A Novel Summer Camp for the Underrepresented Minority High School Students

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ABSTRACT

This paper discusses the experience gained from an innovative summer camp called *Fluor Daniel Summer Camp (FDSC)* designed for underrepresented minority students with a special grant from the Fluor Daniel Foundation. The FDSC project specifically supported the academic enrichment of 20 high caliber students from the Compton, Long Beach, and Lynwood School Districts in the Southern Region of Los Angeles County. The primary objective of the program was to strengthen the students' commitment and confidence in pursuing higher levels of mathematics and science and to enter a career in engineering. The newly developed curriculum focused on the use of mathematics and sciences in higher education, and demonstrated how sciences and mathematics are used to solve real-life engineering problems. It also had an critical component relating to the computer and its uses in engineering and communications, including some skills training in wordprocessing, spreadsheets, computer graphics, and networking using Internet. Further, there was an important parent component empowering the parents to become actively involved in the education of their children.

INTRODUCTION

The College of Engineering at California State University, Long Beach (CSULB) has been actively involved in the pre-college education effort for many years with the implementation of the MESA (Math, Engineering, Science Achievement) Secondary (Pre-College) Program. The MESA mission is to motivate and prepare high school and junior high students to pursue math-based college education and careers. This mission is accomplished through *developing academic and leadership skills, raising educational expectations, and instilling self-confidence* in historically underrepresented students, namely African Americans, American Indians, Mexican Americans and Latin Americans, in engineering, physical science, and other math-based fields, in order to increase the numbers who graduate from a four-year university. The MESA Secondary Program services about 16 high and middle schools, in heavily minority districts, throughout the academic year and helps students from grades 6 through 12. Almost all MESA students go on to college, with a fraction attending CSULB. The College supports this program with year-round programs, operating expenditures, work-study students, participation by the Associate Dean for Instruction to oversee the program, and a Corporate Advisory and Development Council. For the MESA Summer Enrichment Program, the campus provides classrooms, computer laboratories, and supplies. The Fluor Daniel Summer Camp (FDSC) was a special program within the framework of MESA Summer Camp for underrepresented minority students planned for the Summer 1994.

PROJECT DESCRIPTION

Project Goals and Objectives:

Twenty senior high school students with very high academic potential were targeted for the FDSC to impress upon them the importance of applied sciences, mathematics and engineering.

The overall goals and objectives of the FDSC were as follows:

1) Increase students' understanding of mathematics and science concepts, and how they are used in real-life engineering.

2) Emphasizing to students aware that communication skills lead to success in life and introducing them to technical communication tools used by engineers.

3) Expose students to the career choices in the engineering and construction industry sector through industry visits and dialog with company representatives.

4) Allow students to discover how science, engineering and mathematics are used to solve everyday engineering problems.

5) Expose students to the computer and its uses for engineering and communication.

6) Improve student leadership skills and team-work spirit for better performance.

7) Establish a parent component that empowered parents to become actively involved in the education of their children.

Recruitment Plan:

African American, Latino and American Indian students were recruited from local high schools. These are schools in the area surrounding CSULB with an exceptionally high number of students in the target population (70%+). They include Compton, Long Beach, and Lynwood Unified School Districts. Announcements and applications were delivered to math and science teachers in the associated schools. The FDSC participants were selected based on the following factors:

1) Favorable recommendation from math or science teachers.
2) Students personal statement explaining his/her desire to participate.
3) Parental commitment indicating their support for their child's participation..
4) Personal interviews.

Project Design and Schedule:

The FDSC was held on the CSULB campus in order to inculcate the students in the university atmosphere and to make available state-of-the-art labs, and equipment not usually available at

inner-city schools. For many students, this was their first chance to use university facilities. The FDSC was a six-week program; four days a week (Monday -Thursday) spent at the campus while the fifth day (Friday) was used for visiting industrial sites or doing special projects. The students spent six hours a day, from 9:00 a.m. to 3:00 p.m., Monday through Thursday in a structured schedule. The following is a schedule of daily Summer activities:

09:00 -- 10:00 a.m.	Technical Communication Tools
10:00 -- 11:00 a.m.	Mathematics in Real-Life Engineering
11:15 -- 12:15 p.m.	Applied Science in Industry
12:30 -- 01:15 p.m.	Lunch - Enrichment Seminars (*Guest speakers*)
01:15 -- 03:00 p.m.	Computer and Communication Labs

Technical Communication Tools:

The overall goal of this program component was to demonstrate the value of reading and writing skills in all subject areas, especially math and science. Students were encouraged to read and analyze material from a variety of sources including engineering and technical articles. The fundamental value of writing to clearly communicate ideas were emphasized. Written assignments included daily journal writing, summaries of speaker presentations, descriptions of field trips and other information presented in the classroom or lab. Critical thinking and evaluation of information were strongly encouraged to allow students to express their own ideas about the material they were learning. In addition, the students were introduced to other technical communication tools such as computer graphics, wordprocessing and spreadsheets for data presentation.

Mathematics in Real-Life Engineering:

This part of the course was designed to introduce students to the mathematics concepts and techniques as used to solve real-life engineering problems. Students saw the power of simple mathematics such as arithmetic, simple algebra and geometry or trigonometry in solving for volume, weight and cost of construction projects, etc. This early exposure of the usefulness of mathematics helps to cut down the fears and other negative attitudes students have which create self-fulfilling prophecies that retard a student's potential for math advancement. This course serves to place math into the students "comfort zone" thereby increasing interest to enter an engineering career.

Applied Sciences and Industry:

Students were exposed to applied sciences as used by industry to create useful products for the modern society. For example, applied chemistry is used in several industries to produce items such as petro-chemical, detergent, medicine, fertilizer, purer drinking water and air cleaner and so on. The importance of applied physics were emphasized through examples of aircraft and other transport vehicles, etc. The students worked in teams to learn collaborative approaches.

Enrichment Seminars:

This component used professional engineers as speakers to expose students to the real world of engineering and demonstrate how creative engineers are when solving practical problems and designing new products and processes. Each week a different field of study was covered by a person currently working in that field. Students were encouraged to develop a reference notebook that contained the materials from all of the enrichment seminars.

Parent Involvement:

Parents were given detailed information on the goals, the overall structure of the program and their role in the project. The overall goal of the parent participation was to promote an understanding of the education system and give parents the confidence to become active participants in their child's education. The parents of the participating students were invited to the Award Ceremony where a certificate of completion was awarded to each successful participant.

Monitoring Student Progress:

During the six week summer program, weekly staff meetings were held to discuss any difficulties students are having in the classroom. Every effort were made to assist and encourage students who had difficulty with material presented. We also took special note of students who showed exceptional ability in order to maximize their opportunity for advancement. In order to determine whether the participant's attitude has changed toward engineering in general and as possible career choices, pre- and post-questionnaires were used that involved both the students and their parents.

CONCLUSIONS

The results of the surveys indicated that the primary objective of the program — to strengthen the students commitment and confidence to pursue higher levels of mathematics and science and to enter a career in engineering was highly successful. The newly developed curriculum focused on the use of mathematics and sciences in higher education, and to demonstrated (or had students demonstrate it to themselves) how sciences and mathematics are used to solve real-life engineering problems. It also had an important component relating to high-tech communication using Internet and newsgroups. Further, the parental component provided a tool for empowering the parents to become active partners in the education of their children. The financial support received from Fluor-Daniel Corporation is gratefully acknowledged.

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