Academic Support Model of Mentoring & Faculty Involvement for Hispanic Students in CS & Engineering

AHSIE 12th Annual Best Practices Virtual Conference

March 10th, 2020

A Collaborative HSI TITLE III Project

FAU College of Engineering & Computer Science
Florida Atlantic University

Broward College

Palm Beach State College

Presentation Outline

- Institutions
- Research Team and Mentors
- Project Components
- Math Curriculum Refinement
- Recruitment and Marketing
- Summary

FLORIDA ATLANTIC UNIVERSITY

FAU Locations

South Florida is more than just beautiful beaches and perfect subtropical weather – it's an economic and entrepreneurial hub that provides students with countless opportunities to learn through experience.

FLORIDA ATLANTIC UNIVERSITY

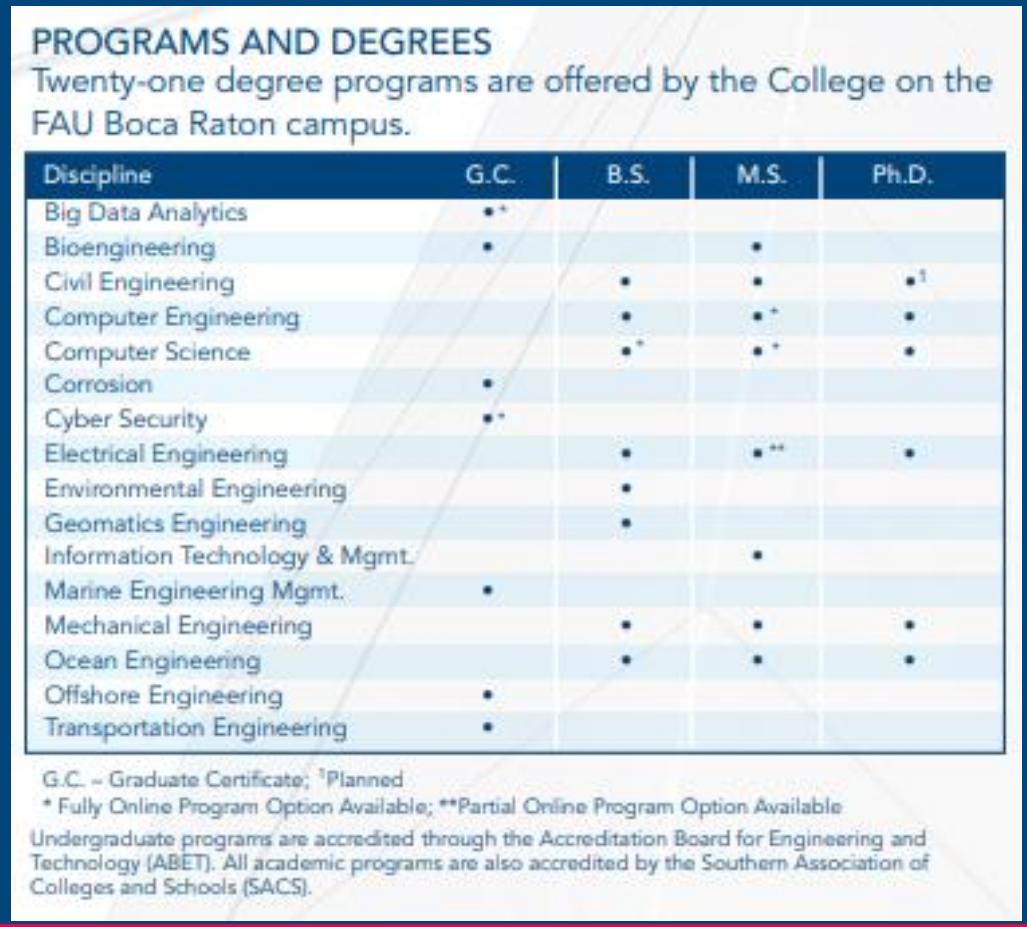
- Founded in 1961; Classes began in 1964
- Original Enrollment: 867 students
- Current Enrollment: 30,000+ students across 6 campuses and 170+ degree programs
- Diversity: Student body is 25% Hispanic and 20% African American
- 56% of student body is classified as minority or international students, making FAU the most diverse institution in the Florida State University System.
- Economic Impact of $6.3 billion per year

- Source: http://www.fau.edu/publicaffairs/about/quick-facts.php

FLORIDA ATLANTIC UNIVERSITY

FAU's College of Engineering and Computer Science

- In 2017-2018, 420 students graduated from the College of Engineering and Computer Science with their Bachelor's degree
- 153 students graduated with a master or doctoral degree
- Programs include Civil, Computer, Electrical, Mechanical and Ocean Engineering as well as Computer Science
- Certificates are available in Big Data Analytics, Bioengineering, Cyber Security and (coming soon) Artificial Intelligence



PROGRAMS AND DEGREES

Twenty-one degree programs are offered by the College on the FAU Boca Raton campus.

Discipline	G.C.	B.S.	M.S.	Ph.D.
Big Data Analytics	•*			
Bioengineering	•		•	
Civil Engineering		•	•	•[1]
Computer Engineering		•	•*	•
Computer Science		•*	•*	•
Corrosion	•			
Cyber Security	•*			
Electrical Engineering		•	•**	•
Environmental Engineering		•		
Geomatics Engineering		•		
Information Technology & Mgmt.			•	
Marine Engineering Mgmt.	•			
Mechanical Engineering		•	•	•
Ocean Engineering		•	•	•
Offshore Engineering	•			
Transportation Engineering	•			

G.C. – Graduate Certificate; [1]Planned

* Fully Online Program Option Available; **Partial Online Program Option Available

Undergraduate programs are accredited through the Accreditation Board for Engineering and Technology (ABET). All academic programs are also accredited by the Southern Association of Colleges and Schools (SACS).

BROWARD COLLEGE PATHWAY

*TO A **SUCCESSFUL** CAREER*

HSI TITLE III GRANT

Annie Myers, Associate Dean, PMI

Dr. Candice Maharaj, Project Director

ABOUT BROWARD COLLEGE

Our mission at Broward College is *Transforming students' lives and enriching our diverse community through academic excellence, innovation, and meaningful career opportunities.*

Broward College is committed to fostering a learning-centered community that celebrates diversity and inclusion by empowering and engaging students, faculty and staff.

Broward College offers an Associate's of Arts two-year transfer degree, Associate of Science offering specialized training in high demand fields.

PALM BEACH STATE COLLEGE

*tres*PATHS PROJECT

An HSI STEM Grant

ABOUT PBSC

4th Largest College of the 28 in FCS

5 Campuses Across PBC

Open-Access Institution

About 50,000 Students

Students from 160+ Countries

Student Profile:

- 35% White
- 32% Hispanic
- 27% Black
- 6% all other

- Variety of Degrees and Certifications

FLORIDA ATLANTIC UNIVERSITY

Research Team

Ali Zilouchian, Ph.D.
PI & Project Dir., Assoc. Dean for Academic Affairs, FAU

Nancy Romance, Ed.D.
Co-PI , Professor, FAU

Hanqi Zhuang, Ph.D.
Dept *Chair,* FAU

Annie Myers, M.S.
Assoc. Dean of IT, BC

Dana Hamadeh, M.E.,
Assoc. Dean of STEM, PBSC

Michael Vitale, Ph.D.
Professor, E. Carolina Univ.

Program Coordinators

Jon Stonger
HSI Research Project Coordinator, FAU

Gerard John-Williams
Project Manager, PBSC

Candice Maharaj, Ph.D.
Program Mgr., BC

Math Curriculum Refinement Team

Jeff Brooks, M.S.
Asst. Professor, BC

Scott Demsky, Ph.D.
Asst. Professor, & Adjunct, BC

Rainer Steinwandt, Ph.D.
Dept. Chair, FAU

Anurag Katyal, M.S.
Instructor, PBSC

Jeremy Underwood, M.S.
Asst. Professor, BC

Ozlem Ugurlu, Ph.D.
Professor, PBSC

Lisa Greenberg, *M.S.*
Instructor, FAU

Lee Klingler, Ph.D.
Professor, FAU

Rose Wilson, M.S.
Assoc. Professor, PBSC

Not Pictured:
- Alex Opritsa, Professor I, PBSC

FLORIDA ATLANTIC UNIVERSITY

Student Mentors

FAU Mentors

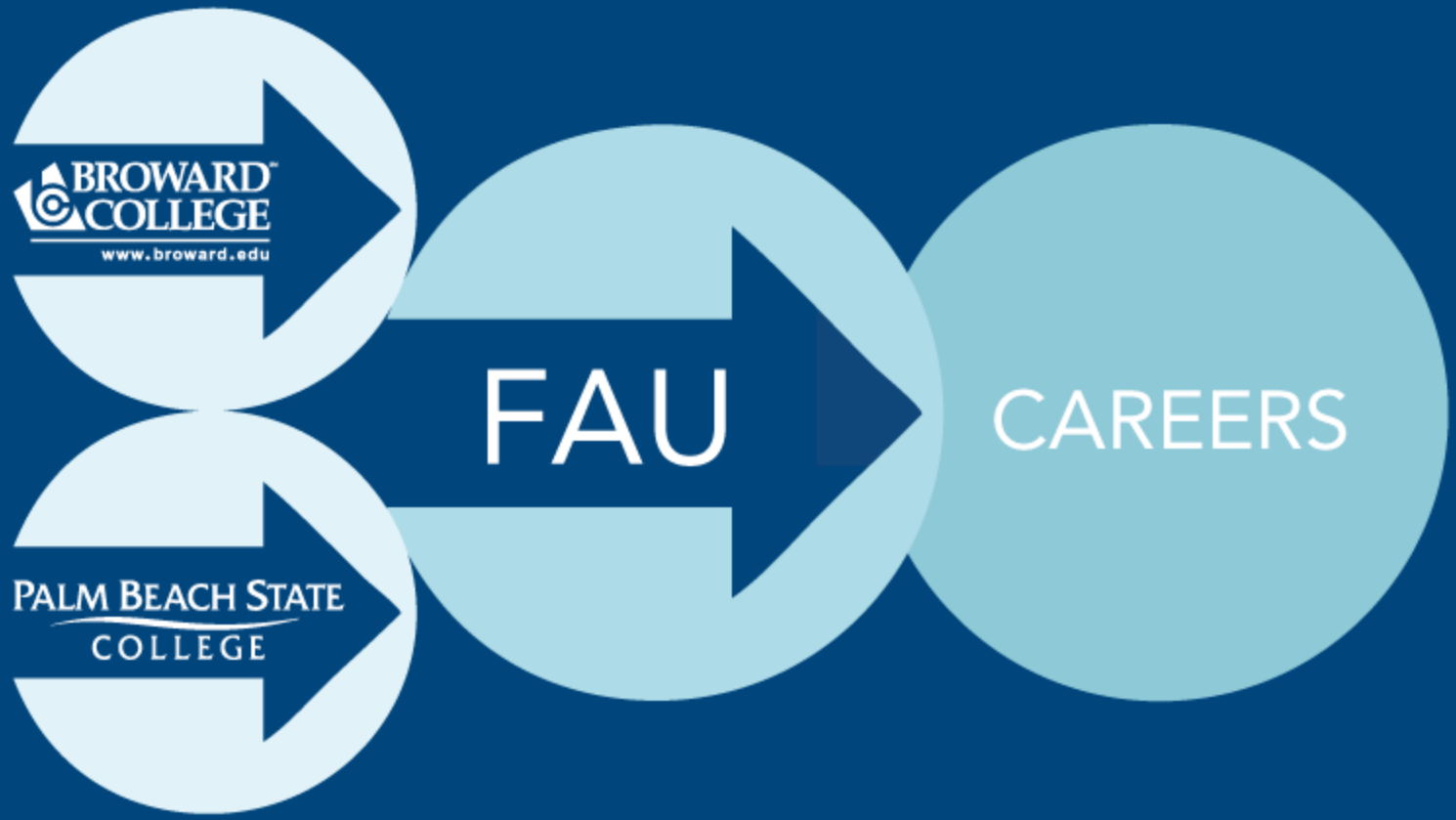
- Focus on hiring Juniors and Seniors in CS, CE and EE
- Exceptional students from other disciplines included
- Preference to ILHP (Innovation Leadership Honors Program)
- Motivated students with high GPA (3.5 or better)
- In-depth training to start each semester
- Mentors travel to Broward and Palm Beach State College to tutor students on site

USDOE Title III HSI Framework

Overarching Purpose

Increase the number of Hispanic and low-income state college students who complete their AA degree, transfer to FAU, and complete their bachelor's degree in CS, CE and EE as well as post-degree employment or advanced degree attainment.

Program Pathway



This program is intended to transform the lives of Hispanic and low income students by allowing them to obtain a degree in Computer Science, Computer Engineering or Electrical Engineering.

PALM BEACH STATE COLLEGE

*tres*PATHS PARTNERSHIP

Weekly meetings with Project Administrators

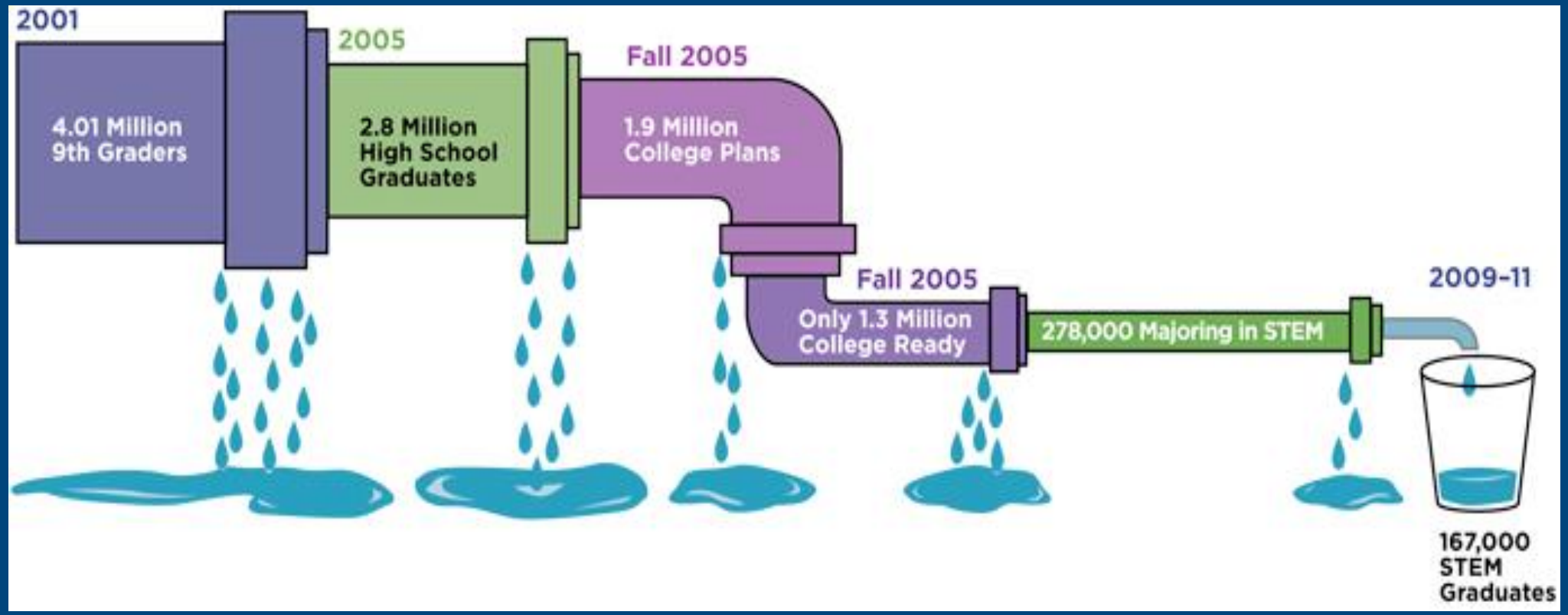
Math Faculty monthly meetings with FAU & BC Teams

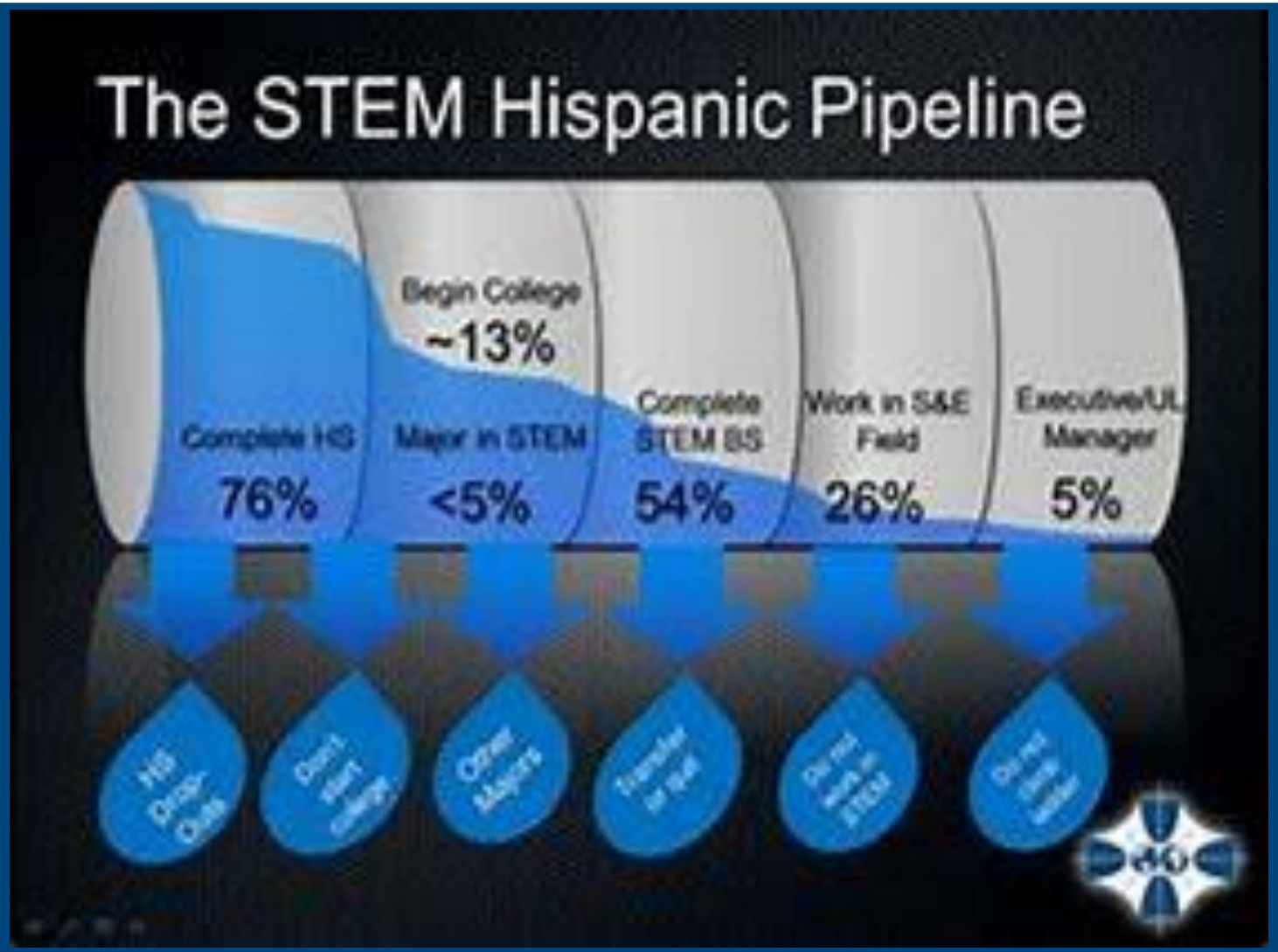
PBSC and FAU Advisors collaboration & campus visits

PBSC Project Director meetings with FAU & BC Project Administrators and Director

Student and Faculty access to FAU's resources

The Leaky STEM Pipeline




The STEM Hispanic Pipeline
Complete HS
76%
Begin College
~13%
Major in STEM
<5%
Complete
STEM BS
54%
Work in S&E
Field
26%
Executive/UL
Manager
5%

Project's Research Framework

Programmatic Challenges

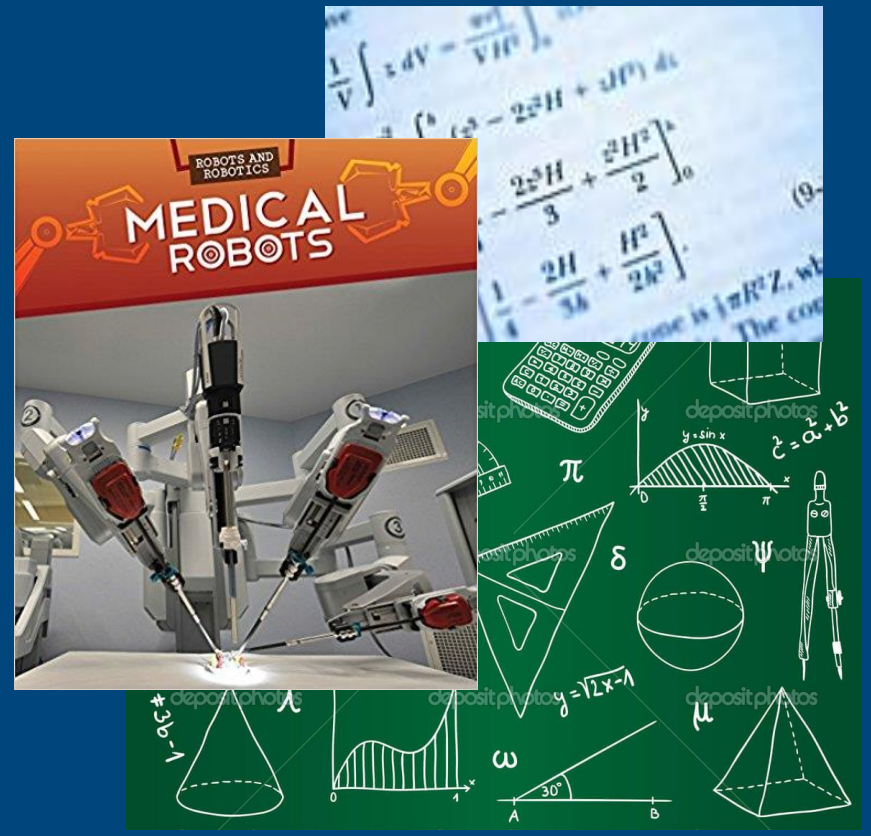
- Student Success Rate in Gateway Courses
- Issues with Retention and Withdrawal - State Colleges
  - Students from the partnering institutions (BC, PBSC) do not complete their AA degree and are unable to transfer to FAU
- Issues with Retention and Withdrawal - FAU
  - Students receiving a DFW grade in Mathematics and Computer Science do not complete their BS degree.

Research Design

- Innovative approaches to remediate learning problems in gateway courses across all institutions.
- Varied student support opportunities and CS/CE/EE career-focused events - geared toward retention and degree completion.

Title III Project Components - BC, PBSC, FAU

- Curriculum Refinement and Alignment – Gateway Courses
- Collaborating Faculty Partners - Mathematics and Computer Science Faculty
- Participant Recruitment
- Participant Support
- FAU Mentors
- Computer Science Learning Community
- Project Research Areas



Title III Project Components - BC, PBSC, FAU

- Gateway Courses
  - 4 Mathematics
  - 2 Computer Science
- Collaborating Faculty Participants
  - Group Curriculum Meetings
  - Courses – Designated for Project Participants
  - Collaborate with FAU Mentors
  - Collaborate with Project Coordinators
  - Collaborate with Associate Deans

tresPATHS TARGETED **COURSES**

MATHEMATICS

College Algebra
Pre-Calculus
Trigonometry
Calculus I

COMPUTER SCIENCE

Intro to Engineering
Intro to Program Logic
Object C Programming
Microcomputer Applications
Programing in C++
Programing in Java

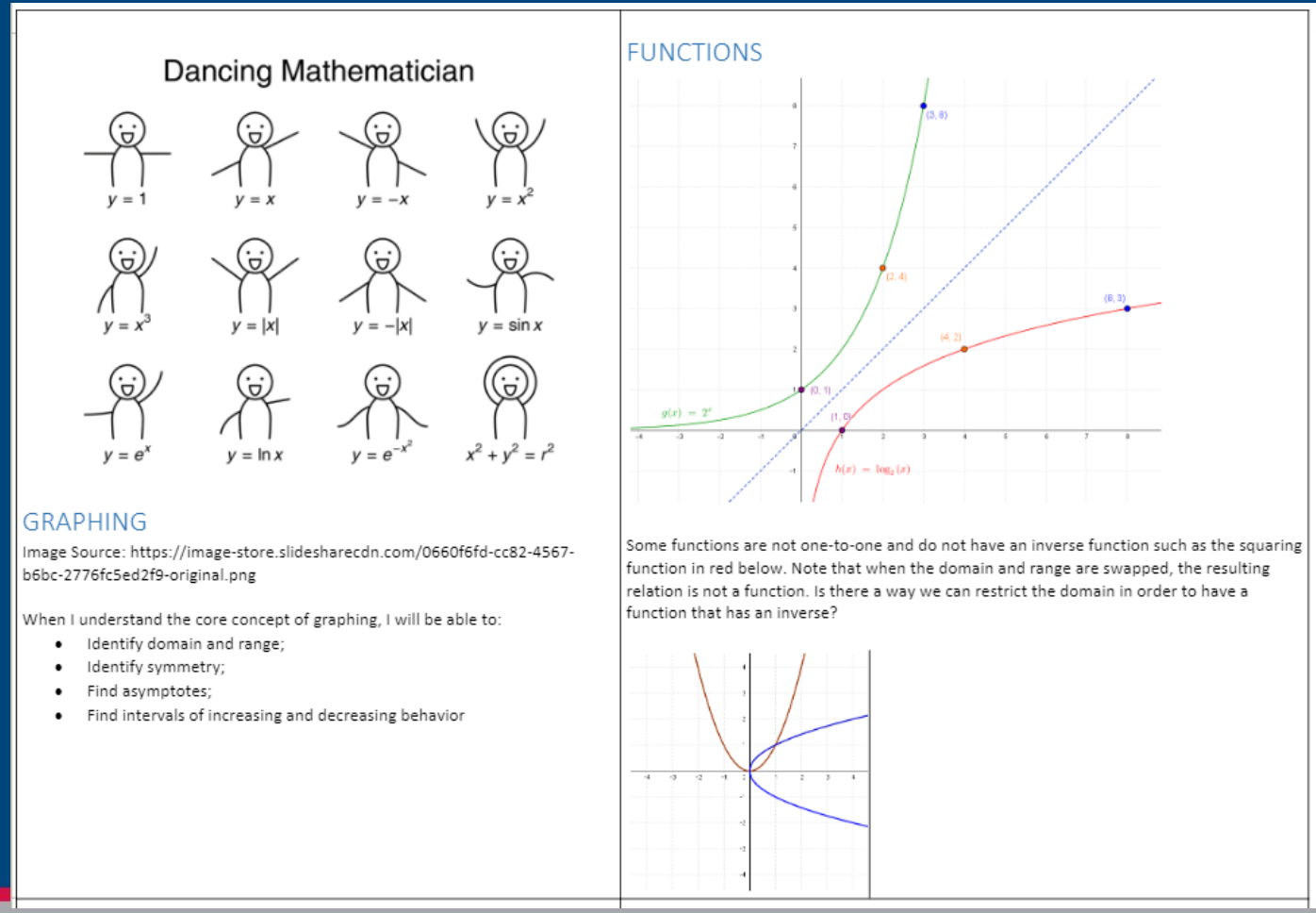
Mathematics Curriculum Refinement

- Align Curriculum between all 3 institutions
  - *What skills does a student need from each prior course to succeed in the next one?*
- Focus on Big Ideas or Core Concepts for each course
  - *What concepts are critical in each course, and how do they transfer to the following one?*
- Problem area worksheets
  - *What common mistakes do students make repeatedly that continue to harm their progress in math?*

FLORIDA ATLANTIC UNIVERSITY

College Algebra Core Concepts

- Solving linear and quadratic equations
- Functions
- Graphs
- Exponents and Logarithms
- Systems of Linear Equations



Dancing Mathematician

GRAPHING

Image Source: https://image-store.slidesharecdn.com/0660f6fd-cc82-4567-b6bc-2776fc5ed2f9-original.png

When I understand the core concept of graphing, I will be able to:

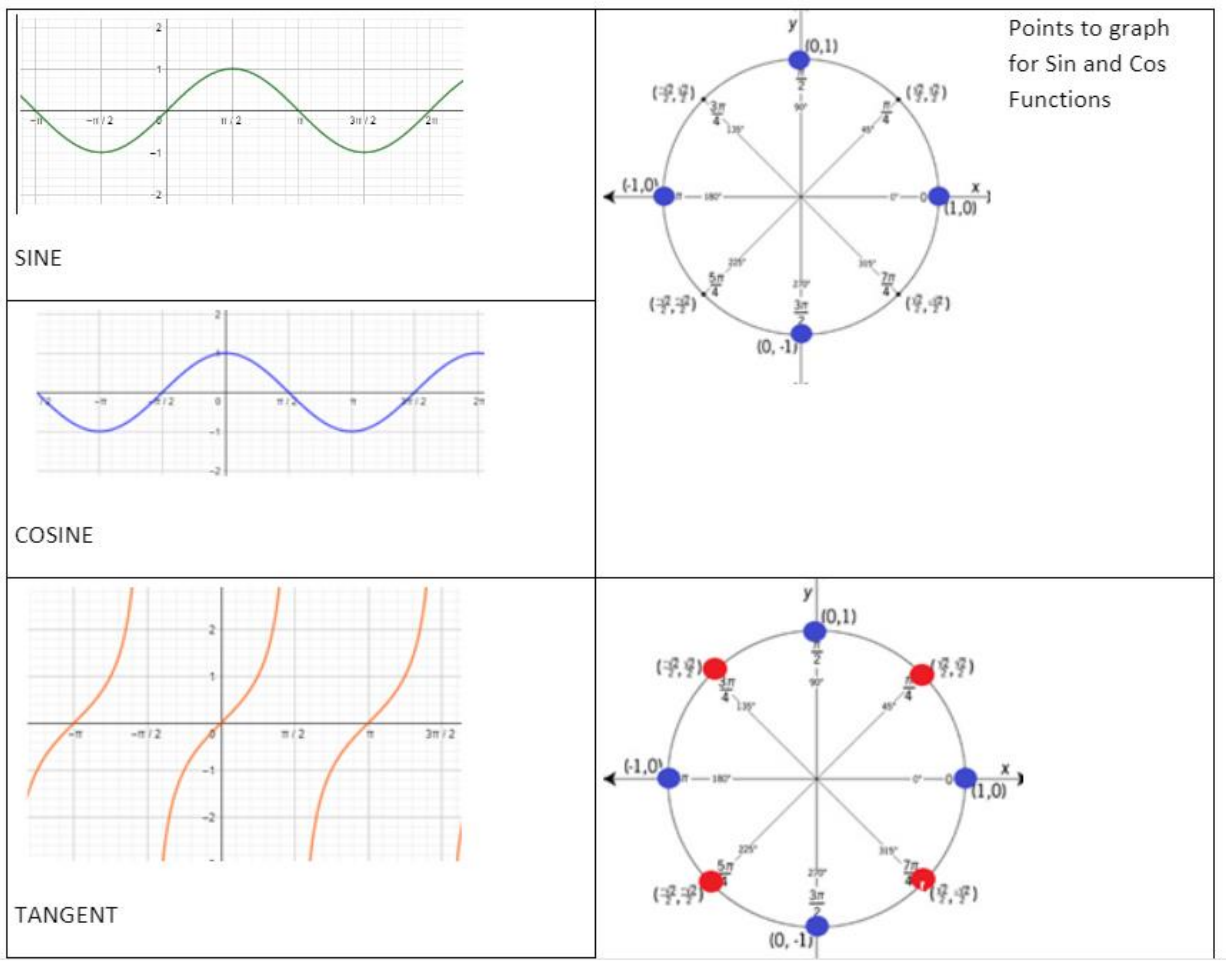
- Identify domain and range;
- Identify symmetry;
- Find asymptotes;
- Find intervals of increasing and decreasing behavior

FUNCTIONS

Some functions are not one-to-one and do not have an inverse function such as the squaring function in red below. Note that when the domain and range are swapped, the resulting relation is not a function. Is there a way we can restrict the domain in order to have a function that has an inverse?

Trigonometry Core Concepts

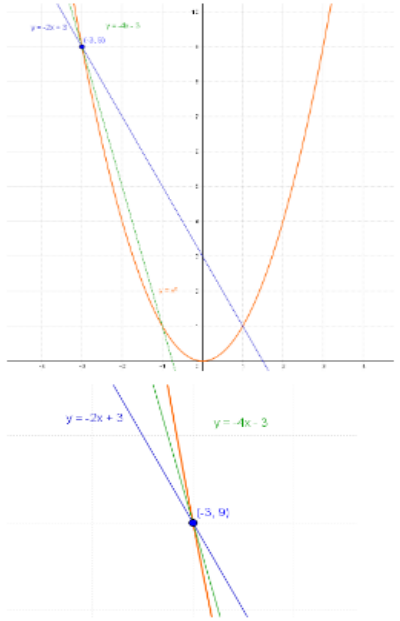
- Unit Circle
- Graphs/Transformations
- Solving Trigonometric Equations
- Trig Identities



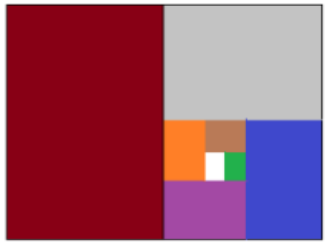
Pre Algebra Core Concepts

- Functions
- Graphing
- Systems of Equations
- Sequences and Series

SYSTEMS OF EQUATIONS AND INEQUALITIES



SEQUENCES AND SERIES



The geometric ratio is 1/2...

The first term is 1/2

$S_\infty = \frac{1/2}{1 - 1/2} = 1$

$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32} + \frac{1}{64} + \frac{1}{128} + \ldots = 1$

Using Pascal's triangle to expand a binomial expression

We will now see how useful the triangle can be when we want to expand a binomial expression.

Consider the binomial expression $a + b$, and suppose we wish to find $(a + b)^2$.

We know that

$(a + b)^2 = (a + b)(a + b)$

$= a^2 + ab + ab + b^2$

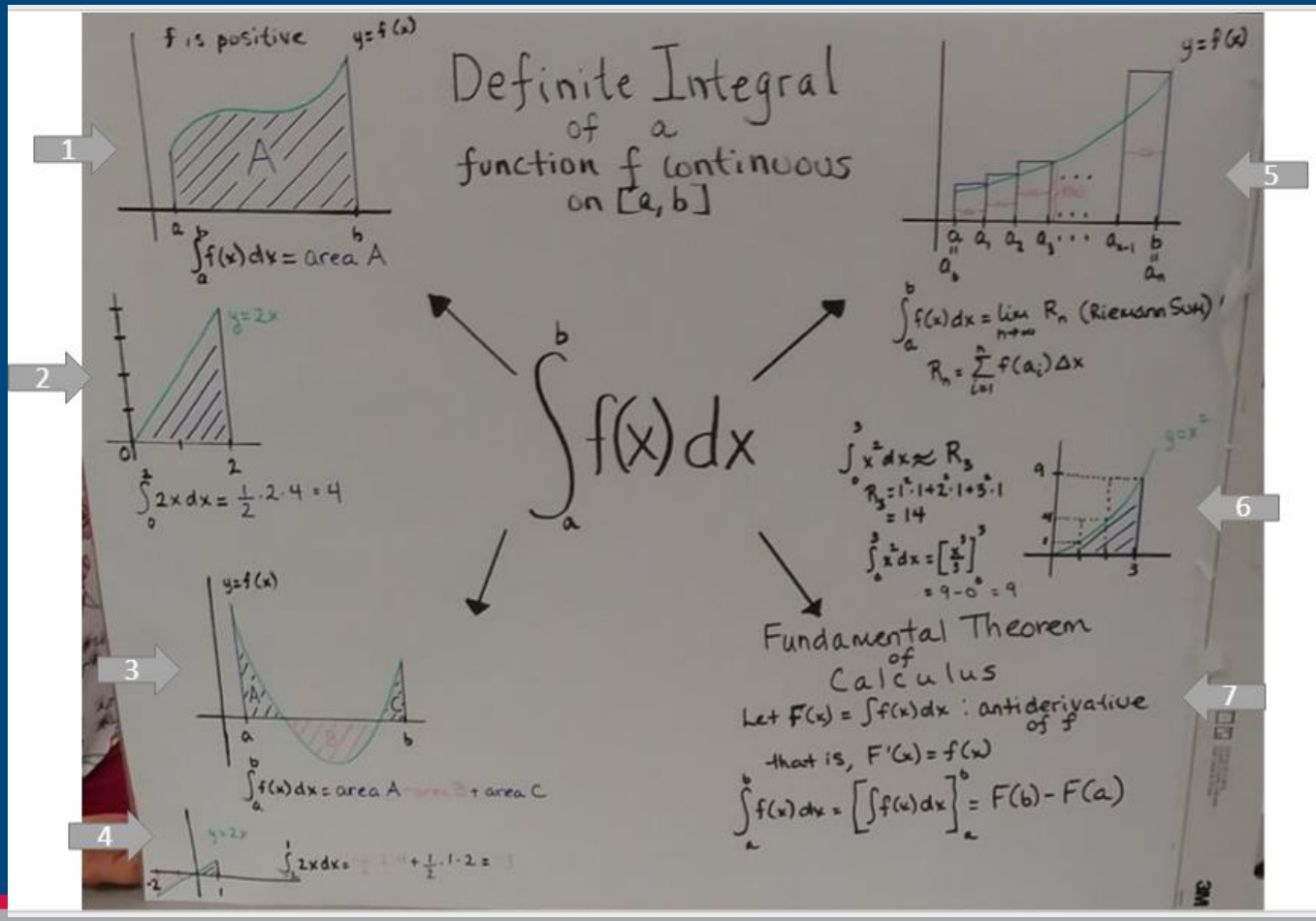
That is,

$(a + b)^2 = a^2 + 2ab + b^2$

```
          1
        1   1
      1   2   1
    1   3   3   1
  1   4   6   4   1
1   5  10  10   5   1
1  6 15 20 15  6  1
```

Calculus Core Concepts

- Limit
- Derivative
- Integral
- Fundamental Theorem



Common Problem Areas

- Identify common mistakes that hurt students year after year
- Create tools to review and correct frequent errors

Common Mistakes
$(a \pm b)^n \neq a^n \pm b^n$
$\sqrt{a \pm b} \neq \sqrt{a} \pm \sqrt{b}$
$\frac{a}{b+c} \neq \frac{a}{b} \pm \frac{a}{c}$
$\frac{a+b}{a+c} \neq \frac{b}{c}$ $\frac{ab}{a+c} \neq \frac{b}{c}$
$\lvert a \pm b \rvert \neq \lvert a \rvert \pm \lvert b \rvert$

Review Worksheets

Algebra Survival Review Name:

In General : $(a \pm b)^n \neq a^n \pm b^n$

1)Show that $(a+b)^n = a^n + b^n$ is true when $n = 2$, $a = 1$ and $b = 0$.

2)Show that $(a+b)^n = a^n + b^n$ is false when $n = 2$, $a = 5$ and $b = 3$.

Since $(a+b)^n = a^n + b^n$ is not always true, in general: $(a+b)^n \neq a^n + b^n$

3)Show that $(a-b)^n = a^n - b^n$ is true when $n = 2$, $a = 1$ and $b = 0$.

4)Show that $(a-b)^n = a^n - b^n$ is false when $n = 2$, $a = 5$ and $b = 3$.

Since $(a-b)^n = a^n - b^n$ is not always true, in general: $(a-b)^n \neq a^n - b^n$

5)Does it make a difference if we replace addition or subtraction with multiplication or division?
Experiment with $(ab)^n = a^n b^n$ and $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$ by choosing appropriate test values.
Based on your test results, do you think these rules are true for all values?

6)In your own words, write a brief explanation of why you can distribute an exponent when multiplying and dividing, but not when adding and subtracting.

Rule: $b^y = x$ **if and only if** $\log_b(x) = y$

Whenever you are asked to compute a logarithm you should ask yourself the following question:

"What EXPONENT (y) do I need to raise the BASE (b) to get the ARGUMENT (x)?"

1. Try some numbers to see what $\log_b(x)$ is when $b = 2$ and $x = 8$.

2. Try some numbers to see what $\log_b(x)$ is when $b = e$ and $x = e^2$.

3. Assume that you are given $\log_2(x) = 3$. What is the value of x?

4. Assume that you are given $\log_e(x) = 2$. What is the value of x?

5. **Student Response:** In your own words explain how you can translate an exponential equation to a logarithmic equation and a logarithmic equation to an exponential equation.

Algebra Review Worksheet Name:

In General : $|a \pm b| \neq |a| \pm |b|$

1)Show that $|a+b| = |a| + |b|$ is true when $a = 2$ and $b = 3$.

2)Show that $|a+b| = |a| + |b|$ is false when $a = 2$ and $b = -3$.

Since $|a+b| = |a| + |b|$ is not always true, in general: $|a+b| \neq |a| + |b|$

3)Show that $|a-b| = |a| - |b|$ is true when $a = 3$ and $b = 2$.

4)Show that $|a-b| = |a| - |b|$ is false when $a = 3$ and $b = -2$.

Since $|a-b| = |a| - |b|$ is not always true, in general: $|a-b| \neq |a| - |b|$

5)Does it make a difference if we replace addition or subtraction with multiplication or division?
Experiment with $|ab| = |a|\,|b|$ and $\left|\frac{a}{b}\right| = \frac{|a|}{|b|}$ by choosing appropriate test values.
Based on your test results, do you think these rules are true for all values?

6)In your own words, write a brief explanation of why you can distribute an absolute value when multiplying and dividing, but not when adding and subtracting.

STUDENT RECRUITMENT

Marketing Strategies

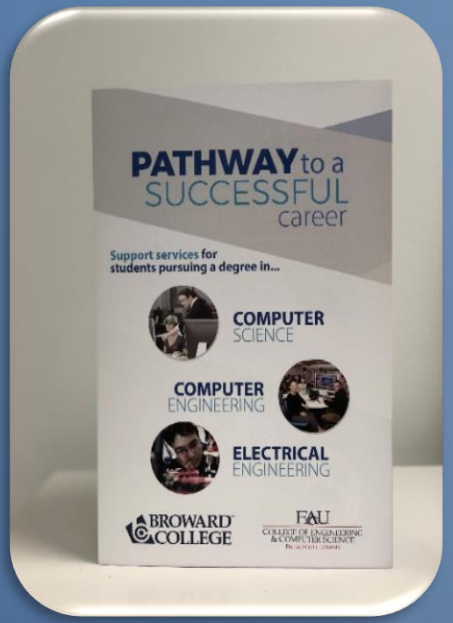
Recruitment Plan

1. Classroom Visits
2. Social Media Marketing
3. Recruitment Emails
4. Seahawk Resource Fair
5. Club Rush Event
6. College Fair
7. Welcome Back BBQ

Create Branding Materials

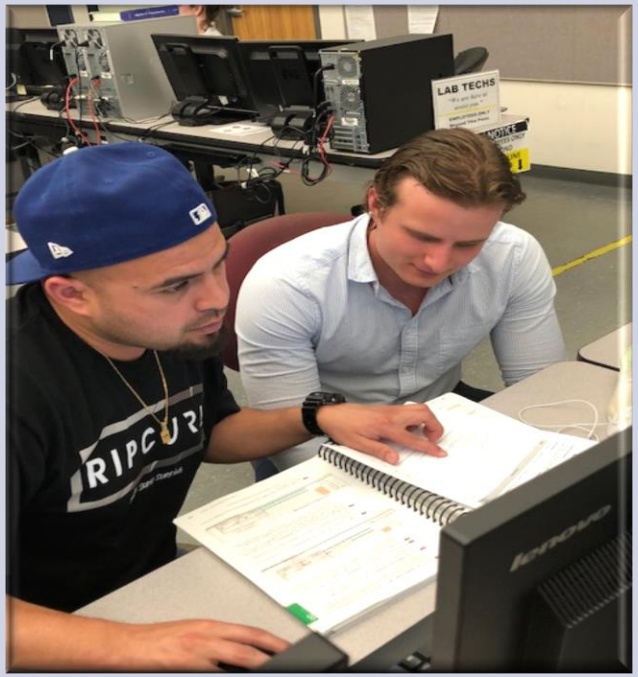
1. Pull up banners and displays
2. PATHWAY Promotional Items
3. BC PATHWAY Website
4. Table Cloths

MARKETING/PROMOTIONAL ITEMS



STUDENT SUPPORT ACTIVITIES

Mentoring – Information Sessions



1. Enhanced academic advising
2. Flight plans – CS, CE, EE
3. FAU Math Mentors located in BC Academic Success Center (North and Central)
4. Learning community

STUDENT EVENTS/ACTIVITIES

1. BC Hackathon
2. Open House
3. Meet and Greet with Mentors and Mentees

tresPATHS EVENT: OPEN HOUSE & CLUB RUSH

tresPATHS Open House

Feb. 20, March 20, April 25

12:30PM - 1:30PM

Room: CA109, HT211 (April)

Boca Raton campus

Light refreshments will be provided.

For more information, contact us at:

561-862-4711

hsistemprogram@palmbeachstate.edu

Join tresPATHS today!

Requirements

- PBSC student pursuing a degree
- Hispanic or low income (per FAFSA)
- At least 18 years of age
- Minimum GPA of 2.5
- Pursuing a B.S. degree in Computer Science, Computer Engineering or Electrical Engineering at Florida Atlantic University (FAU) upon completion of AA at PBSC

Benefits

- Designated advisor with enhanced academic support
- Free Math and Computer Science Tutoring
- Special invitation to events and workshops
- Seamless transition to FAU's College of Engineering and Computer Science
- And more...

PalmBeachState.edu/programs/tresPATHS

*tres*PATHS EVENT: **INFORMATION STATION**

Thank You