Utilizing Cultural, Community, and Career Connections in the Classroom to Motivate the Next Generation of STEM Professionals

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Introduction & Need for LCT Strategy

Instruction in the fields of science, technology, engineering, and math (STEM) has become top priority in the United States because of the high demand for skilled professionals in STEM fields, and the lack of students prepared to meet this need. This has contributed to the need to enhance evidence-based knowledge available regarding STEM interventions and how they can help foster student interest and motivation within STEM subjects. This project aims to make STEM more relevant by using cultural, community, and career ("3 C's") connections to guide further student engagement in STEM education through agricultural life sciences (AgLS) for 5th and 6th grade students at an elementary school Indianapolis.

Connection to Literature

The STEM learning experiences provided to students in this project are focused on the integration of the AgLS, physical sciences, engineering, computational science, and mathematics. The project team delivered this by developing four open-ended, real-world learning activities, Modeling-Eliciting Activities (MEAs), which connect students to their community through agricultural life science contexts. MEAs are a project based instructional tools that are open-ended and centered around realistic problems that involve the development or design of STEM models (Stohlmann, 2013). Four major societal challenges—Health, Energy, Environment, and Food— guided the development of agricultural life science-based MEAs (AgLS MEAs) for the project, all rooted in STEM. The learning experiences were also grounded in the principles of culturally-relevant pedagogy (CRP). CRP is a pedagogy that uses culture to impart knowledge, skills, and build attitudes by empowering students intellectually, socially, emotionally, and politically (Ladson-Billings, 1994). Culturally relevant pedagogy is an important component that was embedded within our project because traditional teaching methods often fail to include an approach that connects curriculum, instruction, and assessment to the experiences, cultures, and traditions of racial and ethnic minority students (Anderson, 1990; Tate, 1994). Teachers play a critical role in providing the sense-making of the MEAs and how they are culturally relevant. The role of community mentors is also critical to help make connections embedded in community, science-related values, and careers. Direct interactions with professionals working in the local industry and community provides students the opportunity to learn about STEM-related AFNR careers, thus enhancing their level of career exploration (Tripp, Helwig, & Yetter, 2017)

By integrating students' personal culture, their local community, and STEM careers through the MEAs, we have a primary focus on developing elementary students' interests, career aspirations, and STEM self-efficacy. The 3 C's connections are established through cultural relevant pedagogy training of teachers, a STEM professional mentoring program, and the creation and implementation of relevant curriculum

How It Works / Implementation of LCT Strategy

In this project, the teachers participated in several teacher professional development (TPD) training sessions focused on MEAs, cultural relevant pedagogy, and classroom management. TPD workshops were organized in such a way as to foster a collaborative and inclusive

relationships among teachers and project team. These relationships promote openness, diversity, inclusion and transparency of power embedded in racialized structures (Bajares & Ronnkvist, 2007). Open dialogue and discursive conversations about various forces that contribute to student successes and failures are grounded in students' everyday lives and assumptions made by schools and educational organizations (Valdes, 2001). Understanding this, we recognized the importance of ensuring that teachers reviewed the curriculum and adjusted it to facilitate bridging the lessons with real-world applications in their specific classroom.

The informal mentoring program, created to enhance the 3 C's, utilizes STEM professionals and graduate students as visitors (all recognized as Community Partners) within the classroom throughout the unit. Community Partners first go through a training session with the project team to learn about the classroom atmosphere, expectations for engagement and their presentations, and an overview culturally relevant pedagogy to help better engage the students. The STEM professionals demonstrated the diversity of careers and people within STEM and agricultural life sciences by serving as informal mentors. Mentors visited the classroom once or twice to discuss their careers, representing the local community, and reiterating the real-world application of the STEM subjects, while also providing feedback and encouragement to the students during their assigned projects.

The basis of this project is rooted in design-based research (DBR), which has allowed for research informed revisions of how the MEAs are implemented within the classroom. It has also informed how we engage and utilize our community partners within the mentoring program.

Results to Date / Implications / Impact

Student focus groups were used to gauge the student connections and perceptions of the 3 C's within the lessons. Transcriptions were coded using initial and descriptive coding techniques after both MEAs. After each MEA, five relevant themes emerged from the 5th and 6th-grade data: (1) student engagement and learning, (2) STEM awareness and career exploration, (3) community engagement, (4) student collaboration, and (5) student impressions/reflections. After the nutrition MEA, students shared they learned about a nutritionist as a career, and they did not know the career existed beforehand. Other students shared that the MEA made them think about a career, but not a "food career." Overall, students seemed to form strong connections with early career community partners, namely the graduate students they met. After the renewable energy MEA, students shared they were interested in doing work to clean their communities. Regarding the community partners, the students mostly recalled information related to the activity they did with the community partners where they learned about renewable energy from a mobile STEM education van. Understanding this, and other outcomes, we were able to see the importance of the 3 C's on STEM instruction within the classroom.

Future Plans / Advice to Others

With this project rooted in DBR, our team members are constantly fine tuning the structure of our implementation to better serve the needs of the students, teachers, and community partners that we engage with. Understanding the importance of flexibility when engaging with each of these groups is paramount to ensure not only the success of the MEAs, but to also ensure that students are able to build string connections to their culture, community and future careers.

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