

Learning with Purpose: Orienting Student Agency Towards Community Solidarity in a Secondary Science Curriculum

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Abstract: This study uses a framework, *learning with purpose*, to support the design and analysis of student learning opportunities in science. Researchers and practitioners developed and implemented a secondary biology unit for use across an urban district in the US wherein students engaged in a community-based citizen science design challenge. Results suggest student agency may influence how students experience and assign purpose in their learning.

Keywords: Purpose, Agency, Science Education, Reform, Curriculum

Introduction

Designing formal learning experiences that students see as relevant to their lives and the world outside the four walls of the classroom has proven an enduring challenge in science education (NRC, 2007). In the years since the advent of recent science education reforms (see NRC, 2012), researchers and developers have taken up this challenge with renewed vigor. Yet, even when using innovative instructional models (e.g., Project-Based Learning) and innovative curriculum designed to reflect reforms, meaningful science learning can remain elusive for all students (Pitts, 2008; Priester, 2020). The aim of ensuring students have learning they find meaningful in the science classroom holds particular significance for addressing inequities in science education; learning that fails to prove consequential to all students by ignoring the strengths students bring from outside the classroom serves to reproduce patterns of marginalization experienced by non-dominant students (Lee & Buxton, 2010).

Learning with purpose

Using a sociocultural perspective and ideas from cultural psychology, this study uses a framework, termed *learning with purpose*, to support the design of more meaningful schooling and its analysis. Much as how leveraging the cultural funds of knowledge students bring to the classroom can promote more meaningful and culturally-relevant learning, this framework proposes that the purposes students and their families orient towards can serve as particularly powerful cultural strengths for learning. At its core, a learning with purpose approach seeks to create opportunities for all learners to act in solidarity with and for their communities. Cross-cultural studies have shown how the act of taking initiative to “pitch in” and contribute to a group endeavor appears more prevalent in non-dominant families, such as indigenous and Latinx families (Rogoff, 2014), than in European American families. The prevalence of this practice indexes a shared purpose where individuals’ activity arcs towards serving the needs of a collective or group (i.e., a community). Ladson-Billings (2000), when discussing orientations in the Black community in the US, noted how central this purpose can prove to peoples’ existence, a notion well-captured in the African saying *ubuntu*: “I am because we are.” To conceptualize how students can collectively engage in learning with purpose over time and at various levels (see Smith, 2020), this framework draws on Leontiev’s (1978) notion of the structure of activity: learning with purpose requires students always move towards the *motive of their activity* (e.g., protect our ecosystem) through smaller *actions and goals* (e.g., find patterns with species) and yet smaller *operations* (e.g., writing notes). Lastly, learning with purpose requires students have meaningful agency in their learning. Students must have opportunities “to act (not merely to know)” (Eisenhart et al., 1996, p.282), to use their learning to do something they and their communities see as important.

Design and implementation of biology unit

To achieve an inclusive vision of science education where all students have opportunities to engage in learning with purpose—while also meeting the aims of science education reforms—proves no small design challenge, particularly at large scales (e.g., school districts). Through a co-design approach, researchers and practitioners from an urban school district in the US developed an 8-week secondary biology unit on ecosystems aligned to reforms in the US, namely the *Framework for K-12 Science Education (Framework)* (NRC, 2012). Part of the district’s official biology curriculum, researchers and teachers saw the unit as a means for all students across the district to engage in more purposeful learning. The vision of the *Framework* offers areas of convergence with a learning with purpose approach, including having students’ learning orient towards a phenomenon and/or problem relevant to students’ lives and communities, as well as positioning students with epistemic agency (Miller et al., 2018). The ecosystems unit employs these aspects in a way intended to blur school and community and position students with the agency to act. In response to a pressing threat (i.e., an invasive species about to eradicate trees

throughout the city), the unit has students take up a citizen science design challenge. This challenge—where students can wield science *in practice* (Penuel, 2014), while acting in solidarity with and for their community—asks students to use science and engineering practices to decide what tree their class should plant and where to maintain the biodiversity and services of their ecosystem. Community members helping to enact students' solutions included the city's parks department and local non-profits. Twelve teachers from eight schools piloted the unit with approximately 975 students. Latinx students comprised around 56% of students, Black students comprised around 14% of students. One classroom, where 92% of students identified as Latinx and 5% identified as Black, served as a focus of study. Researchers used daily surveys across all schools to collect practical measures of students' experiences for each lesson. In the focus classroom, researchers conducted twelve observations as well as three interviews with two Latinx focus student (FS) participants. A mixed methods approach to analysis, including using rounds of inductive and deductive coding (Emerson et al., 2011), focused on ascertaining (1) whether students experienced learning with purpose and (2) how the unit mediated such experiences.

Results and discussion/conclusion

Students' survey responses across all classrooms indicate that, on average, they saw their learning in the unit as relevant to the community (64%) but less so to their class (39%) and themselves (29%); focal students also saw their learning generally as more aligned with the community's purposes. Interestingly, when students noted on surveys that a lesson connected strongly to the citizen science design challenge, these responses showed a moderate correlation to students reporting their learning as relevant to themselves ($r(1222) = 0.32, p < .001$) and to a slight degree their class ($r(1222) = 0.14, p < .05$) but not to the community; data from focal students followed this pattern (e.g., "I don't think they'd [community] want to stop and ask why we're planting a tree," FS). Interview data from focal students also indicated that students felt more agency when working on the citizen science design challenge—both in terms of *actions* (e.g., using science and engineering practices) and the *motive for their activity* (e.g., planting a tree to help ecosystem: "...we provided this research, it should be like brought into like action, like how we're doing planting the tree," FS). These patterns suggest that the agency students experienced may have influenced how they saw and assigned purpose in their learning. With more agency, students associated purpose in their learning with more proximal communities (personal and class) than a more distant "community." This work demonstrates the challenges and promise of designing formal curriculum to promote learning with purpose. Future curriculum designs should continue to explore the interplay of purpose, agency, and community.

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