

Research Internships in Science and Engineering (RISE): Lessons from the First Year

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Abstract

In science, technology, engineering, and mathematics (STEM) fields, the low presence of women at all levels has been well documented. Barriers contributing to the paucity of women have been identified as external, or contextually based^{1,2} (e.g., lack of female role models and the "shadow job" expectation for female faculty of mentoring students even though they receive little formal recognition or reward), and internal, or individually based^{3,4,5} (e.g., low self-perceptions of ability by undergraduate women).

At the University of Maryland (UM), an innovative educational intervention has been developed to help overcome key barriers to the success of women in STEM. **Research Internships in Science and Engineering (RISE)** is designed to serve women in the higher-educational pipeline: incoming first year students, advanced undergraduates, graduate students, and female faculty members. The purpose of this paper is to describe RISE and identify how this program uniquely addresses key internal and external barriers faced by women in STEM fields. RISE is funded by a grant from the National Science Foundation, the Clark School of Engineering and the Office of the Provost at the University of Maryland.

Research Internships in Science and Engineering (RISE): Program Description

There are two key points in the career of undergraduate women where participation in a deliberately designed intervention can significantly impact success. The first is during the transition from high school to college (which tends to be the initial encounter with the predominantly male STEM environment). The second is during the latter half of their undergraduate education, when career options, including whether or not to pursue graduate education, are being considered. Taking into account these opportunity points, the RISE program consists of two different tracks: RISE – The First Year Summer Experience (Track One) for incoming first year students, and RISE – Summer Research Teams (Track Two) for more advanced undergraduates.

RISE – The First Year Summer Experience (Track One) is a two week residential orientation program for first year female students entering engineering, mathematics, computer science or physical science at UM. The focus of the orientation is to address issues of self-confidence and self-efficacy with regards to the incoming student's ability to be successful during the first year in college. Based on previous research indicating that female students often enter STEM fields with fewer technical skills and less confidence than male students, Track One includes technical

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survival skill sessions. Activities incorporate learning basic computer skills, the hands-on experience of taking apart and rebuilding a computer, and learning how to use the electronic communication services at UM. Faculty mentors and RISE Scholars in Track Two provide introductions to their laboratories and research projects. Participants, their faculty mentors, parents, and selected campus guests are invited to attend a concluding celebration luncheon. At this event, the students make team presentations related to issues they might encounter in the fall and how they will solve the problems based on what they learned during RISE. Participants who successfully complete the program receive a \$500 scholarship and a certificate of accomplishment. During the first year of RISE, twenty-four of the twenty-five students accepted into the program earned a scholarship.

RISE – Summer Research Teams (Track Two) involves a guided team-based research experience for junior and senior females majoring in engineering or the sciences. The goals of the Track Two program are to encourage upper level female undergraduates to remain committed to their STEM majors, become excited about research, and to increase their network of female contacts in engineering and the sciences.

While positive team experiences have been shown to motivate students and encourage higher levels of academic achievement leading to increased retention and graduation, a common experience for undergraduate women on project teams involved being in the minority.^{2,6,7,8} From this perspective, the team may become yet another challenge in dealing with isolation in the STEM environment, rather than a potential source of peer support and learning. The Track Two program strives to compensate for the lack of women in STEM fields by creating all female teams. Four undergraduate women are teamed with an advanced peer, already familiar with the research project, and a female graduate student, committed to the field by virtue of seeking an advanced degree. Heading up the group, is a female faculty member. Five such research teams participated in the first year of RISE.

While the core experience for Track Two participants is involvement in the research experience itself with the benefit of several similar role models and mentors, students also attend workshops on effective mentoring and advanced team skills training³. The concluding event of the Track Two program is the *RISE Research Symposium*. At this event, each of the research team presents their research findings to their parents, RISE Track One students, and individuals from the campus. Dr. Rita Colwell, Director of the National Science Foundation, was the featured guest at the first Research Symposium. Her remarks addressed the future of science and technology emphasizing key individuals who made a difference in STEM.

Both tracks of the RISE program are assessed in using both qualitative and quantitative methodologies. Undergraduate participants complete written surveys, participate in focus groups, as well as individual interviews. The faculty members, graduate students, and advanced undergraduates (called Undergraduate Fellows) are evaluated using semi-structured interviews. While beyond the scope of the present paper to review all of the research questions and findings, initial evidence from the project's first year suggests positive impact on the three key questions RISE was designed to address (i.e., the "chilly climate" of STEM fields, lack of appropriate role models, and internal psychological barriers to achievement). Details of these assessments as

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well as programmatic implications for the future of the RISE program will be presented in future publications.

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