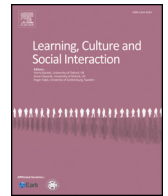




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Examining children's agency within participatory structures in primary science investigations

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ABSTRACT

This research examines the use of participatory structures with children in a fourth grade classroom as they engage in an inquiry-based science unit. The dialectical relationship between structure and agency is central to exploring these children's investigation, as children engaged in an investigation designed partly by themselves, in collaboration with their teachers and each other. We consider to what extent participatory structures mediated children's agency in science investigations. Using a combination of ethnographic and design experiment methods, we zoom in on a case study of one child and his collaborative activities with peers, to contextualize the process and underscore the claim that participatory structures created spaces for children to take agency in different ways. Specifically we demonstrate how open-ended structures and participatory curricular design mediated his agentic participation and also transformed the structures of the class, as teachers and students were positioned in new ways.

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1. Introduction

Bending over his notebook, 10-year-old Leonardo is drawing. He has his head down, and is immersed in work. He is sitting next to another student, Noah. They are supposed to be collaborating on a science investigation together. During the investigation Leonardo acts more or less as an assistant to Noah while following Noah's experiment plan. Noah directs Leonardo at several points during the planning and the execution of the investigation. But Leonardo does not appear to have much interest in carrying out the experiment. In the whole-class discussion that follows the children's group experiments, Leonardo draws in his notebook. His body is turned towards the notebook lying on the desk and he does not actively take part in the discussion.

"When the students are doing one thing, you can often find Leonardo doing something different,¹" Ms. Nuss² the classroom teacher explains, as we (the authors of this article, and co-researchers in a 4th grade classroom) observe that Leonardo engages in his science investigations in quite unexpected ways. She explains that "he isn't always focused on what everyone should be doing, and he's often doing things that aren't directly related to the task." Ms. Nuss's comment about Leonardo is similar to comments we have heard in a variety of classrooms in our careers, and as former teachers ourselves, we recognize the difficulties that can arise when a student appears to be off-task, distracted, and not engaged in classroom investigations as we might hope. Our discussion with Ms. Nuss regarding Leonardo was prompted by our observation that while participating in open-ended science investigations in his fourth grade class, Leonardo's approach to investigations was sometimes unexpected, and, as Ms. Nuss stated, often very 'different' from the investigative approaches of his classmates.

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¹ All transcript text has been translated into English by the research team, and cross-checked for accuracy.

² With the exception of the authors, all participants have been assigned pseudonyms.

In this article, we argue that within open-ended classroom structures, Leonardo was able to take agency in a manner that positioned his approach to science as one that enabled him to design an investigation for tackling questions he was exploring. We describe how he pursued his own questions, which were not necessarily aligned with the questions of his peers, or the expectations of the teachers/researchers. He took agency in a manner that afforded his engaging in investigations, and that shifted the structuring of the thematic science unit. We seek to contextualize the role of “agency” as an educational outcome arising from participatory classroom processes (e.g., Doyle, 2015), and three overarching claims emerge from the data analyses:

1. First, open-ended, participatory curricular structures provided spaces for children to engage in the “doing” of science (Siry, Ziegler & Max, 2012), and through this doing, their ideas and understandings were produced and emerged through agentic investigations.
2. Second, in the taking of agency within open-ended activities, children engaged in science were positioned as resource-rich participants. This provided them with access to differing understandings and perspectives.
3. Third, through the agency | structure relationship, classroom structures were transformed, and students and teacher-researchers were positioned in new ways.

In the sections that follow, these claims are elaborated as we demonstrate ways Leonardo took agency within the context of participatory learning structures. We use these elaborations to illustrate how participatory classroom structures created spaces for Leonardo to engage in meaningful learning despite his unexpected and ‘different’ approaches.

2. Theoretical frameworks

Grounded in cultural sociology (e.g., Bourdieu, 1993; Sewell, 1992) we position teaching and learning as cultural, social acts, and as such, the learning and teaching of science as cultural enactment. Through this perspective, the culture that is science learning is enacted in a dynamic flux, and learning is continually embedded in everyday experiences. Central to the arguments presented in this manuscript is the dialectical relationship between agency and structure, which we elaborate in the next section and then surround in further meaning through the analyses and discussions that follow.

2.1. Agency | Structure

We consider agency to be the “socioculturally mediated capacity to act” (Ahearn, 2001, p. 112). This framing of agency takes into consideration the choice that is involved in acting, as agency implies the *capacity* to act, as something that is mediated in social, cultural (and we would add also historical and political) perspectives. Agency is constructed in social practices, and it is negotiated, and renegotiated in interaction (Kumpulainen, Lipponen, Hilppö & Mikkola, 2014). Our research looks specifically at teachers and students taking agency, and draws relationships to structures that are created to facilitate this. To be more specific, we adopt dialectical perspectives, and as such, we oppose using binaries to make sense of social life. Rather, we work to bring together constructs that are seemingly opposite, and in the dynamic interactions between the two, refine our understandings. Following Roth (2005), we utilize the Sheffer stroke (|) to indicate dialectic relationships (agency | structure). The implication of using the Sheffer stroke instead of perhaps a hyphen or a dash is that neither construct can be the point for understanding the other, but rather, each informs the other (Lund & Hauge, 2011) and necessitates looking at both.

This understanding of agency as recursive, fluid, and dynamic grounds our understanding of agency as dialectically related to the structures that are at play in a given place and time (Sewell, 1992). Structures mediate the agency that a person can (or cannot) take, and in turn, a person’s ability to take agency mediates the structures present (Sewell, 1999). These structures are often described as rules and resources (Sewell, 1992), and they can be, for example, material structures such as curricula if we are examining classroom events, or historically constituted structures, such as a teacher’s expectation for learning–teaching task completion. This fluid relationship has movement, and through this fluidity the contradictions between agency and structure can lead to reciprocal development (Roth, 2002). In short, through dialectics, the relationship between agency and structure changes through the mediated interaction between the two. As individuals use resources to work towards their goals, they change practices (Tobin, 2012), which can serve to transform structures. In the sections that follow, we seek to unpack the structures that mediated the children’s agency (and vice versa) in the context of participatory science investigations. We focus in this analysis on one critical case, Leonardo, to construct an account of what happened when a child is provided with the opportunity to take agency, and does so in differing ways within participatory structures.

2.2. Participatory science investigations at the primary level

Our work with children and teachers is around the subject area of science, and in this particular study an ‘inquiry-based’ science unit was used. The specific curricula we employed engage students in open-inquiry experiences that emerge from students’ questions (van Zee, Iwasyk, Kurose, Simpson & Wild, 2001; Chin, 2004; Gallas, 1995). Relative to more closed forms of science instruction, the use of open-ended participatory structures, in this particular case inquiry-based science learning, can contribute to classroom contexts that are culturally, linguistically, and cognitively meaningful (Ladson-Billings, 1994; Lemke, 2001; Minner, Levy & Century, 2010) and thus position students to access resources they bring to the classroom. As explained by Rajala et al. (this issue), open-ended participatory classroom structures provide spaces for students to incorporate their personal knowledge and interest into investigations, and in this way helps them elaborate a personal sense of classroom instruction.

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