

## **Scholarships and Academic Support for Minority Student Success**

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# Scholarships and Academic Support for Minority Student Success

## Abstract

In this innovative and technology driven global market, to remain competitive US needs to increase the number of STEM graduates and develop a diverse workforce. The purpose of this paper is to analyze the effect of scholarships and various academic supports like, mentoring, undergraduate research, career and professional development activities to increase the minority student success, retention, and graduation.

This study analyzes the demographics and performance of a cohort of National Science Foundation (NSF) Scholarship Recipient Students supported by an NSF Grant. In addition to scholarships, various academic supports are provided to these talented but financially needy minority students. Statistical analyses of the NSF scholarship recipient students' cumulative GPA, retention rate, graduation rate, and graduation time are analyzed, and compared with those of all the students in the concerned majors, college and the university. Student surveys are also conducted to examine the perception or self-evaluation of the students in this matter.

It was found that the demographics of the NSF Scholars under study are similar to all the students in the concerned majors, the college and university. However, the cumulative GPA, retention rate, graduation rate, and graduation time needed are significantly better compared to their peers. This study shows that, the scholarships and various academic supports provided to the talented but financially needy minority students had significant impact on student success, retention, and graduation.

## 1. Introduction

In an increasingly competitive and technology driven global economy, the future prosperity of U.S. to succeed depends in a large measure on a STEM educated workforce. During the next decade, U.S. demand for scientists and engineers is expected to increase four times compared to other occupations [1],[2]. Yet, only 32% of undergraduates in the U.S. receive their degrees in STEM while the corresponding figures for Japan, China, and Germany are 55%, 59%, and 36%, respectively [3]. According to a report published by the UCLA Higher Education Research Institute, while the parity gap between White and Asian students and their underrepresented racial minority peers inspired to be STEM majors has been reduced, the degree completion rates still show a wide disparity between these groups [4]. Though approximately 33% of White and 42% of Asian Americans completed their bachelor's degree in STEM within five years of college entry, STEM completion rates for African American students was only 18.4% [4],[5]. Gaps in race/ethnicity and gender at entry and in completion of science, technology, engineering, and mathematics (STEM) programs indicate that the U.S. struggles to develop a diverse workforce that can compete globally.

Alabama A&M University (AAMU) is a major historically black (HBCU) land-grant and EPSCoR institution established in 1876 with a mission of providing high quality education for over 6300 underprivileged and low-income African-American students. The ethnic distribution of students at AAMU is 91% black, 5% white, and 4% represented by all others. AAMU set a

priority to provide low-income students with higher education and ensure their success through retention, graduation, and advancement.

Alabama A&M University has an extremely large number of students that are in desperate need for financial assistance and support in order for them to continue their higher education and obtain a degree. These students come from low-income households and are first-generation college students. Most of them arrive on AAMU's campus without (1) adequate academic and social preparations, (2) knowledge about college experience and finances, and (3) role models or mentors [6],[7]. Based on recent enrollment data, more than 80% of AAMU students require one or more forms of financial assistance to remain enrolled and 71% are Pell-grant recipients which mean 71% of AAMU students come from low-income households. To meet financial needs approximately 90% of the students enrolled in engineering, technology and computer science programs spend more time working different low-pay jobs. This leaves them tired and inattentive in class and they often show up late or not at all. Subsequently, this affects their grades and ultimately they are not interested in continuing their studies. As a result, the average Freshman 1-year Retention Rate in the College of Engineering, Technology & Physical Sciences (CETPS) at AAMU is 66% and overall retention rate is only 32%.

To address this problem, Alabama A&M University received a grant from National Science Foundation (NSF Award#1564893) to provide scholarships to talented but financially needy students in Mechanical Engineering, Computer Science & Construction Management programs in the College of Engineering, Technology & Physical Sciences (CETPS). Though these scholarships are open to everybody, but the recipients are mostly minority African-American students including female students. In addition, this grant plans to provide academic support like mentoring, undergraduate research opportunity, and career/professional development activities to enhance student success, degree completion, proper employment and/or continuation to graduate school. The purpose of this study is to assess the effectiveness of scholarships and various project activities on retention, success, and graduation of minority African-American students in engineering & technology [8]-[12]. The institutional data required for this analysis are obtained from AAMU Office of Institutional Planning & Research (AAMU Fact Book) [13].

## **2. Support Systems and Interventions**

The overall goal of this project is to increase the success of low income academically talented minority students with demonstrated financial need pursuing baccalaureate degrees in engineering and technology, through providing scholarships and adaptation of academic and professional development activities that support recruitment, retention, student success, and graduation.

To achieve this overall goal, the scholarship management committee solicited applications and provided scholarships and academic support to a total of 50 talented low income mostly minority undergraduate students in Mechanical Engineering, Construction Technology and Computer Science programs, during the last 5 years. The students were awarded up to \$6,250 scholarship per year through the Office of Financial Aid at Alabama A&M University. They were asked to maintain a GPA of 3.0 or better and participate in professional development activities. The Scholarship Management Committee having the PI and three Co-PIs (faculty members of

different engineering, technology, computer science, & education programs) managed the various activities.

Each scholarship recipient student was assigned to an NSF Scholarship Mentor, in addition to his/her department advisor, and were asked to meet with them regularly. The NSF Scholarship Mentors (PI/Co-PIs of this NSF grant and Faculty Members in the respective majors) did an excellent job in communicating regularly with the scholarship recipient students in personal level, advising them continuously with their academic and non-academic problems, motivating them for success, and work as role model for their future career. As a result, most of the NSF scholarship recipient students were involved in various Professional Organizations, attended career development activities/workshops at AAMU like resume writing, interviewing skills, preparation for graduate schools, attended industry career fair, received undergraduate research or STEM internship opportunities. The NSF Faculty Mentors continuous guidance helped the students to maintain or improve their GPA, and significantly increase student retention and success.

All of the scholarship recipient students were registered with the Career Development Services (CDS) of Alabama A&M University and participated in career activities. The Career Development Services arranges various professional development activities including resume writing and mock interviews (to enhance student interviewing skills), campus Career Fairs, etc. Representatives from over 100 companies attend the AAMU Campus Career Fair every semester to recruit students for job or internship. The PIs of this NSF grant worked with the Director of Career Development Services for active involvement of the scholarship recipient students in these career development activities. Most of the scholarship recipient students received undergraduate research and/or STEM internship opportunities from industries during their study at Alabama A&M University, before their graduation. The PIs of this NSF grant (STEM faculty members) either tried to involve the scholarship recipient students in undergraduate research with them or tried to connect them with other STEM faculty members for doing research.

The PIs in collaboration with the AAMU Tutorial Assistance Network (TAN) provided additional Supplemental Instructor (SI) for peer tutoring in STEM gatekeeper courses where more attrition occurs. The NSF Scholarship Mentors (PIs) motivated the scholarship recipient students having difficulty in any course to meet the Supplemental Instructor for peer tutoring and attend the study sessions, and succeed in the course.

### **3. Results and Discussions**

#### **3.1. Cumulative Grade Point Average Analysis**

As mentioned above, the purpose of this study is to evaluate whether the scholarships and academic support activities provided through the NSF grant had any positive impact on the minority student success. Cumulative grade point average (GPA) can be used as one of the instruments for quantitative measurement of student success. Hence, Cumulative GPA of the NSF STEM Scholars at a particular semester are compared with those of the students in Mechanical Engineering, Computer Science & Construction Management majors, the college and university, as shown in Table 1. Alabama A&M University uses a four-point scale for GPA calculation. The Mechanical Engineering, Computer Science, and Construction Management

major student cumulative GPA data, CETPS undergraduate student cumulative GPA data and all AAMU undergraduate student cumulative GPA data were obtained from AAMU Office of Institutional Planning & Research. The cumulative GPA of the students in the Freshman, Sophomore, Junior, and Senior cohorts, as well as combined are analyzed and presented as Average  $\pm$  Standard Error of Mean (SEM). To test the Alternative Hypothesis, “Academically talented but financially needy students studying in STEM disciplines at an HBCU does perform significantly better (in terms of GPA) when scholarships and other academic supports are provided, compared to other students in major, college or university, at  $p=0.05$  level of significance”, statistical analysis of GPAs are performed using Student’s t-test. As shown in Table 1, it was found that cumulative GPA of the minority African-American STEM students receiving NSF Scholarships and other academic supports (NSF STEM Scholars) were significantly better than the cumulative GPA of all the students in the Mechanical Engineering, Computer Science & Construction Management majors, the College of Engineering, Technology & Physical Sciences (CETPS) and the University (AAMU), at  $p < 0.05$  level of significance (indicated with star). Most of the minority students at AAMU have to work more than 40 hours per week for low-paid jobs to remain in college. The NSF scholarships helped the students to work less, spend more time in studying and improve GPA, retention rate, and successful graduation, compared to their peers (other students in the program, college or university). Fig. 1 also shows the comparison of the Average GPA of NSF Scholars with the students in the concerned majors, college and university.

Table 1. Cumulative GPA (AAMU Undergraduate students).

Major	GPA									
	Freshman		Sophomore		Junior		Senior		All Classes	
	Ave $\pm$ SEM	(n)	Ave $\pm$ SEM	(n)	Ave $\pm$ SEM	(n)	Ave $\pm$ SEM	(n)	Ave $\pm$ SEM	(n)
NSF STEM Scholars	3.99 $\pm$ 0.0003	2	3.43 $\pm$ 0.032	8	3.58 $\pm$ 0.028	13	3.57 $\pm$ 0.021	10	3.56 $\pm$ 0.016	33
Mechanical Engineering	1.84 $\pm$ 0.107*	102	2.62 $\pm$ 0.107*	74	2.85 $\pm$ 0.047*	58	2.91 $\pm$ 0.063*	48	2.58 $\pm$ 0.057*	282
Computer Science	1.92 $\pm$ 0.098*	143	2.64 $\pm$ 0.075*	63	2.32 $\pm$ 0.167*	45	2.91 $\pm$ 0.070*	41	2.45 $\pm$ 0.055*	292
Construction Management	2.24 $\pm$ 0.040*	30	2.08 $\pm$ 0.313*	24	2.12 $\pm$ 0.133*	21	2.63 $\pm$ 0.176*	16	2.23 $\pm$ 0.085*	91
CETPS (College)	1.90 $\pm$ 0.057*	457	2.58 $\pm$ 0.054*	246	2.61 $\pm$ 0.060*	196	2.92 $\pm$ 0.031*	201	2.53 $\pm$ 0.028*	1100
All AAMU (University)	1.86 $\pm$ 0.030*	2087	2.59 $\pm$ 0.026*	1220	2.70 $\pm$ 0.023*	877	2.93 $\pm$ 0.013*	801	2.54 $\pm$ 0.014*	4985

\*Significant Difference at  $p < 0.05$

It may be mentioned here that, majority of the peer students “other students in the program, college or university” (with whom the NSF STEM Scholars GPA are compared) do not receive substantial amount of any other scholarships, and have to work long hours for low-paid jobs to remain in college.

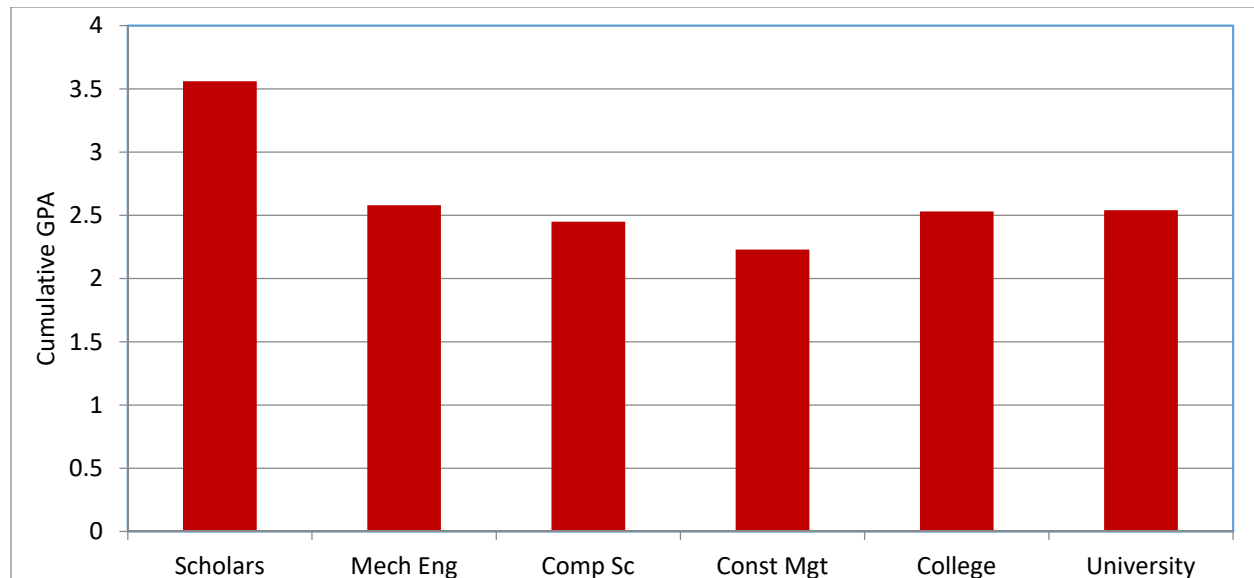


Fig. 1. Average GPA of NSF Scholars and other students in majors, college and university.

### 3.2. Retention Rate Analysis

The students Retention Rate in the program after certain years can be used as the second instrument to measure quantitatively whether the scholarships and academic support activities provided through the NSF grant had any positive impact on the minority student success. The retention rate of the NSF STEM Scholars, all the students in the Mechanical Engineering, Computer Science & Construction Management majors, the College (CETPS) and the University (AAMU) after 1-year and after 4-year are shown in Table 2 and Fig 2. The retention rate data for all the students in the different majors, college and university are obtained from AAMU Office of Institutional Planning & Research (AAMU Fact Book). After 1-year, the retention rate for NSF STEM Scholars was found to be 100% (no one dropped out), while retention rate for all students in the majors ranges from 68.8 to 75%, the college 66.5%, and the university 63.0%, which means the attrition rate during the first year is quite large. But after 4-year, the retention rate for NSF STEM Scholars is found to be 96%, while retention rate for all the students in majors is found to range from 37.5% to 50%, the college 39.0%, and the university only 32.4%, which means 67.6% of students left the university. Though it is not known whether some of the students leaving the university enrolled in some other universities, or the students leaving the STEM-majors moved to some non-STEM majors, the attrition rate of the students in 4-years (percentage of students leaving the program or university) is alarming.

As already mentioned, a large number of students at Alabama A&M University come from low-income households and are first-generation college students, arrive AAMU's campus without adequate academic and financial preparations, and have no role model or mentor. To meet financial need approximately 90% of the students enrolled in engineering, technology and computer science programs spend more time working different low-pay jobs (over 40 hours per week). This leaves them tired and inattentive in class and they often show up late or not at all [14],[15]. Subsequently, this affects their grades and ultimately they are not interested in continuing their studies. The NSF scholarships helps the student to work less for low-pay jobs, and devote more time in studying. The faculty mentoring provided by the experienced faculty

(NSF grant PIs) tries to connect with the students in personal level, advise them in various academic and personal issues, and serve as role model. The scholarships, faculty mentoring, various career and professional development activities provided through this NSF grant to the NSF STEM Scholars significantly increased their retention rate in the undergraduate STEM programs, almost all of them are continuing in their programs, as seen from Table 2 and Fig 2. The mentoring program provided to these NSF scholarship recipient students by experienced faculty in the major, provided professional guidance for their success, which is reflected in their higher GPA, retention and graduation rate compared to their peers, and also supported through the student survey below.

Table 2. Retention Rates for NSF Scholars and First-time in College students.

Major	Retention (after 1-year) (%)	Retention (after 4-year) (%)
NSF STEM Scholars	100	96.0
Mechanical Engineering	68.8	37.5
Computer Science	71.4	40.0
Construction Management	75.0	50.0
CETPS (College)	66.5	39.0
All AAMU (University)	63.0	32.4

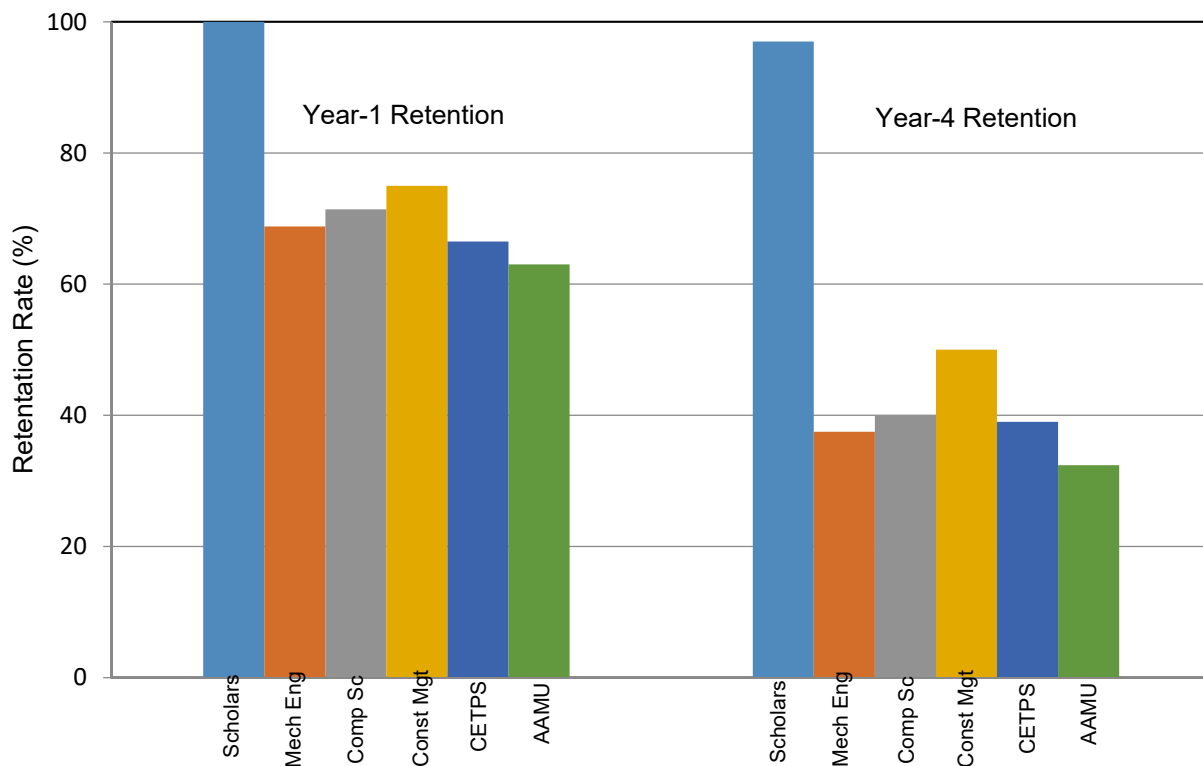


Fig 2. Retention Rates for NSF Scholars and FTIC students after 1-year and 4-year.

### 3.3. Graduation and Professional Placement

Out of the 50 students supported through this NSF grant, 48 students successfully graduated and only 2 students left the program. This means the NSF scholarship recipient students graduation rate is 96%, which is significantly high compared to the College of Engineering Technology & Physical Sciences student graduation rate in 6-years of only 26%.

Again, 47 students graduated with GPA 3.0 or better, which means 94% students maintained GPA 3.0 or better. Out of the total 48 scholarship recipient students graduated, 22 were Female (46% of graduate scholars) and 26 were Male students, though in the college percentage of female students is only 32%.

The program tried to contact the students after graduation and 38 students responded. Out of these 38 scholarship recipient students graduated, all of them are Employed in their professional field or entered Graduate school upon graduation, 100% success.

### 3.4. Analysis of Student Survey

The students' self-evaluation or assessment can be taken as another instrument to measure the effect of the scholarships and academic supports provided through this NSF grant on the student success, retention, and graduation. For this reason, a student survey was conducted among 33 NSF scholarship recipient students, and a partial list of survey questions are shown in Table 3.

Table 3. Partial list of Questionnaire from Student Survey.

Q#	Student Survey Questions
Q1	The NSF Scholarship helped me to do less hours of low-paid work for my financial support and devote more time in studying and improve my grades, remain in school, and graduate in time.
Q2	The mentoring provided by the Faculty Mentors of the NSF program provided professional guidance, encouraged me in my studies and maintain good GPA, and focus on my career.
Q3	The AAMU Career Development activities like Resume Writing Workshop, Mock Interviews, Career/Job Fair interviews with Industry Professionals, helped my professional development, and prepare me for jobs, internships and co-ops, and/or graduate schools.
Q4	The undergraduate research and industry internship opportunities prepared me better for my future career.

The response of the NSF scholarship recipient students (33 numbers) to the above survey questions are shown in Fig 3. As shown in the figure, all the students Strongly Agree or Agree that The NSF Scholarship helped them to do less hours of low-paid work for his/her financial support and devote more time in studying and improve grade (enhance GPA), remain in school (improve retention), and graduate in time (increase graduation rate and reduce graduation time required). As mentioned earlier, a large percentage of AAMU students have to work more than 40 hours per week for their financial support, to remain in college. Most of the students Strongly Agree or Agree that the Faculty Mentoring provided through this NSF grant by experienced faculty provided professional guidance, encouraged them in their studies and focus on their career (which consequently enhanced their GPA, retention and graduation rate). The students also Strongly Agree or Agree that the activities provided by AAMU Career Development Services, like workshops on resume writing and mock interviews, career/job fair interviews with industry professionals, helped in their professional growth, prepare them for professional jobs



and/or graduate school. These activities train the students to write better/effective resumes, dress and act professionally during interviews, and connect to industries for jobs & internships, or prepare for graduate schools. Most of the students Strongly Agree or Agree that the undergraduate research and internship opportunities in industry prepared them better for their future career. All these activities enhance student success, retention, and graduation.

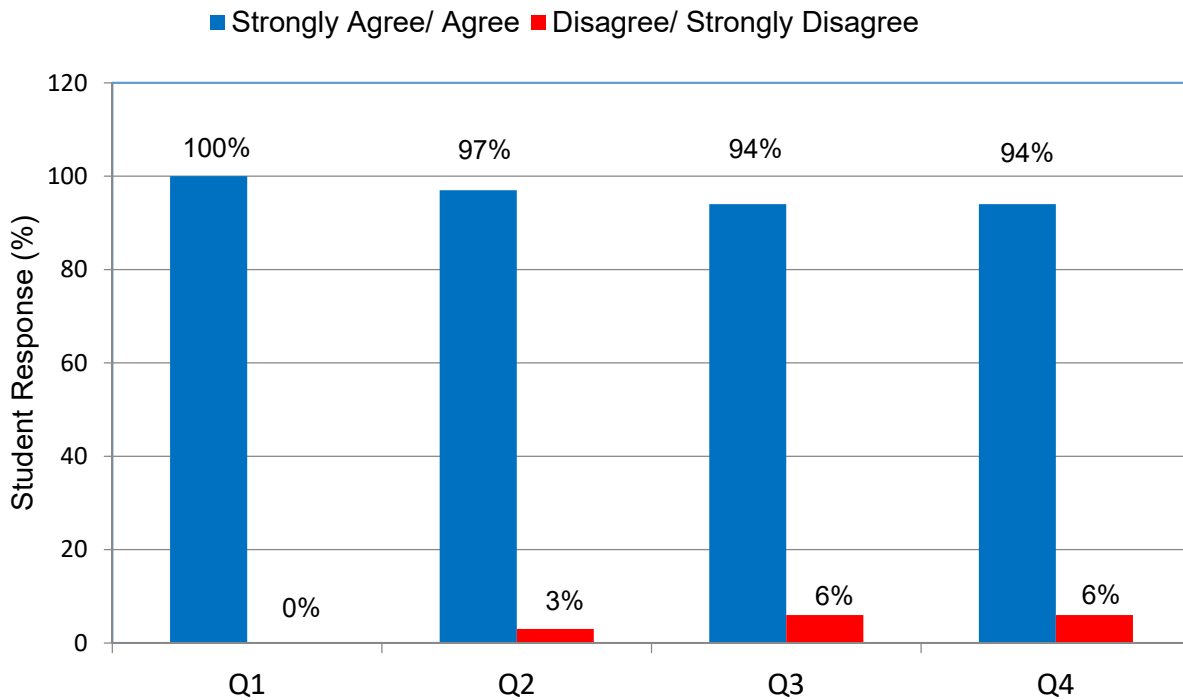


Fig 3. Response of NSF Scholars during Student Survey

#### 4. Conclusion

This study shows that, the NSF Scholarships and various academic supports, like, faculty mentoring, career and professional development activities provided to the talented but financially needy minority African-American students had significant positive impact on student success. Due to the scholarships, these minority low income students could devote more of their time in studying rather than doing low-income jobs to support them in college. The faculty mentoring by experienced faculty served as role models and helped the NSF scholars to focus on their studies. The career development activities enhanced their professional growth. As a result, the Cumulative GPA, Retention Rate, and Graduation Rate of these NSF STEM Scholars significantly increased, and graduation time needed significantly decreased compared to their peers.

#### 5. Acknowledgement

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