



Taking STEPS to Promote STEM Careers

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According to national studies, there are well-documented trends of declining student interest, inadequate student preparation and a lack of female and minority students in science, technology, engineering and math (STEM) disciplines.¹ This leads to a relatively small percentage of U.S. students, and an even smaller percentage of women and minorities, obtaining college degrees in STEM majors and pursuing careers in these fields.

This trend has led higher-education leaders to question if the United States is producing an adequate number of scientists, technologists and engineers to compete in the global economy. As a result, many higher-education institutions have implemented specific initiatives to encourage enrollment in STEM programs, especially among women and minorities.

The University of Wisconsin-Stout, in Menomonie, is a polytechnic university with about 9,000 students that offers a large number of STEM majors, from manufacturing engineering to applied math and computer science. The enrollment of female students has averaged as low as 10% in some undergraduate programs, and the enrollment of minority students is even lower.

Start with small STEPS

When leaders of the engineering and technology programs began examining this issue more than a decade ago, they decided the most effective means of changing the situation was to expose young women and minority students to the opportunities for careers in STEM fields before they make irreversible curricular decisions. As a result, a summer technology camp for girls entering seventh grade was started.

The first Science, Technology and Engineering Preview Summer Camp (STEPS) was held in the summer of 1997. The purpose of the camp is to provide students with experience in STEM fields early enough to influence their choices of math, science and technical courses in middle and high school. The ultimate goal is to increase the participation of women in university programs and in STEM career fields.

Each summer, 160 middle-school girls attend the week-long camp in groups of 40 campers. The camp is held at the UW-Stout campus, and campers stay in one of the residence halls. The camp activities achieve an appropriate balance between technical skill development and recreational activities. They conform as closely as possible to UW-Stout's applied learning philosophy. Selected activities focus on manufacturing concepts involving processes and production systems, as well as the associated scientific and mathematical theories and principles. Instructors have developed interesting and interactive activities, such as building and racing radio-controlled speed boats and airplanes.

The campers also participate in activities involving web design, packaging, printing, automation, chemistry, computer networking, electronics, math and physics. The campers are also in contact—in technical and administrative contexts—with many female role models, including faculty, staff and students from UW-Stout and area high schools.

Recruitment for the program is conducted through middle schools throughout Wisconsin and Minnesota. There is also an online application process. Students pay a small fee to cover the costs associated with the operation of the camp; disadvantaged



students, however, attend at no cost. In 2009, 27% of the girls attended the camp for free, including a group of eight girls from a tribal school in Neopit, WI. The Society for Manufacturing Engineers was the first sponsor of the UW-Stout STEPS program, and other sponsors include companies such as 3M, Caterpillar, Kodak, Phillips Plastics, Ford, Alcoa, General Mills and Target.

Program success

Since its beginning, more than 2,000 young women have completed the STEPS program. In accordance with UW-Stout's nationally recognized quality improvement program, the program is evaluated each year, and the participants are tracked throughout their high school and college years.

Longitudinal data indicate the success of the STEPS program has been significant. Only 1.5% of all girls graduating from high school can be expected to enroll in college engineering and technology majors. The expectation from STEPS program graduates is 11.5%, which means a young woman attending STEPS is approximately eight times more likely to become an engineer or technologist than her contemporaries. Only 5.2% of all girls graduating from high school can be expected to enroll in college natural science and math majors. The expectation from STEPS program graduates is 25%. In follow-up studies, young women report that STEPS had an influence on the decision of their college major, especially for those who selected engineering and technology-related programs.² The STEPS program has been replicated in recent years at universities in Minnesota and Michigan.

Young women who successfully complete the STEPS program may continue to participate in the program in subsequent years by attending the week-long advanced STEPS camp as 10th graders. They also can participate as junior counselors, counselors and lab assistants to continue to build their knowledge, skills and interest in the STEM areas. These young women may also participate in other pre-college programs, activities and contests sponsored by UW-Stout to develop and maintain student interest in STEM majors. These activities include engineering and technology preview days, the Science Olympiad Competition, the High Mileage Vehicle Competition, Lego League Regional Tournaments or the annual competition for STEM scholarships.

Support services

When STEPS graduates or other students enter UW-Stout to enroll in one of the STEM programs, the university offers several support services to help ensure their success. A Math Teaching and Learning Center provides tutoring and assistance to students in introductory math courses, and tutors are also available in the science and technology laboratories.

UW-Stout is a laptop campus, and each STEM student is provided with a laptop. Specialized software for specific STEM disciplines, such as AutoCAD, is available to students through a key server. There are numerous student organizations, such as the Society of Women Engineers and the Applied Math and Computer Science Club, that provide opportunities for leadership development and professional activities. Students interact regularly with employers in their programs, and 80% of UW-Stout graduates complete an experiential learning experience (co-op or internship) prior to graduation. In the last 10 years, the job placement rate for UW-Stout graduates has been at least 95%.

Although STEPS graduates attend numerous colleges and universities, the results at UW-Stout have been encouraging. From 2004 to 2009, as a result of the



STEPS program and other STEM recruitment initiatives, the percentage of women majoring in applied math and computer science, graphic communication management and technology education has increased, and the number of female students enrolled in the applied science major doubled.

Female students are also enrolling in UW-Stout's new STEM majors, including computer game design and development, plastics engineering and computer engineering in healthy numbers. Some of the early STEPS graduates are also enrolling in graduate programs in the STEM fields. The program will continue in the summer of 2010 at the UW-Stout campus.

For more information on UW-Stout and the STEPS program, visit www.uwstout.edu.

References

1. Purdue University, "Attracting Students to STEM Careers," a white paper submitted to the Purdue University Strategic Planning Committee, unpublished manuscript, 2007.
2. University of Wisconsin-Stout, "STEPS for Girls at UW-Stout," annual report, 2009.

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