

REVIEW OF FORMALLY ORGANIZED UNITS

Units seeking to improve student representation in mathematics, science, and engineering disciplines.

Before reviewing the units at UIC that focus on improving the representation of underrepresented students in mathematics, science, and engineering, some background information may prove helpful. In rankings of the number of baccalaureate degrees granted to minority students in Engineering, *Black Issues in Higher Education* ranks UIC 20th overall with 148 degrees granted to minority students. This represents 51% of bachelors degrees conferred in Engineering at UIC in 1999-2000. Looking at the individual groups, UIC was ranked 32nd in number of engineering baccalaureate degrees granted to African Americans (21), 17th in the number conferred on Asian Americans (89), and 22nd in number of engineering degrees awarded to Latinos (38).

Minority Engineering Recruitment and Retention Program (MERRP)

One unit which has an impressive record of recruiting and retaining underrepresented minority students in engineering is the Minority Engineering Recruitment and Retention Program (MERRP). This unit was reviewed in detail in the *UIC Report on the Participation and Success of Underrepresented Students and Staff*, September 2000. A detailed description of the success and effectiveness of this program appears on pages 17 and 18 of that document. What follows is a brief description.

MERRP's goals are to recruit and retain engineering students from underrepresented groups in the engineering profession. Retention and graduation data clearly indicate the

The number of underrepresented students receiving baccalaureate degrees in engineering has almost doubled in the past five years.

effectiveness of this program. For the past two years, the retention of Latino engineering students from freshman to sophomore year has been greater than that of White students. Although the total number of underrepresented minority students enrolled in Engineering has decreased slightly over the past five years from 410 in 1996 to 376 in 2000, the number of underrepresented students that have graduated has increased by 68%. In 1996, 37 underrepresented students received baccalaureates in Engineering. In 2000, the number was 62.

Over the past 4 to 5 years there has been a marked increase in the overall performance of underrepresented freshmen, especially in their math courses. Much of this success is due to the mandatory supplemental instruction provided these students.

Supplemental Instruction (SI) is not a traditional tutoring program; rather, it employs alumni, graduate teaching assistants and advanced undergraduate students who work as instructors under supervision. Through this mechanism students are provided with both tutoring and mentors/role models. Since these sessions became mandatory in 1996, the students who participated have shown a marked improvement in math performance – one grade higher – than students who did not participate.

A couple of practices which deserve special attention are the use of peer and alumni in the supplemental instruction program and the critical role played by internships and exposure to engineering professionals. MERRP has enhanced the

feeling of community among the underrepresented undergraduate students by hiring advanced students to participate in the delivery of supplemental Instruction. At the same time, this practice provided financial support for advanced students and provided near peer role models and mentors for first and second year students. The use of alumni as instructors in the SI program has also proved invaluable.

The sense of community fostered by employing advanced students and alumni in the supplemental instruction program is critical to success.

For the advanced students, contact with working professionals through internships and the encouragement of participation in the National Society of Black Engineers, the Society of Hispanic Professional Engineers, and the Society of Women Engineers is deemed invaluable to academic success.

Contact with professionals in the field is an important factor in degree completion.

One other aspect of MERRP that appears critical to success is the ability to provide financial support. The College of Engineering and MERRP have been successful in obtaining support for underrepresented students. This has allowed students to concentrate on their professional development rather than having to split their time between work unrelated to engineering and their engineering education.

Urban Health Program (Early Outreach Program)

An extensive review of the complete Urban Health Program (UHP) appears in the 1998 *UIC Report on the Participation and Success of Underrepresented Students and Staff* with a focus on its role in the recruitment and retention of graduate and professional students from underrepresented groups. One constituent program, the Early Outreach Program, appears germane to the current report and will be the focus of this review. The College of Education houses and oversees the UHP Early Outreach Program.

UHP Early Outreach Program seeks to identify promising minority and disadvantaged students in elementary and high schools who exhibit potential for completing a health education curriculum. By reaching these students at an early stage in their education, UHP can help develop the basic academic knowledge and skills critical to preparing for a career in basic science teaching and research as well as the health professions.

Of the many initiatives sponsored by the UHP Early Outreach Program, six potentially affect math and science performance in college and the choice of math or science as a career. The programs and 2000-2001 enrollments are:

- Saturday College Program (196)
- High School Senior/College Transition Program (35)
- Hispanic Math/Science Education Initiative (172)
- ABLA (a public housing project adjacent to UIC) Community Scholar Program (306)
- UIC/CPS (Chicago Public Schools) Prep Program (319)
- Educational Enrichment Program (101)

All of these Early Outreach initiatives share a set of common goals. One of these goals is to increase students' proficiencies in science and mathematics by creating a rigorous educational environment in which students' academic abilities are nurtured and their success is celebrated. Three other goals are particularly relevant to the present review. These are: to increase students' abilities to think critically and analytically and to problem solve; to provide parents with workshops which will enhance their ability to support their children throughout their academic careers; and to introduce students to a college environment.

To achieve these goals the various programs employ many strategies. Some of the activities relevant to preparation in math and science mounted by the various programs include:

- Instruction in science, mathematics, language arts, computers, test preparation, public speaking, and Spanish
- Science-focused field trips
- Science fairs
- 4-H activities
- Study skills workshops
- Stress management Workshops, etc.
- Financial planning workshops for students and parents
- Financial aid workshops for students and parents
- Exposure to a college campus
- Workshops that enable parents to participate in academic decisions
- Workshops for parents that help them support their children academically
- Graduate-level courses and in-service training for teachers
- Teachers' symposium.

These programs vary in the age range of targeted students. They range from elementary school student through seniors in high school. One, Saturday College, targets the range from 4th to 11th grade students. One important feature of the majority of these initiatives is that parents are included in the programs. The ABLA Community Scholar Program targets an entire elementary school. It has programs for students, parents and teachers. Success can be assured only if students receive the support they need in their everyday environment.

UHP-Early Outreach finds parental participation critical to improving academic performance.

All of these programs have had a substantial impact on the participants. Each of these programs has a comprehensive assessment component. The following summaries of these assessments focus on the math and science outcomes.

Saturday College Program Seventy-eight percent of the students demonstrated improvement in their overall academic performance; 77% improved in mathematics, 71% improved in science. Further, 78% reported a more positive attitude toward mathematics, and 78% toward science. Data indicate major improvements in standardized test scores as well.

High School Senior/College Transition Program All participants graduated from high school and all were admitted to college for Fall 2001. Participants' mean score on the ACT (22.3) was higher than the national average of 21.5.

Hispanic Math/Science Education Initiative The mean score of participants on the ACT was 21 which is significantly higher than the average ACT scores (15 and 16) at the two high schools program participants attend. Ninety-three percent improved in math and 99% improved in science.

ABLA Scholars Program This year's program focused on parents. Fifty percent of the participating parents demonstrated improved leadership skills and in their ability to assist in school decision making.

UIC/CPS Prep Program An external evaluation of participants in the six-week summer program found that participating students showed increases in their standardized test scores from 1.01 and 1.02 years in reading and .98 and 1.16 years in mathematics. Looking at overall academic performance, 56% improved. Sixty-eight percent improved in math, and 67% improved in science. Assessment of participants in the school-year portion of the program showed the following: 84% demonstrated overall academic improvement; 81% improved in science; and 90% improved in mathematics.

Educational Enrichment Program Ninety percent of participants received grades of "A" or "B" in the cores subject areas of mathematics, language arts, science, and social studies. Overall academic performance improved for a reported 83% of the participants. In math and science, 100% of the students were reported to have improved.

All student participants in the Educational Enrichment Program demonstrated improvement in math and science.
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Regional Math/Science Center (RMSC)

The Regional Math/Science Center (RMSC) is one of the units within the TRIO Programs at UIC. The goal of the Center is to increase the number of underrepresented students who enter and successfully complete undergraduate degrees in mathematics, science and engineering.

RMSC receives federal support and draws from a four-state region. Recruitment of students to the program is accomplished through TRIO programs and high schools in the target areas followed by RMSC staff visits. Participating students must complete an application (including recommendations) and take an entrance exam which assesses skills levels prior to selection. An Individual Educational Plan is developed for each student to ensure that each participant receives the maximum benefit from the program.

The program is designed to provide students with new and exciting approaches to intellectual and personal development through exposure to an intensified mathematics and science curriculum. The focus of the Center includes basic scientific (i.e., physical and health) principles and the foundations of algebra.

Living on campus plays an important role in the development of math/science interests of participants in the Regional Math/Science Center.

Students live on campus for six weeks of the summer. During that time, they are offered classes in mathematics, science, computer science, English, and a foreign language. Students also participate in Career Exploration Modules, a mentor and career shadowing program, and special research projects. Participants also take part in field trips to many science and technology institutes in the Chicago area.

Outcomes are assessed through pre- and post-testing of participants, as well as through collection of follow up information from the participants and where possible from their home schools and TRIO programs. The data on grades before and after attending the program shows that 90% of past participants have shown improvement in their overall grade point averages.