

## Ensuring Students' Success

In May our youngest son will be graduating from college. I hope that he will be successful in life. In fact, a big part of my responsibility is to help ensure that he, and thousands of other students like him, *will* be successful. Ensuring students' success is no small challenge. It means our students must be prepared for college work. It means educating them about the many degree and career options they have. It means creating a campus environment that supports their intellectual growth, social development, health, and well-being. It means engaging our students in challenging learning experiences, in and out of the classroom. And it means preparing them for lives of civic engagement, social responsibility, and lifelong learning.

How well we in higher education do that job has a significant impact on the economy, our society, and the future. To prepare our students for the complex world of today and tomorrow, we need to emphasize high-quality education—particularly in science, technology, engineering, and math. Increasingly, high levels of education in these areas are associated with innovation, discovery, and economic growth. It is estimated that about one-third of all jobs in the United States require a science or technology competency.<sup>1</sup> And according to the Bureau of Labor Statistics, science and engineering jobs are growing at three times the rate of job growth in other fields.<sup>2</sup>

A solid background in science and math is not just important as a prerequisite for a job; it is fundamental to informed participation in modern society. Basic scientific literacy is necessary to understand the complex issues of our day



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and to guide personal decisions as well as civic and cultural participation. Our increasing reliance on technology and the new frontiers being opened by researchers each day drive the need for an understanding of the concepts and processes at work in order to inform wise decisions. Without a doubt, a focus on problem-solving and critical thinking, such as is seen in the sciences, serves us well in a variety of fields and in daily life.

Although all of our students have

great potential, not all of them learn well in the traditional lecture approach. Part of ensuring students' success is looking for alternative learning models. One innovative design is the Student-Centered Activities for Large Enrollment Undergraduate Programs (SCALE-UP) Project, designed by Dr. Robert Beichner and his colleagues at North Carolina (NC) State. Intended to boost students' success in large-enrollment science classes, SCALE-UP utilizes technology to integrate lab

work and lectures in order to engage students in collaborative, hands-on learning. Instead of working alone, students work together in teams, using laptop computers for problem solving and research. These teams of students collectively devise solutions to thought-provoking problems based on real-world situations. This methodology has reduced failure rates for all students by a factor of three, with even greater results for students in groups typically underrepresented in the sciences. For African Americans, failure rates have dropped to approximately one-fourth their previous values. SCALE-UP has achieved similar results at other colleges and universities across the country and has been implemented in subjects such as computer science, chemistry, and engineering.

As the SCALE-UP Project shows, creative instructional strategies that engage students increase their interest and their success. Emphasizing undergraduate research is another method for motivating and challenging students. Many of our students tell me that they chose NC State because of the opportunity to begin hands-on, meaningful research right away. Many students publish in the *Undergraduate Research Journal of North Carolina State University* or present papers with a faculty mentor. In some of our colleges, 40 percent of undergraduates participate in research.

A key reason students are engaged is because they are challenged. And though we certainly want students to be challenged in the classroom, much of their learning takes place outside of class. Participating in service projects teaches students teamwork and project-management skills. What they don't know—about renovating a house or designing a tool for a student with a disability or holding a dance marathon—they must learn. And they do learn—from peers, from information they find on the Internet, and from faculty, staff, and community members. Part of our responsibility in higher education is to create these opportunities and set the expectation that students will take on these real-world challenges and give back to the community.

We must also accept that our students are self-service learners—they will learn on their own. Some of what they learn

will come from TV, some from friends, and some from *Wikipedia* or other sources on the Internet. Their information universe is more often the Internet than the library. What they must learn from us is how to identify problems, define needed resources, evaluate sources of information, analyze what they find, and respect intellectual property. Developing this information literacy is good preparation for students' future as effective, discriminating, lifelong learners.

Not only are our learners inclined toward self-service, but they learn well in peer-to-peer situations. At NC State, women science and engineering students have an opportunity to live and study together through a program known as WISE (Women in Science and Engineering). The program is designed to encourage students' success through peer-to-peer learning. In addition, students can socialize or work in groups in open, collaborative spaces located throughout the campus. Our small-group collaboration configuration for students (Flyspace, <<http://www.ncsu.edu/flyspace/>>) is designed to be inexpensive, modular, and compact, providing group space even on campuses with chronic space shortages. Open scheduling allows any registered student to reserve a space for a meeting or group project. Other spaces bring people together, such as open atriums and informal seating areas that encourage impromptu encounters among students and with faculty.

If those of us in higher education are really concerned with students' success, we can't focus on our own institutions in isolation; we must improve and support education from kindergarten through graduate school. Our efforts must include outreach to our public elementary and secondary schools. Faculty and students from across our campuses can participate in programs in local schools. These activities can include intensive summer programs, pre-college programs, and volunteer efforts. The Science House at NC State, for example, works in partnership with K–12 teachers to emphasize the use of hands-on learning activities in mathematics and science. Through school demonstration programs, student science camps, teacher workshops and innovative laboratory training, and support projects,

the Science House annually reaches more than 5,000 teachers and 25,000 students. Activities like these ignite students' imaginations and capture their interest.

Higher education must also focus on training more qualified teachers, particularly in the areas of science, technology, engineering, and math, as well as supporting those teachers who are already in the classroom. NC State is pursuing an elementary education program concentrated, in large part, on the science and math disciplines. Investing in educating the teachers of tomorrow means that we are helping to shape the long-term success of our students and our citizens. Our university recently dedicated the William and Ida Friday Institute for Educational Innovation, which is conducting pioneering research in learning and education, especially in the use of technology in education. The Friday Institute, as well as other programs across campus, will provide continuing education and assistance for existing teachers. These efforts will help keep more qualified teachers in our classrooms and improve students' preparation for college, with the ultimate outcome being greater success by students.

Ensuring students' success hinges on continually rethinking our students' needs and how we teach, utilizing the latest technology in our classrooms, providing support when and where it is needed, and emphasizing potential careers and lifelong skills. It means increasing outreach to traditionally underrepresented groups. It means using technology to reach beyond our campuses—through distance education and continuing education. The children, young people, and graduates our institutions touch each and every day represent the future. Their success is our legacy and our responsibility.

#### Notes

1. William R. Brody, "U.S. Competitiveness: The Innovation Challenge," testimony to the House Committee on Science, July 21, 2005, <<http://web.jhu.edu/president/speeches/2005/compete.html>>.
2. National Science Board, "Science and Engineering Labor Force," chapter 3 in *Science and Engineering Indicators 2006*, <<http://www.nsf.gov/statistics/seind06/c3/c3h.htm>>.



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