. With the analytical focus on the students, they were more likely to provide input in the form of comments and references to their own experiences and ideas instead of providing contributions in the form of questions

mainly addressed to the teacher. Furthermore, they also tended to follow up other students' contributions and not only the teacher's—as was the case with triadic conversations. The second aspect concerns how everyday experiences were used as *resources for unpacking complex conceptual* issues related to genetics; everyday experiences were invoked both by the teacher and the students in order to explain, contextualise, and show the relevance of general scientific principles.

Conclusions and implications

Scholars have demonstrated the potential of whole-class conversations as instructional activities that might support student reasoning about academic matters (Wells & Arauz, 2006). By combining frequency counts of structural features of whole-class conversations, *and* detailed microanalyses of student–teacher interactions, the current study adds to this body of research by relating structural features of conversations and the mobilisation of students' everyday experiences. Furthermore, the microanalysis of teacher–student interactions illustrates how students' everyday experiences can be used as resources during whole-class conversations. Echoing findings from previous studies on whole-class conversations, the frequency count analysis showed that the majority of the whole-class activities were dominated by triadic dialogue structures (Nystrand, 1997; Wells & Arauz, 2006). In line with Wells and Arauz's (2006) study, the current study shows that most initiations were made by the teacher. Exceeding this finding however, the current study shows that, in conversations identified as true discussion, the vast majority of initiations were made by the students. In other words, in dialogues where the students have the opportunity to initiate, and by that, influence the topic, content, and focus of the conversations, *more* students engaged in the conversations.

Previous studies have demonstrated that students' everyday experiences can be used as resources for supporting students' conceptual learning and invoking multiple perspectives on scientific issues (Silseth, 2018; Warren et al., 2001). The current study confirms, as well as expands, the findings from previous studies. In addition to containing *more* student initiations and multiple student participations, conversations identified as true discussion involved substantially *more* mobilisations of students' everyday experiences—both by the students and the teacher. The microanalysis showed how everyday experiences were used as resources for unpacking a scientific concept in ways that support students' conceptual learning. Furthermore, the mobilisation of everyday experiences enabled the students to reason about complex issues related to genetics as well as enabled the teacher to display this complexity and these coexisting perspectives. Overall, the analyses suggest that orienting to students' everyday experiences in whole-class conversations might enable the teacher to position students as active partners in inquiring into science topics. The current study provides knowledge that can be useful for teachers and teacher educators in designing productive whole-class conversations that support student learning. The empirical findings highlight the importance of designing whole-class dialogues that explicitly invite students to initiate and share their interests and challenges. They also highlight the importance of actively mobilising students' everyday experiences, and provide opportunities for students to invoke their everyday experiences.

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