Virginia Booth Gleghorn, Purdue University, MEP

Virginia Booth Gleghorn is from Indianapolis, Indiana. She is a Purdue University graduate with a Bachelor of Science Degree in Industrial Engineering and a Bachelor of Arts Degree in Psychology. While at Purdue, Virginia was a member of the National Society of Black Engineers, the Institute of Industrial Engineers and the Society of Women Engineers, and actively involved with Purdue’s Minority Engineering Programs.

Virginia was the first female National Chair of the National Society of Black Engineers and the first National Chair to serve two consecutive terms of office, over 80 universities received their official ‘charter chapter’ status during her two terms of office.

Virginia has worked for Proctor & Gamble, Eli Lilly Corporation, RCA, General Dynamics, and served as 1983-89 School Administrator for Bibleway Christian Academy (Toledo, Ohio) serving grades Preschool through 12, Before returning to Purdue University in 2004, Virginia spent 18 years in manufacturing, 10 of which were in the automotive industry with DaimlerChrysler corporation as a Production Supervisor (2 years) Area Manager (4 years) and Lean Manufacturing Manager (4 years) for the Powertrain Division. In the capacity of Lean Manufacturing Manager, she was responsible for 100% implementation of training and integration of lean manufacturing principles at the 3.7L and 4.7L Mack Engine Facilities.

In her current position as Minority Engineering Programs Director for Purdue, Virginia looks forward to continuing the legacy of MEP and addressing retention and matriculation issues using a ‘lean manufacturing’ engineering approach. Her current passion in this effort is to assist in the establishment of a standardized metric system that can be used to demonstrate the impact MEP has had (and continues to have) on increasing the number of engineering graduates from historically under-represented populations. Her passion is to assist in developing, assessing, and sustaining effective STEM initiatives. MEP Directors have laid the foundation to be recognized as the experts on their respective campuses for identifying strategies to improve under represented engineering student access and success. Virginia serves on the National Advisory Board of NSBE and is currently on the National Board of the National Association of Multi-Cultural Program Advocates (NAMEPA).

Dr. Carol S Stwalley P.E., Purdue University, West Lafayette

©American Society for Engineering Education, 2011
Abstract

The academic achievement of underrepresented minorities (URM’s) at institutions of higher education is a topic of increasing concern. Although there is a vigorous ongoing national focus on increasing the recruitment and retention of URM’s in the STEM disciplines, significant achievement and six-year graduation gaps still persist between URM’s and majority students in their cohort.

First semester academic performance is a core metric that sets the tone for shaping student success in subsequent semesters. Of the many factors that contribute to the gap in first semester academic performance and retention of URM’s in traditional universities, transition from an inner city high school environment to a majority global university setting is low hanging fruit. Successful transition became the focus of the Minority Engineering Program Engineering Academic Boot Camp (ABC) bridge program at Purdue University.

Using historical data from the ABC program, this paper examines and discusses the retention and academic performance results of program participants compared to other URM’s as well as the total first semester engineering cohort in the College of Engineering. The results of the data supports the use of transitional programs designed to improve student success in engineering.

Introduction

Universities and corporations have a vested interest in creating a diverse workforce and realizing the tremendous value that diversity brings to the classroom and to the ever expanding technological advancements of a global community. Diversity, as used in this paper refers to URM students that have been historically under-represented in the STEM disciplines. Specifically, African American, Hispanic/Mexican American, and Native American students are referred to as “URM’s”

There is increasing interest in impacting the academic pipeline from Kindergarten through twelfth grade to provide the nation with technically competent URM STEM students to sustain current and create new technologies for generations to come. Corporations, universities, and STEM focused organizations have placed significant emphasis on supporting retention and recruitment efforts. For more than 30 years, these issues have loomed over American institutions and there is concern that although there has been some improvement, it is not enough. As discussed by Lee (1991) these issues are still relevant to the recruitment and retention of minority students today.
When it comes to retention in engineering for URM’s, summer bridge or transition programs have been successful in predominately white institutions (Reichert & Absher, 1997). Purdue University is proud of having one of the largest incoming freshman international engineering student enrollments. That presents a unique challenge to all domestic students, based on the Program for International Student Assessment (PISA) metrics. The 2009 PISA test results placed African American and Hispanic American students far below White and Asian Counterparts in Reading, Math, and Science. African American and Hispanic American students also performed below the Organization for European Economic Cooperation (OEEC) metrics. The OECD consists of 34 member countries worldwide.

The Engineering Academic Boot Camp at Purdue University was launched by the Minority Engineering Program to ensure that incoming freshman students were prepared to compete in a global classroom environment.

![PISA 2009 – Reading](image)

**Note:** Low income schools are those in which 75% or more of students are eligible for free or reduced price lunch; high income schools are those in which less than 10% are eligible.
PISA 2009 – Math

<table>
<thead>
<tr>
<th></th>
<th>Average scale score</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>515</td>
</tr>
<tr>
<td>African American</td>
<td>423</td>
</tr>
<tr>
<td>Latino</td>
<td>453</td>
</tr>
<tr>
<td>Asian</td>
<td>524</td>
</tr>
<tr>
<td>OECD Average</td>
<td>496</td>
</tr>
</tbody>
</table>

International Data Explorer, NCES

PISA 2009 – Math

<table>
<thead>
<tr>
<th></th>
<th>Average scale score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Income</td>
<td>434</td>
</tr>
<tr>
<td>High Income</td>
<td>545</td>
</tr>
<tr>
<td>OECD Average</td>
<td>496</td>
</tr>
</tbody>
</table>

Note: Low income schools are those in which 75% or more of students are eligible for free or reduced price lunch; high income schools are those in which less than 10% are eligible.
Method

After reviewing a five year trend within a cohort, and disaggregating courses’ to develop an aggressive freshman URM students for the academic challenges of a first year engineering student.

The model simulated the rigors of a first semester engineering course load with a course schedule, homework assignments, quizzes, and exams typical of an incoming freshman student. The model required students to invest five weeks in the simulation to see how well they would perform.

International Data Explorer, NCES
adjust to the difference in the pace of learning expected of a world-class engineering curriculum. Student participants were invited to attend with the only requirement that they have been accepted and admitted into the College of Engineering. Twenty-five to thirty participants were selected on a first come first serve basis each year.

Student participants were required to live in the residence halls and commit to the Engineering Academic Boot Camp schedule which included coursework, time management, note and test taking skills, as well as an overview of campus life and university support systems designed for student success.

Students were expected to adhere to an aggressive classroom and study schedule spanning the hours of 8:00a.m. through 11:00p.m. Grade Point Averages were calculated weekly so that students could see the holistic impact of class attendance, homework, quizzes, teacher visitation, and exams on the final grade. No remediation was offered during the academic exercise, however students had access to the typical tutorial centers and resources available on campus. Students were expected to perform competitively in Chemistry, Calculus, MATLAB, and English based on the first semester course schedule requirement for each student.

**Curriculum**

Due to budget constraints, the curriculum for the Engineering Academic Boot Camp was developed by Graduate Assistants who were either recommended by the department or served as Teaching Assistants for the course during the regular school year. Graduate Assistants were employed to create a five week academic exercise that mirrored the actual first semester course content. The curriculum content followed a typical first semester syllabus for each the courses offered in the Engineering Academic Boot Camp. Students were expected to secure their course textbooks and materials and do their best to keep up with the assignments for the duration of the five week period. The Engineering Academic Boot Camp included mentoring opportunities between participants and faculty, corporate partners, undergraduate and graduate students as well as team building activities across cultures. All participants completed a cross-discipline team-based engineering project as a part of the overall Engineering Academic Boot Camp experience. Students would receive a final GPA calculation at the close of the camp, however students do not receive course credit for their participation in the Engineering Academic Boot Camp.

**Results**

The Engineering Academic Boot Camp was launched in the summer of 2005 after a significant decline in academic performance of under-represented minorities for the previous three years. The results from 2005 to present show an upward trend in the academic performance of all under-represented minorities resulting in a narrowing of the achievement gap between URM’s and the total first semester engineering cohort. There is also a significant improvement in first year retention as illustrated in the graphs below.
Comparison of 1st Year Retention for ABC Attendees vs URM Students that did NOT attend ABC

Cohort Year

Retention Rate in Engineering

1st Year - ABC
1st Year - NonABC

1st Semester GPA

Cohort
References
