

Attracting STEM-talented undergraduates to secondary education with early teaching experiences

Paper Submission

1. Objectives or purposes of the study or work being presented:

The purpose of this descriptive study is to investigate the following question:

- (1) In what ways did participation in a semester-long after-school teaching experience attract undergraduate STEM majors to consider a career in teaching?

2. Perspective(s) or theoretical framework:

The research question that is outlined above emerged from a year-long Noyce Capacity Building Grant project that took place at a small liberal arts college in New England during the 2018-2019 academic year. One of the primary objectives of this project was to develop a program that had the potential of increasing the number of undergraduate STEM/Secondary Education double majors at our institution. We attempted to do this by providing early STEM discipline majors with the opportunity to teach a semester-long STEM course within an established campus-run after-school program designed to support the academic needs of high-school students from a nearby local school district. There is ample research that indicates that the recruitment of STEM majors into secondary teaching careers may be amplified when potential teaching candidates are provided with “purposeful [teaching] experiences” (Borderding, 2015, p. 248) that allow them to teach science content to actual secondary students (Luft, et al., 2011; Worsham et al., 2014). Ticknor et al., (2017) noted that such teaching experiences can occur in informal (peer tutoring) or formal (free teaching class) experiences; however, they are most effective when they occur early in a STEM majors college career. In addition, service-learning/community opportunities like the one utilized for this project have the potential of helping *all* potential teachers, regardless of academic discipline, to better understand the content of their educational courses (Hildebrand & Schultz, 2015), as they provide fledgling teachers with the opportunity to make stronger connections between educational theory and practice (Coffey, 2009).

3. Methods/Methodology

In order to learn about the impact that a semester-long teaching experience might have had on each participant’s beliefs and attitudes towards teaching in a high-need district, the following data collection methods were employed:

- Pre-/Post-surveys taken before and after a semester-long teaching experience (researcher generated)
- One 15 minute-qualitative interview, which took place after the completion of each participant’s teaching experience

The students were asked several questions about their attitudes towards teaching in high-need districts before and after the experience through these surveys and interviews.

Interviews were transcribed by the co-Principle Investigator. Researchers utilized the basic thematic approach to coding as defined by Braun & Clark (2012).

4. Data sources or evidence;

Participants were eight STEM majors who were not already in the secondary education program. They were recruited to teach in a campus-run after-school program designed to support the academic needs of high-school students from a high-need school district. Four were recruited for the fall semester and four were recruited for the spring. However, two of the fall instructors enjoyed it so much that they joined as co-instructors in the spring as well. Seven of these undergraduates were interviewed after their teaching experiences (one was unavailable for interviews.)

We also interviewed one STEM senior who was not originally recruited for the program but who was a volunteer in the classroom. They took a job teaching high school after their experience, despite having no previous teaching experience before that program.

5. Results and/or conclusions/point of view (preliminary, on-going, or complete);

Seven of the eight recruited instructors were interviewed about their experience at the end of the year by the Principle Investigator. Upon initial analysis of these interviews, these students can be broken up into three groups:

- one student who had considered teaching before and is now more likely to pursue (graduating senior).
- five students who had never considered teaching but now may consider it in the future (two juniors, one sophomore, and two freshmen). One of these five (a sophomore) indicated a strong preference towards teaching in the future.
- one student who is not considering teaching as a career as a result but enjoyed the experience nonetheless (sophomore).

In addition, an eighth student was interviewed by the co-Principle Investigator, although they were not part of the initial participant pool. This student, a senior, joined the after-school program as a service-learner in the spring for their first teaching experience. The student later applied for and accepted a job teaching high school physics as a direct result of their experience, as explained in their interview transcript.

Preliminary analysis suggests that experience with teaching in this program does lead STEM majors to consider teaching as a career. However, our sample was not ideal, since students typically need to declare their second major in secondary education in their sophomore year in order to fit all of the course requirements in four years. The strong interest in teaching as a career among graduating seniors was striking and leads us to conclude that earlier intervention with a teaching experience could spark interest in teaching in time to add the secondary

education major, thus ensuring that the students are well prepared upon entering the classroom. In fact, in their interview, the eighth student explicitly recommended offering service-learning in such programs as part of freshman STEM courses.

The one student not interested in a teaching career cited a perspective common to STEM students and faculty, i.e. the difference in pay between education and industry. This aligns with common attitudes and beliefs towards teaching held by many STEM majors and faculty.

6. Educational or scientific significance of the study.

The opportunity for STEM majors to teach STEM courses to high school students offers them an authentic, real-world teaching experience that has the potential to demonstrate the personal and professional satisfaction that can come from teaching. This sense of satisfaction may motivate many of them to pursue a second major in education. Thus, over time, our institution may increase in the number of STEM teachers with knowledge, skills, and disposition to teach in high-need schools. In addition, the program described in this study may also benefit the high school students who participate in the STEM courses described in this study.

Bibliography

Borgerding, L.A. (2015). Recruitment of early STEM majors into possible secondary science teaching careers: The role of science education summer internships. *International Journal of Environmental & Science Education*, 10(2), 247-270

Braun, V., & Clarke, V. (2012). Thematic analysis. In *APA handbook of research methods in psychology, Vol 2: Research designs: Quantitative, qualitative, neuropsychological, and biological*. (pp. 57–71). <https://doi.org/10.1037/13620-004>

Coffey, H. (2010). “They taught me”: The benefits of early community-based field experiences in teacher education. *Teaching and Teacher Education*, 26, 335-342.

Hildenbrand, S. & Schultz, S. (2015). Implementing Service Learning in Pre-service Teacher Coursework. *Journal of Experiential Learning*, 38 (3), 262-279.

Luft, J. a., Wong, S. S., & Semken, S. (2011). Rethinking recruitment: The comprehensive and strategic recruitment of secondary science teachers. *Journal of Science Teacher Education*, 22(5), 459–474. doi:10.1007/s10972-011-9243-2

Ticknor, C. S., Gober, D., Howard, T., Shaw, K., & Mathis, L. (2017). The Influence of the CSU Robert Noyce Teacher Scholarship Program on Undergraduates’ Teaching Plans. *Georgia Educational Researcher*, 14(1). <https://doi.org/10.20429/ger.2017.140103>

Worsham, H. M., Friedrichsen, P., Soucie, M., Barnett, E., & Akiba, M. (2014). Recruiting science majors into secondary science teaching: Paid internships in informal science settings. *Journal of Science Teacher Education*, 25(1), 53–77. doi:10.1007/s10972-013- 9360-1