



# Third party certification & entry-level certificates in biotechnology

[Click here to watch the webinar recording](#)

Webinar,

Friday, May 12, 2017: 1:00-2:30 EDT

Tamara Mandell, Lori Wojciechowski,  
Linnea Fletcher, Fiona McAlister, Jeff Bush,  
Neil Glynn, and Joe Wuerffel



# Moderator



Sandra Porter, PhD  
Digital World Biology LLC, WA  
Sandy@bio-link.org, @bio\_link



# Bio-Link

- Works to increase the number and diversity of well-educated technicians in the bioscience workforce
- Our members are workforce-oriented college & high school programs, instructors, industry, students
- Bio-Link.org



# POLL

Please select from the following:

You are a

- Student
- High School Teacher
- College Instructor
- Administrator
- Industry Personnel

# Presenters



Tamara Mandell is the Associate Director for Education and Training at the University of Florida's Biotility.



Lori Wojciechowski is the Assistant Director of Secondary Programs at Biotility at the University of Florida's Center of Excellence for Regenerative Health Biotechnology.





# Biotechnician Assistant Credentialing Exam (BACE)

12 May, 2017

Tamara Mandell  
tmandell@cerhb.ufl.edu

Lori Wojciechowski  
lwojo@ufl.edu

# UF Center of Excellence for Regenerative Health Biotechnology

**Est. 2003 (Florida Biologix &  
Biotility)**

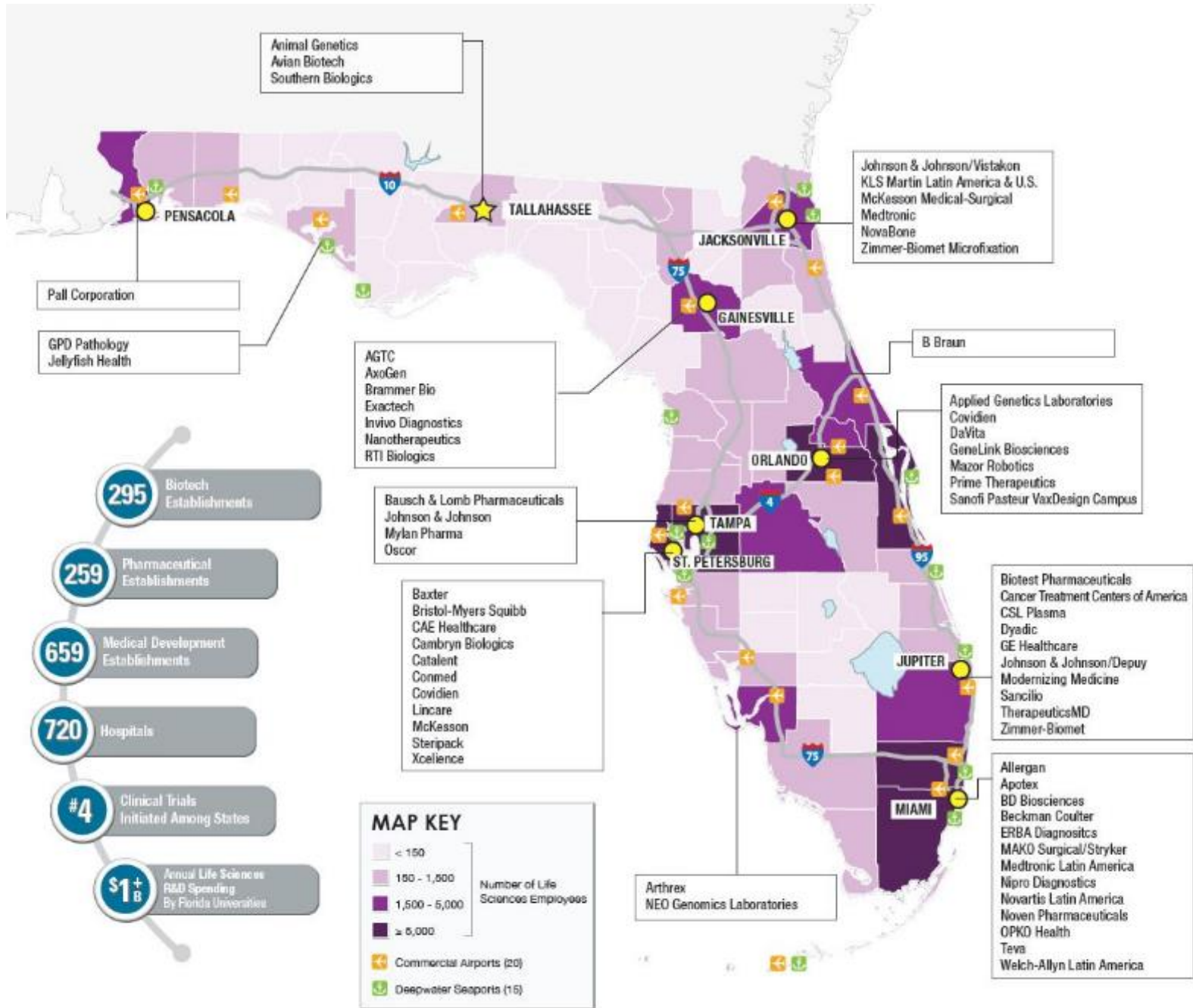
## **Mission:**

- Economic development for State of Florida
- Improve climate and expand infrastructure for translational research
- Develop courses for workforce training



**UF** | Center of Excellence for  
Regenerative Health Biotechnology  
UNIVERSITY of FLORIDA

 **Florida Biologix™**



<https://www.enterpriseflorida.com/industries/life-sciences>

# Building the Workforce



- Develop & deliver curricula for industrial biotechnology (short-course) training
- Ensure programs within educational institutions are relevant & meet industry's needs & standards



## *Florida Partnership for Industrial Biotechnology*

- HS Industrial Biotechnology Program
  - Blended CTE/Academic Credit
  - “Equally Rigorous” Science
- Local Articulation Agreements
- Teacher Training/Prep

# Building the Workforce



## *Florida Partnership for Industrial Biotechnology*

- Develop & deliver curricula for industrial biotechnology (short-course) training
  - Ensure programs within educational institutions are relevant & meet industry's needs & standards
- HS Industrial Biotechnology Program
    - **Blended** CTE/Academic Credit
    - “Equally Rigorous” Science
  - Local Articulation Agreements
  - Teacher Training/Prep

# Career Opportunities

- Research & Development
- Manufacturing
- Quality Control (QC)
- Regulatory Affairs
- Facilities
- Quality Assurance (QA)



# Career Options

## **Technician Level**

- Process Technician
- Manufacturing Prep Technician
- Formulation/Fill Tech
- Quality Control Tech
- Instrument/Calibration
- Environmental Tech

## **Plus Education/Experience**

- Process Engineer
- Development & Manufacturing
- Quality Control Asst./Associate
- Quality Assurance Asst./Associate
- Validation Specialist
- Environmental Engineer
- Research Asst./Associate/Scientist



# Secondary Industrial Biotechnology

## **Biotech I**

**# 3027010**

History, Benefits, Careers

Safety Procedures

Solution Preparation

Basic Chemistry

Basic Equipment

Cell Structure & Function

Culturing Microorganisms

Sterile Technique

Experimental Design

DNA Isolation/Analysis

Environmental Monitoring

Data Analysis

Law & Ethics

Documentation

Communication

## **Biotech II**

**#3027020**

Transformation

Culture Scale-up

Recombinant Proteins

Production of Proteins

Protein Quantification

Filtration & Purification

ELISA

PAGE

Western/Southern Blot

PCR

Assay Development

Quality Control

Quality Assurance

Regulatory Affairs

Product Marketing

## **Biotech III**

**#8736030**

CTE Credit Only

Independent design  
and implementation of  
student projects,  
simulating employment  
in a biotechnology-  
based industry and  
utilizing industry  
partners



Comprehensive sequence covering skills used by industrial, medical, agricultural and research facilities

# Teacher Certification (IBTE)

- District Certification Program
- **Industrial Biotechnology Teacher Experience** (June 19-30)
  - Industry experience in the context of the curriculum, including preparative steps
  - Completion earns “district certification” for certified Biology and Chemistry teachers, enabling them to teach the CTE components of the program
- **Bioscience Industry for Teachers (BIT)**
  - Core Concepts in Biomanufacturing & Quality Systems (July 24-28)



# Statewide Articulation: Secondary to A.S. (Biotechnology)

- POS grant - US Dept. of Education's Office of Career and Technical and Adult Education (managed through FL DOE)
  - Comparison of secondary to postsecondary Biotechnology course standards
    - Syllabi, course descriptions, Florida's SCNS, Instructor communications
  - Alignment with Industry, Postsecondary, and National Standards

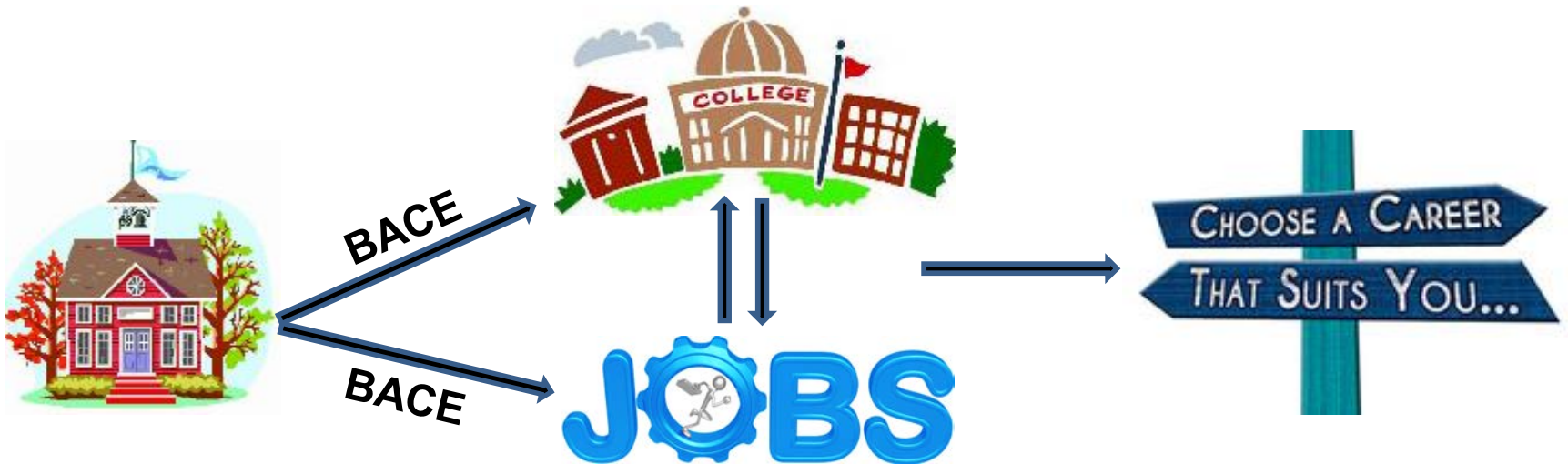
# Florida's Career and Professional Education Act (2007)

## §1003.491

- Facilitate partnerships between business and education
- Provide state residents with access to high-wage/high demand careers
- Attract, expand, and retain targeted, high-value industry
- Sustain a strong, knowledge-based economy

# Florida's Career and Professional Education Act

- Improve academic performance through rigorous & relevant curricula
- Provide rigorous and relevant career-themed courses
- Opportunities to articulate to *postsecondary coursework* and *earn industry certifications*



# “Biotechnician Assistant” Credential

Based on foundational concepts and skills required in  
biotechnology-based workplace settings

- Written & Practical exam
  - Aligned w/Academic and Performance Standards
- Industry recognition via BioFlorida
  - Relevance, Accuracy, Alignment to Standards



- Approved by Florida’s Board of Education, Jan., 2012 for statewide articulation (A.S.) Biotechnology
- Approved by Florida’s Agency for Workforce Innovation

# Biotechnician *Assistant*

- Distinct from A.S. “Biotechnician”
- Basic lab support
  - Prepare solutions, culture media and equipment for use
  - Document data
  - Monitor/maintain equipment.
  - Assist in facility and equipment cleaning
  - Assist with experiments/tests/manufacturing
  - Assists with Inventory, MSDS
- Salary
  - Start out \$10.00-\$12.00/hour
  - High potential for growth



# Biotechnician Assistant Credentialing Exam (BACE)



- **Online (“written”) component**, administered at high school
  - Approximately 75 questions (one point each); 3 hours allotted
- **Practical laboratory component**, which may be proctored at high school or other approved laboratory
  - Practical: Approximately 40-50 questions (100 points total); 3 hours *suggested*

# BACE Information Website

<http://biotility.research.ufl.edu/biotechnician-assistant-credential-bace.html>



Advancing **biotechnology** education and training

Industry Training Registration

Biotility Calendar

Biotechnology News

Teacher Training & Resources

Biotechnician Assistant  
Credential (BACE)

Contact Us

## Biotechnician Assistant Credentialing Exam (BACE)

The Biotechnician Assistant Credentialing Exam (BACE) is an industry-recognized exam designed to assess core skills and knowledge sets identified by industry, and represented within the academic and performance standards of Florida's secondary Biotechnology program. The test has been vetted by the state's industry organization BioFlorida, representing representing more than 3,000 companies and research organizations in the biotechnology, pharmaceuticals, medical devices and biologiculture sectors.

### About the Biotechnology Certification Program

The Biotechnician Assistant Credentialing Exam (BACE) is offered by Biotility at The University of Florida's Center of Excellence for Regenerative Health Biotechnology (UF CERHB). The exam was developed to reflect competencies and skills outlined by the performance and academic standards of Florida's secondary Industrial Biotechnology Program (#8736000), which are in turn based on Florida's industry-described requirements necessary for this entry-level position. Students will be issued a Biotechnician Assistant credential from Biotility for successful completion of both the online and practical components of the exam. Schools may use the BACE for the end-of-program validation required by the Career and Professional Education (CAPE) Act.

The knowledge exam can be administered by an approved proctor via a computer-based online system. The practical exam assesses technical workplace skills, and is performed at an approved Exam Site under the observation of an approved Skills Evaluator. The BACE program and procedures are covered in this manual. It is critical that that Site Coordinators, Proctors, and Skills Evaluators implement the exam procedures as described to ensure the integrity of the exam and of student outcomes.

### Certification Standards

The certification standards for the Biotechnician Assistant Credentialing Exam include the Academic Knowledge and CTE Performance Standards and Benchmarks taught in the Industrial Biotechnology program at the secondary level. Certified individuals have a knowledge and skill set applicable to entry level positions in the biotechnology industry.

[Industrial Biotechnology Academic Knowledge and CTE Performance Standards](#)

Upon completion of the Biotechnology Assistant Credentialing Exam, each successful participant will receive:

- A BACE Certificate
- A letter to the employer explaining the benefits of hiring a BACE-certified student
- Access for employer's to verify certification

[BACE Registration Forms, Teacher's Guide, and Practice Exam](#)

[BACE for PLTW Teachers](#)

[Log onto BACE Exam Website](#)

# BACE Forms and Information

<http://biotility.research.ufl.edu/biotechnician-assistant-credential-bace/bace-school-registration.html>



Advancing **biotechnology** education and training

Search Biotility

Industry Training Registration

Biotility Calendar

Biotechnology News

Teacher Training & Resources

Biotechnician Assistant  
Credential (BACE)

Contact Us

## BACE School Registration

### Step 1: Review the Procedures Manual

Download the [BACE\\_Procedures\\_Manual\\_15\\_16](#) for details on site, proctor and student registration.

### Step 2: Register Your Site and Personnel

[SITE REGISTRATION FORMS](#)

### Step 3: Schedule Your Exam Date

After registering, please contact [lwjoo@ufl.edu](mailto:lwjoo@ufl.edu) to schedule your exam date(s).

### Step 4: Order Exams

Fill in and return the [ORDER FORM](#).

### Step 5: Register Your Students

Fill in and return the [STUDENT REGISTRATION SHEET](#).

### Step 6: Review the Teacher's Guide

Download the [BACE TEACHER'S GUIDE](#) and [PRACTICE EXAM](#) for details on preparing your students.



[BACE for PLTW Teachers](#)

# BACE Written Exam Subjects

## CELLS (8%)

- Cells (general)
- Cell Structures & Organelles
- Identifying Cell Structures

## CHEMISTRY/BIOCHEMISTRY (42%)

- Bonds
- Cell Respiration
- Chemistry, Molecules & Macromolecules
- DNA Structure & Function
- Enzymes & Reactions
- Periodic Table
- Protein Structure & Function
- Reaction Rates
- Translation (Gene Expression)

## GENETICS (5%)

- Genomics
- Mitosis & Chromosomes
- Meiosis
- Ploidy

## LABORATORY SKILLS/APPLICATIONS (23%)

- Cell and Tissue Culture
- Electrophoresis
- Microscopy
- Polymerase Chain Reaction (PCR)
- pH
- Restriction Enzymes
- Southern Blotting
- Transformation & Transfection
- Western Blotting & ELISA

## RESEARCH & SCIENTIFIC METHOD (12%)

- Experimental Design
- Understanding Scientific Method
- Graphing

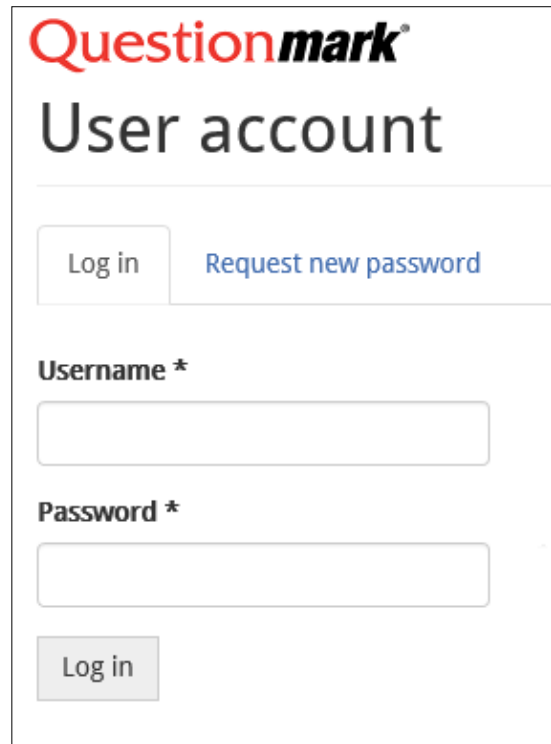
## GENERAL TOPICS IN BIOTECHNOLOGY (10%)

- Applications
- Benefit to Society
- Biotech Careers
- Ethics
- Historical
- Regulatory
- Workplace

Please see "Teacher's Guide & Practice Exam" for sample questions

# Log In: Questionmark

<https://ondemand.questionmark.com/home/403129/>



The image shows a login form for the Questionmark platform. At the top left is the Questionmark logo, with 'Question' in red and 'mark' in black. Below the logo is the text 'User account'. There are two links: 'Log in' (a button) and 'Request new password' (a text link). Below these are two input fields: 'Username \*' and 'Password \*'. At the bottom is a 'Log in' button.

Questionmark®

User account

Log in Request new password

Username \*

Password \*

Log in

Questionmark is an online automated proctoring site that monitors a variety of events, behaviors and patterns, such as key strokes

# BACE Practical

- Proctored in an approved laboratory by District-level proctor, or by course teacher with District-level supervisor present
- Exams and reagent kit are supplied in advance
- Proctors assess students' skills based on supplied rubric in Skills Assessment Form
- Exams, Skills Assessment Form and students' work are sent back to Biotility for scoring

# BACE Practical Exam Subjects

## **APPLIED MATHEMATICS IN BIOTECHNOLOGY (15%)**

- Density
- Graphing
- Beer's Law
- Standard Curves
- Axis Scaling and Limits
- Plotting Data

## **BIOTECHNOLOGY SKILLS (49%)**

- Autoclaving
- Culturing Organisms
- Aseptic/Sterile Technique
- Electrophoresis
- Liquid Measurement (Macro and Micro)
- pH Adjustment and Measurement
- Pipetting (Macro and Micro)
- Serial Dilutions
- Spectrophotometry

## **LABORATORY EQUIPMENT (12%)**

- Identifying Glassware
- Proper Usage:
- Electrophoresis Equipment
- Spectrophotometer
- Micropipettors
- Weighing/Using Balance

## **PREPARING SOLUTIONS (12%)**

- Proper Technique
- Volume/Volume Calculations
- Weight /Volume Calculations
- Molarity Calculations
- Dilutions

## **WORKPLACE SAFETY & BEHAVIOR (12%)**

- Identifying Safety Symbols
- Laboratory Safety Protocols
- Understanding Safety Data Sheets (SDS)
- Personal Protective Equipment (PPE)
- Labeling Samples & Product

# Grade Level & GPA



High School Freshman (0%, 0) High School Sophomore (1%, 4)

High School Junior (56%, 217) High School Senior (43%, 167)

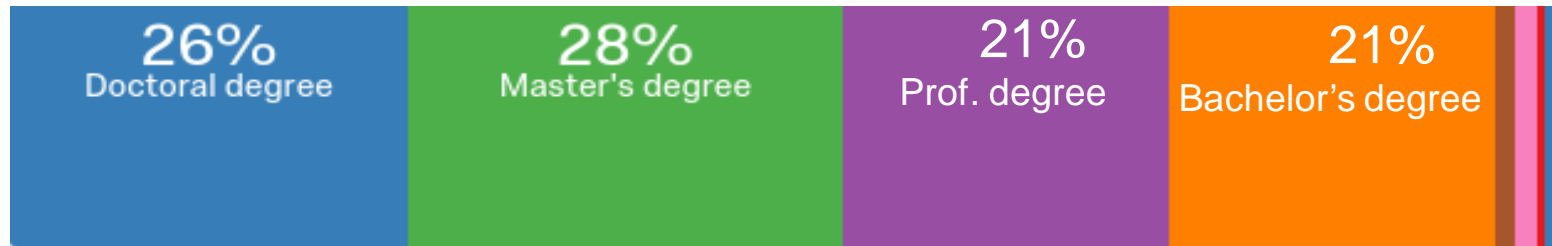
College Freshman (0%, 1) College Sophomore (0%, 0) College Junior (0%, 0)



3.51 - 4.0 (68%, 262) 3.01 - 3.50 (22%, 87) 2.76 - 3.0 (6%, 22)

2.5 - 2.75 (2%, 8) Below 2.5 (0%, 0) I Prefer Not to Answer (2%, 8)

# Level of Education Planned to Complete



■ Doctoral degree (26%, 99) ■ Master's degree (28%, 108)

■ Professional degree (JD, MD) (21%, 81) ■ Bachelor's degree in college (4-year) (21%, 81)

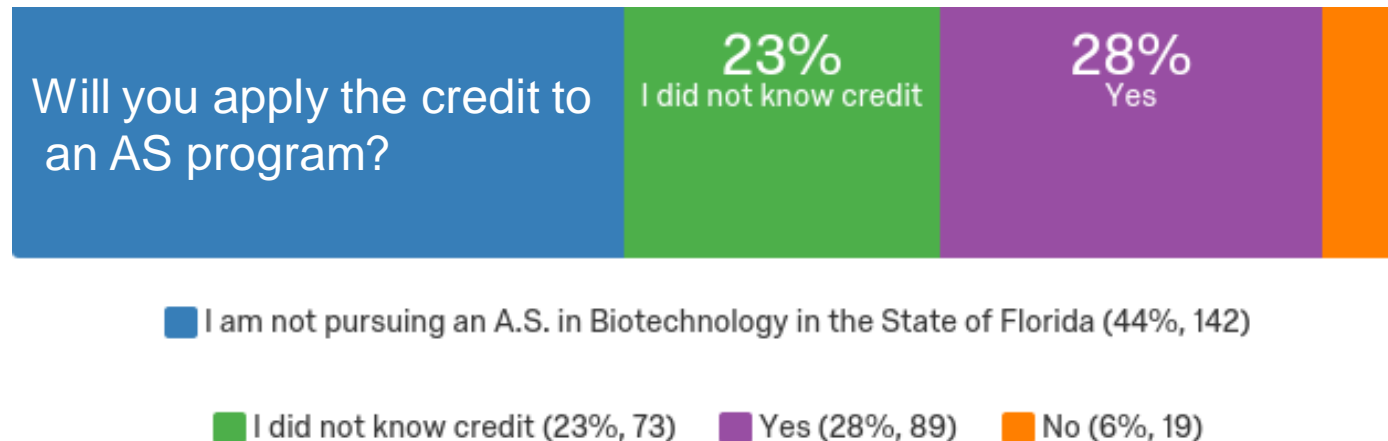
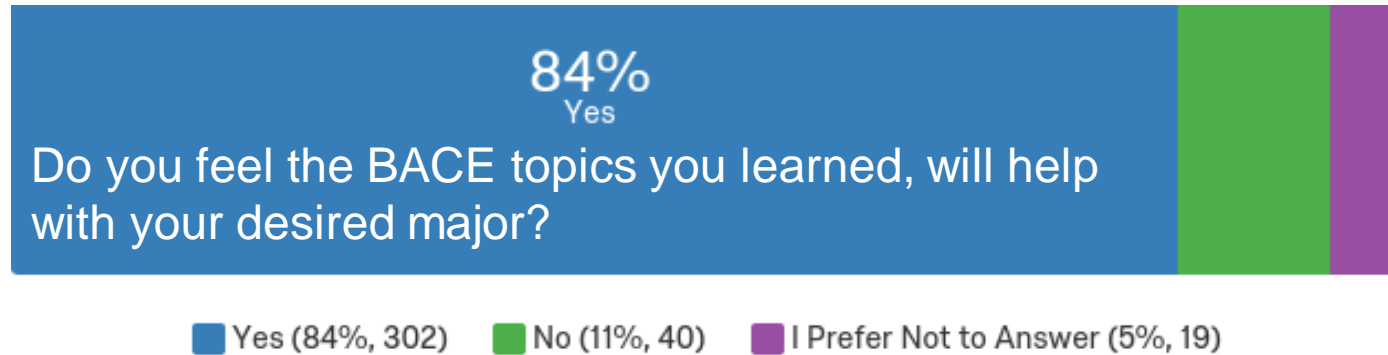
■ Some college but no degree (0%, 0)

■ High school graduate (high school diploma or equivalent including GED) (1%, 5)

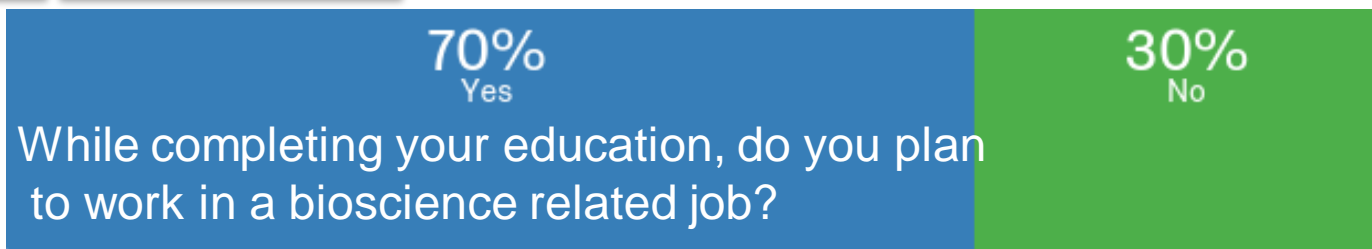
■ I Prefer Not to Answer (2%, 6) ■ Associate degree in college (2-year) (1%, 2)

■ Less than high school degree (2%, 6)

# BACE & College



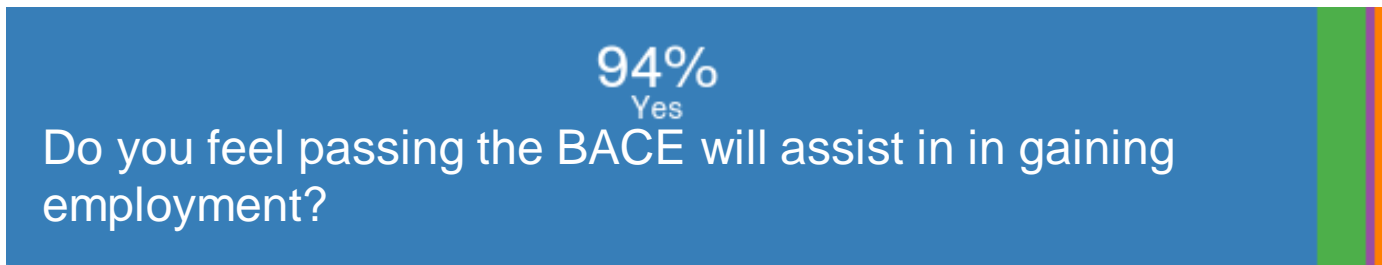
# Employment Plans



■ Yes (70%, 219) ■ No (30%, 96)



■ Yes (68%, 256) ■ No (32%, 119)



■ Yes (94%, 352) ■ No (3%, 13) ■ It Already Has (1%, 2)

■ I Prefer Not to Answer (2%, 7)

# BACE Statistics

Year	2012	2013	2014	2015	2016
# Schools	4	7	10	26	32
# Students	55	100	232	417	592
Passage Rate	69.1	63.0	68.1	69.0	63.0

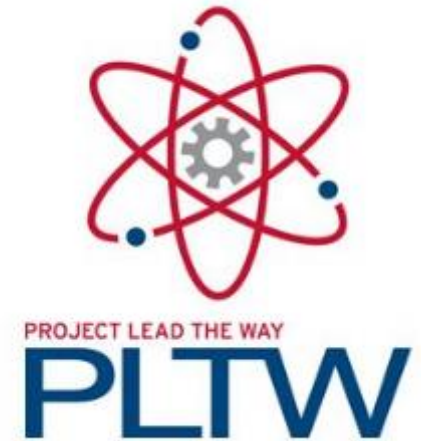
\*2017

1158 Students Registered to take BACE

To date, 638 have taken the exam, 64% Pass Rate

# National Interest

- PLTW Biomedical Sciences (BMS) Program
  - Foundation Courses
    - Principles of the Biomedical Sciences (PBS)
    - Human Body Systems (HBS)
    - Medical Interventions (MI)
  - Capstone Course
    - Biomedical Innovation (BI)
  - Adopted in Florida as Credentialing Exam



# National Interest

- National Consortium for Bioscience Credentials (DOL)
  - National Center for Biotechnology Workforce to bridge the entry-level Biotechnician Assistant credential with sequentially higher credentialing opportunities.
- AZ, OK, TX
- BioLink

# QUESTIONS SO FAR?

# Presenters



Linnea Fletcher, PhD  
Biotech Department Chair  
Austin Community College  
(ACC)



Dr. Fiona McAlister  
Biotech Instructor  
Southern Oklahoma  
Technology Center



Jeff Bush,  
Biotech Instructor  
Vero Beach High School,  
Florida,





# Texas Adoption of BACE

- Placing biotechnology entry level certificate in high schools and 2 year colleges
  - Graduating ~ 130 students this year with the certificate
- Like other states, Texas moving towards requiring 3<sup>rd</sup> party certification for high school career pathways

**CTE will pay for this exam**

**THIS YEAR--**

- Need to get Texas industry to validate the BACE certificate
  - The 4 Community College Biotech Programs in Texas are getting the exam validated by their advisory boards

# SOTC Biotechnology Academy, Oklahoma

Dr. Fiona McAlister

- Junior and Senior High School students – 1 or 2 year Academy
- 2 teacher academy – 6 Biotechnology courses, AP Biology & AP Env. Science
- 580 students since 2007.
- 97% graduates go to college.
- 85% in STEM major.
- Ave. ACT Science score improvement of 3 points
- 90 students have participated in 10 week internships
- 6,500 internship hours in past 8 years
- 16,000 hours summer employment at the Noble Foundation.

# Value of **BACE** to OK Careertech

- Oklahoma Careertech – certification driven
- SOTC Biotechnology Academy 1<sup>st</sup> in OK to use BACE (2017)
- 48 students tested
  - 63% passed
- Recruiting tool
  - importance of BACE for resume development
  - stringent assessment that shows both knowledge and lab skill
  - use of BACE credentials for college research assistantship positions
  - BACE credentials an advantage to REU selection

# BACE EXAM

## VERO BEACH HIGH SCHOOL

- Motivator for students to have an outcome at the end of the two year course they know is unique
- Beneficial for students when applying to college
- Special recognition at graduation for students.
  - Earn a special cord signifying they passed a certification exam.
- Has helped students get jobs at local labs working as lab technicians, or internships.
- Gives practice at taking a major exam that includes a lab practical.
- Many of the students I have are AP level students and know how to study for written exams, but do not have experience with lab practicals.
  - Challenged in a way other classes do not provide.
- Test scores used as an evaluation tool for part of our school score in the same way AP exams are used.
- The exam validates the program to outside professionals in the community.

# **BACE EXAM**

## **VERO BEACH HIGH SCHOOL**

### **Outcomes**

- Last year (our first) we had 39/51 students pass the exam (76%).
  - Currently awaiting scores for this year's exam
- Two students in the Bioscholars program at the University of Florida who were eligible to get into the program because of the biotech classes and passing the BACE exam.
- Several students have been selected to be interns at the Harbor Branch Oceanographic Institute.
- Two students hired at Syngenta as lab technicians during senior year.
- Two students hired at the Vero Entomology lab run by the University of Florida.
- One student doing an internship program at the Indian River Medical Center in the pathology department
- One student working in the quality control department lab at a local citrus grower

# QUESTIONS SO FAR?

# Presenters



Neil C. Glynn, Ph.D.  
Group Leader - Disease  
Control  
Biological R&D  
Syngenta Corp.



Joseph Wuerffel, Ph.D.  
R&D Scientist  
Syngenta Corp.



# BACE at Syngenta Corp.



## Neil Glynn

- The Disease Control team, Nematology
- BACE trained student from Vero Beach (FL) High School, working part-time (Jan. 2017 to present)
- Duties
  - Field sampling
  - Processing & analysis of soil samples in the laboratory to determine severity of nematode contamination
- Equipment
  - Centrifuge, pipettes, phase and stereo microscopes
- Critical skills
  - Experimental design, attention to detail, accurate record keeping

R. Joseph Wuerffel, Ph.D.



Research and Development Scientist

Product Evaluation, Biological Assessment - North America

- Weed Control group at the Syngenta R&D facility in Vero Beach has hosted a BACE student since Sept. 2016.
- Student has assisted with PCR-based molecular assays for the detection of herbicide resistant weed species.
- Duties include:
  - DNA isolation from plant tissue via the CTAB method
  - Standard PCR, qPCR, restriction digests, PCR clean-up, and gel electrophoresis
  - The student also helped optimize DNA isolation from weed seed

# Bio-Link Resources

- [Biotech-Careers.org](http://Biotech-Careers.org)
- [Bio-Link.org](http://Bio-Link.org)
- Links to archived webinars
- Summer Fellows Forum – June 7-10th
- Sign up for our newsletter



# QUESTIONS

# TIME FOR THE SURVEY

[https://wsu.co1.qualtrics.com/SE/?SID=SV\\_2aWGjhfCJOWwVZX](https://wsu.co1.qualtrics.com/SE/?SID=SV_2aWGjhfCJOWwVZX)

**THANK YOU!**