

ROLE OF TEACHER IN STUDENT CENTERED LEARNING METHOD

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Abstract

Students and teachers in twenty-first century STEM classrooms face significant challenges in preparing for post-secondary education, career, and citizenship. Educators have advocated for student-centered instruction as a way to face these challenges, with multiple programs emerging to shape and define such contexts. However, the ways to support teachers as they transition into non-traditional teaching must be developed. The purpose of this study is to explore the impacts on educators of teaching in student-centered, peer-mediated STEM classrooms and preparing student peer leaders for their roles in these classes. Research questions examined how teachers think about themselves as they implement student-centered pedagogy, the difficulties they face as their roles and identities shift, and the ways they grow or resist growth. Qualitative research conducted at two urban secondary schools documents the diverse experiences and responses of teachers in an innovative, student-centered STEM instructional program.

Introduction:

Students and teachers in twenty-first century secondary STEM classrooms face significant teaching and learning challenges in preparing for post-secondary education, career, and citizenship. This preparation extends far beyond mastery of content knowledge, which has been the focus of traditional STEM instruction. The Partnership for 21st Century Learning includes *Learning and Innovation Skills* in its Framework for 21st Century Learning. They define these learning and innovation skills as creativity and innovation, critical thinking and problem solving, communication, and collaboration. The Next Generation Science Standards (NGSS) are consistent with this focus on twenty-first century skills. The argument for why the new standards are important states:

Science—and therefore science education—is central to the lives of all. A high-quality science education means that students will develop an in-depth understanding of content and develop key skills—communication, collaboration, inquiry, problem solving, and flexibility—that will serve them throughout their educational and professional lives

The National Council of the Teachers of Mathematics include in their Six Principles of School Mathematics concepts relevant to twenty-first

century skills: 1) Teaching: “Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well,” and 2) Learning: “Students must learn mathematics with understanding, actively building new knowledge from experience and previous knowledge”. The Partnership for 21st Century Learning defines learning environments that will support the development of these critical skills, requiring professional development that will facilitate a significant pedagogical shift.

Research about student-centered instruction in STEM, with students taking an active role in the learning process rather than being passive recipients of information from the teacher, demonstrates outcomes consistent with developing 21st century skills and STEM mastery. A variety of instructional models in STEM classes define themselves as student-centered

Teachers’ roles and responsibilities in student-centered STEM classrooms:

Effective implementation of novel pedagogies requires understanding teachers’ roles and responsibilities in the transformed classrooms. The student-centered classroom literature defines the teacher’s roles and responsibilities in classes that employ student-centered pedagogies, including

various iterations of constructivist and inquiry-based instruction. According to Moustafa et al. in constructivist classes the teachers' role is to encourage and accept student autonomy and create a comfortable atmosphere for student expression," acting as guides for their students. Constructivist teachers behave in marked contrast to traditional instruction where teachers dominate the classroom and provide direct instruction focused on content knowledge acquisition. Friere saw teachers as partners of students who were pursuing agency as opposed to teachers being "positioned as enforcers, disciplinarians, and police officers"). Teachers who implement democratic STEM pedagogy must learn to share authority with their students, enabling the student to make instructional decisions that the teachers support and enact. Again, specific examples of research in several student-centered instructional models illustrate common themes of impacts of student-centered environments. Researchers describe teachers in inquiry-based classes as catalysts, who act largely through guiding questions. According to Yukhymenko et al.

In order to fulfill their new roles, teachers must shift their focus in the classroom from lecturing to assessing. Inquiry-based teachers become assessors because "it can help in diagnosing students' prior knowledge, gauging students' understanding throughout the learning experience and guiding instruction, and measuring their understanding and knowledge at the completion of the learning experience". In other words, "(t)he facilitator maintains the focus on learning, guides the process, meters the challenge, and provides appropriate feedback to each student and the whole group" This change in focus represents a dramatic shift from past practice.

Teacher identity:

For the purposes of this study, *teachers' roles* refer to what teachers do in classrooms and *teachers' identities* refer to the ways that teachers think about themselves and their classroom roles. This work builds on Grier and Johnston's argument that, "Teacher identity is based upon the core beliefs one has about teaching and being a teacher that are constantly changing and evolving based upon personal and professional experiences"). The

current study expands the literature by examining how a particular pedagogy affects teachers' identities as they learn to implement a new instructional model. Reviewing the teacher identity literature, Davis et al. argue that teachers' personal histories and professional experiences influence their professional identity development. While teachers' experiences are central to their identity development, these experiences are processed within a particular context and influenced by a community of practice;. According to Basu et al., "In our use of the term identity, we align ourselves with those who view identity as fluid and constructed socially within communities of practice" .Proweller and Mitchener argue that students play a central role in the development of their teachers' professional identities. In the current study, students who act as peer leaders form a major component of the teachers' communities of practice, increasing the complexity of the teachers' professional context. Much of the research on teacher identity development focuses on pre-service teachers and/or early career teachers across contexts, while the current study includes teachers across a range of professional experience in a particular instructional environment.

Knowing what students are doing

Some teachers discovered additional, unanticipated benefits to implementing PERC. As Matthew explained, "I have a natural tendency to have students working in groups and have responsibility put on the students to focus and stay on task. So I feel like implementing this program is simple for me." In non-PERC classes, he continued to ask students to work in groups but was never sure whether they were on task and learning when he stepped from one group to another, reducing his feelings of efficacy as a teacher. In particular, he worried about groups composed of English Language Learners who spoke their native language during class. When he did not speak the students' language, he did not know if they were discussing math or their weekend plans. PERC made Matthew successful in his preferred instructional modality, increasing his feelings of self-efficacy as a teacher. He described the satisfaction he felt knowing that groups were discussing math with their TAS,

regardless of the language they were speaking. Teachers such as these readily adopted the roles necessary to share responsibility for student learning with their TAS and felt fulfilled by their success within these roles. Such teachers experienced satisfaction rather than stress during these role shifts. They had wanted and waited to live the identity of facilitator of learning rather than fount of content.

Supporting individual students

In connection with the student-centered nature of the PERC model, PERC teachers described the ways in which the PERC Program enhanced their role of meeting the needs of individual students. While praising the program to potential PERC teachers, Matthew described the insider information that his TAS provided as part of their class discussions about grouping students to maximize success and minimize conflicts. Supporting this perspective, TAS claimed that it was easier for students to be vulnerable and share sensitive information with a peer who could then advocate for them with their teacher. As a second year Biology teacher, Lily argued that because the TAS were keeping all students engaged in PERC class, she was able to sit with groups, have in depth conversations, and support struggling students for extended periods of time. She believed that her role in the PERC class was to deepen the learning experience for individual students rather than ensure that all students were in some way on task.

Teacher evaluations

PERC teachers talked about having been pushed by their administrators to implement student-centered classrooms, particularly because of the new evaluation system based upon the Danielson Framework. Although Alice claimed she had always had a student-centered approach to teaching as a special education teacher, she articulated the ways that implementing the model would make all teachers successful, "In terms of PERC it's totally set up for a successful observation. It's set up, it just looks right in terms of student-centered learning and interactions and all of that it's totally where education needs to be." Administrators shared how impressed they were with the dramatic improvement in observation ratings that their PERC

teachers received. They claimed that they had urged their teachers to be more student-centered before with minimal results. Andrew, describing prior frustration, explained that he had never known how to make this work and that the PERC Program enabled him to embrace the identity of a highly effective teacher using current educational definitions. Similar teachers recognized the role shifts required by their changing profession and appreciated that the PERC model facilitated growth into a new identity.

Resisting the transition to student-centered instruction:

While most teachers involved in the program ultimately embraced and succeeded with PERC, one teacher in the mature school was never able to adopt the model. Her identity was antithetical to the model and she remained resistant to change. Hillary, a veteran Algebra teacher, began PD in the PERC Summer Institute claiming that she had always been successful with having students sit in rows and she did not see why she should do anything differently, describing herself as "old school." When asked what she meant by "successful," she did not have an answer. During the summer, Hillary focused on tutoring individual students rather than learning how to collaborate with the TAS and implement the model with the entire class. She continued to hold onto her role as content expert and resisted becoming a facilitator and learning team manager. Her observation records demonstrate that most of her instruction remained teacher-centered, with little work being done in groups led by TAS.

Learning to implement

While most participating teachers claimed that their induction into the PERC Program convinced them that the model would be effective for their students, that did not mean that the ultimate transformation in identity and practice was easy. Some teachers described feeling like a "novice," a term the program adopted for PERC teachers during their first summer in order to prepare teachers for that experience. Some participating teachers articulated a significant amount of struggle with learning to trust their TAS, like Alan admitting, "it is hard to let go the first couple of years." As Andrew shared,

Results:

All participating teachers described multiple benefits of teaching in a student-centered classroom and differences from traditional classrooms. Their transitions to this type of teaching fell into three major categories based upon past identities and current beliefs. Some teachers found the pedagogy consistent with preexisting identities and embraced it without radical change to their concepts of teaching. They described ways in which the model helped them become the teachers they had always wanted to be. Other teachers, who initially identified as deliverers of STEM content, had more difficult experiences adjusting to student-centered instruction. In one case, a teacher resisted change and exited the program, maintaining her identity and deciding not to become student-centered. Other participating teachers made dramatic shifts in their identities in order to implement the program. These teachers described significant learning curves as they shared responsibility for student learning with student leaders.

Conclusions

This study suggests that radically changing the learning environment can affect teachers' identities and their approaches to teaching in predictable ways that can inform teacher education and professional development programs for STEM teachers, maximizing the success of teachers as they implement student-centered pedagogy.

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