In this issue:

Encouraging Women and Minorities to Attain Degrees in Computing and Related Fields

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Abstract: Two Maryland colleges (one a four-year liberal arts college for women, and one a public community college) are working in similar ways to increase the number of graduates, especially women and other under-represented groups, in their computer science, computer information systems, engineering, and mathematics programs. In August 2004, each was awarded funding by the National Science Foundation to create Computer Science, Engineering and Mathematics Scholarship programs. Faculty mentoring, an academic year seminar series, and career information are being used to increase degree attainment.

Keywords: computing fields, engineering, graduates, mathematics, mentoring, minorities, National Science Foundation, retention, scholarships, seminars, success rate, women

EDSIG activities include the publication of ISEDJ, the organization and execution of the annual ISECON conference held each fall, the publication of the Journal of Information Systems Education (JISE), and the designation and honoring of an IS Educator of the Year. ● The Foundation for Information Technology Education has been the key sponsor of ISECON over the years. ● The Association for Information Technology Professionals (AITP) provides the corporate umbrella under which EDSIG operates.

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ABSTRACT

Two Maryland colleges (one a four-year liberal arts college for women, and one a public community college) are working in similar ways to increase the number of graduates, especially women and other under-represented groups, in their computer science, computer information systems, engineering, and mathematics programs. In August 2004, each was awarded funding by the National Science Foundation to create Computer Science, Engineering and Mathematics Scholarship programs. Faculty mentoring, an academic year seminar series, and career information are being used to increase degree attainment.

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1. WOMEN AND MINORITIES IN COMPUTING FIELDS

According to the National Science Foundation's *Science and Engineering Indicators 2004*, in 1999 women comprised 27.1% of the computer science and mathematics workforce, and just 9.5% of the engineering workforce (NSF, 2004). Degree data for under-represented minorities presents a similar picture. Collectively, African Americans, Hispanics, and other non-Asian/Pacific Islander ethnic groups including Native Americans, constituted 24% of the U.S. population in 1999, but just 12% of the IT workforce (Steinbach et al, 2002), and 11% of engineering graduates (NACME, 2004).

It has been projected that in 2010, 47.9% of the workforce will be female and 26% will be black or Hispanic (BLS, 2005). Women and minorities, including African Americans and Hispanics, are under-represented in information technology (IT) and engineering. Studies, including (AAUW, 2000) and (Lee, 2000), show women receive just 9% of engineering-related bachelor's degrees, and less than 28% of the computer science bachelor's degrees. Women nationally comprise about 20% of IT professionals. Programs funded by the National Science Foundation (NSF), including Computer Science, Engineering, and Mathematics Scholarships (CSEMS) and student support projects, are intended to assist women and underrepre-

sented groups through the educational system and into successful CSEM careers.

A report released April 3, 2006 by the American Council on Education (ACE) titled, "Increasing the Success of Minority Students in Science and Technology," found that major factors contributing to degree completion in STEM (Science, Technology, Engineering and Mathematics) fields were full-time attendance, hours worked while enrolled, and rigor of high school curriculum. "The challenge now is to move traditionally underrepresented students toward timely degree completion by supporting these students – both academically and financially throughout their undergraduate careers," according to report co-author Dr. Eugene L. Anderson, associate director of the Center for Policy Analysis at ACE.

2. TWO INSTITUTIONS

The Community College of Baltimore County (CCBC) is a three-campus system serving the greater Baltimore metropolitan area. In Fiscal Year 2005, 40% of the credit students were enrolled in transfer programs, 62% were female, and 31% were African American. Fall 2005 credit enrollment at CCBC overall was 19,622 students of which 7,049 were full-time. Of the 1,819 graduates who earned Associate degrees or certificates in FY 2005, 63% were female and 22% were African American. The institutional rate of Pell awards provides one indication of the amount of unmet financial need. At CCBC in the 2004-05 academic year, 25% of the credit students received a Pell grant. Of these awardees 53% were African-American and 73% were female.

The Women's College at The College of Notre Dame of Maryland (CND) is a weekday undergraduate program for women, the majority of whom are full-time students. There is also a Weekend College for men and women, most of whom are part-time students, whose career and/or family responsibilities make weekend study preferable. The Fall 2005 enrollment at CND was a total of 1,686 undergraduates, with 1,048 students in the Weekend College, and 638 students in the Women's College. In 2005 CND awarded bachelor's degrees to 260 graduates who had completed their undergraduate requirements. CND is a leader among Maryland's private colleges in educating students of

color (28% of the total student population). Also, 91% of students in the Women's College receive financial aid and approximately 40% are the first in their families to attend college.

3. CSEM SCHOLARHIP PROJECTS

Characteristics of NSF CSEMS Projects

NSF-funded CSEM Scholarships are intended to promote full-time enrollment and degree achievement; provide educational opportunities to academically talented, low-income students; and to encourage underrepresented groups including women to enter these careers. Individual awards may not exceed $3,125 or the student's unmet need per year as determined by completion of the Free Application for Federal Student Aid (FAFSA). Federal funding to support this NSF scholarship and student support services program is derived from H1-B visa fees collected by the U.S. governtment for each foreign worker in these fields. Because the goal of this scholarship program is to train U.S. students to provide high-tech skills needed for national competitiveness, scholarship recipients must be: United States citizens, nationals, refugee aliens, or permanent resident aliens. Scholarships are awarded to full-time students in CSEM degree programs for eligible attendance expenses including tuition and fees, housing and food allowance, books, supplies, transportation, and dependent care. Each institution can determine its own additional criteria for award and renewal of CSEM scholarships. In August 2004, CND and CCBC were each awarded NSF funding for four-year CSEMS projects after having jointly shared a two-year project from 2001 to 2003 (Sorkin, Tingling, et al, 2005). The paper (Sorkin and Mento, 2006) describes aspects of these current CSEM projects through Fall 2005.

Targeted Major Programs in the CND CSEM Project

CND's four-year project, *The Cordia Karl Scholars Program: Preparing Women for Leadership in Computer Science, Engineering and Mathematics,* (DUE-0422449) provides NSF funding to support twenty academically talented women with demonstrated financial need, enabling them to complete a bachelor's degree in Mathematics, Computer Science, Computer Informa-

Program	Number of Program Majors per Year					
	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006
CMSC	9	11	8	8	5	5
CIS	23	20	19	11	7	3
MATH	8	9	15	16	11	15
PHYS/ENGR	3	3	3	2	2	2
Total in CSEM Programs	43	43	45	37	24	25
All Women's College Programs	734	694	689	649	638	621

Figure 1.　Number of Program Majors in CSEM Programs in the Women's College at CND during FY 2001 through FY 2006

tion Systems, or Engineering. The Cordia Karl program is named in honor of the founding chair of the Mathematics Department at CND to underscore the College's historic commitment to the development of women for leadership in mathematics and the sciences. As shown in Figure 1, enrollment in the Women's College at CND decreased steadily from 734 students in Fall 2000, to 621 in Fall 2005. Over the same period, the number of students majoring in the combined CSEM programs also decreased from 5.9% of the entire enrollment in Fall 2000 to 4.0% of the entire enrollment in Fall 2005. This is a 32% drop in the percent of Women's College students majoring in the combined CSEM programs, even though the number in Mathematics has increased.

Features of Cordia Karl Scholars CSEM Program at CND

Student Seminar: The Project Investigator leads a one-credit per year seminar to prepare awardees for success in their fields through various activities. Awardees discuss readings with particular attention to strategies for success for women in CSEM fields. They meet with a panel of CND alumnae who pursued graduate work in these fields. They are briefed by the Career Planning Center on the graduate application and job search processes. They participate in site visits to local government and industry facilities, such as NASA Goddard Space Flight Center and Lucent Technology; and they meet with Advisory Board members who provide detailed advice on academic choices and career goals. In addition, scholars are encouraged to attend any 10 cultural events on campus per year, so that they may fully experience the interdisciplinary nature of knowledge. In addition, awardees conducted research on significant women in their fields. They presented their research papers at a meeting with department faculty and advisory board members. Many awardees reported that these women inspired them to persevere and continue with graduate education.

Targeted Major Programs in the CCBC CSEM Project

NSF funding for the four-year CSEM scholarship project, *Promoting Computer Science, Engineering, and Mathematics with Scholarships and Student Support Services,* (DUE-0422225), enables CCBC to award 30 scholarships per year (CCBC, 2006). Computing field associate degree programs targeted by this project are: the Internet and Multimedia Technology (IMMT) program that includes the 2+2 Simulation and Digital Entertainment bachelor's degree program with a local 4-year university; the Computer Science (CMSC) transfer program; and the Computer Information Systems (CINS) and Data Communications and Networking (DCOM) programs that prepare students for entry-level employment or transfer to a 4-year institution

The new E-Business (EBUS) career program is also targeted, as are the Mathematics (MATH) and Engineering (ENGR) transfer programs.

Program	Number of Full-Time Program Majors			
	Fall 2001	Fall 2002	Fall 2003	Fall 2004
CINS	376	355	263	174
CMSC	196	175	145	106
ENGR	83	105	103	112
IMMT	30	34	40	71
Totals for CSEM Programs	685	669	551	463
All CCBC Credit Programs	6,494	6,919	7,030	7,095

Figure 2. Number of Full-Time Program Majors in CSEM Programs 2001-2004 at CCBC

As shown in Figure 2, full-time credit enrollment at CCBC increased steadily from 6,494 in Fall 2001 to 7,095 in Fall 2004. However, over the same period, the number of full-time students majoring in the combined CSEM programs decreased steadily, from 10.5% of the full-time credit enrollment in Fall 2001, to 6.5% of the full-time credit enrollment in Fall 2004. This is a 38% drop in the percent of full-time students majoring in these CSEM programs, even though the numbers in the IMMT and ENGR programs have increased.

Features of the CSEMS Program at CCBC

The *CSEM* award goes to the student's college account and is applied to tuition, books, and fees. After those expenses are paid, the remainder goes directly to the student and can be used to meet the student's many indirect educational expenses including transportation, childcare, and the basic living costs of food and shelter.

Monitoring Awardee Progress: Many CCBC students are squeezed between working, maintaining family, and going to school. *CSEM* scholarships provide the economic boost that many talented low-income students need to continue their education as full-time students. The program has controls and reviews in place, so weaker students can be identified quickly and given appropriate support for academic success. Each awardee's progress is monitored to identify whether they have maintained eligibility from semester to semester. A probation procedure is used for students who fall just short of completing the required 12 credits, or of maintaining the required 2.5 GPA for renewal. The probation option gives borderline students another semester of scholarship aid to improve their grades while being tracked more closely. However, students whose academic performance is significantly lower than required will lose their scholarships and must regain good academic standing before reapplying.

Mathematics Placement Criteria: Seventy percent (70%) of entering CCBC students require non-credit developmental mathematics courses. To increase retention of awardees in CSEM programs and to motivate potential awardees to begin taking mathematics courses early in their college careers, *CSEM* awardees must demonstrate readiness to take MATH 082 Introductory Algebra (the middle level of developmental mathematics) or higher.

Mathematics Credit Change Increases CSEM Awardee Pool: Effective in the Spring 2006 semester at CCBC, the number of credits for the MATH 163 College Algebra course was reduced from 4 credits to 3 credits, as the right triangle trigonometry previously in that course was moved to the MATH 165 Precalculus course. A pleasant unforeseen result of reducing the number of credits for College Algebra was that the enrollment in that course on the Essex campus nearly doubled from Spring 2005 to Spring2006 (although there was no accompanying increase in college or department enrollment), and a similar increase occurred for Fall 2006 over Fall 2005.

More students now view College Algebra as a viable alternative to a 3-credit terminal general education mathematics course for non-STEM majors. This gives those students a real option to consider majoring in a STEM program.

4. ACTIVITIES AT CCBC

Mentoring by Faculty in CSEM Programs

Mentoring is an important aspect of the CCBC CSEMS project. High-quality connections between students and faculty can increase student retention in college. Astin's (1993) involvement theory identified 3 factors as contributors to student success: academic involvement, relationships with faculty members, and participation in student peer group activities. Each CSEM scholarship awardee is assigned a CSEM faculty mentor based on his/her major and campus location. Since traditional CCBC students are not assigned specific academic advisors to guide them through college, the CSEM mentorship program is a major benefit for awardees.

Each awardee must sign a Mentoring Agreement and mentoring logs are due monthly or bi-monthly from all mentors and mentees. The responsibilities of each student (mentee) and faculty member (mentor) are clearly communicated when the student first receives the award, and reinforced during the Summer Career Experience, and the Career Luncheon Seminar Series for awardees and faculty mentors. Mentees and mentors are expected to meet (in person, by email, or by phone) at least once a month, with more frequent meetings required early in the fall semester to establish a proper tone for the academic year. During the interactions, one helpful activity is development and management of an Individual Academic Learning Plan created by students under the guidance of faculty mentors. The IALP helps the student gauge the amount of time and coursework necessary to complete his/her studies before transfer to a four-year institution and/or completion of the associate's degree.

Efforts to Increase the Transfer Rate

Another feature addresses the fact that some talented CCBC students do not even consider CSEM-eligible transfer programs because they cannot afford to continue their education beyond community college. Only 6% of the students enrolled at CCBC in 2001 transferred the following year to public 4-year institutions in Maryland. The CCBC CSEM program encourages more students to continue their studies at 4-year institutions by designating up to 20% of its scholarship funds to "follow" awardees who transfer and assist their completion of bachelor's degrees in STEM fields. The renewal application process for students transferring to a four-year institution ensures that these awardees have a CSEM major, have an advisor, and have registered as fulltime students at their transfer institution. CCBC faculty mentors from CSEM fields continue to mentor their transferring awardees using email, phone and in-person contact methods. To be eligible for the transfer scholarship awards, renewal scholarship students must have earned at least 30 credits at CCBC and provide documentation of their acceptance and full-time status at the 4-year institution in a CSEM major; unmet financial need; and successful completion of prior coursework in a CSEM degree program. Offering students the option of transferring their CSEM scholarship along with their credits to a 4-year institution enables students to reach greater success in a CSEM field.

As of Fall 2006, 19 of the 50 CCBC CSEM awardees from Fall 2004 through Spring 2006 have transferred to a four-year institution, and an additional 3 awardees have graduated with an associate's degree (but did not transfer). This 44% success rate (22/50) for CCBC CSEM awardees after 2 years compares well with the 3-year success rate of 25% for all 2,107 full-time CCBC freshmen matriculating in all programs in 2000. (At CCBC 20% of those students had transferred and an additional 5% graduated after 3 years.) (MHEC, 2004)

5. OUTCOMES AT CND AND CCBC

CSEM Awardees at CND

For the 2005-2006 academic year, 12 students at CND received CSEM scholarships. There were 8 in Mathematics, 1 in Engineering, 1 in Computer Science, and 2 in the dual majors Computer Science and Computer Information Systems. Eight (8) of these 12 awardees were White, 2 were African American, and 2 were Asian. Four students were seniors and graduated, one of whom will continue her education in graduate school.

Mobile Computer Lab at CND

CND was able to leverage NSF's CSEM scholarship investment to attract a Hewlett Packard (HP) grant for 30 laptop computers. Co-PI Joseph DiRienzi, who works with sci-

entists at NASA Goddard, has a commitment to a cooperative, inquiry-based lab environment. He creates engineering and physics curricula that reflect cutting-edge discoveries in the disciplines with pedagogical innovations. The HP mobile environment will enable him to transform engineering labs into a more collaborative, flexible environment.

Women and Minorities among CSEM Awardees at CCBC

Fifty (50) individual CCBC students received CSEM Scholarship awards during the two-year period from Fall 2004 to Spring 2006. Some received the award for just 1 semester and others for all 4 of those semesters. The average length of award was 2 semesters. A total of 10 awardees, including 3 women, had transferred to four-year institutions by the Spring 2006 semester and an additional 9 awardees (including 3 more women) are transferring for the Fall 2006 semester. Over half (11/19) of the transferring awardees have transferred to the University of Maryland Baltimore County (UMBC), with 2 others transferring to the University of Baltimore, and 6 to other institutions. Women remain underrepresented in the CSEM Scholarship awards made at CCBC under this project. Since Fall 2004, 40% (20/50) of awardees were women. Over the past 5 years females have consistently represented the largest portion of CCBC Graduates and credit students. However, the percent of women in CSEM programs at CCBC has been decreasing in the CINS, CMSC and IMMT programs, as shown in Figure 3. Female enrollment in Engineering has remained steady at 15%.

The distribution of credit students at CCBC in FY2005 by racial/ethnic group as self-described at course registration was as follows: White 57%, African American 31%, Asian 5%, Hispanic 2%, and Unknown 5%. Minority groups that have been under-represented in CSEM fields nationally have been represented among the 50 CSEM awardees in numbers near to or greater than their population percentage at CCBC. In particular, 48% of awardees were White, 30% were African American, 18% were Asian, and 4% were Hispanic.

Awardee Attitude Survey at CCBC

Our purpose in using an attitude survey is to determine what influences students to select and persist in CSEM fields. Claudia Morrell, Director of the Center for Women in Information Technology at UMBC, (UMBC, 2006) provided the Principal Investigator with the Attitude Survey Questionnaire shown in Figure 4, which is completed by CCBC CSEM awardees each semester. As part of the CCBC project evaluation, a subset of the 24 statements was used. Responses made by awardees in August 2005 and January 2006 to statements #1, 14, 16 and 24 were recorded. Results are provided in Figure 5. Although 100% of respondents were enthusiastic about their CSEM major, not all respondents believed that having a mentor was vital to their success. And not all believed that CSEM role models had had a positive effect upon them.

Survey data indicates that a relatively small number of factors influenced these students in choosing a CSEM career. Awardees' responses to the open-ended question, "What one factor would you say influenced you to consider a CSEM career and why?" were grouped directly by the evaluator into 5 distinct categories. Results are shown in Figure 6. No relative importance can be applied to any factor by looking at its percentage, since students were asked to indicate one factor, not all factors that influenced them to consider a CSEM career. This same questionnaire will continue to be given to students during the 2006-7 academic year. At the end of that time there may be enough data to also track changes in individual student responses.

6. CONCLUSION

CCBC and CND are using a variety of means within their different student populations to attract and retain full-time students, particularly women and under-represented minorities, in CSEM major programs. Their common goal is to provide students with scholarship funds and support services, such as mentoring and providing information about careers and higher education, so that students graduate and continue their education in CSEM fields.

7. ACKNOWLEDGEMENT

the authors and do not necessarily reflect the views of the NSF.

8. REFERENCES

AAUW Educational Foundation Commission on Technology, Gender, and Technology Education (2000) "Tech-Savvy: Educating Girls in the New Computer Age." Washington, DC.

Astin, A. (1993) "What matters in college? Four critical years revisited." Jossey-Bass. San Francisco.

Bureau of Labor Statistics (2005) "Table 1. Civilian Labor Force by Sex, Age, Race and Hispanic Origin, 1980, 1990, 2000, and Projected 2010." http://www.bls.gov/opub/mlr/2001/11/art2tab.pdf

Community College of Baltimore County (2006) CSEM Scholarship Web Site. http://www.ccbcmd.edu/csems

Lee, C.J. (2000) "Study Finds Girls Are Turned Off by Computers." PG News. April 11, 2000. http://www.postgazette.com/regionstate/20000411girls1.asp

Maryland Higher Education Commission (2004) Retention, Transfer and Graduation Rates of New Full-Time Freshmen at Maryland Community Colleges: Two, Three and Four Years after Entry, p. 42-49. http://www.mhec.state.md.us/publications/research/Archives/2004RetenTransfandGradRatesNewF-TfreshMDCC.pdf

National Action Council for Minorities in Engineering (2004) 30 Years: Annual Report 2004. p. 2. http://www.nacme.org/pdf/AR2004/AnnualReport2004.pdf

National Science Foundation (2004) Science and Engineering Indicators 2004. http://www.nsf.gov/statistics/seind04/c3/c3s1.htm

Sorkin, S. and B. Mento (2006) "Collaborating to Promote Computer Science, Engineering, and Related Programs with Scholarships and Student Support Services." Proceedings of 9th International Conference on Engineering Education, July 23-28, 2006. http://fie.engrng.pitt.edu/icee2006/

Sorkin, S., T. Tingling, A. Beiderman, and J. Walker (2005) "Promoting Computer Science, Engineering, and Related Programs with Scholarships and Student Support Services." 35th ASEE/IEEE Frontiers in Education Conference, Oct. 19-22, 2005. http://fie.engrng.pitt.edu/fie2005/

Steinbach, T., J. White, and L. Knight (2002) "Encouraging Minority Enrollment in IT Degree Programs through Participatory Organizations." Informing Science. June 2002. pp. 1451-1464. http://proceedings.informingscience.org/IS2002Proceedings/papers/ Stein204Encou.pdf

University of Maryland, Baltimore County. (2006) Center for Women & Information Technology. http://www.umbc.edu/cwit/

Program	% Female Enrollment					
	Fall 2000	Fall 2001	Fall 2002	Fall 2003	Fall 2004	Fall 2005
CINS	44%	45%	41%	40%	42%	37%
CMSC	32%	29%	27%	27%	21%	23%
ENGR	13%	15%	15%	15%	15%	15%
IMMT	68%	51%	53%	41%	29%	21%
All CCBC Credit Programs	60%	61%	61%	63%	63%	63%

Figure 3.   Percent of Females among CSEM Program Majors at CCBC from Fall 2000 through Fall 2005

	I feel enthusiastic about my CSEM major		I intend to pursue a career in CSEM area		CSEM role models have had a positive effect on me		Having a mentor is vital to my success	
	Agree	Strongly Agree	Agree	Strongly Agree	Agree	Strongly Agree	Agree	Strongly Agree
August 2005 N = 30	27%	73%	17%	77%	47%	27%	40%	33%
January 2006 N = 26	23%	77%	31%	69%	50%	42%	54%	38%

Figure 5. CCBC CSEM Awardee Responses in 2005-6 to Attitude Statements

Factor Cited by Awardee	Frequency Percents	
	August 2005 N = 29	January 2006 N = 25
Career Opportunities	24%	32%
Enjoy Working with Computers/New Technology	35%	28%
Enjoy CSEM Subjects	21%	28%
CSEM Role Models/Teachers	17%	4%
Other	3%	8%

Figure 6. CCBC CSEM Awardee Responses in 2005-6 to Factor Influencing Choice of a CSEM Career

COMPUTER SCIENCE, ENGINEERING, AND MATHEMATICS (CSEM) PROGRAM ATTITUDE ASSESSMENT QUESTIONNAIRE

Your Gender: [ ] Male   [ ] Female

Your Current Age: _____   ID Number: _____

Your Race: [ ] African-American   [ ] Caucasian   [ ] Other
                    [ ] Asian   [ ] Hispanic

WHAT IS YOUR INTENDED **CSEM** (Computer Science, Engineering and Mathematics) MAJOR?
[ ] Computer Information Systems (CINS)   [ ] Biomedical Engineering (ENGR)
[ ] Computer Networking (DCOM)   [ ] Chemical Engineering (ENGR)
[ ] Computer Science (CMSC)   [ ] Civil Engineering   (ENGR)
[ ] E-Business (ECOM)   [ ] Computer Engineering (ENGR)
[ ] Internet and Multimedia Technology (IMMT)   [ ] Mechanical Engineering (ENGR)
[ ] Simulation and Digital Entertainment (SDE) [ ] Mathematics (MATH)
[ ] Other _____

WHEN DID YOU FIRST CONSIDER A **CSEM** MAJOR?
[ ] Elementary school   [ ] Middle school [ ] High school   [ ] College

CHECK THE BOX THAT BEST DESCRIBES HOW YOU FEEL ABOUT THE FOLLOWING:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. I feel enthusiastic about my **CSEM** major	Y	Y	Y	Y	Y
2. I am likely to continue in my **CSEM**	Y	Y	Y	Y	Y
3. I expect to do well in a **CSEM** area	Y	Y	Y	Y	Y
4. My major is too difficult	Y	Y	Y	Y	Y
5. I think about switching my major	Y	Y	Y	Y	Y
6. I value **CSEM** subjects	Y	Y	Y	Y	Y
7. **CSEM** subjects are boring to me	Y	Y	Y	Y	Y
8. I enjoy learning **CSEM** subjects	Y	Y	Y	Y	Y
9. **CSEM** subjects are difficult for me	Y	Y	Y	Y	Y
10. **CSEM** subjects are exciting to me	Y	Y	Y	Y	Y
11. Good grades encourage me	Y	Y	Y	Y	Y
12. I'm smart in **CSEM** subjects	Y	Y	Y	Y	Y
13. I' m easily discouraged by low grades	Y	Y	Y	Y	Y
14. Having a mentor is vital to my success	Y	Y	Y	Y	Y
15. I have not had positive **CSEM** role models	Y	Y	Y	Y	Y
16. **CSEM** role models have had a positive effect on me	Y	Y	Y	Y	Y
17. I think faculty involvement is important	Y	Y	Y	Y	Y
18. Good teachers are helpful to my success	Y	Y	Y	Y	Y
19. Teachers have helped me to understand difficult **CSEM** concepts	Y	Y	Y	Y	Y
20. Good teachers in **CSEM** subjects have helped me	Y	Y	Y	Y	Y
21. Many career opportunities are available in **CSEM** careers	Y	Y	Y	Y	Y
22. An advisor has helped me with career planning	Y	Y	Y	Y	Y
23. I am familiar with **CSEM** professional societies	Y	Y	Y	Y	Y
24. I intend to pursue a career in **CSEM**	Y	Y	Y	Y	Y

WHAT ARE YOUR CURRENT CAREER PLANS?

WHAT ARE YOUR CAREER GOALS?

WHAT ONE FACTOR WOULD YOU SAY INFLUENCED YOU TO CONSIDER A **CSEM** CAREER AND WHY?

Figure 4. Attitude Questionnaire provided by UMBC's CWIT for use with CSEM awardees at CCBC.