HOW TO CREATE AN ENTRY-LEVEL CERTIFICATE FROM CORE BIOSCIENCE SKILL STANDARDS
NATIONAL CAREER PATHWAYS NETWORK ANNUAL CONFERENCE

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Agenda

• Developed the Core Bioscience Skill Standards
  • Decided on a Common Language (Skill Standards)
  • Developed or Recruited Existing Skill Standards in 3 Areas (Medical devices, biomanufacturing, and R&D bioscience technician)
  • Determined Overlapping Skill Standards –Produced Core Skill Standards

• Implementing the Core Skill Standards
  • Compared Them to What Already Existed in Texas and Kentucky
  • Validate and Implement a Level One Certificate for High Schools, 2 year and 4 year Schools in Texas and Kentucky

• Biotility™ 3rd Party Testing
It Started with a TAACCCT Grant:
It started with a TAACCCT grant

• Grant Strategies to assist TAACCCT workers
  • Improve and expand recruitment
• Harmonize a set of bioscience core skills
• Accelerate completion time in credentialing programs
• Build capacity for bioscience education
What does harmonization mean?

- Identify Core Competencies in 3 Sector Hubs
  - Biomanufacturing
    - Review existing skill standards
    - Hub led by NBC
  - Medical Devices (new)
    - Develop new skill standards
    - Hub led by Sengyong Lee (Ivy Tech)
  - Bioscience Laboratory Skills
    - Review existing skill standards
    - Hub led by Bio-Link
- What do these 3 sets of skill standards have in common?
Laboratory Skills

Biomanufacturing

CORE

Medical devices
Philosophy: What does “Core” mean?

- What EVERY technician does on the job?
  - Tremendous diversity of job functions
- OR… What every employer of technicians would reasonably expect a technician to have learned?
  - Even though an individual entry level technician might not do all these things
  - Includes entry level technicians at companies in the three industry sectors
    - Meant to include R&D at a company but some skill standards may not pertain to a technician in an academic lab
### Process?

<table>
<thead>
<tr>
<th>Biomanufacturing</th>
<th>Laboratory Skills</th>
<th>Medical Devices</th>
<th>Example DRAFT Common Core</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dons appropriate personal protective equipment and/or gowning</td>
<td>Select and use appropriate Personal protective equipment at all times</td>
<td>Use personal safety equipment as required by manufacturing guidelines</td>
<td>Use appropriate personal protective equipment at all times</td>
</tr>
<tr>
<td>Identifies unsafe conditions and takes appropriate action</td>
<td>Identify unsafe or unsecure Conditions and take corrective action according to established procedures</td>
<td>Identify safety issues, including pinch points, and report concerns to supervisor</td>
<td>Identify unsafe conditions and take appropriate action</td>
</tr>
<tr>
<td>Works with hazardous/biohazard materials</td>
<td>Follow Institutional Policies Relating to Biological Hazards</td>
<td>Adhere to safety requirements (OSHA), blood borne pathogens and FDA (7.4 Eng.)</td>
<td>Comply with safety requirements (OSHA, biohazards, etc)</td>
</tr>
<tr>
<td>Accesses and utilizes MSDS (SDS) and LOTO</td>
<td>Find and Use Material Safety Data Sheets (SDS) and other information sources</td>
<td>Locate and apply Material Safety Data Sheets (MSDS) in material handling (2.2 Prod.)</td>
<td>Locate and use Safety Data Sheets and other information sources</td>
</tr>
<tr>
<td>Participates in company safety training</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Performs waste treatment and or disposal operations (e.g. sharps, chemicals, flammables)</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Performs environmental monitoring activities</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Records data and documents activities (e.g. paper hard copy and/or electronically)</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>
Format: Components of a Skill Standard

- **Critical Work Functions**
  - Major responsibilities of the job
    - Example: “Provide routine facility support”

- **Key Activity**
  - Essential task performed to accomplish the CWF
    - Example: “Maintain inventory of raw materials, parts, components, and/or equipment”

- **Performance Indicator**
  - Concrete, visible ways that we will know the individual is doing the activity correctly
    - Periodic inventory of stock taken in compliance with established procedures; Materials are stored appropriately; Expired materials are discarded

- **Underlying Technical Knowledge**

- **Assessment**
  - Exercise to determine proficiency
Chosen Format

- What is the general area of responsibility?
- What are the related tasks? i.e., What must the worker do?
- How do we know when the task is performed well?

Critical Work Function

- Key Activity
- Performance Indicator

What are the required areas of expertise a worker must have in order to perform the task with excellence?

Assessments

Underlying Technical Understanding

What evaluations could be used to test the worker’s ability to perform the task well?
Industry Input and Recognition

• Core Team experience
• Face to face meetings
  • National Advisory Council for c3bc Consortium
• Online Survey
  • Industry Supervisors of Entry-level technicians
Core Critical Work Functions

- Maintain a safe and productive work environment
- Provide routine facility support
- Perform measurements/tests/assays
- Comply with applicable regulations and standards
- Manage and communicate information
- Perform mathematical manipulations
Why CORE skill standards?

• Define skills and knowledge necessary for entry level positions
  • Students know and can articulate what they know
  • Industry recognizes what students know
  • Provides the means for measuring student performance (performance indicators that are determined by industry)

• They provide a framework for developing and implementing the curriculum
• Possibly develop credential based on those core competencies
• Facilitate process to award credit for prior learning
Caveat: Necessary but not Sufficient
Implementing the Core Skill Standards

- Determine Framework and Get Industry to Validate the Framework
  - If necessary, add more skill standards
- Align with State and Local Standards
- Reverse Engineer the Skill Standard to Develop Curriculum and Assessment Tools
- Focus On “Area Needs” To Determine Specific Examples
Determined Framework and Got Local Industry to Validate It (Working on Statewide)

Level One or Entry Level

Level Two (Biomanufacturing)

Advanced Technical Certificate (4-year) or Applied Associates Award (2-year)
Level One Certificate

- BIOLOGY 1414 or BITC 1411
- EDU 1300 or Another BITC Course
- BIOLOGY 1415 or BITC 1402
- BITC 1340
- BITC 2486 or Independent Research or Biomanufacturing*
Align with State and Local Standards

- In Texas
  - Texas Skill Standards: Texas Adopted the Washington Bioscience Skill Standards
  - TEKs – (Texas Essential Skill Elements) High School Standards

- The Core: Two of the courses are “Biology” Courses
Reverse Engineer the Skill Standards

• **Performance Indicator**
  - Concrete, visible ways that we will know the individual is doing the activity correctly
    - Periodic inventory of stock taken in compliance of established procedures; Materials are stored appropriately; Expired materials are discarded

• **Curriculum and Assessment Tools Developed Using Local Examples** – Produce An Inventory for the State and National Level and Store at the Bio-Link Clearinghouse Site
Biotechnician Assistant Credentialing Exam (BACE)

Based on foundational concepts & skills required in biotech-based workplace

- Written & Practical Components
- Aligned w/Academic and Performance Standards
- Industry recognition through BioFlorida
  - Accuracy, Representative of Industry Needs, and Alignment of Questions to Standards
  - Biopharmaceutical, Diagnostics, Environmental
- Approved by Florida’s Board of Education, and Agency for Workforce Innovation, statewide articulation (A.S.) 2012
- Manufacturing and Health Science Career Clusters
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, SDS
• Salary
  • Start out $10.00-$12.00/hour
  • High potential for growth
BACE Written Exam Subjects

**CELLS (8%)**
- Cells (general)
- Cell Structures & Organelles
- Identifying Cell Structures
- Cell Division

**CHEMISTRY/BIOCHEM (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
- Scientific Method
- Graphing
- Analysis

**GENERAL TOPICS IN BIOTECHNOLOGY (10%)**
- Applications
- Benefit to Society
- Biotech Careers
- Ethics
- Historical
- Regulatory
- Workplace
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 Measurement and Adjustment
- Pipetting (Macro and Micro)
- Serial Dilutions
- Spectrophotometry
- Documentation

**LABORATORY EQUIPMENT (12%)**
- Identifying Glassware
- pH Meter
- Electrophoresis
- Spectrophotometer
- Micropipettors
- Balance

**PREPARING SOLUTIONS (12%)**
- Proper Technique
- Volume/Volume
- Weight /Volume
- 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
National Interest

- Arizona
  - Adopted BACE, Joint Technical Education Districts
  - 2016-2017 CTE Programs with Identified Industry Certifications to meet A.R.S. §15-391(5)(k)

- Texas
  - Austin Community College
    - Anderson HS and LASA Academy

- Oklahoma
  - Southern Oklahoma Technology Center

- Indiana
  - Richmond HS

- Project Lead the Way, BMS Program
- Community College Consortium for Bioscience Credentials
  - National Center for the Biotechnology Workforce
 Credential Earners

Immediate plans for school?

- Cutrale
- Florida Dept. of Environmental Protection
- Florida Medical Entomology Laboratory (UF IFAS)
- Harbor Branch Oceanographic Institute
- Hydrosphere
- Indian River Medical Center
- Mayo Clinic, Jacksonville
- Novabone
- SFC Lab Tech
- Syngenta
- United Juice Companies
- Duke, Molecular Genetics and Microbiology, PhD candidate
- Duke, Nursing Program
- UC Berkeley, PhD candidate
- UF Dept. of Pathology, Immunology, & Laboratory Medicine (Masters)
- UF Medical School
- Univ of Illinois at Urbana-Champaign, Inst. for Genomic Biology, PhD candidate

- 57% plan to work in a science related job while in school
- 32% non-science related
- 9% no work
- 2% no School

32% Response Rate (58/182) 2014
Contact Information and Questions?

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