Initiatives to financially, academically, and socially support underrepresented minorities in STEM disciplines

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Abstract

Attracting and retaining students in STEM disciplines is still a struggle for academic universities across the nation. There has been curriculum reforms and many initiatives in higher education to make STEM programs more attractive to incoming freshmen. Along the same lines, some of greatest challenges faced by STEM workforce is the lack of diversity where the workplace is not well represented by underrepresented and/or disadvantaged populations. To address these challenges, academic institutions offering STEM programs are investing time and effort to increase and retain underrepresented STEM students by bringing in initiatives that would best serve the interest of these underrepresented groups. This paper describes such retention and recruitment initiates introduced at a state university which has seen a dramatic increase of Hispanic STEM students in the recent years and has historically high numbers of economically-disadvantaged and first-generation college students. A cohort of students were formed after careful evaluation of the candidate's profile according to a set of selection criteria. These were students in the engineering, computer science, and mathematics disciplines representing rural, economically disadvantaged students, minority, predominantly Hispanic students, and first-generation college students. This paper will highlight and evaluate the various initiatives adopted in this project to ensure the retention and graduation of this cohort of students. The impact of financial, academic, and social support given to the selected group of students will be discussed in this paper. Results from focus groups, surveys, and student testimonies collected from this project will be briefly discussed in this paper to the benefit of universities seeking ways to recruit, retain, and graduate underrepresented minority students in STEM disciplines.

Keywords: retention and recruitment initiates, underrepresented STEM student, disadvantaged populations

1. Introduction

Retaining and increasing the success of STEM students coming from an economically disadvantaged, underserved, and predominantly rural regions have always been a challenge in higher-ed [1-3]. Identifying the diverse needs of these student population that go beyond just academics along with building a strong support system addressing these needs has been the focus of many universities [4-10]. Disadvantaged students struggle academically due to lack of proper support and a venue to voice their concerns. Studies have shown that students in economically disadvantaged rural schools lack access to advanced training necessary to achieve the highest educational and job goals in science, technology, engineering, and mathematics (STEM), adding to the disparity in excellence. Research has shown that for some of these initiatives to be successful, the exposure to STEM fields have to start early on in their K-12 education. The research study conducted by Ihrig et.al [11] analyzed the perspectives of 78 high-school students and their 32 teachers, participating in an extracurricular, school-based, STEM talent development program for rural students from economically disadvantaged communities. Using qualitative and quantitative data sources, the researchers were able to determine the general trends in the

curriculum as well as detailed results of the interactions of educators and students. Qualitative program evaluation data sources included both open-ended and closed-ended survey. The former included a focus group interview with STEM Excellence coordinators and teacher while the latter included a structured survey instrument completed by students about their experiences in the program and general demographic data. At the end of the academic year, teachers performed a supplementary online survey. Findings suggest that students and teachers shared satisfaction with involvement in the program, and that they thought about their work more creatively and objectively. Analysis of focus group responses and open-ended survey data gave rise to three primary themes describing the perspectives of educators on their STEM Excellence program experiences: (a) Increased understanding, (b) Increased recognition, and (c) Enhanced awareness. Results also showed that the impression of students about mathematics and science activities were significantly different, which provides information on ways to improve programming for future high-performing rural students. These findings broaden the literature to support the use of informal STEM education environments for underserved talented populations to increase engagement and access to demanding curricula [11].

A case study analytical methodology, including record review, semi-structured interviews, and participant observations, used by Lane [12] analyzed how the Comprehensive STEM Program (CSP) program promoted the retention and graduation of underrepresented students at a large, public, predominantly white institution. Qualitative data were used to explain both the curriculum and how it affects student outcomes. Examples of data included interviews, interactions with the participants and records. The study had few limitations: 1) The qualitative methods used in this study limit the generalizability of the findings 2) primary usage of interviews to construct the model that emerged from this study. The latter was mitigated using multiple data sources in this study, in the form of interviews, observations, and document analysis, to strengthen the validity of the findings. A model emerged from this study which included four components: proactive treatment, holistic support, community building and STEM identity creation catalysts. Such elements included several approaches and activities which were influential in program participant outcomes. More than serving as a conduit for academic and social integration, several authors have failed to consider the complexities and nuances of the program's role. Many researchers referred to the college experience as the black box [13], as it is difficult to determine which factors lead to retention or attrition of the students. In the current study, an integrated conceptual framework that examined aspects of student success, sense of belonging, scientific identity, and conceptions of care within a STEM enrichment program enlightened a multifaceted model for identifying and describing the program's inner workings and resulting student outcomes.

Wilson et al. [14] in their paper discuss how the introduction of two NSF-based scholarship programs has shown substantial and measurable progress, allowing the University to provide scholarships within the STEM disciplines to economically disadvantaged learners. The combination of multifaceted mentoring approaches with financial aid addressed the social and financial gaps experienced by economically disadvantaged students in higher education. The success of those programs were demonstrated by its participants ' graduation rates. Upon developing a successful mentoring program, the costs for college education were leveraged

efficiently and effectively, graduation rates increased, many students received regional/national awards and recognitions; and student performance (GPA) improved. Enriquez et al. [15] in their paper describe how a small federally designated Hispanic-serving community college has established a scholarship program for financially vulnerable community college students who wish to move to a four-year university to obtain a bachelor's degree in a STEM field. Developed through a S-STEM grant NSF Scholarship, the program included cooperation between STEM teachers, college employees, administrators, student organizations and industry partners, four-year colleges, local high schools and professional organizations. In addition to providing financial support, student access to academic capital was enhanced by an intensive math review program, tutoring, study groups, additional training, and internship opportunities for research. Access to cultural and social capital was increased by providing scholars with faculty mentors; engaging students with STEM faculty, university researchers, and industry professionals through field trips, summer internships, professional organizations, and student clubs; supporting student and faculty participation at professional conferences, and providing opportunities for students and their families to interact with faculty and staff.

In order to run a successful scholarship program, financial support plays an important role. But, the other services offered through the program also help with the overall progress of the students receiving the scholarships. The key to building a successful scholarship program depends on the activities that will benefit the cohort not only financially but also academically, professionally, and socially. Studies have shown us that financial, academic, professional, and social support to STEM students helps with retention and graduation rates [16].

In this paper, one such initiative that was funded by NSF SSTEM program has been discussed in detail with the results obtained so far. The remaining of the paper is structured as follows: Section 2 discusses few recent NSF S-STEM scholarship programs and their results. Section 3 presents background information about West Texas A&M University, previous awards obtained, and the success stories. Sections 4 discusses details about the TEAMSF grant received from National Science Foundation (NSF), the application process, selection criteria, total number of awards given out so far, student demographics, degree programs, and the new initiatives introduced as a part of this NSF program. Results pertaining to student involvement in different activities and the retention rates recorded during Year 1 and Year 2 are discussed in Section 5. Section 6 concludes the paper with future work.

2. Related Work

In this section seven recently awarded NSF S-STEM scholarship programs were studied to understand the model used, services offered through the scholarship program, and the outcomes achieved. The main purpose of this analysis was to understand the number of students involved in the scholarships, their demographics, disciplines involved, and most importantly the services offered through these programs to help the students academically, professionally, and socially. Important results as reported by the authors have been listed in this section to study the significance of the support services offered through the programs.

1) SPIRIT: Scholarship Program [17]

University: Western Carolina University

Discipline: Engineering and Engineering technology

Number of students: 27 new and continuing students

Initiatives:

1.Peer and faculty mentoring

2. Vertically integrated Project Based Learning (PBL)

3. Undergraduate research experiences

Results:

Peer discussion groups reduced their anxiety concerning time management and alleviated their anxieties associated with degree completion

2) Building a Community of Scholars [18]

University: Robert Morris University

Discipline: Engineering, Mathematics, and Science

Number of students: 21 students

Initiatives:

1**.** Living arrangements were made for the cohort

2. Mathematics and Science Boot Camp (MSBC) orientation sessions were conducted. These sessions included community service, cultural activities, reading and writing skills strategies, note taking, time management, critical thinking, and decision making skills

3. Living-Learning cohort which included meeting with professionals, sharing their internships, co-ops, and research experiences with other students

4. Involved in several community service projects

Results:

1**.** High retention rate

2. Good overall academic performance

3. Successful adjustment to the university

4. Desire to remain together as a community of learners

3) NSF S-STEM Scholarship [19]

University: University of Akron

Discipline: Engineering, Arts and Sciences

Number of students: 16 students, 5 years

Initiatives:

1. Two, one-credit courses
2. Peer mentoring of seniors to freshmen

Results:

1. Beneficial to the retention of the freshmen
2. New study habits and the importance of time management
3. Experience in research, report writing, and poster presentations were also found to be very beneficial to the freshmen

4) NSF S-STEM Scholarship [20]

University: University of Maryland Baltimore County

Discipline: Mechanical engineering

Number of students: 45 students, 5 years

Initiatives:

1. Proactive recruitment
2. Selected high impact practices such as orientation, one-to one faculty mentoring, peer mentoring, and community building
3. Participation by students in research-focused activities such as research seminars and undergraduate experiences
4. Participation by students in career and professional development activities

Results:

1. Feel a stronger sense of community on the campus over the non-scholar affiliated

Colleagues

2. Women in the S-STEM have an easier time integrating academically as well as transfer students in the program

5) ECE Scholars [21]

University: Seattle University

Discipline: Electrical and Computer Engineering

Number of students: 32 students, 5 years

Initiatives:

1. Peer tutoring, informal study partners and industry mentorship program
2. Professional development seminars and social activities.

Results:

1. Positive impact on the department in terms of strengthening the collaborative community
2. Willing to engage with other students and help organize formal or informal social and professional events
3. Contributing positively to its learning community

6) NSF S-STEM Scholarship [22]

University: Purdue University Northwest

Discipline: Engineering, Math, and CS

Number of students: 59 total participants

Initiatives:

1. Tutorial and writing assistance, undergraduate research opportunities, visitations to research laboratories and graduate schools
2. Attendance and/or participation in research conferences and professional career counseling
3. Work experiences intrusive services provided by a Federal TRIO Program

Results:

1. Academic performance

2. Successful completion of the college degree and applying for employment and graduate study

3.Students benefited from the expertise of faculty members in terms of instruction, research, and career development

7) Pathways for Engineering: Access to Resources for Learning (PEARL) [23]

University: Northern New Mexico College

Discipline: Engineering and Technology

Number of students: more than 50 different students

Initiatives:

1. Student recipients participated in orientation meetings and college service activities such as peer tutoring and recruitment activities

2."Brown Bag Lunch" gatherings with faculty

Results:

1. Very successful retention strategy

2. Helped students focus on their studies and increased their credits per semester

3. Background

A. About the university

WTAMU, a member of the Texas A&M University System, is a Hispanic Serving Institution and regional university that provides comprehensive higher education opportunities in an underserved, predominantly rural, economically disadvantaged region of the state. WTAMU's student population includes several overlapping groups that have historically been underrepresented in STEM and/or are less likely to be retained in and graduated from STEM programs. These groups include a) a predominantly rural, economically disadvantaged population (70%), b) a large minority student population (31%), and c) first-generation college students (~50%).

Seventy percent of WTAMU students come from 26 largely rural counties in the Texas Panhandle[24]. Economic disadvantage requires most WTAMU students to work part-time or full-time to support themselves while attending school, placing them at an academic disadvantage and increasing the risk that they will not complete their degree. The per capita income of the WTAMU service area is $15,833 compared to that of $19,617 for Texas and

$21,587 for the United States. Only 18% of the region's residents have a bachelor's degree or higher, well below the state and national averages (23% and 24%, respectively). As a result, almost 50% of the undergraduate students at WTAMU are first-generation college students [25]. In the Texas Panhandle, 44% of the public school population is minority (37% Hispanic), and the schools serve 14,000 migrant students, the second largest migrant student population in the state of Texas [24].

At WTAMU, the number of STEM majors nearly doubled (from 697 students to 1240 students) from fall 2005 to 2014. This growth occurred in three ethnic groups: Black Non-Hispanics increased 195% (from 20 to 59 students), White Non-Hispanics increased by 35% (from 530 to 716), and Hispanics increased by 229% (from 103 to 339). The increase in Hispanic student participation in the STEM disciplines may be due, in part, to the growing young Hispanic population in the Texas Panhandle and across the state. In 2004, the K-12 student population in the Texas Panhandle region was 37% Hispanic.

WTAMU retains about two-thirds of the first-year freshman into the second year, but STEM majors retain less than half of first-year students into the second year. By the third year, STEM retention rates are 20 percentage points behind other disciplines. These trends continue through graduation, resulting in STEM graduation rates that are less than half the rate of other university programs, and perhaps more concerning, less than half the national average for STEM programs.

B. Previous SSTEM awards and success within engineering, computer science, and mathematics disciplines

WTAMU TEAMS and C3 SSTEM programs have provided great opportunities to promote the recruitment, retention and graduation of underrepresented STEM students. Nationwide, less than 18% of engineering students are females and less than 13% are minority students [26]. Nonetheless, when looking at the 2007-2016 TEAMS and TEAMS2 scholarships for engineering and/or mathematics graduates, 31 % have been awarded to women and 30 % to minority students, and 90 % of TEAMS and TEAMS2 scholarship recipients either remain in their STEM fields or have graduated and are currently working in STEM positions. Similarly, when looking at the 2009-2013 C3 scholarships for STEM community college transfer students, 49 % were awarded to women and 38 % to Hispanic students, while the student population of WTAMU STEM was 33 % female and 22 % Hispanic.

4. NSF TEAMSF Scholarship

NSF S-STEM awards are aimed at achieving high quality STEM workforce in STEM disciplines workforce by focusing on low-income academically talented students with demonstrated financial need. Many universities have reported their success stories with NSF S-STEM grants at their institutions [27-31]. West Texas A&M University (WTAMU) received funding in fiscal year 2017 from the National Science Foundation (NSF) for a Scholarships in Science, Technology, Engineering, and Mathematics project (SSTEM) entitled Teaming Engineering and Mathematics Students for the Future (TEAMSF). The goal of WTAMU project is to develop well-trained professionals who are ready to contribute to the economic growth and competitiveness of the nation's work force. To accomplish this, the project has three objectives:

(1) increase the recruitment, retention, student success, and graduation of low-income, academically talented students pursuing degrees in STEM fields; (2) adapt, implement, and study models of effective evidence-based practices, and strategies that contribute to understanding of how these practices affect recruitment, retention, and student success; and (3) contribute to the implementation of co-curricular peer-led team learning (PLTL) and experiential learning activities.

A. Student selection, scholarship application, and awards

Students wishing to participate in TEAMSF must be US citizens, permanent residents, nationals or refugees; should have completed the WTAMU Scholarship Application Form; qualified for financial aid and have unmet financial need as determined by WTAMU Financial Aid office; and demonstrate academic potential in engineering and mathematics. Students planning to pursue or currently pursuing a degree in engineering or mathematics may apply for scholarship funds under this program regardless of academic classification, but preference is given to first- and second-year and transfer students. TEAMSF selection team jointly reviewed student applications usually during the first week of April. Applications were ranked using a scoring rubric giving points, based on application materials submitted, for categories related to eligibility criteria and interest. This rubric was developed through iterations of two previous S-STEM programs. In order to be granted scholarship renewal, students must: Maintain full time enrollment in engineering or mathematics; Have cumulative GPA >3.25 (exception may be granted for Scholars having a grade point during the most recent academic year greater than the Scholar's Cumulative GPA). Awards were made beginning in the fall semester each year. Students who do not meet the criteria for continuation entered into a one-semester probationary period with an analysis to identify the problem and additional supports to help the student overcome the problem.

The total number of S-STEM awards given out during Year 1 and Year 2 along with the dollar amount can be found in Table 1. Table 2 summarizes the total number of applications received, number of new awards given out during Year 1 and Year 2, and the total number of continuing scholars.

Table 1 Summary of proposed amounts and numbers of awards.

Academic Year	Number of S-STEM Awards	Amount
Year 1 (2017-2018)	11	$23,528
Year 2 (2018-2019)	25	$122,988
Total	36	$ 146,516

Table 2 Summary of applications and awards for the two-year period of the program.

	2017-2018	2018-2019
Number of Applicants	15	30
Number of New Awards	11	16

% Successful Applicants	83.5	80
Number of Continuing Scholars		9
Total Number of Scholars	11	25

B. Student demographics and program of study

Student demographic information collected during the first two years of the program can be found in Table 3. The degree programs of the TEAMSF cohort is listed in Table 4.

Table 3 Summary of student demographics of active NSF scholars

Demographics		**Academic Year 2017**		**Academic Year 2018**	
		No.	**%**	**No.**	**%**
Gender	Male	4	36.36	12	48
	Female	7	63.63	13	53
	Total	11		25	
Ethnicity	Hispanic	6	54.54	10	40
	White	4	36.36	14	56
	African American	1	9.09	1	4
First in Family to Attend College?	Yes	3	27	10	47.6
	No	5	45	11	52.4
First in Family to Study a STEM field?	Yes	6	54.5	15	71.4
	No	3	27	6	28.6

Table 4 Summary of majors of study of active NSF scholars

	Academic Year 2017		**Academic Year 2018**	
Major	**No.**	**%**	**No.**	**%**
Pre-Engineering	4	36.36	7	28
Mechanical Engineering	3	27.27	6	24
Environmental Engineering	2	18.18	2	8
Electrical Engineering	1	9.09	1	4
Civil Engineering	1	9.09	1	4
Computer Science	-	-	6	24
Mathematics	-	-	1	4
Engineering Technology	-	-	1	4
TOTAL	11		25	

C. Retention and recruitment initiates introduced

i. Academic Support

One of the ways TEAMSF scholars received academic support was through the incorporation of a formal Peer Led Team Learning (PLTL) into the classes for increasing engagement of students in STEM learning and also to provide other student support services to enhance retention and academic success.

A formal Peer Led Team Learning (PLTL) was incorporated into the TEAMSF mathematics classes and the success of this model as shown in Table 5. led to the introduction of PLTL with other classes where student success rates were low. Due to the varying levels of existing college credit among the participants, PLTL was expanded to include a wide variety of courses and topics. The number of courses that incorporated PLTL significantly increased from 9 in 2017-2018 to 31 in 2018-2019. The total number of students who got served through this program increased from 60 in 2017-2018 to 1,121 in 2018-2019. The tremendous success of this program can also be attributed to the fact that all the PLTL supplement instructors were given metacognitive training at the beginning of the each semester and periodic tips and strategies to increase student success. The School of ECSM has housed a College Success Coach to train these PLTL supplement instructors and to monitor them on a weekly basis and receive feedback.

During the academic year 2018 – 2019, 5 mentors were hired and coached to oversee a small cohort of TEAMSF scholars assigned to them. The scholars met with their mentors bi-weekly in small groups and met as a big group monthly with their faculty advisors. These mentors helped the TEAMSF scholars academically and also with co- and extra- curricular activities. The entire cohort has become a strong peer-led group that receive academic, social, and professional support. TEAMSF participants find the GPA requirement for scholars and the regular interaction with their peers around academics helpful and an encouragement toward consistent, strong performance.

Table.5 PLTL Model Impact Analysis

	2018SP		**2018FA**		**2019SP**	
Course	**Pass rate**	**A/B Rate**	**Pass rate**	**A/B Rate**	**Pass rate**	**A/B Rate**
CS 1337	47%	36%	66%	54%	81%	75%
CS 2325	77%	30%	NA	NA	88%	56%
CS 2336	47%	42%	71%	35%	56%	26%
CS 3305	60%	50%	NA	NA	77%	77%
CS 3322	NA	NA	92%	71%	NA	NA
ENGR 1375	65%	45%	64%	50%	77%	47%
ENGR 2301	70%	46%	68%	56%	67%	54%
ENGR 2302	76%	38%	62%	30%	NA	NA
ENGR 2302	NA	NA	NA	NA	83%	51%
ENGR 2332	65%	36%	55%	39%	61%	38%

ENGR/EVEG 2331	NA	NA	NA	NA	60%	60%
ENGR/ET 2371	NA	NA	NA	NA	78%	54%
ENGR/MENG3320	NA	NA	NA	NA	88%	50%
ENGR/MENG 4350	82%	53%	92%	89%	84%	67%
MATH 1325	63%	44%	65%	51%	NA	NA
MATH 2413	NA	NA	31%	31%	NA	NA
MATH 2413	72%	45%	70%	44%	86%	51%
MATH 2414	84%	58%	85%	33%	87%	62%
MATH 2414	NA	NA	42%	23%	63%	42%
MATH 2414	NA	NA	NA	NA	76%	53%
MATH 3340	41%	22%	33%	6%	59%	36%
MATH 3340	NA	NA	63%	41%	54%	34%
MATH 3342	NA	NA	70%	61%	57%	36%

PLTL Supplemental Instructors were given metacognition training by a trained professional. This training introduced students to concepts of metacognition and about Bloom's Taxonomy which revealed to them the importance of understanding how they learn. This training also provided the students with the lens through which they can view the learning activities and measure their intellectual growth. Also, the training presented a specific study system that can quickly empower students to maximize their learning. The importance of dealing with emotion, attitudes, and motivation by suggesting ways to change students' mindsets about ability and by providing a range of strategies to boost motivation and learning was also addressed in the training. Faculty members were also a part of this training program

The other model introduced within TEAMSF program was mentoring, where TEAMSF scholars were divided into small groups and were assigned with mentors who in-turn reported to a faculty member. The mentee size was anywhere between 3 – 6 and the small groups met with the mentors as frequent as needed. The mentor mentee assignment were made depending on their year of study, gender, and program of study. TEAMSF participants have a strongly positive view of the mentoring they received. They find the interaction with their mentors reassuring, "super encouraging," motivating, and a means of participating in a community in which they can develop strong relationships. They described the mentoring as a big brother/sister model. They also felt that the mentors pushed them toward success, helped them with classes and to understand processes and expectations at WTAMU, and provided personal assistance that they might not have encountered elsewhere like introductions to other students, encouragement to participate in on-campus activities or clubs, and a listening ear whenever it was needed. One focus group participant noted that this has motivated her to think about how she can help younger WTAMU peers in the future.

Three themes were noted regarding this point: 1) mentors helped students identify areas in which they were being unproductive, 2) mentors aided students in course and faculty selection, and 3) mentors were able to function as tutors based on their prior experience with the courses

participants were taking. These factors contributed to mentoring in the project being viewed positively by the participants.

ii. Professional Support and Social Support

TEAMSF students participated in the different activities arranged throughout the year for them to grow professionally and socially. These include visits to campus by experts, site visits at companies, technical speaker events, joining and participating in professional clubs/organizations, experiential learning opportunities like working on a Habitat for Humanity house, and a potluck dinner hosted by the project leadership. These activities have helped develop relationships between the students and the students who participated in the focus groups stated that they valued these activities.

TEAMSF participants were enthusiastic about the site visits and experiential learning opportunities they had been provided. They learned it is "OK to not understand" everything on first exposure from listening to the experiences of active engineers. They were encouraged to find persons like them who had been successful and that these people "started where we are now." And, they found the perspectives of and insight from professional engineers helped them refine their own perspective and expand upon it. In addition to the learning about engineering and career paths through these different activities, several students noted a horizon expanding element in the experiential learning. Several others stated that they had noted differences in approaches between the male and female speakers and that the approach of and information shared by several females was of particular value for interviewing and understanding possible differences between male and female leaders.

5. Results

WTAMU has successfully given 36 NSF S-STEM scholarships to predominantly minority students in the fields of engineering, mathematics and computer science. Total number of students who took part in the various activities organized throughout the academic year for the TEAMSF student cohort can be found in Table 6. These activities were organized according to student preferences as well as distributed across academic, professional, and social growth of these students. Participation at these various activities were voluntary but were arranged in such a way that they met the student needs from different disciplines. Table 7 provides the student feedback on the usefulness of these activities and as seen from the table, most of the activities received a score of 3 and above. Another important finding as seen in Table 8 is the average GPA of these students which was above 3.0 for both the years and the average weekly hours students spent on working part-time jobs was within the range of 10 – 12 hours. These numbers not only show the academic success of TEAMSF students but also highlight the importance of the scholarship amounts that greatly met their financial needs making it light on their working part-time job hours. Table 9 shows the retention rates achieved during year 1 and year 2 with the TEAMSF students.

Table 6. Summary of student involvement in program activities

Activities	Number of Students involved in Academic Year 2017 (out of 11 students)	Number of Students involved Academic Year 2018 (out of 25 students)
Academic support services	5	13
Career counseling	2	4
Field trips	9	13
Internships	3	8
Meetings/conferences	10	17
Mentoring	6	10
Recruitment	3	4
Research opportunities	4	4
Seminars	6	7
Other (Community Service)	8	14

Table 7. Summary of student perception of usefulness of program activities as determined from end-of-year student surveys.

How Useful are the following activities? *1 – Not useful at all; 2 – Somewhat useful; 3 – Useful; 4 – Very Useful*

Activities	Average Response	
	Academic Year 2017	Academic Year 2018
Academic support services	3.10	3.30
Meetings/conferences	3.50	3.09
Field trips	3.45	3.05
Workshops/seminars	3.10	3.33
Outreach activities	2.80	3.14
STEM-related clubs	3.23	3.43
Mentoring	3.65	2.95

Table 8 Comparison of average student GPA and average weekly hours of work.

	2017FA	2018SP	2018FA	2019SP
GPA	3.219	3.44	3.42	3.24
Hours	10.2	12.3	11.2	11.95

Table 9. Summary of scholar retention rates

Semester	Retention Rate	No.	No. Changed major	No. Left unregistered	No. dropped below 3.0 GPA
Fall 2017	100%	11	-	-	-
Spring 2018	100%	11	-	-	-
Fall 2018	100%	25	-	-	-
Spring 2019	80%	20	2	2	1

Student feedback

Following are the responses received from the NSF TEAMSF student cohort for the question 'Impact of receiving a scholarship on your personal efficacy?

"This scholarship helps me be more included. As far as financially it helps me cover textbooks and other school expenses not in tuition".

"Scholarships encourage me to continue Working towards my degree even though I struggle greatly because it gives me hope that someone is willing to support my efforts at gaining a better quality of life".

"Without this scholarship I would not be able to attend school. The year I received this award, I was at the point of having to drop out due to funds.My goals are directly met through this funding opportunity."

"This scholarship has allowed me to focus on my schoolwork without having to worry so much about finances. This scholarship program has also allowed me to reach out to other students and receive advise on my major, allowing me to becoming more efficient."

"This scholarships has had a positive impact on me. It's the reason that I have been able to go to college without worrying about a large financial impact. It's helped me create good relationships with other students whom I can go to if I'm struggling with something."

"I am grateful to receive scholarships, they have pushed me to work more in my academics. Scholarships have helped me focus more in school and worry less about my financial problems. I have had the opportunity to meet new people and get out of my circle with scholarships. Without scholarships I would have more worries in my life.

It also me to focus on my class work."

"The impact scholarships have had on my academic career and efficacy has been tremendous. I have always had the desire to pursue higher education to not only help myself but my family as well. Without scholarships I wouldn't be able to help support my family in the future. With this knowledge, Scholarships have pushed me to work my hardest as not to waste the money that is graciously given to me but also not to waste my time."

"I will not be working this semester only thanks to this scholarship. I will have more time to focus on school."

“The scholarship enables me to attend college. Without our the financial support I would likely be able to attend part time in order to work full time.”

“It makes life easier. I dont have to worry about my financial situation and instead i can go us on my school work.”

“Receiving a scholarship has help me focus on my academics. Rather then worrying about tuition and loans. It has held me to a higher standard to do well in my classes and be more involved on campus.”

“This scholarship has had a great impact on me mentally and financially. It has helped lighten the load and has allowed me to focus more on my academics. It is a great feeling to have this kind of help in my education. It has pushed me to continue and want more out of my education. Being in this program has been nothing but good experiences for me. I have learned much about my field of interest and that of the professional world.”

“This scholarship has really helped me to take my organization skills to another level to help me be as productive as possible. It has also introduced me to new people and activities happening around campus that I would not have otherwise be exposed to. I am grateful for this opportunity to learn more about the school, my field of study, and my own interests as well.”

“This scholarship had not only presented me with financial aid, but it has also helped me expand on my further knowledge in the field. I have been able to expand my connections with other companies that come and present themselves, as well as learning new internship opportunities and what I need to do to prepare for them.”

“This scholarship relieved many burdens that go beyond my own worries. It allowed my family to not worry about my school finances and allowed me to focus on school better. Although my academic performance was not what I intended it to be, due to other reasons, I consider this scholarship has contributed to my academic, professional, and personal growth. For this, I am grateful.”

“The scholarship allows me to focus a little less on working and a little more on excelling at school.”

“Receiving a scholarship has allowed me to set financial burden aside and focus on excelling in my class work.”

“Well, now that me and my sister are both attending the university, this scholarship really helps keep a burden of having to work more than 40 hours a week to keep up with payments and schoolwork. I helps me focus more on my studies rather than trying to earn money to make it past the next month.”

“Being awarded this scholarship has allowed me to stay focused on my studies, work less, maintain a clear view on my objectives, and it has helped me grow as a student and person. I am extremely thankful for this scholarship in what I have learned from my mentors and the amount of weight it has taken off my shoulders.”

“Scholarships allow me to focus on my classwork and learning new concepts that will help me when I join the workforce. Instead of having to worry about paying for school, I am able to dedicate myself fully to accomplishing more in my studies.”

6. Conclusion and Future Work

TEAMSF scholarship program at WTAMU has shown academic, social, and professional growth among the students involved in the various activities organized. Results were collected over a duration of two years spanning four semesters. The PLTL model introduced has been very productive in enhancing student learning and academic success in challenging courses. Mentoring activities have also been helping the TEAMSF students grow professionally, socially, and academically. Students really appreciate the feeling of oneness and the support received by being a part of the cohort. Interaction with peers, seniors, faculty mentors, administrative staffs, industry professionals, and the community has created a profound impact on these students and contributes towards their overall success in their career paths. Retention and other initiatives introduced through TEASF program has helped students financially, academically, professional and socially. External evaluation of the entire program has helped the principal investigator identify areas of improvement. Careful planning of various activities, along with a sustainable model of mentorship remain the crucial factors for the success of this program.

Future plans for the program include recruitment efforts to include a more diverse population of underrepresented minorities. Reaching out to more rural high schools through outreach activities will be focused in the upcoming years. Also, training and professional development activities will be offered to student mentors and faculty mentors involved in the program. Careful planning of program activities that show increase in student participation and student success rates will be of main focus in the upcoming years. Quasi experimental comparison study will be performed to compare student success, progress, and cumulative GPA in the group of students who actively took part in the program and a comparison group of students who were not a part of this program.

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