2006-1068: BUILDING A BRIDGE FOR STUDENTS TO TRANSITION FROM HIGH-SCHOOL TO COLLEGE

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Building a Bridge for Students to Transition from High-School to Engineering Curriculum

Abstract

The Wright Science, Technology and Engineering Preparatory Program was initiated in 1988 to develop the education in science for the youth in city public schools which are mostly comprised of first-generation college and economically challenged students. The participating students upon successful completion of the program requirements while in 10th grade are awarded full-tuition scholarship to pursue a bachelor's degree of their choice at our university. These high-school seniors while in 12th grade attend a series of workshops designed to aid students in having a smooth transition to college. After these students graduate from high-school, in the summer they also attend a mentoring program designed to prepare them as mentors and role-models. Upon completion of the mentoring program, students participate in a week long academic advantage program to hone their math skills required for the first year of college. This paper presents in detail the model implemented along with our observations and findings.

Introduction

Ethnic minorities, especially African Americans, remain underrepresented in a number of occupations, including those which are identified as high-technology areas. Engineering is one such area where African Americans and other minorities (defined here as Hispanics and Native Americans) have been traditionally underrepresented[1].

In the United States, 12.6% of all the first professional degrees awarded in 2001 are to underrepresented minorities[2]. Also, 15.7% of the bachelor degrees awarded in science and engineering are to underrepresented minorities[2]. This has increased compared to the year 1992[1]. However the overall number of first professional degrees awarded has not increased but decreased from 35.2% in 1966 to 31.8% in 2001[3]. This demonstrates a need for greater efforts to train more students in Science, Technology, Engineering and Math (STEM) fields. Literature review has shown that some of the hurdles in this process are, i) insufficient awareness of the programs in the underrepresented minorities; ii) lack of role-models; iii) lack of self-efficacy; iv) lack of social support.

Our university has initiated the Wright Science, Technology, and Engineering Preparatory Program (Wright STEPP) for the underrepresented minorities in the year 1988, and has been successful in reaching its goal of increasing the number of students entering college. In the process of continuous improvement to the Wright STEPP, the Wright Engineering Bridge (WEB) program was initiated in 2003, which is the main focus of this paper. Every year the WEB program is administered through collaboration of our university, Wright Patterson Air-Force Base (WPAFB), city public schools and the corporate local industries.

Wright STEPP

The necessity to support the education of youth underrepresented has been in existence since the late 1980's. Our university identified this early in time and initiated the Wright STEPP in 1988 to provide academic enrichment and tuition scholarship to students of the city public

schools who are scholarly, but have financial problems. Wright STEPP targets all 7th through 10th grade students in the city public schools. Forty students from the 7th grade are selected each year with a minor replacement at the higher grades. Every year, 160 students (40 from each grade 7th - 10th) attend this four-week program that operates at our university campus. This program is in accord with the American Competitiveness and Workforce Improvement Act of 1998, which addresses the national workforce's need to increase the number of graduates in STEM fields.

1st Year	2nd Year
Intro to Science	Intro to Electrical Engineering
Intro to Engineering	Intro to Environmental Engineering
Pre- Algebra	Algebra
Pre-Geometry	Geometry

Computers
Field Trips
Project Labs
Written and Oral Communication

3rd Year	4th Year
Intro to Aerospace Engineering	Intro to Photonics/Optical Engineering
Intro to Chemical Engineering	Intro to Human Factors Engineering
Algebra	Pre-Calculus
Trigonometry	Math Preparation

Figure 1: Outline of the Wright STEPP Program

The major goals of Wright STEPP are: 1) to demonstrate students, the importance of graduating from STEM fields; 2) to enhance the students' math skills as a preparation to college; 3) to increase minority enrollment in STEM programs; 4) to increase the graduation rates; and 5) to help students who completed Wright STEPP have a smooth transition to college.

Through contact with successful engineers and scientists from our university, WPAFB, and local industries, the Wright STEPP students receive a first-hand opportunity and head start in learning what the campus and work life is all about in a hands-on technology-based environment. Fig. 1 shows the typical syllabus of Wright STEPP. Students learn not only math and science, but also written and oral communication skills, problem solving and study skills, career opportunity awareness, and an introduction into computer science. Simultaneously, they visit industries, attend engineering seminars, and talks delivered by several role model speakers. Students, who completed the program with specific academic standards (cumulative 3.5 GPA and no grade less than a 'B' during the regular high school year) are offered a four-year full-tuition scholarship to attend our university and pursue a bachelor's degree of their choice.

A typical weekly schedule of the Wright STEPP program is shown in Table 1. The city school buses pick students from their home every morning throughout the duration of the program, and arrive at the university campus at about 8:30 am. Students from all the grades are brought together in an auditorium between 8:30 – 9:00am to discuss their daily activities, performance and other administrative stuff. Some days, successful alumni of the Wright STEPP deliver a small talk on the importance of college education and the Wright STEPP. Students attend classes and sessions from 9:00 am - 2:10 pm with a lunch break of 75 minutes. Every Thursday, throughout the duration of program, students also visit a local industry to get an

exposure of what an engineer does in his daily job, and the collaborative work involved behind making Wright STEPP successful.

Table 1: Typical weekly schedule for Wright STEPP (4th Year)

	8:30 – 9:00	9:05 – 9:55	10:00 – 10:50	11:00 – 12:15	12:25 – 2:10
Monday	Administrative	Math Placement Prep	Pre-Calculus	L U N C H	Science
Tuesday	Administrative	Math Placement Prep	Pre-Calculus		Computers
Wednesday	Administrative	Math Placement Prep	Pre-Calculus		Project Lab
Thursday	Field Trip				Written & Oral Communication
Friday	Administrative	Math Placement Prep	Pre-Calculus		Hands-on science experience

The major components of the Wright STEPP program are (a) academic performance, (b) technical knowledge, (c) hands-on experience, (d) role-models, (e) workshops, (f) field-trips, and (g) financial incentives.

Academic Performance
Admission to this program is based on student performance in middle and high school classes. Though students initially enter the program based on their performance in and prior to 7th grade, they are still required to maintain a 3.0 minimum GPA in order to continue. Failure to comply with the GPA results in student being removed from the program. To demonstrate the importance of the student's academic performance, when ever the GPA of the student falls below 3.0, his/her place is replaced by some other student based on the high school teachers' recommendation. This is implemented to encourage students to work hard while in middle and high school and maintain a minimum 3.0 GPA. This also creates peer competition, which in turn encourages hard work necessary to secure admission into the program.

Hands-on Experience
The human mind grasps concepts better when an activity is performed in real time compared to when read from a book. Hands-on experience provides students an opportunity to learn by doing, which also enhances their ability to think critically[4]. This type of experience not only enables the students to learn better, but also increases their ability to think towards the successful completion of the job. For this reason, majority of the sessions in Wright STEPP are designed with activities through hands-on experience.

Role Models
Many incoming minority students lack the level of motivation and confidence necessary for success, due to inadequate social support and role models. This program provides several

sessions with successful role models to motivate students towards success in engineering. These role model speakers include scientists and engineers from our university and WPAFB. They demonstrate that success is achieved through competence and perseverance to work, not through ethnic group status alone. These sessions are designed to aid in increasing the self-efficacy of students in the program.

Workshops

Many entering students are inadequately prepared in high school for the physics, chemistry and math courses required for engineering majors[5]. For this reason, weekly academic workshops are designed for each grade. These workshops provide students with week-long supplementary material to work with guidance provided at every step. These workshops not only provide students with academic support, but also promote their confidence and increases peer pressure to accomplish more in a limited time.

Financial Incentives

To alleviate the monetary hurdles faced by most entering students, this program provides financial incentives. Students, who meet the requirements by completing the program with a minimum specified performance, are provided with full-tuition scholarship to attend our university and pursue a bachelor's degree of their choice.

Wright Engineering Bridge Program

Periodic revisions and improvements are one of the reasons behind the success of any program. With this in mind, the Wright STEPP program has been in constant improvement since it was initiated. One of the supplemental programs designed in this process recently is the Wright Engineering Bridge (WEB) program. The key components of the WEB program are 1) WEB Workshops, 2) WEB Mentoring Program, and 3) Academic Advantage Program.

WEB Workshops

Graduates of Wright STEPP while in 12th grade are encouraged to attend a series of workshops to make the transition to college smooth and successful. These workshops are conducted at 6:00 pm on weekdays, to allow both the parent and student to attend without any schedule conflicts. They usually last for around 1.5 – 2 hours. Logistics of providing transportation was found not be feasible, and hence not provided. As these workshops take place during dinner time, food is provided. As of date, students are encouraged, but not mandated to attend the workshops. As participation is not mandatory, not many students attended these workshops in 2003. To allow more students to avail this opportunity, a perk of fee waiver to attend the Academic Advantage Program later in the summer is provided for students attending these workshops. Through this process, the number of students participating in workshops has increased from 25% in 2003 to 50% in 2005. Our advisory committee is currently working to develop new methods to increase this to 80%. A typical schedule of the workshops is shown in Table 2.

Workshop- A

The focus of this workshop is to enlighten students about the scholarships, financial aid opportunities, and housing available once in college. The first presentation starts with the Director of Scholarship programs introducing students to the various scholarship opportunities available such as Free Application for Federal Student Aid (FAFSA), First Year Scholarships,

Transfer Scholarships, University College Continuing Student Scholarships, Student Leader Development Scholarships along with their respective eligibility criteria, and procedures students need to follow in order to apply for the same. As all the students who participate in WEB program are graduates of Wright STEPP, they are granted four year tuition scholarship to attend our university. It is emphasized during this workshop that, though students have tuition scholarship through Wright STEPP, they can still apply for additional scholarships to help pay for books and living expenditure etc.

Table 2: Typical Schedule of WEB Workshops

Workshop - A	November 21, 2005	Scholarship, Financial Aid, Housing, and Admission to College
Workshop - B	December 6, 2005	Summer Jobs, Internships, and Cooperative Job Experience, and Undergraduate Research Opportunities
Workshop - C	January 11, 2006	Cover Letter, Resume Writing, and Interviewing
Workshop - D	February 8, 2006	College Placement Testing, College Orientation, and Retention Skills
Workshop - E	March 8, 2006	Meeting with Wright STEPP Alumni, the College Experience and Life after College, Keynote Speaker, Meet the Dean of College of Engineering and Computer Science

The second presentation is delivered by the Director of Housing. This starts with introducing students to the various housing opportunities available on-campus. Students are also shown the safety precautions taken by the campus security in order to ensure student safety, and make the students feel comfortable that campus housing is safe, and friendly.

Later students are introduced to one of the successful programs at our university, known as Learning Community (LC). LC is a major component of a new student's first-year experience at our university. Students are shown the statistics that nearly 85% of all incoming students participate in some form of LC. These LCs consist of small group of students taking classes together, usually including first-year seminar linked to one or more general educational course. Students are introduced to the two types of LCS, 1) Program-based LC where students in certain majors have natural LC cohorts as part of their program. These include engineering, computer science, dance, music and theatre majors. 2) Seminar-based LC where students participate in LCs centered upon a first-year seminar that focuses on issues relating to enhancing success in college. Students are also shown the various advantages of participating in LCs such as; making new friends, learning success skills and strategies, managing time and stress, connecting with university resources and activities, learning effective study tips, sharing learning experience, and having fun. The presentation ends with a question and answer session which generally turns out to be very positive in terms of interaction among the administrative group and the parents.

The session on admission emphasized that, every student seeking admission should submit an application. Students were guided through admission requirements which include application

fees, SAT scores, letters of recommendations and transcripts. Later, they are helped to complete and return the application on time.

Workshop-B

WSU has an active career services center which provides students information on the various job opportunities available both on and off-campus. The career services center conducts periodic recruitment events, where students meet prospective employers to avail the job opportunities. Workshop-B focuses on this aspect through out. A representative from career services center gives a presentation on the types of employment opportunities available, and procedures students need to follow in order to take advantage of the same. Internships and Cooperative jobs are particularly emphasized during the presentation.

The College of Engineering and Computer Science (CECS) at our university has an active division that encourages and supports undergraduate research. The Director of Research Experience from Undergraduate Education delivers a presentation and introduces students to the undergraduate research opportunities available on campus such as, 1) the Wright Honors Program sponsored by the WPAFB to our university students where the first and second engineering students are hired to gain lab experience while in college; and 2) the INROADS national program that was designed to increase business career opportunities and knowledge for the best ethnically diverse students, while giving corporations the opportunity to develop diverse managerial talent[6].The INROADS program was designed for juniors and seniors in college.

During this workshop, it was evident that the workshop is successful through the several questions raised, and the constant contact maintained with our faculties about the opportunities available even after the completion of WEB program.

Workshop-C

The focus of this workshop is to help students in applying to jobs. Corporate industries now not only require technical knowledge, but also good communication skills, which include both written and oral. Research shows that written communication skills are analyzed in the resumes and cover letters students write, and oral communication skills are analyzed in the interview process. To aid the students, the career services center conducts a workshop to improve the oral and written communication skills of students.

This workshop starts with providing students a sample cover letter and asking them to identify mistakes in the same. Most of the time, it was found that there were not more than one or two students who were able to identify at least a few mistakes in the cover letter. Students are later provided a list of action verbs to choose from, while communicating with the prospective employers, and are also taught how to write a good cover letter.

In the resume writing workshop, students are given a quiz that is designed to test their knowledge of the basic information and practices one should have prior to developing a resume. During this section also, it was found that only few students were able to answer at least a few questions. At the end of this quiz, students are provided with correct answers and explained the rationale behind each. Later students are provided printed material on how to develop a winning resume, methods to build a resume, few business samples of resumes etc.

The last part in this series is to introduce students to the key aspects an employer looks for in a candidate. Students are introduced to the concept of the total package which includes; communication skills, computer/technical aptitude, leadership skills, teamwork, interpersonal abilities, personal traits, critical thinking/problem solving abilities, intelligence and common sense, willingness to learn, and work related experiences. Each of these concepts along with their importance is explained in detail during this session. This series concludes with a session on etiquette that needs to be followed during the interview process.

With the workshops made interactive, there generally was a lot of communication among students and the instructional group. It was also found that some students who came to the workshop with a draft of their resumes fine tuned their resume and made it professional.

Workshop-D

All entering first year engineering students in our university are required to take a College Placement Test which tests student's math, and verbal skills. In order to prepare students for this test, a review session was conducted during this series. The math part covered concepts of algebra and trigonometry. The tutorial session conducted during Workshop-D helped students to register for a higher level math class in the math tutoring session conducted later in summer, and learn more math concepts before starting college. This in turn helped students to take fewer classes in math as a part of their course curriculum.

Students entering college after high-school go through tough times to cope up with stress, and time management etc. Retaining students at the end of first year is the key to retention through graduation. To aid in this process, a presentation is delivered by the Office of Undergraduate Education on time management skills, teaming, networking with peers, communication with peers and faculty, participation in student organization to meet new students and prospective employers, and retention skills. This helped towards increased student interest and participation in engineering activities.

Workshop-E

Last in the workshops is a meeting with Wright STEPP alumni and the Dean of CECS. This session provides WEB program students a window to the university and the professional world through the eyes of the university and Wright STEPP alumni. This session starts with an ice breaker by a panel of Wright STEPP alumni. This panel includes a wide range of students including those who have not performed well academically to students who did exceptionally well and secured a job in industries. The panel casually introduces themselves to the entire WEB program students, to create a friendly environment in the classroom. Later each of them delivers a brief talk by sharing their experiences while in college and after securing a job. This panel highlights the importance of education in the current environment, and how to make use of the opportunities available while in college.

Following is a speech by the Dean of CECS. The Dean formally introduces himself and welcomes the students to CECS. He brings the statistics to students that more than 20% of the CEOs from the Fortune 500 companies had their first degree in engineering. Later more statistics

on engineering are also brought into picture. Over the past, it was observed that an interest was sparked in the students about the importance of engineers in the current world.

WEB Mentoring Program
Many incoming first year students lack the level of motivation and confidence necessary for success due to inadequate mentoring. A mentor establishes a personal relationship with the student to provide professional instruction and guidance. The student, in an educational environment, benefits through mentors in two major ways: fast assimilation into the educational environment and establishment of professional competence[7].

WEB Mentoring Program Implementation
This program works along with Wright STEPP and spans for four weeks in the summer. The primary goal of this program is to train the Wright STEPP graduates as mentors and role-models. All sessions in the Wright STEPP are taught by scientists and engineers from our university and WPAFB. Most of the times, these instructors need additional help in teaching. To take this towards our advantage, the Wright STEPP graduates are chosen to assist the instructors during the program. Every year, around 20 Wright STEPP graduates are hired on hourly wages to assist the instructor in teaching duties. These students are not required to start teaching from day one. The Wright STEPP students are introduced to the instructors a week before the program starts, and periodically there after. Through these meetings, instructor guides the students and trains them in various skills in planning, organization, and leadership necessary during college. Through this program, students were able to develop mentorship and networking skills, and were also able to hone their technical knowledge.

With the idea of designing a program to prepare the first-year incoming students as mentors and provide good motivation tot eh WSTEPP students, a model was developed at our university. Based on our experience and several literature reviews, five concepts were incorporated into the mentoring program to train these aspiring mentors: (a) commitment to the role of mentoring, (b) teaming instructional groups, (c) peer support, (d) people skills and, (e) technical knowledge.

Commitment to the role of mentoring
A good mentor is highly committed to the task of helping beginning teachers find success and gratification in their work[8]. Scientists and engineers in this program undertook two student participants from WEB program as their protégés and trained them in essential concepts of mentoring. Mentors constantly assigned tasks and guided the students through completion.

Teaming Instructional Groups
One major activity performed by any mentor is instruction. Effective instruction requires careful planning, organization and understanding of the audience. Student participants from the WEB Bridge Program are teamed with an instructor for all classes and workshops in the program. The instructors provided students' advice on effective methods of instructing the Wright STEPP students in technical aspects, and helped them with planning and organization of the course material in several workshops.

The teaming of these students with instructors proved to be advantageous in several aspects. First, this provided an opportunity for students to work closely with the instructional group and

learn effective teaching methods. Second, this helped the instructional group to better understand the student thinking process, and mold their instructional methods to cover more concepts in the limited time available.

Peer Support

Rogers[9] pointed out that empathy means accepting others without judgment. It is believed that a mentor needs to be committed to the role of mentoring and helping others. Also, it was observed that the success of a team project would be easily possible through cooperation in teams. This was demonstrated as an example in the mentoring program to encourage the teaming abilities of an individual. One of the issues demonstrated to the protégés in this program is that, mentors do not judge protégés as being poorly prepared, overconfident or defensive. But view them as challenges in an effort to provide meaningful support. It was very important for the mentors to make the protégés understand the importance of the problems they might face in the beginning phase of teaching. In order to do so, professors were advised to revisit their first year experiences as a teacher and pick similar situations and explain them to the students. Doing so helped students better understand problems and their consequences.

People Skills

Technical knowledge alone does not guarantee success of a student. An individual needs to have good PEOPLE skills (Problem-solving, Ethics, Open-mindedness, Persuasiveness, Leadership and Educational interests[10]). These are few of the concepts taught to the students. Initially mentors gave their protégés a plan to follow in order to accomplish this task, and work towards successful completion of the task. This plan did not include step by step procedure, but an outline to aid the protégés in the initial phases. Protégés were encouraged to think and formulate methods to fix the problems if any arise.

Open-mindedness and flexibility are very important in the industries. Protégés should not be restricted to limited ways of thinking, but be open to many ideas. This was reinforced by posing different ways to solve and evaluate a problem in an optimal manner. Learning by doing was found to be the best approach in terms of leadership. Students were encouraged to be leaders for a group and guide them toward success. The belief behind doing so was that, delegation of tasks to individuals is an important characteristic of a leader. Other qualities developed through leadership were confidence, identification of their strengths and weaknesses and decision making.

Education is never complete. Life long learning is a concept that should be embraced to be in pace with the advancements in any field of study. Students were encouraged to take proactive steps in exploring various resources to enhance their knowledge.

Technical Knowledge

Instruction is one of the major tasks performed in mentoring. Often, this instruction is in technical field of work. The mentor had to be prepared for all possible questions the protégé might ask during instruction. Protégés were given a small job of instructing some concepts in a particular area to the Wright STEPP students. They were also told to be prepared for all possible questions that might arise. In the initial phases, protégés prepared for the course material and taught the same, but had some difficulty in answering the questions due to insufficient

preparation. Through this process, students realized the importance of preparation before instruction and did not have difficulty answering questions in the later sessions.

Academic Advantage Program

Academic Advantage Program (AAP) was initiated in 1991 to increase retention in first year students. The CECS at our university felt that, new direct from high school students would benefit from a program that 1) refreshes their math skills; 2) provides a medium for social dynamic, and 3) overall give them a "jump-start" on their first quarter at college. The AAP offered each summer by the CECS is an intense and innovative one week program especially designed for new direct from high school students who plan to study engineering or computer science at our university during the fall quarter. Upon completion of the mentoring program, WEB students participate in AAP to hone their math skills required for first year of college. This spans for a week from Sunday evening through Thursday evening.

The AAP provides students with 20 hours of math instruction to review math skills necessary in first-year college. This math instruction is available in four levels of difficulty that correspond roughly to the results of Math Placement Level (MPL) tests taken by all students. Students are suggested to retake the MPL test at the end of the week and register for a more advanced math course if they improve their MPL score. With the constantly changing engineering curriculum, new courses are being added on timely basis. This limits the students' possibilities to graduate from college in limited time span. Improving math skills before going to college helps students do better in MPL scores, which in turn reduces the number of math courses students' need to take while in college. This was realized to be an added advantage to students participating in AAP.

Instruction was provided by CECS faculty members and upper level engineering students. This provided an opportunity for the students to become acquainted with some of our faculty. Breakout problem sessions were instructed by upper level engineering students from our college, again providing students an opportunity to meet and get to know each other.

On Sunday evening when the program starts, students met in the outdoor amphitheatre and learn about "The Week Ahead". They are introduced to one and other, and the instructional group through an interesting ice-breaker. The ice-breaker gets "cool" acceptance as it involves dividing the students into teams, providing each team a frozen t-shirt, and seeing which team gets the frozen t-shirt on one of their team members in the shortest time.

Starting from Monday, students attended math tutoring sessions from 9:00 am – 3:30 pm. Later in the evening students participate in social activities to get to know each other better and get acquainted with the campus before classes start. The typical schedule of evening activities was as follows. On Monday evening, students attended a college picnic where they met the Dean and faculty members in a social setting. On Tuesday and Wednesday before dinner, students participate in engineering challenge competitions where they compete in teams to build the tallest K'NEX tower and a paper helicopter that hovers for the longest time. Most of the times, students give high marks to these two activities. In the evenings after dinner, students enjoy bowling, a euchre tournament, movies, and visits to the local Mall.

At the end of AAP, students are provided an option to retake the MPL test to see if they had an improvement in the scores. It was observed that 65-70% of students who did retake the test had improvement in their MPL score one or more levels. These improved scores helped in reducing the number of math courses students need to pursue towards their engineering curriculum.

We found that parents are especially interested in the program as they easily identify the benefits. The evaluations received from the attendees as well as personal contact with the student attendees is very positive. Most students felt math instruction is very useful and are especially pleased if they improved their MPL scores. We also feel that the greatest value to the students through this program is the new friends they make during the weeklong program, to work together on their first semester classes.

Conclusion
The principal operational advantage of Wright STEPP is its ability to recruit and retain minority students in the STEM fields. Based on subjective observations and judgments, it was found that the Wright STEPP has an effect on: (a) improving the study skills and habits of students; (b) improving teamwork, cooperative learning, positive competition, peer support; and (c) creating a learning environment and a community committed to striving for excellence rather than settling for remediation. Over the first eight years, 320 students enrolled in this program and of these, 162 enrolled in our university. About 46% of the students who entered our university graduated with professional degrees with some still under progress.

The impact of Wright STEPP on our nation's engineering and computer science workforce is significantly profound as it: (a) benefits underrepresented minorities by increasing recruitment and retention in STEM fields through quality intervention services, (b) demonstrates the importance of teaming to succeed in STEM fields, (c) prepares minorities for careers in STEM fields by valuing diversity, (d) enhances student communication skills and peer competence, (e) enhances the critical thinking process, (f) and enhances the partnership between government, higher education, local corporate industries and public high schools. Also, results obtained from the Wright STEPP Program added to our knowledge base, the effectiveness of interventions aimed at increasing minority representation in the engineering and computer science fields.

Through the WEB program, Wright STEPP graduates are now better prepared for college and look forward towards their first class in engineering. Commitment of students in the WEB program was also increased to a considerable extent. Also, by allowing the Wright STEPP graduates to be mentors for the current Wright STEPP students, the Wright STEPP sessions are made more interactive so that students make the best of the time spent on the university campus. Based on the feedback obtained from students, and subjective observations of the WEB Program instructional group, it was found that students have learned principles of effective mentorship, improved their math abilities, and had a smooth transition to college.

Furthermore, by participating in the WEB program, students are now prepared to meet the new engineering challenges, such as outcome assessment in the College of Engineering and Computer Science adopted by the Accreditation Board of Engineering and Technology (ABET). These challenges involve continuous quality improvement, which builds upon the concepts of

systematic pursuit of excellence. As a result, our program provided students with quality academic advising, hands-on activities and tutorial service that help to: i) establish a strong foundation before and during first year of college, ii) develop their study skills, and iii) motivate group dynamics and exposure to opportunities available in college.

Through the feedback obtained from the participating instructional group, we identified that students communicate effectively, and interpret data and understand professional and ethical responsibilities, which are required to succeed in college. It is our hope that, implementation of such pre-college program will improve the learning opportunities and encourage the success of all students in the STEM curricula. The overall goal is to have under-represented groups in proportion to the population in entering into the STEM careers.

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