

More Focus on Math, Science Education Vital to Economic Progress

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A great deal of attention recently has been focused on an issue of real importance to the future of our nation -- the need to train more undergraduates, especially blacks, Hispanics and women, in science, technology, engineering and mathematics (STEM) fields. We cannot envision a sustained U.S. economic recovery in our increasingly competitive world without a steady supply of highly trained professionals in the STEM disciplines, nor can we imagine full economic equality and opportunity unless the diversity of STEM professionals mirrors that of our nation as a whole. We congratulate both the Obama administration and the Association of American Universities (AAU) for highlighting this issue. Given the differential achievement gaps and escalating poverty rates among racial and ethnic minorities: How will the nation respond?

The administration has put STEM education on the front burner through a series of reports, and has emphasized the importance of higher education in eliminating disparities among those in the STEM fields. A Commerce Department report released last month found underrepresentation of blacks and Hispanics in STEM fields. "Educational attainment may affect equality of opportunity in these critical, high-quality jobs of the future," the report said. "... by increasing the numbers of STEM workers among currently underrepresented groups through education we can help ensure America's future as a global leader in technology and innovation." This puts significant responsibility for solving this problem on the shoulders of higher education, and it is a challenge we are eager to meet.

For example, there is the AAU's announcement, a few months ago, of a five-year initiative to improve STEM education at the undergraduate level. In announcing the initiative, the AAU noted the disturbing fact that more than 40 percent of entering college freshmen who planned to major in STEM-related fields changed to non-STEM majors by graduation. If we are to make progress in producing more professionals in science and technology, it is imperative that we reduce this attrition and support students who want a career in the STEM disciplines so they graduate with a STEM degree. We also need highly trained and inspirational K-12 science and math teachers, which is why initiatives such as the Association of Public and Land-grant Universities (APLU)'s ongoing efforts to prepare a new generation of top science and math teachers are so important.

Much of the responsibility for making progress rests with individual colleges and universities, as our mission includes recruiting, educating and graduating the STEM professionals of the future. At the University of Illinois at Chicago we have long recognized these issues and have many initiatives in place with proven results. We want to share some highlights in hopes that they will stimulate a deep interest in the topic and a sharing of ideas and solutions.

We were greatly honored earlier this year when UIC's Women in Science and Engineering program was one of only four organizations and 11 individuals across the U.S. to receive the 2011 Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring. The awards, administered by the National Science Foundation (NSF), recognize the role mentoring plays in the academic and personal development of students studying science or engineering -- particularly students in groups underrepresented in those fields. The WISE program founded in 2002, works to increase participation of women and girls in science, technology,

engineering and mathematics.

UIC's WISE program has built a strong network with community organizations and local businesses to attract grade school girls to math and science. A peer mentoring program supports undergraduate women majoring in math and the sciences. We've reached out to literally thousands of girls and young women -- from grade school through college -- to spark their interest in the STEM fields.

And we're seeing results. For example, at UIC our most recent six-year graduation rates for female STEM majors rose in two years to 50 percent from 43 percent among African Americans, to 48 percent from 46 percent among Latinas, and to 66 percent from 53 percent among whites. More than 1,300 students in grades 6-12 received online mentoring from 225 science, technology, engineering and math professionals.

Other programs extend to faculty. Women in Science and Engineering System Transformation (WISEST), was established to increase the number and leadership status of women and underrepresented minority faculty members in science and engineering at UIC. Since 2006, the number of female tenure-system faculty members in the 11 STEM disciplines has increased to 51 from 33. The number of underrepresented minority women has risen to eight from four. WISEST has supported start-up costs for 14 new faculty members and a 15th starts in January. In an effort to ensure that the transition from graduate student to faculty is robust, UIC WISEST completed a highly successful postdoctoral program for underrepresented STEM women, for one cohort. Resources to make such programs widely available should be an important priority.

While progress is being made at UIC and at many other universities, we have much work ahead of us. A 2010 study by the American Association of University Women, citing NSF statistics, said that in 2007, colleges and universities awarded 138,874 STEM bachelor's degrees to men and just 88,371 to women, even though women made up the majority of U.S. undergraduates.

Elementary, middle and high schools are critically important because that is where students' career paths are often identified, their ambitions are nurtured, and they obtain fundamental knowledge necessary for success at the university level. At UIC and many other universities, colleagues are working to improve the quality of instruction and create opportunities in the STEM fields for young students.

Vicki Chou, dean of the UIC College of Education, is principal investigator for a four-university, \$16 million Teacher Quality Partnership grant from the U.S. Department of Education. The five-year project, now in its third year, will reform teacher training to ensure deep, relevant knowledge in math, science and reading. Maria Varelas, professor of curriculum and instruction, has co-lead National Science Foundation grants totaling more than \$6 million with colleagues from biology, chemistry, earth science, environmental science and physics for teacher preparation. Donald Wink, professor of chemistry, is a leader of the NSF-funded Chicago Transformation Teacher Institutes. In partnership with four other Chicago-area universities and in conjunction with Chicago Public Schools, Dr. Wink and UIC colleagues are developing programs to improve high school math and science education. Programs such as the Science Olympiad, based in suburban Chicago, have had a profound influence on thousands of young people in all 50 states.

To help increase representation of blacks and Hispanics in STEM fields, student groups in UIC's College of Engineering, such as the National Society of Black Engineers (NSBE) and the Society of Hispanic Professional Engineers (SHPE), are active in trying to attract and retain students in engineering programs. NSBE is working with the city of Chicago's community college system to encourage transfer students to consider engineering programs. This past April, UIC-SHPE co-hosted the society's regional conference, attracting almost 400 Hispanic undergraduate and graduate students and more than 75 Hispanic high school students from the Chicago Public Schools.