# Educators' Equity in STEM (EESTEM) II Summary

Leadership Team: PI: Ben Williams, PhD, NAPE CEO; Co-PIs: Natalee Hilt, PhD, Stark State College, OH and Fred Owensby, PhD/Robert Mitchell, Dona Ana Community College, NM; and NAPE Program Manager: Gregory Jackson

The Educators' Equity STEM Academy (EE-STEM II; DUE 1601548) successfully developed an effective model to deliver high-quality professional growth nationally with fidelity for over 200 community college science, technology, engineering, and mathematics (STEM) technician education faculty and their secondary colleagues teaching college and secondary gateway courses. The professional learning enhanced teaching skills and practices, and educator self-efficacy in creating an equitable learning environment. Significant positive student outcomes for women and girls, students of color, and students with disabilities were observed, and the project met or exceeded all of it goals.

The National Alliance for Partnership in Equity (NAPE) Education Foundation together with Doña Ana Community College (DACCC), New Mexico and Stark State College (SSC), Ohio created the EE-STEM Academy Phase II to deliver a rigorous professional development (PD) program for educators. The PD included four components: (1) a 4-day (28 hour) Summer Institute in a central location (Dona Ana Community College in Las Cruces, New Mexico and Stark State College in Canton, Ohio), (2) eight structured and facilitated monthly Professional Learning Communities (PLCs) hosted in the academic year, (3) tools and resources that were easily available to the participants and supported and enhanced the work begun at the Institute, and (4) a virtual Capstone Presentation at the conclusion of the academic year for educators to present their selected strategies and their impact on student outcomes to other participants and teams, and the Leadership Team. In addition, each team was expected to reach out to at least 10 other instructors and administrators at their colleges in order to expand understanding, commitment, and sustainability of efforts.

The Micromessaging to Reach and Teach Every Student™ program was developed to serve technician education faculty and high school career technical education teachers and was piloted through an NSF grant (DUE # 1104163) to create an equitable and inclusive student experience. Micromessaging has demonstrated significant success in improving faculty attitudes, intentions, and behaviors that have transformed their teaching practices and had a demonstrated impact on student outcomes in multiple class settings. Over three years, EE-STEM II was developed as a model to implement NAPE's highly effective EE-STEM Academy program at multiple diverse community college sites with fidelity nationally.
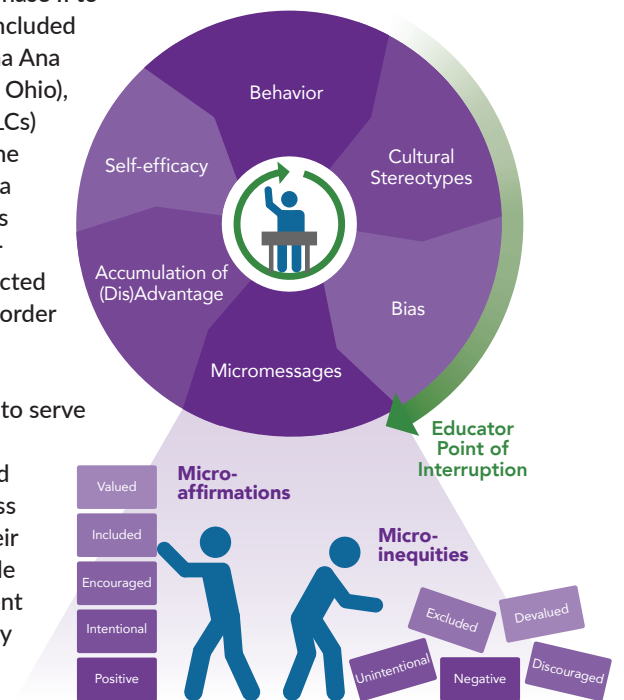
September 2019 marked the end of Year 3 and the conclusion of the grant. In October 2019 we began a no-cost extension year to complete evaluation activities and disseminate results. Over the course of the three-year project, we successfully implemented the full Micromessaging Academy with two cohorts of **92 STEM community and technical college faculty** and some of their counterparts from feeder secondary programs - **46 in each. 15 colleges from 11 states participated**. Through extension activities, **an additional 342 educators were reached**, far exceeding the goal of the project. The cohorts for each project are listed below (see below):

Micromessaging Cohort 1 FY18

- Austin Community College, TX
- Bainbridge State College, GA
- Baltimore City Community College, MD
- Delgado Community College, LA
- Northwest State Community College, OH
- River Parishes Community College, LA

Micromessaging Cohort 2 FY19

- Dona Ana Community College, NM
- Georgia Northwestern Technical College, GA
- Indian Hills Community College, IA
- National Technical Institute for the Deaf: RIT, NY
- North Idaho College, ID
- Owensboro Community & Technical College, KY
- Santa Fe Community College, NM
- Stark State College, OH
- Utah Valley University, UT

Educators' Equity in STEM (EESTEM) II Summary

Evaluation and Results

For this project, the evaluation team included The Allison Group and SMU CORE, which co-developed a new set up evaluation instruments, including a pre-/post-/delayed-post survey for the Institute and Academy, and an interview protocol for the Professional Learning Community leads. Results from the project are very positive.

The project measured the impact of the NAPE Summer Institutes on educator perceptions with respect to equity in the classroom. Self-reporting by participants indicated that there was little to no change in their perceptions. The pre-Academy scores for equity-positive attitudes were high (leaving little room for improvement), indicating that participants who would sign up for the Academy may already have made shifts in perspective. However, the project also measured change in knowledge and skills, and found that **participants at least doubled their knowledge and understanding, based on their self-reporting**. There were three and four-fold gains for many of the knowledge and skills identified for the Academy. This indicates that, even though participants may have had exposure to the issues addressed by the *Micromessaging* professional development, and may have made the decision to make changes, **they did not have the knowledge and skills to do so before completing the full Academy**. Large gains in knowledge and skills were evidenced, and were strongly attributed to the Summer Institutes by 61% of participants.

Participants were asked to rate their knowledge and skills in creating an equitable classroom before (pre) and at the end of the Summer Institutes (post) and at the end of the Academy (delayed post). A five-point scale with associated values was used:

No Knowledge = 1
Beginner: You have some experience or basic knowledge = 2
Proficient: You can utilize at a satisfactory level = 3
Advanced: You can utilize better than most = 4
Expert: You can utilize with a superior level of skill and teach to others = 5

Weighted averages were calculated for the ratings for each of the areas of knowledge and skill highlighted in the Academy and are shown in Table 1 below.

	Pre n=49	Post n=46	Delayed Post n=43
How an instructor can contribute and is accountable for the inequities in their classroom.	1.86	3.28	3.70
How to facilitate an equitable learning environment.	1.88	3.26	3.72
How stereotypes or "single stories" limit the opportunities and potential for students and their future careers.	1.65	3.34	3.81
How "single stories" can be created and perpetuated.	1.43	3.32	3.79
How implicit bias affects the messages that instructors send to their students.	1.60	3.28	3.70
How labels can impact a student's success.	1.88	3.38	3.93
How to encourage the exploration of STEM careers for those underrepresented by gender, race and ethnicity and (dis)ability status.	1.82	3.13	3.70
How the accumulation of micromessages affects a person's self-efficacy.	1.53	3.28	3.79
How to use the four sources of self-efficacy to increase success in STEM.	0.82	3.00	3.40
How to reinforce a growth mindset to build students' self-efficacy in STEM.	1.20	3.15	3.70
How to impact a student's attribution style to improve their performance and persistence.	1.10	2.91	3.49
How to move from deficit-based to asset-based learning.	0.86	2.81	3.35
How to develop culturally responsive instruction to improve equity in the classroom.	1.33	3.21	3.63
How to disrupt the cycle of inequity and foster strategies that increase potential for success for marginalized students.	1.18	3.06	3.63

Table 1: Participant self-ratings of level knowledge and skills before the Academy, at the end of the Summer Institute and at the end of the Academy.

Participant self-ratings of their level of knowledge with respect to equity concepts before vs. after the training increased from an average of 1.44 to 3.67 at the end of the Academy, **increasing by an impressive 207% or three-fold**. Participants reported an additional 15.6% gain in knowledge and understanding at the end of the II Academy after completion of the PLCs and the capstone projects.

The most learning gains in knowledge and skills occurred with the five shown in Table 2. All of them showed three-to-four-fold gains in understanding.

	% Change Pre vs. Delayed Post
How to use the four sources of self-efficacy to increase success in STEM.	314.6%
How to move from deficit-based to asset-based learning.	289.5%
How to impact a student's attribution style to improve their performance and persistence.	217.3%
How to reinforce a growth mindset to build students' self-efficacy in STEM.	208.3%
How to disrupt the cycle of inequity and foster strategies that increase potential for success for marginalized students.	207.6%

Table 2: Knowledge and skills with the top five gains in learning, pre v. delayed post

The vast majority of participants (93%) reported that, by the end of the Academy, they had changed many of their practices or altered them in minor ways. Participants reported that the top changes in classroom practice were: **1) to actively identify and challenge cultural stereotypes in their lives, on their campuses or institutions and among their interactions with others and 2) to reinforce growth mindset by praising students for their efforts during the process, not their intelligence and final results.**

While nearly all participants (97.8%) believed their actions in the classroom would have some impact on their students, **83.7% actually observed at least some impact on students. The most-mentioned impacts were increased student engagement (i.e. more involved in learning); increased self-efficacy (belief in their ability to be successful at some task related to the classroom, i.e. I can do this); and greater sense of belonging.**

In terms of impact on institutions, participants reported **observing greater awareness of the importance of creating an equitable learning environment and also more frequent conversations with colleagues about equity and the performance of students from historically underserved groups, namely women and girls, students of color, and students with disabilities.**

Implementation Findings

The CORE (Center on Research & Evaluation at Southern Methodist University) research team was able to take the high-medium-low qualitative ratings for the 8 different Micromessaging activities, and quantify them into fidelity scores. The fidelity scores were then used to explain variability in some pre-post-delayed post outcomes from the surveys. Major findings of the research were:

- Overall cohort 1 fidelity of implementation was stronger than cohort 2.
- Across analyses, fidelity of implementation seems to have had a stronger influence on *self-efficacy* than on *understanding and skill*[1].
- Self-reported *understanding and skill* related to Micromessaging got progressively better from pre- to post- to delayed-post time points, for both cohorts (fidelity of implementation did not explain variability in understanding and skill).
- There was a slight advantage (not statistically significant) in self-reported *understanding and skill* for participants who had also had another recent equity training.
- Interestingly, at the end of the Institute, participants who were at sites who would then go on to get a higher fidelity rating left the Institute with a higher self-perceived improvement in skill, suggesting perhaps more confidence, motivation, or other positive factor carrying them in to the school year.
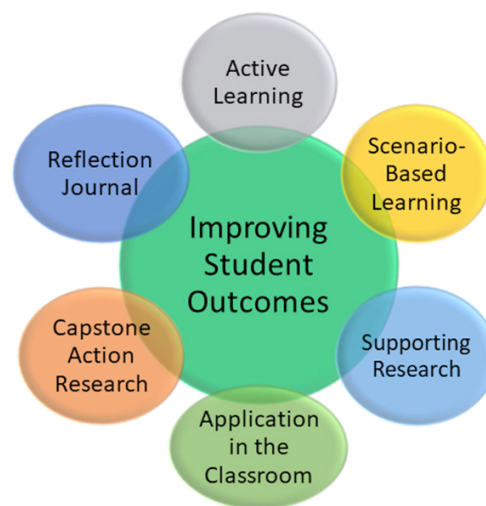
[1] Mean comparisons and correlations using self-efficacy as the outcome variable were statistically significant while analyses with understanding and skill were not.

Conclusion

We are highly encouraged by the positive results of the EESTEM II Project. This NSF ATE-funded three-year grant allowed us to implement our highly effective *Micromessaging Academy* with fidelity to nearly 100 community and technical college STEM faculty and their secondary counterparts from 15 institutions representing 11 states over the course of two years of intensive and impactful professional learning. Participants far exceeded the goal of outreach to peers at their institutions, with 342 additional faculty and administrators educated and engaged in examining evidence- and research-based interventions to create a more equitable learning environment. Participants overwhelmingly self-reported positive gains in their knowledge and skills, and greater self-efficacy in creating an equitable learning environment, and they observed significant student outcomes for women and girls, students of color, and students with disabilities, as a result of capstone projects through which they implemented their learning. EESTEM II was successful in meeting, and even exceeding, all of it objectives.

Quotes from participants reveal some of the powerful outcomes from this project throughout its various components: The Summer Institute, PLCs, and Capstone Showcase.

"During the NAPE Conference in New Mexico in the Summer of 2017, I was inspired by the change I could make in the classroom with regards to the lifetime of success I could impress on my students. I was inspired by finally understanding to categorize the issues my students, and I, face as inequities and not inequalities. I was inspired by learning that impact of micro-messages, and that self-confidence depends on the development (or attribute) of self-efficacy. It also has made a difference to engage with students and colleagues who want to serve the community better by interrupting the circle of inequity."

"I felt that the tools provided at the summer Institute allowed me to teach more effectively in my classroom and allowed me to understand the Culture Wheel deeply. I felt like I came away with a skill set to teach my colleagues how they too could interrupt their teaching practice and look at how cultural stereotypes, bias, micromessages, self-efficacy, and behavior can impact student learning. The strategies that I was able to share with my colleagues was a valuable piece of the VERY beginnings of a culture shift that needs to happen within our campus community. The professional growth I received became infectious to my colleagues as we developed a plan on how to infuse the information to a greater audience."

"I think for me personally like what was most beneficial with this experience was looking at the focused curriculum-based activities that we could do to take that deeper dive. You know like the critical self-reflection that was involved in looking at multicultural competence and you know understanding the culture wheel and looking at the different components involved in that and being able to utilize the classroom observation because it wasn't until this cohort I had ever even been observed in the classroom which is a shortcoming of our organization by far. But using the model has been so powerful in looking at how do we create this professional learning community that includes the action research but also deepens the understanding and builds metacognition around these different topics.... I just feel like the model is just phenomenal for you know making sure that there is that continuity in that ongoing rather than just like a four-day training and then you just don't ever come back to it."

"Before the NAPE conference, if you would have asked me what the term equity means I would have given you the definition regarding value of property or holdings. I came back to the classroom following the NAPE conference with a desire to put more effort into putting myself into the shoes of my students. This required me to apply extra effort into not only get to know the students but to also hear their 'story'. With busy schedules and limited access to students, taking the time to get to know them is my struggle. I believe this is a critical behavior to put my effort towards. I believe this effort will benefit the students and myself. We'll see. My teaching methods are methods that I have observed, cultivated, and molded. My own experiences in teaching and life have created preconceived expectations. My experiences with students are constantly evolving. When I first began teaching I believed that all my students would or should work with the same work ethic that I did. Learning my students 'story' has allowed me to begin to partner with my students creating equity and efficacy through empathy and patience yet maintaining a goal rich environment with high expectations."

"The Capstone provided a platform to share the ideas we learned at the summer institute and provided our campus leadership a glimpse into the work that staff and faculty are engaged in with regards to improved success for students. The Capstone was a culmination of our efforts and was valuable to our entire team as we move forward to share this critical information both on and off campus-noticing is interrupting and we have noticed!"