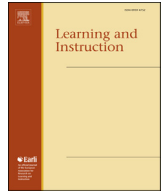




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## Dialogic teaching and students' discursive identity negotiation in the learning of science

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### ABSTRACT

This study sought to understand how dialogic teaching, as enacted in everyday classroom interaction, affords students opportunities for identity negotiation as learners of science. By drawing on sociocultural and sociolinguistic accounts, the study examined how students' discursive identities were managed and recognized in the moment and over time during dialogic teaching and what consequences these negotiations had for their engagement in science learning. The study used video data of classroom interactions collected from an elementary science learning project and placed a specific analytic focus on four students in particular. The results reveal evidence of a rich variety of discursive identities exposed during dialogic teaching, thus demonstrating how the students' identity negotiations were configured according to the social architecture of classroom discourse. Addressing the temporal dimension of dialogic teaching points out critical shifts in the students' discursive identities, of which identification is argued to be pivotal when creating equitable science learning opportunities.

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### 1. Introduction

Dialogic modes of teaching and learning have attracted increased attention in science education as potential practices that afford students with greater authorship, meaning, and more equitable opportunities to learn (e.g., Resnick, Asterhan, & Clarke, 2015). This is in contrast to narrow, authoritative, and impersonal approaches in which the classroom discourse does not allow for the bringing together and exploration of students' interests, concerns, and ideas. In dialogic teaching, the role of the teacher is to create an interactional space for students to talk and think together, creating an intersubjective orientation (cf., van der Veen, van Kruistum, & Michaels, 2015) that support exploration of different views and understanding (cf., Nystrand, Wu, Gamoran, Zeiser, & Long, 2003). The critical features typically associated with the dialogic approach to science education entail providing students with opportunities to negotiate their everyday and scientific reasoning, manage alternative viewpoints, appropriate the cultural norms and discourses of the discipline, and build positive personal dispositions and identities toward science (e.g., Kaartinen & Kumpulainen,

2002; Kumpulainen & Lipponen, 2010; Mercer, Dawes, & Kleine Staarman, 2009; Scott, Mortimer, & Aquiar, 2006). These elements are becoming increasingly emphasized in the Finnish National Core Curriculum (FNBE, 2014) that, in addition to developing students' profound disciplinary knowledge (*knowing what*), addresses students' competences to learn to collaborate, negotiate, and build meaning and scientific knowledge (*knowing how*).

While ample research exists on dialogic teaching and learning (see, e.g., Resnick et al., 2015; van der Linden & Renshaw, 2004), less is known about how it defines the kinds of student identities it values, supports, and rejects in everyday science classroom interactions. Considering the efforts in Finland and more globally (cf. FNBE, 2014; OECD, 2008) to make science education meaningful to every student and to promote science learning as an inclusive social practice, this is arguably a serious limitation. The present study addresses this gap and underscores how researching identity is crucial for unpacking the complex relationship between classroom discourse and science learning. Consequently, this study seeks to understand how dialogic teaching, as enacted in everyday classroom interaction, creates opportunities for students' identity negotiation as learners of science. This is relevant in a time when science education is viewed as an equal right of, and necessity for, everyone (Dumont, Istance, & Benavides, 2010; FNBE, 2014).

By drawing on sociocultural and sociolinguistic literature, this

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study holds that learning science is not simply a matter of conceptual acquisition but also concerns identity negotiation—that is, it affects who we are, who we like, how we are treated, and how we feel about ourselves and others as learners of science. A sociocultural perspective on identity diverges from essentialist perspectives that conceptualize identities as fixed, innate, and biologically determined as well as from constructivist perspectives that regard identities as arbitrary constructs (Francis, 2008). In contrast, identities are regarded as socially situated, mediated, and produced, as well as multiple and shifting (Holland, Lachiocotte, Skinner, & Cain, 1998; Nasir & Saxe, 2003; Wortham, 2003). Furthermore, students' interests, attitudes, and motivation pertaining to science learning and how they respond to science education depend on the beliefs, values, and accepted identities of the cultural communities of which they are part (Lemke, 2001).

### 1.1. Dialogic teaching and learning in science education

Despite the potential of dialogic teaching in science education (e.g., Resnick et al., 2015), it also creates complex demands on teachers and students. For example, teachers often deal with tensions when providing diverse students with opportunities to explore various perspectives while maintaining sufficient control to achieve curriculum goals (Kovalainen & Kumpulainen, 2005; Scott et al., 2006). For science learning to take place, dialogic teaching needs to provoke reasoned argumentation, critical analysis, and collective reflection (Mercer & Howe, 2012). Moreover, educationally productive discourse requires establishing ground rules for social interaction, which demands systematic and longitudinal collective efforts (Mercer, 2008). A recent synthesis of empirical research on dialogic teaching concluded that it can potentially lead to enduring learning gains when it is adequately structured and when students are made accountable to shared standards of reasoning (Resnick et al., 2015).

Furthermore, asymmetries of participation can result in differences in learning opportunities and gains (Howe & Abedin, 2013). Unequal opportunities to contribute to classroom interaction are dependent on the degree of inclusivity of the interaction patterns (Kovalainen & Kumpulainen, 2007; Rajala, Hilppö, & Lipponen, 2012); students' senses of competence and agency (Clarke, 2015); linguistic, gender, and ethnic identity dissonance (Brown, 2004; Brown, Reveles, & Kelly, 2005; Gilbert & Yerrick, 2001; Lee & Fradd, 1998); and curriculum appropriateness (Rosebery, Warren, & Conant, 1992).

The research on classroom discourse and student identity in science education has similarly unpacked the mechanisms that create or hamper opportunities for engagement and learning. Brown (2004) showed how classroom discourse mediated whether ethnically diverse students could enact identities as learners of science. These students often rejected the use of scientific discourse, as they felt it conflicted with their identity (see also Brown et al., 2005). Furthermore, power relations shape students' identities as certain positions and discourses can be given statuses that are more privileged than others (Olitsky, 2007), such as privileging scientific jargon over non-technical language.

Overall, the research to date indicates that the social contexts of science classrooms mediate students' opportunities for identity development as learners of science (Olitsky, 2007; Silseth & Arnseth, 2015). Students' identities are shaped as they negotiate goals, meanings, and roles within the science classroom (Varelas et al., 2007). To further address these findings, the present study points to the importance of researching the interactional contexts of science classrooms in the moment and across time, and how these contexts account for students' identity negotiation. The study also builds on the body of knowledge on this subject by

contributing research on student identities during dialogic teaching to the existing research on students' identities in science education.

### 1.2. Sociocultural and sociolinguistic approaches to classroom discourse, identity, and science learning

The study is situated within sociocultural and sociolinguistic approaches that take social activity and discourse as core units of analysis (Cole, 1996; Gee, 1999, 2001; Vygotsky, 1962). The sociocultural approach holds that science learning is an interactional process in which social practices and artifacts create a shared semiotic system for joint participation, modes of thinking, and science learning (Kelly & Chen, 1999). It emphasizes the importance of understanding science learning beyond conceptual acquisition in the development of identities (Kumpulainen & Renshaw, 2007).

According to sociocultural theory, learning and identity development are intertwined. Learning transforms who we are and what we can do (Lave & Wenger, 1991) while identity defines how we position ourselves and our actions. Identities are actualized and designated "stories" that we tell about ourselves and that others tell about us (Sfard & Prusak, 2005). They are also performances that we enact as we interact with others (Holland et al., 1998). As people become more (or less) central members of a community, changes in identity accompany changes in position and status (Tan & Barton, 2008). This, in turn, offers people new opportunities to engage with the ideas, constructs, processes, and artifacts that are available in the community. Thus, identity shifts are integrally related to knowledge shifts and together signify learning.

From a sociolinguistic perspective, in every discursive exchange participants co-construct meaning through interactions that position them as particular types of people (e.g., scientific, literate, competent, oppositional, etc.). Discourses offer students ways to use language to signal their identities to indicate group affiliation and cultural membership (Gumperz, 1982; Gee, 1999, 2001; Hymes, 1974). Participating in classroom interaction involves the negotiation of identities in consequential sociocultural contexts (Brown, 2004; Wortham, 2003). Therefore, the organization of classroom interaction and choices of discourse carry implications for how students and teachers perceive both each other and themselves.

In this study, the notion of *discursive identity* (Brown, 2004) serves as an analytic tool for understanding student identity negotiation in the dialogic teaching of science. The discursive identity model takes into account the sociocultural nature of learning and examines how learning offers students the potential to become certain people (Lave & Wenger, 1991). This allows us to study how students' identities are negotiated over time through discourse, including antecedent histories, assumptions, and cultural knowledge (Mercer, 2008). From the perspective of discursive identity, identity construction is understood through an evaluation of how one signals identity in the moment, how those signals are interpreted and recognized over time, and how sociocultural contexts mediate this process (Brown et al., 2005).

### 1.3. Study

In this study, we ask the following two questions:

- How are students' discursive identities negotiated, managed, and recognized in the moment and over time in the elementary science classroom during dialogic teaching?
- What opportunities and tensions emerge through dialogic teaching with regard to students' identity negotiation in the learning of science?

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