Student Voice and Student Choice: Middle School Science Teachers Foster Identity Using a Social Learning Environment

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Abstract: This research interrogated how four middle school science teachers connected students' personal experiences to the construction of scientific knowledge. Teachers used a video-based social learning environment (SLE) to elicit student and familial knowledge. We examined how teachers leveraged technology to validate the ways that race, language, and culture, through the lens of identity, were critical in students' construction of science knowledge. The SLE prompts used by teachers were analyzed and findings are discussed.

Middle school students naturally bring their identities and personal knowledge classrooms as they are navigating social contexts and encountering challenging academic content. Teachers have power to validate the knowledge and experience students bring to the classroom. When students do share their unique perspectives, teachers do not necessarily know how to connect students' personal experience with academic knowledge. This research explores how four middle school science teachers' use a social learning environment (SLE) to elicit student identity. An SLE is an online space where those within the community can co-construct knowledge, collaborate, and learn together. The purpose of the use of an SLE for these middle school science teachers is to create an environment where students feel safe offering responses to prompts that can amplify science content. This research seeks to answer the question: In what ways do teachers use the SLE to foster student identity? This work has the potential to provide innovative ways for science teaching pedagogies to be inclusive of race, language, and culture.

Theoretical framework

The research is framed around sociocultural learning theory which asserts learning is a social process that is influenced by adults and peers. The SLE provides students with an innovative opportunity to construct knowledge through discourse and interaction with their teachers, families, and classmates. In these online spaces, students inherently connect their knowledge construction with their cultural expertise. This study uses the conceptual frameworks of student identity, knowledge integration, and adaptive expertise to explore how teachers use a video-based SLE to cultivate student identity.

One's identity is constantly evolving, and may show up in different ways within different spaces. There are several factors that inform how one chooses to be seen. Esteban-Guitart and Moll (2013) describe Funds of Identity IFoI) as "the historically accumulated, culturally developed, and socially distributed resources that are essential for a person's self-definition, self-expression, and self-understanding" (p. 31). They further suggest that there are five major types of FoI: (1) *Geographical Funds of Identity,* (2) *Practical Funds of Identity*. (3) *Cultural Funds of Identity* (4) *Social Funds of Identity*, and (5) *Institutional Funds of Identity* (p. 38). This definition stems from research on funds of knowledge (FoK) that asserts that students come into learning spaces with accumulated knowledge from existing within their families and sociocultural groups (González, Andrade, Civil and Moll, 2001). Students internalize their funds of knowledge to become funds of identity by making meaning of their lived experience, within familial, social, and cultural resources, to describe themselves (Esteban-Guitart & Moll, 2013).

Knowledge integration (KI) is a constructivist framework that emphasizes building on the repertoire of ideas held by learners and helping them to incorporate new ideas into a coherent, normative scientific understanding (Linn & Eylon, 2011). The KI framework identifies four main processes that promote learning: eliciting ideas, adding ideas, using evidence to distinguish among ideas, and reflecting and integrating ideas (Clark, Varma, McElhaney, & Chiu, 2008). While each of these processes are important, eliciting ideas is especially relevant for this study. Teachers design culturally relevant SLE prompts and activities to elicit students' ideas and connect them to classroom content. Follow up discussions in the classroom encourage students to use evidence from SLE responses to critique ideas, engage in reflection, and integrate new scientific knowledge with everyday knowledge that is relevant, meaningful and likely to validate their identities.

According to Hatano and Oura (2003) *adaptive experts* are those who are willing to modify their teaching in order to flexibly support their students. The prompts teachers assign in the SLE are open-ended by design so that students are free to share a broad range of ideas. To incorporate these ideas in their instruction, teachers consider new perspectives, create new classroom activities, and reimagine how they lead classroom discussions.

Doing this may make the classroom less predictable for teachers yet more meaningful for students. In this study, teachers are constantly revisiting what works well in their classrooms in regard to SLE use making them both reflexive practitioners and, thus, adaptive experts.

Methodology and Results

This work was part of an NSF-funded project that utilized a technology-enhanced social learning environment (SLE) called Flipgrid ™ (flipgrid.com) to engage science teachers, students, and families in discussions and activities that connected students' personal interests and cultural knowledge with their academic science learning experiences. Four middle school science teachers, Carina, Katja, Ron, and Susan, designed prompts and activities within the SLE that allowed students to make connections between the academic content of their science lessons and their personal identities that included race, language, and culture.

The four teachers disseminated a total of 38 prompts during their first year of participation. Of those 38 prompts, there were 21 unique prompts. Ten of the prompts w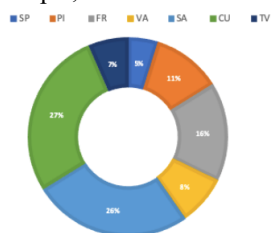ere assigned synchronously with at least one other teacher. The prompts were coded for how they elicited student identity using the teacher-designed and research team validated codes: (1) Science Perceptions (SP), (2) Personal Identity (PI), (3) Familial Relationships (FR), (4) Values (VA), (5) Student Agency (SA), (6) Conceptual Understanding (CU), and (7) Trust and Vulnerability (TV). Figure 1 shows the percentage breakdown for the codes the 21 distinct prompts received. The total number of codes is greater than 21 because some prompts received more than one code. It is clear from the results that teachers used the SLE most often to elicit students' conceptual understanding (26% of prompts). This makes sense given that the prompts were delivered in science classrooms. Figure 2 shows how many identity codes each of the prompts received.

Figure 1. Percentage breakdown of identity codes.

Figure 1. Number of identity codes per prompt.

Discussion and implications

The SLE is a platform for nurturing the confluence between identity and agency in middle school science classrooms. Several of the prompts ask students to explain a concept which gives them a platform for engaging in the use of scientific language coupled with the ability to articulate what they have learned. These practices allow students to develop agentic skills, increase their communication skills, and better understand their peers' ways of thinking. Nasir and Shah (2011) state that "identity is deeply intertwined with processes of learning, because identity speaks to one's sense of connection and belonging" (p. 24). Aspirationally the teachers in this study can work toward explicitly eliciting notions of self related to race, language, and culture. As teachers continue to navigate the complex use of the SLE in their science classrooms, they can work toward inclusivity and perpetuation of students' existing and evolving Funds of Identity.

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