ENGAGING EARLY UNDERGRADUATE STEM STUDENTS IN RESEARCH EXPERIENCES TO IMPROVE RECRUITMENT AND RETENTION

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PROJECT DESCRIPTION

The Alma College PRISM project (Positive Routes Into Science and Mathematics) is a program that focuses on increasing the number of STEM graduates through a positive recruitment and retention program that creates a STEM learning community. It engages students through a focus on early involvement with undergraduate research and an enhanced introductory STEM curriculum. The PRISM program is funded by an NSF-STEP (Science Talent Expansion Program) grant.

The core of the PRISM plan is a comprehensive suite of activities spanning the STEM student’s first year at Alma College. It begins with a summer research oriented experience before the student arrives on campus, moves through a series of courses, seminars, and community building activities, and culminates with a summer research experience. Select students move on to become student research associates and peer mentors in their later years. STEM students are recruited to Alma through outreach to area high schools and recruitment at science fairs, Alma’s Math, Science and Technology Day, and Alma’s Scholars Summit Day.

The number of FYS students interested in the sciences is now 220 or 56% of the first-year class up from 179 (45% of the first year class) in Fall of 2009. The number of declared science majors has increased from 175 (12.6% of total enrollment) in 2008 to 251 in 2013 (17.2% of total enrollment). Students participating in our ASPIRE and Summer Research Programs were retained at a higher rate from their first to second year and had higher GPAs at Alma in spite of having the same academic credentials as the science students who did not participate in the summer activity. Beyond the statistical benefits, the program clearly has played a major role in improving the science culture at Alma, rejuvenating faculty interest in student-faculty research, and producing students qualified for national research and internship opportunities.

IMPLEMENTATION AND ACHIEVEMENTS

ASPIRE: Over the past four summers, one hundred and forty-six entering students Alma College spent one week on Alma’s campus working in small research teams of faculty, upper-class, and first-year researchers. Exit surveys for those years indicate that the program was well received. In those four years, all of the students rated it as very good or excellent. More importantly, students overwhelmingly reported that the experience significantly increased their confidence in their research skills and also in their ability to succeed in graduate school and in their chosen career. Correspondingly, they reported having high career aspirations, with approximately 90% indicating that they planned to pursue an advanced degree after college, with 43% and 22% respectively, indicating that they expect to obtain a Ph.D.

Subsequently, these ASPIRE students have been tracked to determine if this activity impacts whether they are retained at a higher rate. For the 2010-2012 ASPIRE program participants, the retention rate was 95.2% from first to second year compared to 81.2% for the rest of the campus. This could be due to self-selection bias. However, we purposefully did not use high school GPA or standardized test scores for selection. Applicants wrote an essay indicating their interest in science and research. The overall science high school GPAs for ASPIRE and Non-ASPIRE Science students were comparable. Therefore, it appears as if our selection process was successful in not picking “the best and brightest” who would tend to be retained at a higher rate anyway. Furthermore, the ASPIRE program has had a significant effect on the academic performance of students participating. We tracked student GPAs in science classes for participants in the ASPIRE program. ASPIRE students in 2010 had a greater GPA than non-ASPIRE students (2.90 compared to 2.67). In 2011, the same effect was noted (2.95 for the ASPIRE and 2.63 for the non-ASPIRE).

In the ASPIRE program, 67.7% of the participants were women (compared to 58.0% on campus) and 12.0% of the students were minority students (compared to 8.9% on campus). Similar demographics were seen with the 10-week summer research activity (73.3% female compared to 58.0% on campus and 11.5% minority compared to 8.9% on campus).

FIRST-YEAR SUMMER RESEARCH PROGRAM: This 10-week research experience for first-year students (rising sophomores) has been run the past four summers. Sixty-three students participated over the four years. These students worked in science research labs across the STEM disciplines. Upper-class students served as peer mentors in each of the research labs. The exit survey conducted for those years showed that all of the students rated the Summer Research Program as very good or excellent. In addition, 23 presentations at regional and national scientific conferences and three publications came from students in the summer program.

This program also had a significant impact on retention for students in the sciences. The 2nd to 3rd year retention rate for students participating in the Summer Research Program was 100% compared to 88.9% for those who did not. These two pools of students had very similar high school GPAs and ACT scores. We saw the same improvement in academic performance for the Summer Research Program participants that we saw with the ASPIRE program. In 2010-2012 the participants had a 3.5 GPA compared to a 3.05 for other science students.

Last year’s graduation class (2013) was the first group of students that participated in the Summer Research Program as first-year students. One hundred per cent of the students in that class graduated. This year’s graduating class (2014) will be the first class that participated in all of the PRISM activities.

SUMMARY

1. The number of science majors has increased and students participating in the PRISM program were retained at a higher rate than their peers.
2. In comparison to an academically comparable group of students, PRISM participants had improved academic performance.
3. PRISM has produced students qualified for national research and internship opportunities.
4. The program has played a major role in improving the science culture at Alma, rejuvenating faculty interest in student-faculty research.

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