

## **Research Experience for Teachers: How Hands-On Research and Student Mentoring Impacts Teachers' Self-Efficacy Beliefs**

*Nancy K. Ceja<sup>1</sup> and Scott Gartlan,<sup>2</sup> Executive Director*

*<sup>1</sup>Department of Physics and Optical Science, University of North Carolina at Charlotte*

*<sup>2</sup>Charlotte Teachers Institute, University of North Carolina at Charlotte*

**BACKGROUND:** This study used a mixed-methods model to evaluate the effectiveness of the Charlotte Teachers Institute (CTI) Summer Research Experience for Teachers (SRET) for Charlotte-Mecklenburg School (CMS) teachers. The SRET program operated over a four-week, sixty-hour period in which CMS classroom teachers were matched in pairs with a university research team at one of three participating universities: University of North Carolina at Charlotte, Johnson C. Smith University, and Queens University. SRET focused on providing mastery and vicarious experiences to teachers with the goal of increasing self-efficacy in the sciences and humanities.

**METHODS:** Seventeen teachers participated one of eight research teams led by university professors. Undergraduate and graduate students acted as research mentors for the teachers throughout the program. Participants completed pre- and post-T-STEM/Humanities surveys, which focused on five constructs (Friday Institute for Educational Innovation, 2012). Teachers also completed weekly reflections that focused on their mastery and vicarious experiences. A participant-observer logged daily reflections while acting as mentor for three teachers at the university physics lab.

**RESULTS:** A paired samples t-test analysis of the quantitative T-STEM/Humanities surveys showed a statistically significant difference between pre-test ( $M=3.4$ ,  $SD=0.46$ ) and post-test ( $M=3.8$ ,  $SD=0.34$ ) on the Teaching Efficacy and Beliefs construct;  $t(14) = -3.02$ ,  $p=0.009$ . These results suggest that teachers who engage in hands-on research are more likely to develop self-efficacy and confidence in teaching STEM and humanities subjects. Furthermore, these self-efficacy beliefs represent items such as confidence to teach science and humanities effectively, confidence to answer students' science and humanities questions, and knowledge to increase student interest in science and humanities. Participant-observer reflections yielded four themes: (1) Asking Questions, (2) Praising Success, (3) Personal Responsibility, and (4) Classroom Connections. All participants' high degree of interaction contributed to the development of these themes.

**CONCLUSIONS:** Results demonstrate teachers improved self-efficacy beliefs and confidence after engaging in hands-on research in a university setting. These results suggest that engaging teachers in collaboration and hands-on research can positively change self-efficacy beliefs and confidence. In particular, this construct explores teachers' attitudes toward student success. Teacher confidence and knowledge are associated with positive student academic outcomes. Implications from these findings suggest those who are interested in positively influencing teacher self-efficacy beliefs should invest in hands-on, collaborative research in a university setting. Themes from the participant observation underscore the importance of asking questions and praising successes in research settings. Further research should explore between-group analysis.