

Mathematics, Science, and Engineering Academy for Middle School & High School Students

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Abstract

Since 1993, the Cooperative Developmental Energy Program (CDEP) of Fort Valley State University (FVSU) has implemented the Mathematics, Science, and Engineering Academy (MSEA). The goal of the CDEP's MSEA program is to create a continuous pipeline of minority and female students, from eighth grade through Ph.D., majoring in mathematics, science, or engineering.

MSEA targets minority and female students during their eighth grade year – one of the most critical periods of their educational development and growth. The students selected to participate in MSEA are academically conscientious and considered the cream-of-the-crop in their respective schools. These students are recruited from across the country. During each summer (from 8th grade to 12th grade), the students are exposed to advanced mathematical concepts, and hands-on-laboratory experiments beyond what they are taught at their middle schools and high schools. Under the supervision of engineers, students completed various engineering projects. The students also visit other universities, national laboratories and private industries. All these experiences are valuable in helping the students to excel in their educational pursuits.

All the MSEA participants must maintain excellent grades to remain in the program. Each year the students are evaluated to determine eligibility for the academy. If a student fails to meet the required criteria (at any grade level) while in the program, then he or she will not be allowed to participate in the next level of the MSEA academy the following year. This motivates all the MSEA participants to do well during the rest of the academic year.

Introduction

In 1983, with the start-up funds for the U.S. Department of Energy's (DOE) Office of Minority Economic Impact, the Cooperative Developmental Energy Program (CDEP) at Fort Valley State University (FVSU) was founded. CDEP is an innovative cooperative program between FVSU and private and governmental sectors of the nation's energy industry that focuses on the recruitment and placement of academically talented minorities and females into professional level careers in the energy industry. The CDEP program established 3+2 dual-degrees in mathematics/engineering and mathematics/health physics with the University of Nevada, Las Vegas (1992) and mathematics/engineering with Georgia Institute of Technology (2000). CDEP

also offers dual-degrees in mathematics/geology or geophysics in collaboration with the University of Oklahoma (1992). In 1993, CDEP implemented a pre-college pipeline program, Mathematics, Science, and Engineering Academy (MSEA).

There are many pre-college summer programs throughout the country,^{1,2,3,4,5,6} but our program is the only one that targets minority and female students, and begins in the 8th grade and continues to the Ph.D.

The Academy

The pre-college Mathematics, Science, and Engineering Academy (MSEA) Program operates in the following manner:

As rising 9th graders, students spend 3 weeks on the FVSU campus where they are introduced to the objectives of MSEA and CDEP. They are given enrichment assignments in science and mathematics, along with engineering projects. Visits to museums and field trips are used to supplement classroom enrichment. The students also visit Georgia Institute of Technology's College of Engineering and are informed about various research projects.

The following summer as rising 10th graders, students visit the University of Nevada, Las Vegas for one week. They are introduced to various engineering disciplines and spend time in the various engineering laboratories. Students complete engineering projects; field trips to Hoover Dam, Yucca Mountain nuclear repository site, and the Grand Canyon are included for academic enhancement.

As rising 11th graders, students spend one week at the University of Oklahoma (OU). Students are introduced to the geosciences and are taken on two outstanding geological field trips; one to the Wichita Mountains and the second one to the Arbuckle Mountains. Additionally, they visit active oil fields and an oil refinery.

After having completed campus visits to the four institutions that are involved in the dual-degree programs, MSEA students return to FVSU as high school seniors to participate in a combined academy for two weeks. This two-week academy consists of two parts. Part one is marked by an intense one-week workshop on preparing the MSEA students to take the SAT standardized test, which is used for college admission in the state of Georgia. Part two of this academy consists of introducing the MSEA students to the oil and gas industry. This introduction takes place in the form of field trips to visit the oil and gas industry in New Orleans, LA and Houston, TX alternating between the two cities on an annual basis. The purpose of the field trip is to acquaint MSEA students with the oil and gas industry and some of the professional engineers and geoscientists who work in the industry.

Upon the completion of the program as high school seniors and providing that they have scored a minimum of 1100 on the SAT, these MSEA graduates are offered scholarships in FVSU/OU, FVSU/UNLV, or FVSU/GA TECH dual-degree programs in geosciences, engineering, or health physics.

The Successes of MSEA

Since 1993, 359 students have participated in MSEA. The average entering class size over the entire nine year period is 39.89 students per year (Table 1). The retention rate of each class is measured by the number of students that enter the program as rising 8th graders and continue through the 12th grade academy. Since MSEA is a five year pre-college program, 1998 represented the first MSEA graduating class. Thus, the retention rate is based on the number of students that graduated from 1998 through 2001. The average graduating class size for this period is 20.25 students or 51 percent (Table 2). MSEA students are required to maintain a minimum overall 3.00 grade point average and must maintain a grade of “B” or above in mathematics and science courses over a five year period. Out of the 81 students who have graduated from the program, 40 students (approximately 50%) have entered into one of CDEP’s dual degree programs in mathematics/engineering, mathematics/health physics, or mathematics/geosciences. Therefore, the program has proven to be an effective method of recruiting minority and female students to pursue majors in science, mathematics or engineering.

Table 1, Number of Students Entering the Program Each Year

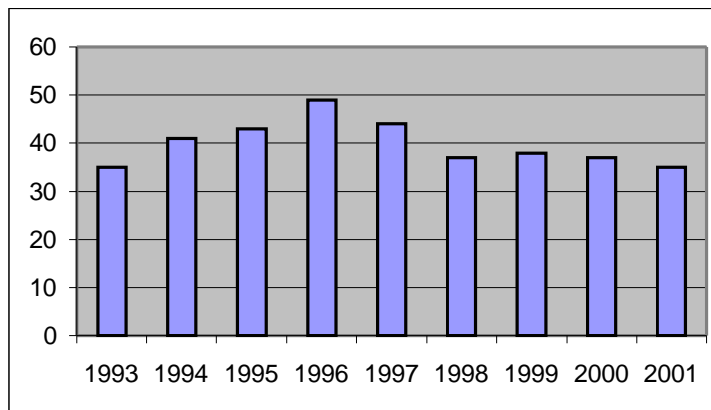


Table 2 Number of Students Graduating from the Program

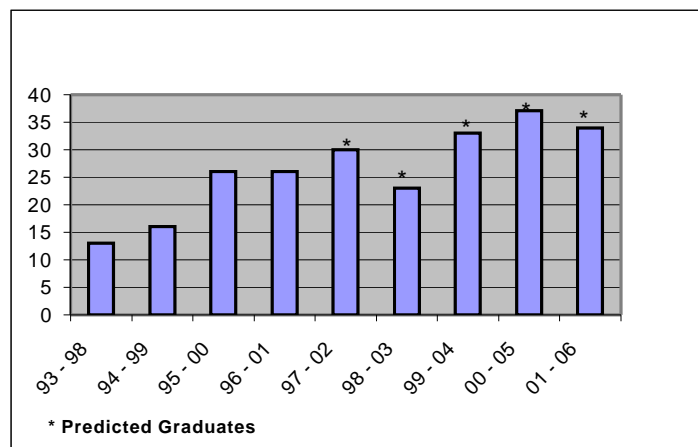


Table 3 illustrates the ethnic diversity of the program. African American students make up 84 percent of the students that participated in MSEA. Caucasian in Table 3 represents female students who as a group are also under represented in mathematics, science and engineering. Also shown in Table 3 is the gender of participants in the program; the female to male ratio is about 1.7 to 1.

Table 3 Ethnic Diversity and Gender of the Program

Ethnic Background							Gender	
Afr.- American	Hispan ic	Native American	Native Alaskan	Asia n	Caucasia n	Bi- Racial	Male	Femal e
84	02	01	01	03	05	4	37	63

The Future

Through the efforts of many people over the past nine years, the Mathematics, Sciences and Engineering Academy has made a great impact on the lives of many young minority and female students. Via MSEA, we hope to continue to produce more minority and female engineers and scientists. Though it is appropriate to momentarily reflect with pride on the past, we must continue to work hard for the future.

Acknowledgment

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Biographical Information

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