

## **Work in Progress: Relational Justice and Collaborative Self-Determination in Engineering Education**

### **Overview**

Within engineering and science education, the value of collaborative work has been well established. Research underscores the significant advantages of joint-activity and learning collaboratively, including social, cognitive, and disciplinary skill development in addition to cross-cultural communication among people from diverse races, genders, and ethnicities (Boaler, 2008). In science and engineering classrooms, the National Research Council (2015) recognizes environments that provide opportunities for collaborative learning to be important spaces for developing 21st-century skills needed for all young people. In this work-in-progress paper, we examine some emergent patterns found in the joint activity systems of a STEAM summer program; especially we describe two emergent, distinct patterns of collaborative interaction which we label as “type 1” and “type 2,” one of which we find to be more conducive to the kind of collaboration that can foster “relational just” interactions.

Within diverse engineering classrooms, research suggests that creating and maintaining equitable and productive joint activity can be a continual challenge for teachers as part of a larger complex and difficult process (Shah & Lewis, 2019). Within this study, we choose to view learning activity through a joint activity lens due to the fact that research suggests this framework may serve as a scaffold for multilingual students to support their efforts to become epistemic agents within learning spaces (Storch, 2017). To that end, joint activity systems, and the collaborative learning that they allow for, are mediated by both students and teachers’ social interactions as well as the larger relational socio-historical context in which these classroom social and cognitive engagements and coordinations are experienced and attained (De Abreu, 2000).

The social interactions of collaboration and their relational contexts are not culturally neutral and, as (Baron, 2003) suggests, they “can be loaded with issues of identity-related to both the self and one's partner” (p. 311). In educational spaces, when students work within groups they have a tendency for replicating the existing social hierarchies they see around them as well as exacerbating status differences within classrooms by constructing an obligation to position themselves based on their perceived abilities in order to assign individuals roles or tasks. Such behaviors can lead to classifications and may ultimately exclude students from culturally and linguistically diverse backgrounds or any students from whom their cultural repertoire of participation significantly differs from the dominant group within the classroom (Baron, 2003). The exclusion of these students can transform “collaborative” classroom environments into potentially threatening and isolating spaces for marginalized students.

These considerations make collaboration within the classroom a complex topic. Collaboration involves complex social and cognitive processes that can be beneficial to

students including “adaptability, perspective-taking, improvisation, self-regulation, and problem-solving skills” (Alcalet al., 2018, p. 137). However, if for marginalized students, if no symmetrical relations or, what Baoler (2008) refers to as considerations of “relational equity,” are included in the classroom and pedagogical decisions and procedures then it is difficult to achieve just joint activity for students and teachers.

## **Overview of Methods**

In this study, our research pulls from a longitudinal study that examines an inquiry-based, middle school STEAM (Science, technology, engineering, arts, and mathematics) program supporting Black and Brown multilingual students’ positive science and engineering identity development. The participants in this program were multilingual students from local community middle schools who had been recruited based on the criteria of being actively identified by their schools with the deficit-focused term of “English Learners” or “(ELs).” As part of this study, in the summer 2021 implementation of this study, we collected over 240 hours of video data in addition to student interviews, journal observations by staff and teachers, extensive field notes, and artifacts. Students and facilitators who participated in this program spoke a multitude of languages, including, but not limited to, Spanish, Portuguese, and Haitian Creole in addition to English.

We began our analysis by rewatching the video footage from the classroom in our summer program. During this process, we focused on students’ interactions with each other in order to find patterns of collaboration. We identified and selected video footage that illustrated instances of multiple students working alongside each other on the same engineering task. We then coded these selected video footages, examined the videos for both verbal and nonverbal student moves. Along with transcripts of what was said, we created visual representations of how the students physically interacted with each other, the space, and the tools and objects in the room. Once we had these emergent codes, we organized our codes and categorized them to examine for patterns. As we worked with these emerging patterns, we began to see two emergent categories of collaborative work. As a result, we asked the following questions: (1) What were the emerging patterns for those collaborations? (2) What were the conditions (components) of the first type of collaboration? (3) What were the conditions (components) of the second type of collaboration? (4) Under what conditions did the most apparently “flexible” collaborative work happen?

In progress findings for the emerging patterns for those collaborations

- Equal authorship and resource sharing amongst group members
- Emerging distribution of tasks based on unique skill sets
- Valuing group member’s opinion
- Encouraging and enjoying group member’s success