

Authenticity and Entomology Knowledge in Science Classrooms

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Abstract: A long-standing goal of science education has been for students to engage in “authentic” science. This goal of authentic science has appeared in many policy documents, and most recently, in the Next Generation Science Standards (NGSS, Achieve, 2013) in the United States. Thirteen years after the release of NGSS, we still wonder about how to support students to engage in “authentic” science in classrooms. Our presentation will examine relationships between authenticity, epistemic agency, and uncertainty, and equity. The presentations will approach the topic in two ways: expectations and norms for students, and the role of teachers. Students may be engaging in “authentic” science when they are exercising epistemic agency. We will conclude with questions for the field to consider.

Purpose

A long-standing goal of science education has been for students to engage in “authentic” science, which has appeared in many policy documents, and most recently, in the Next Generation Science Standards in the United States (NGSS, Achieve, 2013). Thirteen years after the release of NGSS, the field of science education still wonders how to support students’ engagement in “authentic” science. We propose that any discussion about “authentic” science must include:

- Epistemic agency (the power and responsibility to shape knowledge production in a context, Stroupe, 2014)
- Uncertainty (the inherent unpredictability that emerges from social interactions, Manz & Suárez, 2018)
- Equity (disrupting power structures to create opportunities for justice, Burgess & Patterson Williams, 2022).

In this session, we place epistemic agency, uncertainty, and equity in conversation with authenticity to advance a needed conversation for the field.

Framing

We propose that conversations about authenticity parallel issues of power. Authorities in classrooms, such as teachers and scientists, ask students to trust their expertise, yet people in positions of scientific power have sometimes caused lasting harm to people without power (see History of The National Native American Boarding School Healing Coalition, 2020, & Jones, 1981). To address issues of power and authenticity, we report on the InsectLife project. InsectLife explores how elementary and middle school teachers partner with university-based entomologists to support students as to engage in authentic science and co-design moth research. We ask:

- How do actors in InsectLife define authenticity and power in science classrooms?
- How do actors design and enact opportunities for students to engage in authentic science?

We utilize Cultural Historical Activity Theory (CHAT) to analyze how actors plan opportunities for authenticity. CHAT describes generative interactions between participants as “co-configuration” (Engeström, 2004). The InsectLife project focuses on co-configuration between interacting activity systems as participants navigate contradictions that arise when they attempt to collaborate.

Methods

Participants

Six teachers (grades 1-6) and a university-based team (professional entomologists, science educators, graduate students, and undergraduate students) interacted in a series of week-long professional learning sessions and monthly meetings. All participants attend a week-long series of professional learning opportunities at an R1 university.

Data collection

Planning. We requested or informal planning from teachers. When engaged in planning conversations with teachers, we paid attention to their pedagogical reasoning, and how they framed problems of practice.

Artifact collection. We collected teacher and student-created documents related to planning, instruction, and reasoning for each lesson and all work associated with the classroom context, including lesson plans, assessments, instructions for activities or tasks, and tools (created, modified, or adapted by participants to solve problems).

Semi-structured interviews. We interviewed each teacher and the research team (including ourselves) to understand how each actor involved in the project defined “authenticity”, and considered how to support students’ engagement in authentic science. Each interview was video recorded.

Data analysis

Coding Category 1: Elevating students to epistemic agency. Given that students are often positioned without power, we coded the data for four possible opportunities in which students could be explicitly positioned with epistemic agency, perceive themselves as epistemically agentic, and to act with that agency.

Coding Category 2: Co-configuration of moth research. We coded the participants’ talk moves, pedagogical practices, and resources used to participate in the classroom learning community. We wanted to document how the participants were able to navigate tensions about the co-configuration process, rather than merely name the problems that arose.

Findings

We make four primary assertions. First, participants defined authenticity differently depending on their role. While scientists described truth as an outcome of scientific investigations, teachers saw truth as a social construct established through relationship-building. Second, teachers and scientists recognized the power of having scientific “experts” in classrooms, yet for different reasons. Scientists wanted their knowledge to help students design investigations about moths in their communities. Teachers noted that scientists added legitimacy to classroom investigations, thus contributing to truth-building efforts. Students felt more like epistemic agents because they worked alongside scientists. Third, teachers, students, and scientists all agreed that students should engage in “authentic” science. However, they wondered about whether this means that students should engage in “novel” science, or in “reproductive” science that replicates established canonical knowledge and practices. Fourth, teachers and scientists designed opportunities for students to create local classroom epistemic practices. While local practices became authentic for students to act as epistemic agents, teachers and scientists wondered about the generalizability of such practices in other contexts.

Contributions of the study

Connections between authenticity, epistemic agency, uncertainty, and equity have critical implications for teaching and learning. If authenticity is framed as “figuring out” established science, students could have opportunities to engage in certain practices — such as asking questions and designing investigations — that might help them build an understanding of science that is valued in hegemonic canonical settings. At the same time, their decisions may not change the arc of the teachers’ pedagogy or shift the classroom community’s epistemic agency, which raises questions about *whose* epistemologies are valued in the classroom and the broader discipline of science. Alternatively, students’ decisions *could* significantly change the arc of the science and pedagogy, causing learning goals and science practices to emerge that teachers never expected. This version of authenticity — designing solutions given inherent uncertainty — could empower students with epistemic agency, but requires teachers to reframe how they see students, science, and pedagogy.

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