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BOARD # 274: NSF IUSE Project: A Culturally Inclusive Teaching Institute for STEM Community College & High School Faculty

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Introduction

As the demand for skilled science, technology, engineering and mathematics (STEM) workers continues, creating a truly innovative STEM workforce that includes individuals from various backgrounds and life experiences still falls short of being realized [1]. Community colleges are one avenue to attract and retain students from different backgrounds and experiences, since a greater variety of students enroll at these 2-year institutions than at other undergraduate institutions [2]. Yet, research shows that community colleges have been struggling to retain and graduate minoritized students across STEM areas, with many students achieving academic success at consistently lower rates than their counterparts [3], [4]. Previous research shows that one solution to increasing retention and achievement for all students studying STEM subjects is to provide faculty with training in culturally responsive and inclusive teaching practices [2], [5].

This paper reports on a year-long faculty professional development program for STEM faculty teaching at a northeast community college and for area high school science and mathematics teachers. The program focused on culturally responsive and inclusive teaching practices [5], [6], and consisted of a 3-week virtual summer institute and mentoring on use of inclusive practices during the academic year that followed. Each week of the institute included 9 hours of live meetings over videoconferencing, during which nationally recognized speakers facilitated sessions on culturally responsive teaching, intersectionality, and students of color experiences in STEM. As well, participants completed reflections, discussions and readings outside of the live video meetings on their own utilizing the institution's learning management system.

Our research questions were: Does participation impact faculty beliefs and self-efficacy in using such practices? Do students who take classes with faculty trained in culturally responsive and inclusive practices show higher levels of academic achievement in STEM?

Methods

Participants

Participants were recruited via division meetings as well as by distribution of a flyer to academic leaders and asked to complete an application to indicate interest. The community college's institutional review board approved human subjects data collection for the project.

A total of 18 college and 10 high school faculty participants took part in the first two Institutes (cohort 1: 11 college, 3 high school; cohort 2: 7 college, 7 high school). Results in this report focus on data collected 1-3 terms post-Institute from the first two cohorts of college faculty participants.

Measures

Faculty Culturally Responsive Teaching (CRT) Self-Efficacy. A pre/post survey was used to

measure community college and high school faculty participants' awareness of stereotypes and their impact, understanding of growth mindset, and skills with cultural competence and culturally responsive pedagogy [7]. The CRT survey items asked participants to respond to their attitudes about equitable teaching and culturally sensitive instruction. The first part of the survey (40 items) measured teacher self efficacy in relation to teaching tasks related to CRT. The second part of the survey (26 items) measured how teachers associate positive student outcomes with CRT. After reviewing the survey with faculty advisors, we adapted the survey for this project by reducing the number of items to 18 and 11 respectively, with some slight wording changes to better reflect our participants. The response scale was also adapted to be on a 5-point likert scale, rather than a numerical scale from 1-100. By using a retrospective pre/post model we sought to capture the growth in participant mindset, understanding and skills.

The survey was administered twice: once immediately after the summer institute and then again after one semester of implementing the inclusive curriculum materials and practices. Response rate for the survey administration immediately after the institute was 64% for cohort 1 and 100% for cohort 2. After one semester of implementation, the response rate to the survey was 42% for both cohorts.

Student Achievement. Student outcome data for the Fall term in which each cohort implemented their inclusive course materials and practices were collected from the community college institutional research office. Specifically, student grade distributions by race/ethnicity were compared between course sections taught by participants and non-participants.

Results

Faculty CRT Self-Efficacy

In both cohorts, faculty confidence across the CRTSE survey items was sustained between the end of the summer institute and the end of the Fall semester. There was some variation between participants with teachers being overall slightly less confident than community college faculty. Three areas of highest confidence across the full cohorts are related to building a positive classroom environment including community, trust and belongingness (see table 1).

Table 1
Confidence in Implementing Culturally Responsive Teaching (CRT)

	Average Rating		
Survey question: How has your confidence to do the following changed since the end of the first Fall after the summer institute?? (1= decreased a lot; 5= increased a lot)	Cohort 1	Cohort 2	Average
Build a sense of trust in my students.	4.4	4	4.1
Design a classroom environment using displays that reflect a variety of cultures.	4.2	3.6	3.8
Assess student learning using various types of assessments.	4.2	3.9	3.7

Use a variety of teaching methods	4.2	4	3.9
Explain new concepts using examples that are taken from my students' everyday lives.	4.4	3.9	3.8
Teach students about their cultures' contributions to science.	4.2	3.7	3.8
Critically examine the curriculum to determine whether it reinforces negative cultural stereotypes.	4.4	3.9	3.8

Student Achievement

Institutional data revealed that Black, Hispanic, and White students enrolled in Fall STEM classes taught by cohort 1 faculty had greater percentages of academic success (C- or higher) than students enrolled in STEM courses taught by non-participants. In all other (non-participant) college STEM courses during this same timeframe, the percentage of the same group of students achieving a grade of C- or higher remained largely unchanged [see figures 1-3 for the cohort 1 descriptive statistics].

This continued with cohort 2, as Black (69% in Fall 2023; 79% in Fall 2024) , Hispanic (66% in Fall 2023; 80% in Fall 2024), and White students (76% in Fall 2023; 83% in Fall 2024) enrolled in Fall STEM classes taught by cohort 2 faculty participants had greater percentages of academic success (C- or higher) than students enrolled in other STEM faculty sections. That is, the comparison groups showed the percentage of Black students with C- or higher was 63% in Fall 2023 and 69% in Fall 2024. For Hispanic students, 65% in Fall 2023 and 66% in Fall 2024 achieved a C- or higher. For White students in the non-participant courses, 71% in Fall 2023 and 74% in Fall 2024 achieved a C- or higher.

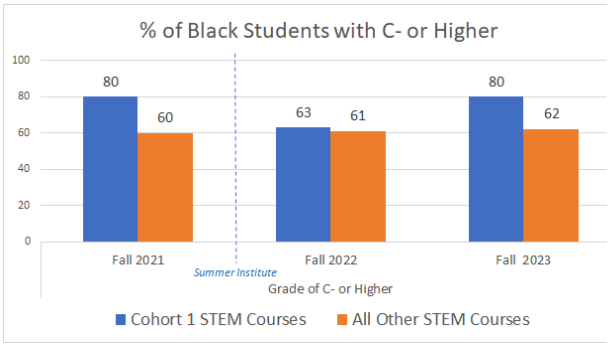

Figure 1
Percentage of Black Students with C- or Higher: Cohort 1 faculty compared to other STEM faculty

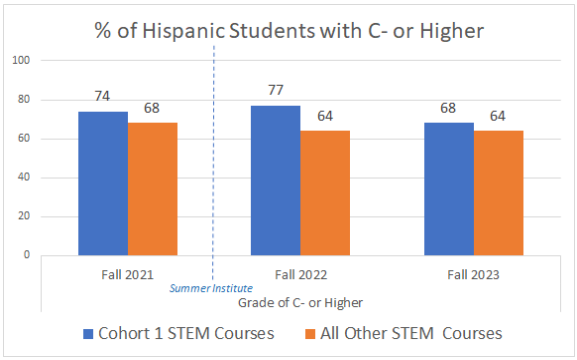

Figure 2
Percentage of Hispanic Students with C- or Higher: Cohort 1 faculty compared to other STEM faculty

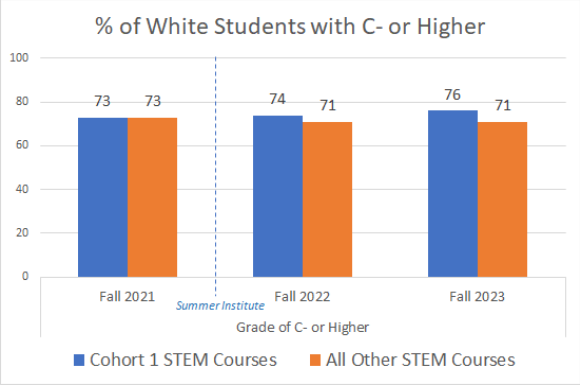

Figure 3
Percentage of White Students with C- or Higher: Cohort 1 faculty compared to other STEM faculty

Discussion

Compared to STEM course sections taught by non-participants, participation in the training program showed to have a positive impact on both community college faculty confidence in inclusive teaching practices and their students' achievement in STEM courses. The results are consistent with other research that found professional development focused on culturally responsive and inclusive teaching practices positively impacts faculty beliefs and confidence in using culturally responsive teaching practices [6] as well as reduces achievement gaps [5].

More research is needed to determine if these findings regarding faculty confidence and student achievement can be replicated with a larger sample. As well, investigating the impact of such inclusive practices on student motivation may provide additional insights on the possible long-term impact on student trajectories in pursuing work in the STEM areas.

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