

# FEMALE STUDENTS' PERCEPTIONS OF SCIENCE: THE ROLE OF RESEARCH EXPERIENCES IN DEVELOPING SELF-EFFICACY

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## Abstract

The number of students enrolling in science degrees is declining, with one suggested reason being students' stereotypical perceptions of science. Science may be seen as highly factual with little role for creativity and discussion, a perception that may impact disproportionately on females and minority groups. Thus, one strategy to improve interest in science is to provide authentic research experiences in high school so that students experience the creativity, trial and error and teamwork characterizing professional science (Graham, Frederick, Byars-Winston, Hunter & Handelsman, 2013). Interest and persistence in STEM can be improved by fostering students' self-efficacy, defined as their belief in their ability to succeed in specific situations or accomplish a specific task. While a number of sources of self-efficacy have been identified, mastery – or the feeling of successfully accomplishing a task – appears to be the greatest contributor (Bandura, 1986). This means that authentic research experiences need to be carefully designed and scaffolded so that students do actually experience mastery.

We have investigated the role of high school research experiences in fostering science self-efficacy in females by using a two-pronged approach that examined high school students' perceptions of a research experience as they undertook it and science undergraduates' retrospective perceptions of school experiences of science inquiry. A structured reflective journal was used to capture female students' views as they completed an open-ended research project. Students responded to questions about their learning, confidence and experiences, with twenty-eight Year 9 students from an all-female secondary school participating in the study. Fifteen second or third year female science undergraduates were interviewed about their science self-efficacy and the influence of school experiences on sources of self-efficacy. The journals and interviews were analysed qualitatively to identify key themes relating to self-efficacy and its sources.

From our analysis of the secondary students' reflective journals we observed a developing understanding of science in parallel with gains in mastery for many students. Interestingly, some were surprised to find the project more interesting and enjoyable than they had anticipated, suggesting that such experiences can change perceptions of science. However, a minority found the project too hard, reinforcing their negative perceptions of science. While it is unrealistic to expect that all students will be inspired by one experience, this does underscore the need for appropriate scaffolding. Mirroring the results from secondary students, we found that many undergraduates mentioned some kind of inquiry or research project as being influential in developing their interest in science. The way they spoke about these experiences was consistent with a significant role for mastery, as they highlighted ownership, independence and pride in their achievements. Our study suggests that well-designed research projects in high school can increase self-efficacy and interest in science for females and this may be a strategy to address declining enrolments at university.

Bandura A (1986) *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.  
Graham, M.J., Frederick, J., Byars-Winston, A., Hunter, A-B., & Handelsman, J. (2013) Increasing Persistence of College Students in STEM *Science*, 341 1455-56

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