Abstract title:
The Strange Case of Andrews University Biology: Lessons in STEM Success from a (seemingly) Traditional Program

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The Biology Department of Andrews University developed an academic program for undergraduate majors that led to unusual academic success and exceptional acceptance rates in entering STEM-based careers in medicine and the sciences. Approximately 70% of the students that were enrolled at the end of their freshman year graduated and, on average, as a group of graduating senior biology majors, scored above the 90th percentile on nationally normed exit exams (Major Fields Test) when compared with the average scores of graduates of biology programs of other universities. These test results plus their rates of acceptance, following application, into graduate programs (>90%) and medical schools (>80%) were substantially higher than would be predicted from their high school based grades and SAT/ACT scores. The high success rates of students from cultural groups under represented in STEM (Science, Technology, Engineering, Mathematics) fields (30 to 35% of Biology graduates) were particularly noteworthy.

Each new major, on entering the biology program is mentored/advised by a departmental faculty member. The mentoring included collaboration in making effective choices for classes to be taken each year, achieving success in these classes and frequently included support/assistance in problem solving in other areas of their lives. Faculty members approached their teaching with the goals of: a. offering rigorous, effective courses; b. being readily accessible to students for assistance in their courses; c. developing thoughtful, analytical, problem-solving approaches to their courses; d. mentoring students in undergraduate research projects that were frequently published and/or presented at appropriate professional meetings/venues.

These experiences, for students who pursued improvement in their STEM-based education, frequently led to educational transformation of their success by the end of their second year of study. This group who achieved improved success, in combination with biology majors who were highly successful from the beginning, provided the “foundation” for the high success rates of graduating senior biology majors. However, it was not really clear which components of our program were
and are) most effective in promoting the unusual success experienced by biology students and graduates. The objectives of this report are to briefly present the metrics that document it’s unusually high rates of student success, and the results of the National Science Foundation supported (by both STEP and CCLI grants) evaluation of the reasons that underlie these high rates of student success.

The NSF-supported study proceeded along two tracks: 1. An "experimental" approach that involved developing a new, interdisciplinary Behavioral Neuroscience (BNS) program targeted at attracting and involving students who would not otherwise choose to prepare for a STEM-related career, many of whom would enroll in the university’s psychology program; 2. An in depth qualitative and quantitative evaluation of the reality of and factors underlying the success of students enrolled in - and graduated from both the biology and BNS programs.

BNS program. The organization and steps of the biology program were “cloned” and provided the underlying structure of this new program (based in Biology, Behavioral Science and Mathematics). The BNS program has attracted an unusually high proportion of students from cultural groups that are usually under represented in STEM disciplines. The success of the student’s in this program has duplicated the success of students in the biology program. Over 4 years, of the students completing this program, 35% have gone on to graduate or MD/PhD programs, and 45% entered medical school.

Evaluation of the factors underlying the success of both BNS students and biology majors
A careful quantitative evaluation of the “success metrics” over a 5-year period, revealed much more about the successes experienced by the students. Equally, or perhaps more importantly, an extensive, qualitative study of biology alumni and current students, that over sampled under prepared students and students from ethnic groups under-represented in STEM disciplines was undertaken and has illuminated the reasons for the students’ unusually high levels of success. These results are the focus of the rest of the presentation.