

**VANDERBILT UNIVERSITY**

**1997 MINORITY ENGINEERING SUMMER RESEARCH PROGRAM**

**GRANT # N00014971G008**

**19990202 029**

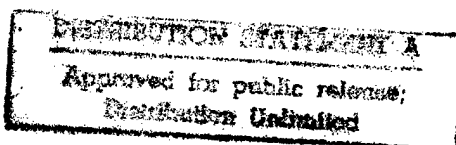
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**FINAL REPORT TO US NAVY**

**JANUARY 8, 1999**

**DTIC QUALITY INSPECTED 2**



<b>REPORT DOCUMENTATION PAGE</b>			<i>Form Approved</i> <b>OMB No. 074-0188</b>	
<small>Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503</small>				
1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE 8 Jan 1999	3. REPORT TYPE AND DATES COVERED Final		
4. TITLE AND SUBTITLE 1997 Minority Engineering Summer Research Program			5. FUNDING NUMBERS Grant N00013971G008	
6. AUTHOR(S) Edward J. White, P.E. Alan R. Bowers, P.E.				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Vanderbilt University School of Engineering Box 1826, Station B Nashville, TN 37232			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Office of Naval Research, Atlanta Region 100 Alabama Street, SW Suite 4R15 Atlanta, GA 30303-3104			10. SPONSORING / MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION / AVAILABILITY STATEMENT Public Availability			12b. DISTRIBUTION CODE	
13. ABSTRACT ( <i>Maximum 200 Words</i> ) Selected incoming freshmen "at risk" students were admitted to the Engineering and Classroom Summer Research Program with the intent of introducing these students to the classroom and research environment at Vanderbilt University, in addition to presenting to them the wide range of professional opportunities available. Participants also included high school teachers and counselors (previous program participants). The program included workshops, courses, computer skills, field trips, and research projects designed to enhance the probability of academic success. The program appears to have been successful in increasing the academic performance of this group of "at risk" students.				
14. SUBJECT TERMS "at risk students", Minority Summer Research Program			15. NUMBER OF PAGES 6	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT unclassified	20. LIMITATION OF ABSTRACT	

## Vanderbilt University: Dean Edward J. White

The Vanderbilt Engineering and Science Summer Research Program (ESSRP) was supported by these funds from the U.S. Navy (summer 1997 and summer 1998). Specifically, these funds were used to cover the costs of room and board and fieldtrips.

Incoming Freshmen were eligible for the program based on the following criteria (for 1997 minority status was used for eligibility):

1. High school ranking  $< 3.0$  (Vanderbilt ranks high school quality on a scale of 0 to 5.0 based on the number of advanced courses available, student dropout rates, and percentage who attend college.)
2. Financial Need  $> \$25,000$  per year

These were used as indicators of educational and economic disadvantages. All students in this group were sent letters of invitation and application forms for the program. Seventy-six invitations were sent in 1998 and 30 students applied for the program. The University projects a Vanderbilt GPA for each student based on SAT scores, high school GPA, and high school ranking (0 to 5.0). The group considered to be most "at risk" are those with the lowest projected GPA, although no student is admitted with a projected GPA  $< 2.0$ . Therefore, this "at risk" group was targeted for the program. Those with the **lowest projected GPA** from the 30 applicants were selected in 1998.

The 1997 and 1998 Engineering and Science Summer Research Program (ESSRP) at Vanderbilt University consisted of 39 incoming freshmen (20 male and 21 female), six high school science teachers, and seven counselors (previous summer participants). The advisor was Alan R. Bowers, Associate Professor of Civil and Environmental Engineering. The students represented a variety of ethnic minorities, and included those of African American (20), Hispanic (8), Asian (5), American Indian (1), and Pacific Islander (1) descents. In addition, the student group was nationally distributed, originating from 17 states (Arizona, Alabama, California, Florida, Georgia, Hawaii, Illinois, Indiana, Maryland, Michigan, Mississippi, New York, North Carolina, Tennessee, Texas, and Washington). The teachers were from the Metro-Nashville School system.

The administrative mechanism for the program had previously been in place and has proven successful in introducing students to the classroom and research environment, as well as introducing them to the type of professional opportunities that are available in government and industry. The teachers were included in many of the activities, including the research program, and were also included in the same introductory computer course as the students. The program can be broken down into the following components to achieve the objectives:

1. **Workshops:** Short workshops were developed to facilitate a smooth transition between high school and the less structured and less supervised, college environment. These also served to introduce some of the services that are

available to the students on campus. The teachers were included in these workshops to acquire a better understanding of the expectations at a national research university in general, and more specifically, engineering. The topics of these workshops included Multiculturalism, Reading/Study Skills, Introduction to the Electronic Library, Academic Advising, and Technical Writing. In addition, several corporations presented information on employment and internships that were available for minorities (1997 only). These included Armstrong Industries, Ashland Oil, Carrier Corporation, and Dupont Corporation

2. **Short Courses:** Short courses were developed as an introduction to college courses that the students would take in the freshman year (ones that are traditionally difficult for engineering freshmen). This served to evaluate the student's background in these areas, make them more comfortable and increase their preparedness for college level courses. The courses included Chemistry and Calculus. The teacher was not included in these courses.
3. **Computer Orientation:** The students were enrolled in the same freshman course that all engineering students take at Vanderbilt (ES 130 – Introduction to Computing in Engineering). This was an intensive six-week version of the course taught in the academic year. Students had regular assignments and had to pass a comprehensive final after they arrived on campus in the fall. In 1997, all 21 students passed the course, and in 1998, 16 of 17 students passed the course, for which they received three credit hours, and proceeded on to the next course in their curricula. One student did not complete the course for medical reasons and re-enrolled in Fall 98. Teachers that participated in the summer program were expected to show improved skills and were enrolled in the more advanced course with the students for the summer 1998 (ES 130).
4. **Fieldtrips:** Several fieldtrips were implemented to introduce the students and teachers to research and developments in science and engineering as well as job opportunities for engineers and scientists. These fieldtrips included Stennis Marine and Engineering Research Center (Naval Oceanographic Office) (Bay Saint Louis, MS), Smith and Nephew (Memphis, TN), Proctor and Gamble (Jackson, TN), and NASA (Huntsville, AL). The trip to the Stennis Center was two days allowing for some group activities in Gulfport, MS and New Orleans, LA (this trip was specifically funded by the US Navy). Each trip was attended by the students, teachers, counselors, and the program coordinator.
5. **Research Projects:** Each student and teacher was assigned a faculty research advisor(s) and given an introduction to the on-going research in the faculty member's group. The students were given individual projects that were relevant to the research within the group. These projects included studying the literature, analyzing data, performing research in the laboratory, and/or completing a computer program. Each participant had to write a summary abstract of their research (attached as Appendix A) and present the results of their research at the end of the program (15-minute presentations to the entire group). Participants

were required to develop a multimedia presentation (PowerPoint®) based on the material learned in the Computer Course, including graphics and color photographs.

The success of the program can be measured by the accomplishments of the students. Over the past few years, several have given presentations at professional meetings, published the results of their work in journals, and won national awards at student meetings. In addition, the graduation rate of the summer participants is excellent, and exceeds 80%. Many of the summer participants have gone on to graduate and professional studies.

Evaluations of the program indicate a high level of satisfaction among the students and teachers. Questionnaires were given to all of the participants at the end of the program and they were permitted room for individual comments. In particular, all thought the field trips were valuable and that the computer courses were useful and interesting. The participants found the research experience to provide insight into the research process and to give them a head start in the research game. The teachers believe that the computer skills learned can make them more effective in presenting materials to high school students as well as permit them more access to classroom materials, such as the Virtual School at Vanderbilt.

Sixteen of the 1998 ESSRP students actually attended Vanderbilt in Fall 98. One did not attend and decided to stay in Hawaii. A comparison of the mid-term performance of the ESSRP freshmen with the rest of the freshman student body (including second-year students with freshman status) and the entire group of students that were invited to participate in the 1996 ESSRP is presented in Table 1. While 68.8% of the ESSRP freshmen received deficiency notices compared to 37.9% of the total number of students with freshman status, the nature of deficiencies were generally less severe. For example, only 16% of ESSRP participants received Fs compared to 32% Fs for all those with freshman status and 24% Fs for those among those freshmen that were eligible for ESSRP but did not participate in the program.. Considering that this group was the most "at risk" group in the pool, the program appears to have a positive impact on their performance.

For the 1997 participants, 21 of 21 students attended Vanderbilt in the Fall of 1997 and all of these returned for the 1998 academic year. A summary of performance indicators for this group is presented in Table 2. As of mid-term 1998, one student had officially withdrawn and returned home for family reasons, and two students were on academic probation and don't appear likely to return for the Spring 99 semester. The rest, 18 out of 21, appear to be reasonably assured of graduating within five years, for an expected graduate rate of 85.7%.

Table 1: Mid-term Performance of Vanderbilt 1998 ESSRP Freshmen Compared to All Engineering Freshmen and Those Eligible for ESSRP

	Number of Students	Total Number of Deficiencies <sup>a</sup>	Students Receiving Notices	Number of Deficiencies		
				C-	D	F
Freshmen Class	359 <sup>b</sup>	252	136 (37.9%)	57 (23%)	114 (45%)	80 (32%)
ESSRP Candidates <sup>c</sup>	61	51	29 (47.5%)	12 (24%)	25 (49%)	12 (24%)
ESSRP Participants	16	19	11 (68.8%)	8 (42%)	8 (42%)	3 (16%)

- a. A grade of C- or lower at mid-term constitutes a deficiency
- b. Includes ESSRP group and second year students with Freshmen Status
- c. Includes those students eligible to apply for ESSRP, but not those who actually participated

Table 2: Performance of 1997 MEP Participants <sup>a</sup>

Number of Students Entering Freshman Class	Number of Students Returning for Fall 98 <sup>b</sup>	Students Receiving Deficiency Notices	Number of Deficiencies <sup>c</sup>			
			C-	D	F	Total
21	21 (2.89)	8 (38%)	4	4	4	12

- a: Prior to 1998, the program was named the Minority Engineering Program (MEP)
- b: Only 2 students were on probation (GPA > 2.0/4.0), one student left school at mid-term Fall 98 due to family reasons. Value in parenthesis is the average GPA for the group after the Freshman year.
- c: One student received three Fs and one D, accounting for 75% of Fs and 33% of total deficiencies.