

INFORMATION SYSTEMS EDUCATION JOURNAL

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Interim Awardee Outcomes after Four Years of a STEM Scholarship Program

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Abstract

This paper describes the results of a four-year follow-up of need-based scholarship awardees at a community college as they made progress toward their goal of associate's degrees and/or bachelor's degrees in Science, Technology, Engineering, and Mathematics (STEM) fields. From 2014 through 2018, through National Science Foundation funding, need-based scholarships were offered for full-time STEM students with a minimum grade point average, and U.S. citizenship, or status as permanent resident alien or refugee alien. Spatial skills testing and practice, faculty mentoring, and a monthly luncheon workshop series with information on career and transfer were used to increase associate's and bachelor's degree attainment or transfer in STEM fields. Outcomes of these efforts are described, including spatial skills attainment and practice, and time elapsed from initial enrollment in the community college to subsequent bachelor's degree attainment. Outcomes by gender, race/ethnicity, and initial mathematics placement of awardees are also provided.

Keywords: spatial skills, mentoring, scholarships, transfer rate, underrepresented, STEM, time to degree

1. INTRODUCTION

Regarding undergraduate enrollment, in 2014 Blacks, Hispanics, and other racial/ethnic groups underrepresented in STEM fields were more likely to be enrolled in public 2-year institutions; whereas Whites and Asians were more likely to be enrolled in public 4-year institutions (NSF NCSSES, 2017). Blacks make up 13.2% of the U.S. population, and Hispanics comprise 17.5% of the U.S. population (Chang, 2015).

Women's bachelor's degree attainment in science and engineering declined in every field from 2004 to 2014 (Espinosa, 2015). In 2014, women earned 18.1% of computer science bachelor's degrees and 19.8% of engineering bachelor's degrees (down from 25.1% and 20.5% in 2004). The proportions of bachelor's degrees earned by Blacks in computer science and engineering in 2014 fell to 9.75% and 3.83% (down from 10.44% and 4.99% in 2004). In 2014, Black women earned 2.61% of computer science bachelor's degrees and 0.99% of engineering

bachelor's degrees (down from 4.63% and 1.70% in 2004). The proportions of bachelor's degrees earned by Hispanics in computer science and engineering in 2014 rose to 9.74% and 9.56% (up from 6.27% and 6.93% in 2004). Hispanic women earned 1.79% of computer science bachelor's degrees in 2014 (nearly flat from 1.77% in 2004), and earned 2.08% of engineering bachelor's degrees (up from 1.72% in 2004) (NSF NCSES, 2017).

The National Science Foundation's Division of Undergraduate Education provides a program known as Scholarships for Science, Technology, Engineering, and Mathematics (S-STEM) that can address the underrepresentation described above (NSF, 2017). This program makes grants to institutions of higher education, which in turn are responsible for selecting scholarship recipients and reporting demographic information about student scholars. Scholarship recipients must be academically talented but financially needy and enrolled full-time in one of these major programs: computer and information sciences, engineering, mathematical sciences, biological sciences, physical sciences, geosciences, or technology areas associated with those fields. Individual scholarships cannot exceed \$10,000 per year.

The individual college/university determines award criteria, including minimum GPA and eligible major programs for the S-STEM program. However, NSF guidelines specify that students who are awarded these scholarships must be U.S. citizens, permanent residents, nationals, or refugees.

This paper describes degree and other outcomes after four years for a specific S-STEM scholarship program at the Community College of Baltimore County. The scope of the paper includes demographics of the combined CCBC awardees, and transfer and graduation rates, for all awardees and certain subgroups of awardees, including by gender, race and ethnicity. Results of spatial skills testing and practice are provided. Awardees' time elapsed from initial enrollment at this community college to bachelor's degree attainment is also presented.

2. INSTITUTIONAL INFORMATION

The Community College of Baltimore County (CCBC) is a public two-year college system with three campuses serving the greater Baltimore metropolitan area. The Fall 2015 combined credit enrollment was 22,179 students of which 29% were full-time students. Thirty-nine percent (39%) of the credit students were African

American, and 60% of credit students were female. In FY 2016, CCBC awarded 2,194 associate's degrees.

From 2012 to 2017, although CCBC's total fall enrollment steadily declined (falling 23% over that period), enrollment in STEM associate's degree programs increased 10%. Within STEM associate's degree programs at CCBC, the largest enrollment increase occurred in the new Information Systems Security (also called Cybersecurity) program which grew 277%. Although the total number of associate's degrees awarded at CCBC was unchanged from 2012 to 2017, there was a 69% increase in the number of STEM associate's degrees awarded at CCBC (MHEC, April 2018, May 2017, March 2018). In 2017, 13% of CCBC's enrollment was in STEM programs. These increases are shown in **Figure 1** (see Appendix).

3. MCIS SCHOLARSHIP PROGRAM AT CCBC

MCIS Scholarship Program

From Fall 2014 through Spring 2018, 101 full-time CCBC students (34 female and 67 male) majoring in certain STEM fields were awarded renewable MCIS semester scholarships through NSF funding. Awardees retained their scholarships for one or more semesters with the average length being 2.6 semesters. Eligible major programs for MCIS included the following transfer and career programs: Computer Science (COSC), Engineering (ENGR), Mathematics (MATH), Physics (PHYS), Information Systems Security (ISS), Engineering Technology (ET), Information Technology (IT), and Network Technology (NT). **Figure 2** shows the distribution of awardees among these major programs. Engineering (31/101) and Computer Science (23/101) are the CCBC major programs with the highest numbers of MCIS awardees. Over half of the 101 awardees were in COSC or ENGR programs. Thirty-four percent (34/101 = 34%) of the 101 awardees were female.

These awardees have been highly successful in graduating with associate's degrees and/or transferring to 4-year institutions where 19 have already earned bachelor's degrees.

Selection Process and Demographics of MCIS Awardees

Each semester new, renewal, and transfer MCIS scholarship applications were received. They were due by June 1 for Fall awards, and by December 1 for Spring awards. Members of the Steering Committee, comprised of representatives from the targeted MCIS programs met early in July and

January to review applications and transcripts, select scholarship awardees, and determine whether any of the renewal or transfer awards for the upcoming semester should be probational. Probational awards were made to awardees who fell just short of meeting the renewal criteria of completing 12 or more credits with 2.8 GPA or higher.

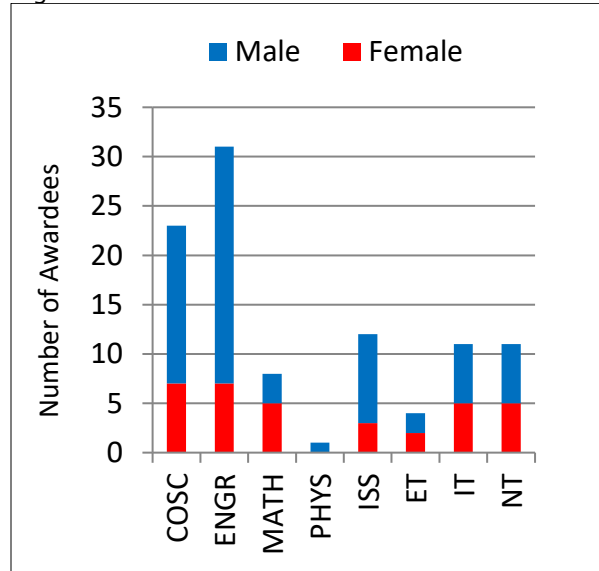


Figure 2. All 101 MCIS STEM Awardees from Fall 2014 through Spring 2018 by Major Program and Gender.

Probational awards were made to awardees who fell just short of meeting the renewal criteria of completing 12 or more credits with 2.8 GPA or higher. Probational awards provided lower financial support (generally 25% lower) along with the incentive to improve grades. Students whose academic performance was significantly lower than required were not awarded renewal scholarships.

The distribution of all credit students at CCBC in Fall 2014 by racial/ethnic group as self-described at course registration was as follows: White 45%, Black 39%, Asian 7%, Hispanic/Latino 5%, and Other/Unknown 4% (MHEC, May 2017). The institutional rate of Pell awards provides one indication of the level of unmet financial need. In Fall 2015, CCBC had 42.3% Pell enrollment compared to 34.8% Pell enrollment at all Maryland community colleges.

Minority groups that have been under-represented in STEM fields nationally are represented among the 101 MCIS awardees from Fall 2014 through Spring 2018 in proportions close to their population percentage at CCBC. In

particular, 38% of the 101 awardees self-identified as White, 37% as Black, 20% as Asian, 5% as Multiple Races, and 1% as Hawaiian/Pacific Islander. Among all these, 5% were Hispanic/Latino, as shown in **Figure 3**.

A total of 259 (81F/178M) semester scholarship awards were made over 4 years, for the \$540,000

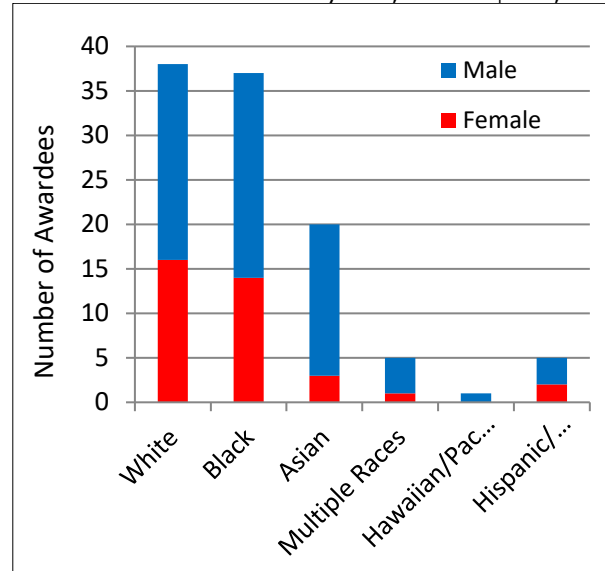


Figure 3. All 101 MCIS Awardees from Fall 2014 through Spring 2018 by Race/Ethnicity and Gender.

of scholarship funds. The average semester award was \$2,124, but each semester the individual awards were fixed percentages of each awardee's remaining unmet financial need after his/her other awards and subsidized loans were taken into consideration. As a result, actual award amounts ranged from \$80 to \$5140 per semester.

Faculty Mentoring

Each MCIS awardee was paired with a faculty mentor from his/her major field and met at least every other week for the first six weeks of the semester and monthly thereafter, either in person, via email and/or by phone. Awardees completed a Mentoring Agreement that they reviewed with their mentor. Mentors maintained a mentor log documenting the meetings and detailing what actions the scholar needed to take before the next meeting.

With high numbers of engineering and computer science awardees, several additional faculty members became mentors for the MCIS scholars, joining returning mentors for an eventual total of 22 faculty mentors. Mentors provided advice and

guidance when issues arose, and developed and managed an Individual Academic Learning Plan to ensure that awardees were on track for academic success. Some mentors also assisted students with obtaining employment. Since traditional CCBC students are not assigned an academic advisor to guide them, the MCIS mentorship program was a major benefit for awardees. Students found that through their participation in the program, they also got to know other STEM faculty who were happy to provide assistance in addition to their own mentors.

Incorporating Spatial Skills Training

The ability to think in terms of spatial relations is an important skill for STEM students as they take courses toward their career goals. "Spatial thinking refers to a set of mental skills that enable us to reason about space and the relationships between objects," (Gagnier & Fisher, 2016). Research suggests that spatial visualization abilities are important for success in STEM fields such as engineering, chemistry, computing and mathematics (Sorby, 2009; Metz, Jarosewich & Sorby, 2016; Gagnier, & Fisher, 2016). MCIS scholarship students were required to participate in completing the Purdue Spatial Visualization Test: Visualization of Rotations (PSVT:R). The test consisted of thirty multiple choice questions taken over a twenty-minute time limit, aimed at assessing the spatial ability of students. The goal of participating in the test was to improve student spatial thinking skills for those with a low score. Students that scored less than 70% on the test were asked to participate in one hour weekly to bi-weekly workshops to practice their visualization skills for the duration of the semester. Workshops consisted of practice sketching sessions of visualization skills and examining 3D rotations. At the end of the semester, students were requested to take the PSVT:R again. These workshops were conducted on two of CCBC's three main campuses on a rotating basis.

Originally, students would take the test using a traditional paper version, which was graded manually or by Scantron. However, during the Spring 2016 semester, as CCBC was one of the community college partners to the Spatial Skills Instruction Impacts Technology Students (SKITTS) project an online version of the test and workshops was used (Metz, Jarosewich & Sorby, 2016), and (Sorby, Metz & Jarosewich, 2016). This model allowed students to make the choice to attend all of the workshops online, face-to-face or a combination of the two as a blended format. The online content was administered through Blackboard and was expanded so that students in

other courses outside of the MCIS program could practice with the material. The online course included ten modules composed of video lectures, video examples, PowerPoint notes, practice and additional sketching exercises that were assigned. Materials were based on the Spatial Course Learning Resources (Sorby, 2009). The Blackboard course was created as a self-enrolling organization that was open to students throughout the campus.

Students could submit practice sketches as scanned documents through email or through the Blackboard site. Some students submitted paper versions of their sketches in-person at one of the campus locations. Feedback was provided to students in all formats. A substantial additional benefit of the spatial skills workshop was additional support provided to students. Workshops allowed additional interaction with faculty in an informal learning environment that allowed for spontaneous discussions about courses, majors, and career information. Feedback from students indicated that this additional time with faculty outside of the classroom was beneficial.

Spatial Skills Testing of Awardees

At the first MCIS workshop of each semester in August and January, new MCIS awardees were given the PSVT:R spatial skills test. Also at the first workshop of the semester these requirements of being in the program were addressed to make sure new awardees understood them: attending monthly workshops, regularly meeting with a faculty mentor, and practicing spatial skills if they scored less than 70 on the PSVT:R. During the first two years, spatial skills practice was provided through spatial skills workshops (bi-weekly to monthly). In the last two years, practice was provided through various format options, such as face to face, hybrid, and online modules using Blackboard. Students were asked to confirm that they were willing and able to make the commitment. However, earning a "passing" score of 70% or higher on the PSVT:R was not an MCIS scholarship eligibility criterion.

Examining all 101 MCIS scholarship students, 47 scored at or above the 70% threshold (47/101) yielding a 46.5% pass rate on first attempt. Thus 54 students were strongly encouraged to participate in the spatial skills workshops. To be considered as completing the workshops, students had to participate in at least 80% of workshop sessions. This was also true for online students, where they were required to submit at least 80% of all practice materials and additional tasks.

After completing the workshops, there was an average positive change of 16 points, for students retaking the PSVT:R. The average of the highest scores obtained for the PSVT:R from all students was 67.6%. This score includes scores for students who completed the workshops (and re-took the exam for a potentially higher score), and those who passed on the first attempt. From this group the average highest score for females was 62.3% and 70.3% for males. Examining all post PSVT:R scores, 63 students or 62.4%, were now at or above the 70% threshold. This included 18 females (18/34 = 53% of females) and 45 males (45/67 = 67% of males) that were now in the passing range. Additionally, the average high score for Black students was 56.4%, Asian students 62.1%, and 79.3% for White students. Four students did not self-identify with one of these racial/ethnic groups.

Awardee Leadership and Volunteer Roles

MCIS scholarship awardees were encouraged to participate in the service component of the MCIS scholars program. The service component of the program gives students the opportunity to gain valuable leadership skills, become more involved with CCBC, build their resume, and expand their network. The Student Ambassador Program is a leadership opportunity for MCIS scholars who are dedicated to serving and representing the college. Student Ambassadors provide campus tours, serve as CCBC representatives and perform duties at various CCBC campus and community events. Some Computer Science/Information Technology, Information Systems Security, and Network Technology students volunteered their services by working in the Homework Lab as tutors. Students select two hours per week that they sit in the Homework Lab to assist students on academic subjects by furnishing information, helping solve problems, offering support, and suggesting study tips and strategies. The Lab presents a good option not only for tutoring but also for building peer-mentoring relationships. Each semester there were 4 to 8 MCIS student computer lab volunteers. Several awardees volunteered as tutors for self-paced developmental mathematics classes. Working as a tutor provided some of the best workplace training possible; MCIS tutors were dependable motivated, caring and responsible, all of which are valuable qualities to prospective employers and other key stakeholders.

Interventions Used

During the four year grant period, there were no MCIS dropouts from the program. Several interventions incorporated in the program contributed to increased retention and completion

with a specific focus on minority students and females. Some of the interventions used were one-day workshop in August focusing on STEM programs, guest speakers from STEM fields, optional internships for awardees, CCBC Technology, Engineering and Mathematics (TEM) Pathway workshops on resume writing, monthly mentoring of all awardees by STEM faculty, and monthly luncheon workshops for awardees and faculty mentors.

STEM faculty mentoring played a pivotal role in MCIS student success and retention. Faculty focused on academic adjustment, retention, and overall educational success. Mentors were proactive in maintaining consistent and high retention rates by advising on course selection and schedules prior to each semester, checking periodically during the semester with mentees on their academic standing, building relationships, offering tutoring sessions for programming courses facilitated by computer programming faculty, and more.

Efforts to Increase the Transfer Rate

The MCIS scholarship program encouraged awardees to continue their STEM studies at four-year institutions. To assist awardees to complete bachelor's degrees in these fields, the MCIS project proposal stated that 20% of scholarship funds would "follow" awardees who had transferred. MCIS scholarship funding was awarded to former awardees who had earned an associate's degree, or at least 45 credits, in an MCIS-eligible program at CCBC before transferring to a four-year institution. In addition, students kept their STEM faculty mentor while transitioning to the four-year college.

Awardee Transfers

MCIS awardees who transferred to a four-year institution from CCBC with an associate's degree, or at least 45 credits in an eligible STEM program, were given the option of retaining their MCIS scholarship for up to 2 semesters upon transferring. This enabled students to reach greater success in a STEM field by drawing attention to the possibility of transfer to a four-year school for students who otherwise might not have considered transfer. Transferring awardees had to provide documentation of their: admission and full-time status at the four-year institution in an MCIS-eligible STEM major, unmet financial need, and successful completion of prior coursework in an MCIS-eligible STEM degree program at CCBC.

Because of the large number of MCIS awardees who transferred, in some semesters the percent

of available funding allocated for transfer awards was as high as 32%. However, due to the higher costs of attendance at a four-year institution (compared to attendance at CCBC), the percentage of their unmet financial need that was awarded to transfer awardees was never as high as the percentage for awardees still at CCBC. Of the 259 (81F/178M) semester scholarship awards that were made over 4 years, 85 (24F/61M) were transfer awards made to former CCBC MCIS awardees who had transferred to a four-year institution to pursue a bachelor's degree in an MCIS-eligible STEM program.

Awardee Internships

Awardees were encouraged to apply for internships, and scholars were provided assistance and information about various internship opportunities. Two MCIS awardees received internships from Constellation, a local Exelon energy company. Another awardee, a computer science major, participated in the REU Site: *Interdisciplinary Program in High Performance Computing* in the Department of Mathematics and Statistics at the University of Maryland, Baltimore County (UMBC) in Summer 2017 (Della-Giustina et al, 2018).

Two MCIS awardees (both engineering majors) were selected for a 6-week paid summer internship program funded by NIH called *BUILD a Bridge to STEM* at UMBC. This program focuses on biomedical and behavioral sciences and is open to students from area community colleges.

In addition, MCIS scholars were encouraged to attend the TEM Pathways workshops with initiatives that invite community organizations to speak on internships. Some of the firms that are providing Cybersecurity internships for CCBC students are: First Financial Federal Credit Union (second consecutive year), MECU of Baltimore (second consecutive year), CCBC IT Services (first year), Exelon Corporation (first year), and Whiting-Turner Contracting Company (first year).

4. AWARDEE OUTCOMES

Sixty-four percent (65/101 = 64%) of the 101 total MCIS awardees have transferred to a 4-year institution, and an additional 19% have earned associate's degrees but did not transfer to a 4-year institution. As shown in **Figure 4**, 64% of the 101 MCIS awardees have earned associate's degrees, and 19% have earned bachelor's degrees (as of July 2018). And 69% have earned at least one of these degrees.

MCIS Awardee Outcomes by Initial Mathematics Placement Level at CCBC

Students entering CCBC take an *Accuplacer* mathematics placement test which determines their initial mathematics placement. Over half of entering students have an initial mathematics placement that is developmental. That is, the student places into one of the 3 non-credit developmental mathematics courses: MATH 081 Pre-Algebra, MATH 082 Introductory Algebra, or MATH 083 Intermediate Algebra.

MCIS awardees at CCBC were required to have eligibility for MATH 083 Intermediate Algebra, or higher, at the time of their award. They could obtain this eligibility through their initial mathematics placement, or by first completing any needed developmental mathematics courses. Among the total 101 (34F/67M) CCBC MCIS awardees from Fall 2014 through Spring 2018 were 34 (17F/17M) whose initial mathematics placement level at CCBC was developmental. Although most (25) of these 34 awardees initially placed into MATH 083, there were 7 who initially placed into MATH 082, and 2 who initially placed into MATH 081. The outcomes and success rates for the 34 awardees with initial placement into developmental mathematics, and for the other 67 awardees with initial placement into non-developmental mathematics are shown in **Figure 5**. Among those who initially placed into developmental mathematics, 79% (27/34) transferred to a 4-year institution or graduated with an associate's degree (but did not transfer) and the other 7 were still enrolled at CCBC in Spring 2018. Among those whose initial placement was into non-developmental mathematics, 85% (56/67) transferred to a 4-year institution or graduated with an associate's degree. Eight (8) of the other 11 in this group were enrolled at CCBC in Spring 2018. The remaining 3 were enrolled at CCBC in 2017 and successfully completed through Calculus II or higher. Among the 101 total MCIS awardees, females formed 50% (17/34) of the developmental initial placement group, and 25% (17/67) of the non-developmental initial mathematics placement group of awardees.

Sixty-eight percent (68%) of awardees with initial developmental math placement have earned associate's degrees compared to 63% of awardees with initial non-developmental mathematics placement. Fifty-six percent (56%) of awardees with initial developmental math placement have transferred to 4-year institutions compared to 67% of awardees with initial non-developmental mathematics placement.

Awardee Outcomes by Gender

Considering all 101 awardees to date from Fall 2014 through Spring 2018, as of July 2018, a total of 64 (21F/43M) awardees (63%) have transferred to 4-year colleges/universities. Overall, 62% (21/34) of the female awardees, and 64% (43/67) of the male awardees have transferred, as shown in **Figure 6**.

Considering all 101 MCIS awardees, as shown in **Figure 7**, at the end of Year Four, 44% of female awardees were in either COSC or ENGR major programs, and 63% of male awardees were in those 2 programs. The ISS program (now called Cybersecurity) also had a higher percentage of male awardees (12%) than female awardees (9%). On the other hand, females had higher percentages of awardees in MATH, IT and NT (45% combined) compared to 20% of male awardees in those 3 programs combined.

Awardee Bachelor's Degrees

Bachelor's degrees have been earned by 19 awardees (19/101 = 19%) to date, including 21% (7/34) of female awardees and 18% (12/67) of male awardees. This is shown in **Figure 6**. Additionally, another 43 (14F/30M) MCIS awardees were enrolled at transfer institutions in 2018. The institutions from which awardees earned their bachelor's degrees were: 11 from University of Maryland Baltimore County (UMBC), 3 from University of Maryland University College (UMUC), 1 from Capitol Technology University, 2 from Towson University (TU), 1 from University of Baltimore (UB), and 1 from University of Maryland College Park. Major programs for those 19 who have earned bachelor's degrees are: IS/IT (5), Cybersecurity (4), Computer Science (2), Mathematics (2), Chemical Engineering (1), Computer Engineering (1), Electrical Engineering (1), Mechanical Engineering (1), Simulation and Game Design (1), and Management of Aging Services (1). This is shown in **Figure 8**. For the 19 MCIS awardees who have earned bachelor's degrees, the elapsed time from initial CCBC entry to bachelor's degree attainment has ranged from 44 months to 119 months, with median time of 60 months (5.0 years), and average time of 65 months (5.4 years).

These times are expected to increase as additional MCIS awardees earn bachelor's degrees. Research funded by Lumina Foundation found that for students with a prior associate's degree, the average time elapsed from initial postsecondary enrollment to a bachelor's degree was 8.2 years. Among bachelor's degree earners with no associate's degree, but with prior enrollment in 2-year institutions, the average

time elapsed to bachelor's degree was 6.0 years (Shapiro, Dundar, Wakhungu, Yuan, Nathan & Hwang, 2016).

Awardee Outcomes by Racial/Ethnic Group

As shown in **Figure 9**, to date, 63% of the 101 MCIS awardees transferred to a 4-year institution.

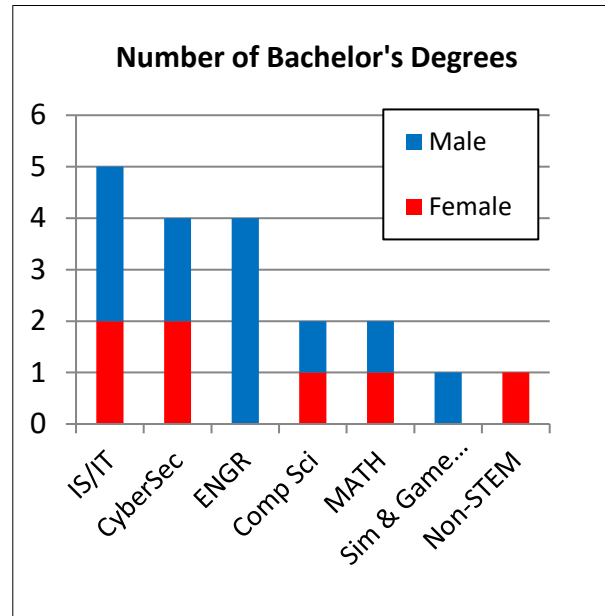


Figure 8. Major Programs for Bachelor's Degrees Earned by 19 CCBC MCIS Awardees from Fall 2014 through Spring 2018 by Gender.

The transfer rate is similar among White and Black awardees (66% and 65%). Although 64% of all awardees have earned associate's degrees, 71% of White awardees, 65% of Black awardees, and 55% of Asian awardees have earned associate's degrees. This is shown in **Figure 10**.

5. CONCLUSIONS

From Fall 2014 through Spring 2018, 101 full-time CCBC students majoring in certain STEM fields received S-STEM scholarships for one or more semesters through NSF funding.

These awardees have been successful in graduating with associate's degrees and/or transferring to 4-year institutions where 19 to date have earned bachelor's degrees.

The transfer rate to 4-year institutions is similar for Black awardees (65% transferred), and White awardees (66% transferred). Black awardees have a higher rate (22%) of earning bachelor's

degrees than White awardees (18%). Associate's degree attainment is higher for White awardees (71%) than for Black awardees (65%).

Awardees with initial developmental mathematics placements were less likely (56% vs. 67%) than those with non-developmental math placements to transfer to 4-year institutions and earn bachelor's degrees (12% vs. 22%), but were more likely (68% vs. 63%) to earn associate's degrees.

Female and male awardees were equally likely to earn associate's degrees (65% and 64%), and transfer (62% and 64%) to 4-year institutions.

Sixty-three percent (63%) of bachelor's degrees earned by awardees were in IS/IT, Cybersecurity, Computer Science, and Game Design major programs combined. Twenty-one percent (21%) of earned bachelor's degrees were in Engineering programs, and 5% were in non-STEM major programs.

Initially taking the PSVT:R spatial skills test, only 46.5% of the MCIS students scored above the 70% pass rate. After participating in several spatial skills workshops, students on average improved their spatial skills score by 16 points. MCIS students averaged a 67.6% passing rate overall after re-taking the test. The spatial skills workshops provided students with additional support, faculty interaction and practice with their 3D visualization skills.

Awardees' mean time elapsed from initial CCBC entry to bachelor's degree was 5.4 years, and the median time elapsed to bachelor's degree was 5.0 years, for the 19 MCIS awardees who have already earned bachelor's degrees.

6. ACKNOWLEDGEMENT

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Appendices

CCBC Associate's Degree Program	Enrollment in Program Major						Associate's Degrees Awarded					
	2012	2013	2014	2015	2016	2017	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017
* Science	551	624	724	746	749	669	27	33	37	44	42	35
Engineering	494	464	413	406	345	307	13	13	9	20	15	24
Computer Engineering	0	0	9	56	97	99	0	0	0	0	1	4
Electrical Engineering	0	0	7	45	72	69	0	0	0	1	1	3
Computer Science	454	415	442	473	442	470	15	14	28	21	42	27
Secondary Ed - Chemistry	10	9	6	2	2	1	0	0	0	0	0	0
Secondary Ed - Mathematics	26	37	30	26	14	17	2	2	0	1	3	0
Secondary Ed - Physics	4	5	4	4	1	0	0	0	0	0	0	0
Geospatial Applications	31	30	29	42	33	19	1	7	9	1	9	4
Information Technology	257	308	283	304	299	291	26	23	39	33	28	40
Information Systems Security	81	140	139	233	268	305	4	8	32	29	37	45
Network Technology	242	435	438	385	218	172	37	34	47	34	29	30
Engineering Technology	111	140	129	117	89	69	5	8	5	5	10	8
Totals:	2,261	2,607	2,653	2,839	2,629	2,488	130	142	206	189	217	220
CCBC Total Fall Enrollment and Total Associate Degrees	25,188	24,275	22,887	22,179	21,193	19,349	2,132	2,086	2,020	2,200	2,174	2,133
% STEM Enrollment and Degrees	9%	11%	12%	13%	12%	13%	6%	7%	10%	9%	10%	10%

*Biology, Chemistry, Environmental Science, Mathematics, and Physics data are included in the Science program.
Sources: MHEC Trends in Enrollment by Program (April 2018, May 2017, June 2016), MHEC Trends in Degrees and Certificates by Program (March 2018, November 2016, March 2016), MHEC Opening Fall Enrollment (November 2011, December 2012, November 2013, November 2014, November 2015, December 2016, December 2017), and MHEC Data Book 2018, 2017, 2016, 2015, 2014, 2013, 2012, 2011.

Figure 1. CCBC Enrollment and Associate's Degrees Awarded in STEM Programs, 2012 – 2017.

Awardee Outcome	MCIS Fall 2014 – Spring 2018	
	Number of Awardees	% of Awardees
Transferred to 4-yr	64 (21F/43M)	63%
Graduated (Associate’s degree but no transfer)	19 (6F/13M)	19%
Still Enrolled (in community college in 2017 or 2018)	18 (7F/11M)	18%
Dropped Out	0	0%
TOTALS:	101 (34F/67M)	100%
Associate’s Degrees:	65 (22F/43M)	64%
Bachelor’s Degrees:	19 (7F/12M)	19%
Earned at least one of these degrees (Associate’s or Bachelor’s):	70 (23F/47M)	69%

Figure 4. Outcomes (as of 7/5/18) for All 101 CCBC MCIS S-STEM Awardees from Fall 2014 through Spring 2018.

Awardee Outcome	Developmental MATH Level		Non-Developmental MATH Level		Combined	
	Number of Awardees	% of Awardees	Number of Awardees	% of Awardees	Number of Awardees	% of Awardees
Transferred to 4-yr	19 (10F/9M)	56%	45 (11F/34M)	67%	64 (21F/43M)	63%
Graduated (Associate's degree but no transfer)	8 (3F/5M)	24%	11 (3F/8M)	16%	19 (6F/13M)	19%
Still Enrolled (in community college in 2017 or 2018)	7 (4F/3M)	21%	11 (3F/8M)	16%	18 (7F/11M)	18%
Dropped Out	0	0%	0	0%	0	0%
TOTALS:	34 (17F/17M)	100%	67 (17F/50M)	100%	101 (34F/67M)	100%
Associate's Degrees:	23 (10F/13M)	68%	42 (12F/30M)	63%	65 (22F/43M)	64%
Bachelor's Degrees:	4 (1F/3M)	12%	15 (6F/9M)	22%	19 (7F/12M)	19%

Figure 5. Outcomes (as of 7/5/18) for All 101 CCBC MCIS S-STEM Awardees from Fall 2014 through Spring 2018 by Initial Mathematics Placement Level upon Entry to CCBC.

Awardee Outcome	Females		Males		Combined	
	Number of Awardees	% of Awardees	Number of Awardees	% of Awardees	Number of Awardees	% of Awardees
Associate's Degrees:	22	65%	43	64%	65	64%
Transferred to 4-yr	21	62%	43	64%	64	63%
Bachelor's Degrees:	7	21%	12	18%	19	19%
TOTAL AWARDEES:	34		67		101	

Figure 6. Outcomes (as of 7/5/18) for All 101 CCBC MCIS S-STEM Awardees from Fall 2014 through Spring 2018 by Gender.

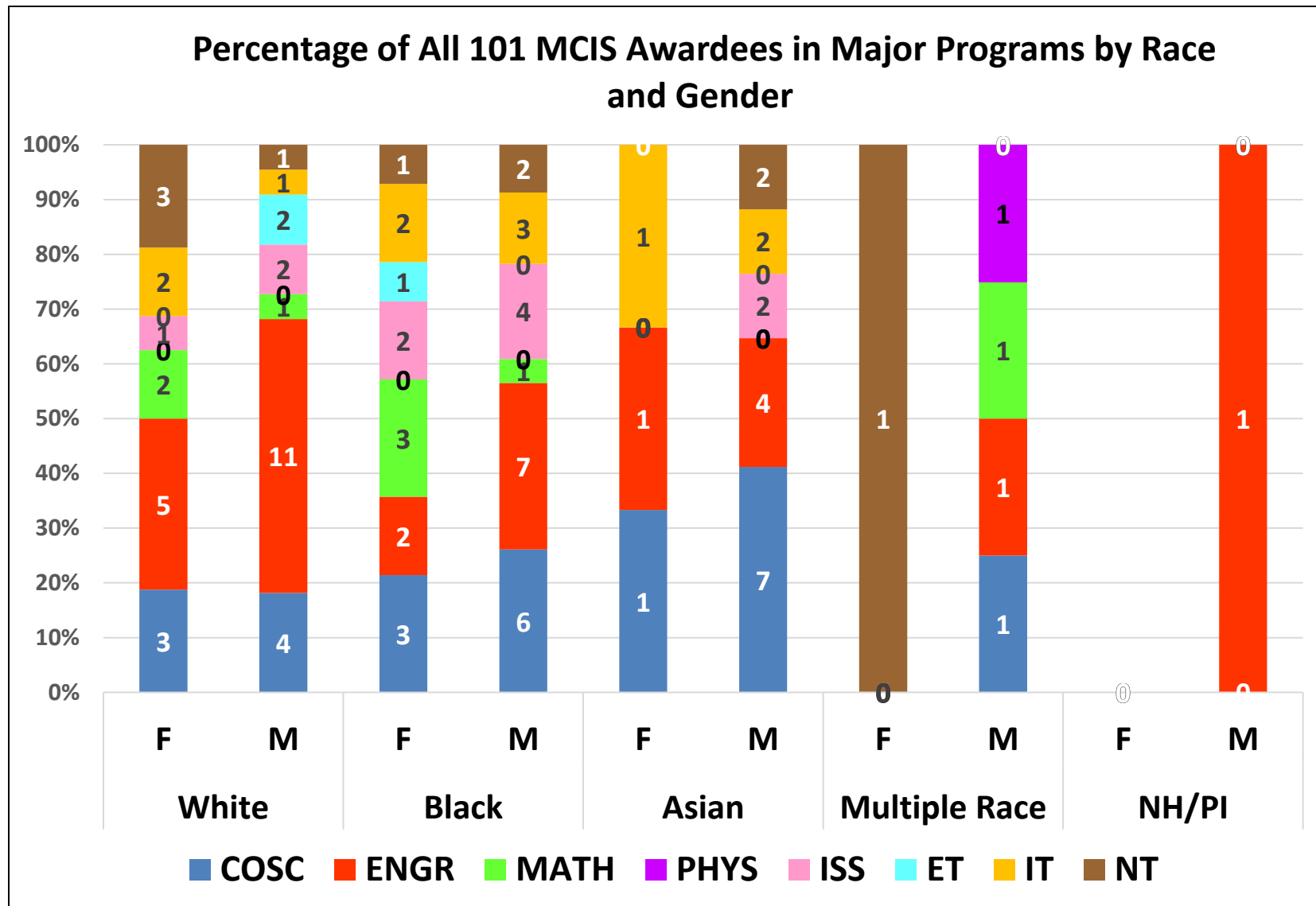


Figure 7. Percentage of All 101 MCIS Awardees in Major Programs by Race and Gender through Spring 2018 (showing number of awardees in each group at end of Year 4)

Awardee Outcome	MCIS Awardees Fall 14 – Spring 18		Racial/Ethnic Group									
			White		Black		Asian		Other		Hispanic/Latino	
	Number of Awardees	% of Awardees	Number of Awardees	% of Awardees	Number of Awardees	% of Awardees	Number of Awardees	% of Awardees	Number of Awardees	% of Awardees	Number of Awardees	% of Awardees
Transferred to 4-yr	64 (21F/43M)	63%	25 (11F/14M)	66%	24 (8F/16M)	65%	11 (2F/9M)	55%	4 (0F/4M)	67%	3 (1F/2M)	60%
Graduated (Associate's degree but no transfer)	19 (6F/13M)	19%	8 (3F/5M)	21%	5 (2F/3M)	14%	4 (0F/4M)	20%	2 (1F/1M)	33%	0	0%
Still Enrolled (in community college in 2017 or 2018)	18 (7F/11M)	18%	5 (2F/3M)	13%	8 (4F/4M)	22%	5 (1F/4M)	25%	0	0%	2 (1F/1M)	40%
Dropped Out	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
TOTALS:	101 (34F/67M)	100%	38 (16F/22M)	100%	37 (14F/23M)	100%	20 (3F/17M)	100%	6 (1F/5M)	100%	5 (2F/3M)	100%
% Female in that Racial/Ethnic Group:	34/101	34%	16/38	42%	14/37	38%	3/20	15%	1/6	17%	2/5	40%

Figure 9. Awardee Outcomes for 101 CCBC MCIS S-STEM Scholars by Racial/Ethnic Group.

Note: Hispanic may be any race. Awardees declaring as Hispanic/Latino self-identified as 2 White, 2 Multiple Races, and 1 Black.

Awardee Degree Outcome	MCIS Awardees Fall 14 – Spring 18		Racial/Ethnic Group									
			White		Black		Asian		Other		Hispanic/Latino	
	Number of Awardees	% of Award-ees	Number of Awardees	% of Award-ees	Number of Awardees	% of Award-ees	Number of Awardees	% of Award-ees	Number of Awardees	% of Award-ees	Number of Awardees	% of Award-ees
Associate’s Degrees:	65 (22F/43M)	64%	27 (11F/16M)	71%	24 (9F/15M)	65%	11 (1F/10M)	55%	3 (1F/2M)	50%	1 (0F/1M)	20%
Bachelor’s Degrees:	19 (7F/12M)	19%	7 (3F/4M)	18%	8 (4F/4M)	22%	2 (0F/2M)	10%	2 (0F/2M)	33%	1 (0F/1M)	20%
Earned at least one of these degrees (Associate’s or Bachelor’s):	70 (23F/47M)	69%	28 (12F/16M)	74%	26 (9F/17M)	70%	12 (1F/11M)	60%	4 (1F/3M)	67%	1 (0F/1M)	20%
TOTALS:	101 (34F/67M)	100%	38 (16F/22M)	38%	37 (14F/23M)	37%	20 (3F/17M)	20%	6 (1F/5M)	6%	5 (2F/3M)	5%

Figure 10. Degree Outcomes for 101 CCBC MCIS S-STEM Scholars by Racial/Ethnic Group

Note: Hispanic may be any race. Awardees declaring as Hispanic/Latino self-identified as 2 White, 2 Multiple Races, and 1 Black.