Produced by MassBioEd Foundation for the
Massachusetts Community Colleges & Workforce Development Transformation Agenda

Aligning Expectations:

Determining Life Sciences Entry Level Workforce Needs & Alignment of Community College Curriculum

mccwdta
Massachusetts Community Colleges & Workforce Development
Transformation Agenda

MassBioEd
MASSACHUSETTS BIOTECHNOLOGY EDUCATION FOUNDATION

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April, 2014

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Introduction:

MassBioEd Foundation has an extensive background in providing productive linkages between higher education institutions and the life sciences sector, especially through the Massachusetts Life Sciences Education Consortium (MLSEC). With this background, MassBioEd was pleased to work with the Massachusetts Community Colleges and Workforce Development Transformation Agenda (MCCWDTA) to enhance the knowledge and capabilities of community colleges to respond to current life sciences employment needs. To achieve this objective, MCCWDTA and the MassBioEd Foundation formulated the following work plan.

Align community college life sciences core competencies to industry specific job functions and desired skills by:

- Generating an "Industry Entry Level Demand Report" summarizing the availability of jobs in life sciences and related sectors that are attainable with an associate degree or less. Matching the skills required for these jobs to the core competencies established for community college biotechnology/biomanufacturing programs.
- Designing career and academic pathways for community college graduates entering the life sciences workforce.

Strengthening understanding and relationships between community college and life sciences companies by:

- Identifying companies likely to hire associate degree graduates by area.
- Conducting two regional meetings to bring together industry, community colleges, staffing agencies and relevant non-profits to share the information gathered in the first task and to discuss any gaps or obstacles to employment for community college graduates.

The following report is a summary of the findings and outcomes.

Align Community College Life Sciences Core Competencies to Industry Specific Job Functions and Desired Skills:

1. Industry Entry Level Demand Report

Data from Burning Glass was provided for the time period spanning August 2012 - August 2013. The data was collected from the following industry categories: Pharmaceutical and Medicine Manufacturing; Medical and Diagnostic Laboratories; Scientific Research and development Services; Medical Equipment and Supplies Manufacturing; Navigational, Measuring, Electromedical and Control Instruments Manufacturing. These categories were meant to be broadly inclusive of all industries in the area that may have jobs requiring the skills taught in the community college biotechnology programs.

Six hundred and four job postings came up in the search. Specific skills were pulled out from the top seven job titles and matched to the MLSEC Core Competencies. To drill deeper, the same process was carried out for the specific positions of "manufacturing production technician" and "biological technician."

All of this data is summarized in Attachment #1: Alignment of Community College Biotechnology Programs to Industry Needs.

General comments on the data:

- Of the 604 jobs that came up in the search, 234 (38.7%) are in clinical lab technology which is a separate, distinct program from the biotechnology curriculum.
- Our programs are designed to fit the manufacturing niche where 100 (16.6%) jobs were identified. However, we may be underreporting the actual number of manufacturing technician positions due to the extensive use of contract agencies to fill this type of job. The temporary-to-permanent pathway is common in this field.
- The skills specified in the Core Competencies are a very good fit for the manufacturing technician jobs!.

2. Develop academic and career path maps for specified life sciences careers.

Based on the Core Competencies, program requirements for associate degrees and certificates in biotechnology, and general understanding of the biotechnology industry, a series of diagrams were developed to explain a generalized pathway to careers in the biotechnology industry as well as the progression along an academic pathway. These figures are included in Attachment #2: Career Mapping.

Feedback:

The feedback to these diagrams at the regional meetings was very positive. Having a graphic that clearly outlined the core skills taught in the community college programs was an awakening moment for several of the industry representatives and made a big impact. It showed that the bachelor's degree bias is more of a general reaction based on the assumption that more education is always better. Once the specific skill set covered in the community college curriculum was put forward, the industry

representatives were impressed and the discussion changed to how to get this information across to hiring managers and human resources. With this information in hand, job descriptions can be crafted to specifically select for community college program graduates that have the skills best suited to manufacturing entry level positions.

Strengthen Understanding and Relationships between Community Colleges and Life Sciences Companies:

Two regional meetings were held to bring together members of the local biotechnology industry, staffing agencies, relevant non-profit agencies and community college biotech programs: one on February 26, 2014 at Shire in Lexington, MA and one on February 28, 2014 at the Mount Wachusett Community College, Devens campus. The purpose of these meetings was to review the data regarding entry level employment opportunities in local life sciences companies and to assess the extent that community college associate degree or certificate graduates are qualified to fill these positions. The career and academic pathway diagrams (Attachment 2) were also presented for comment and discussion.

These meetings provided a forum to build relationships between all of these different stakeholders, strengthen awareness of community college programs, and address any gaps between student preparedness and job requirements. Feedback from the meetings is summarized below along with suggested next steps.

Aligning Expectations - Regional Meetings Summary:

The meetings were well attended and the participants break down as follows:

Location	Community College	Industry	Professional Staffing Agency	Foundation/ Non-Profit	Total
Shire	16	12	4	13	45
Devens	10	5	1	7	23

After viewing a presentation summarizing data on the availability of entry level positions in life sciences companies in Massachusetts, information about the skills taught in community college biotech programs (Core Competencies) and the pathway maps, participants were divided into discussion groups and tasked with answering the following questions:

1. Is our stated "value" of community college graduates correct? Are there other education or skill requirements that we are not considering?

2. Are there other actions (beyond education items above) you could recommend to build the credibility of community college graduates and facilitate the pathway to industry employment?

The groups were structured to distribute individuals representing the same institution and each group had members from all sectors.

Regional Meeting Comments:

The comments can be broken down into the following categories. Many of these comments came up in multiple groups.

Hands-on skills:

- Make sure students understand the scale of manufacturing vs. small lab scale.
- Chemistry skills needed: molarity, solution making, pipetting.
- Need for internships in real GMP environment.
- Could the curriculum be more project-based to get the feel of actual industry experience? Emphasize any of these skills in an interview. (Could this be an intermediary step between lab courses and internships?)
- Job shadowing in a company for both community college faculty and students would be useful exposure to workplace environment.
- Tours of companies to expose students to the scale and general work environment.

Professional behavioral skills:

- A capstone-type course summarizing skills, program knowledge and professional readiness is a good thing.
    - Do all programs include this?
- Job readiness or professional skills ("professional skills" is the preferred description vs. soft skills): Industry representatives feel that while the community college applicant may have the necessary hands-on skills to do the job, these individuals often fail to distinguish themselves during the interview process and are rejected on this basis.
    - Behavior/professional attitude
    - Team work
    - Being on time and reliable
    - Active listening
    - No "drama"

Interviewing skills:

- Students need to better articulate the strength of their hands-on skills during interviews.
- Resume and cover letter writing to make sure relevant skills stand out.
- Importance of personal preparation and presentation at the interview; dress appropriately and research the company. Be prepared to talk about the company's culture and products.
- Always "on" during the interview: maintain professional demeanor during all phases of the interview.
- Be ready for behavioral questions (For example, how do you deal with conflict and ambiguity?).

Internships:

All agree that an internship is a great help and often a requirement for entry level employment in biotechnology. How do community college students secure these opportunities?

- Internship questions:
    - What percentage of internships converts to employment?
    - Are there more internship opportunities than actual jobs?

Other:

- Get the word out to industry human resources professionals and hiring managers about the skill level of associate and certificate graduates, the forgotten "middle children" of educational pathway between high school grads and more advanced degrees.
- Make sure associate and certificate graduates understand that professional advancement is limited by this level of education. Candidates will be more employable if they express interest in continuing their education to the bachelor's level.

Recommendations & Next Steps:

Steps community colleges can take:

- Include more professional development, resume writing and interviewing skills into curriculum.
- Continue to build relationships with companies in their vicinity to make sure the companies are aware of the skills community college graduates possess. Work toward getting more internships and possibly scholarships in place with these companies.
- Continue to stay abreast of the hands-on skills employers are looking for.
- Build relationships with staffing agencies to facilitate entry level contract employment

Steps industry can take:

- Include community college students in their internship programs. Possibly reserve one or two internships for community college students each year.
- Consider setting up scholarships for community college interns. Even if the amount granted is small, it can support students and could help build loyalty.
- Have HR and hiring managers consider which positions could be filled by associate degree and certificate graduates and actively recruit these candidates for those positions.

Steps employment agencies and non-profits can take:

- Make use of the MLSEC Industry Endorsement process to raise industry awareness of the core competencies and skill level of associate degree and certificate holders.
- Continue to provide forums that bring representatives from industry, staffing agencies and community colleges together to facilitate relationships and collaboration between these stakeholders.

Attachment #1:

Alignment of Community College Biotechnology Programs to Industry Needs

Alignment of Community College Biotechnology Programs to Industry Needs

February 26, 2014 Shire, Lexington MA

February 28, 2014 MWCC, Devens MA

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Meeting Objective: Strengthen Life Sciences Workforce Pipeline

Activities:

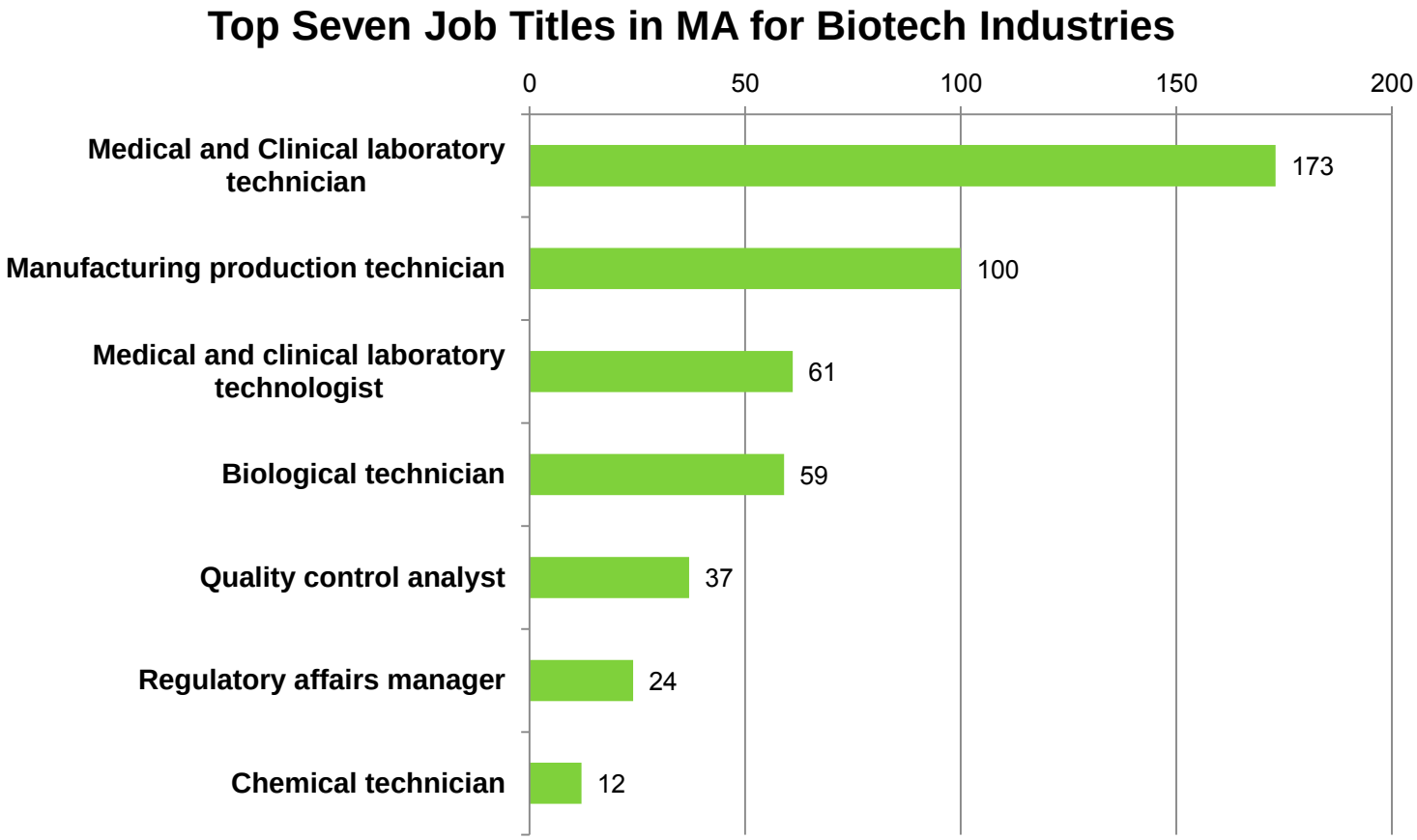
- **Introductions**
- **Presentation – what we think we know**
- **Discussion & group work**
- **Report out**

In Demand Biotech Jobs In Our Area

- **Industries searched:**
  - **Pharmaceutical and Medicine Manufacturing**
  - **Medical and Diagnostic Laboratories**
  - **Scientific Research and Development Services**
  - **Medical Equipment and Supplies Manufacturing**
  - **Navigational, Measuring, Electromedical and Control Instruments Manufacturing**

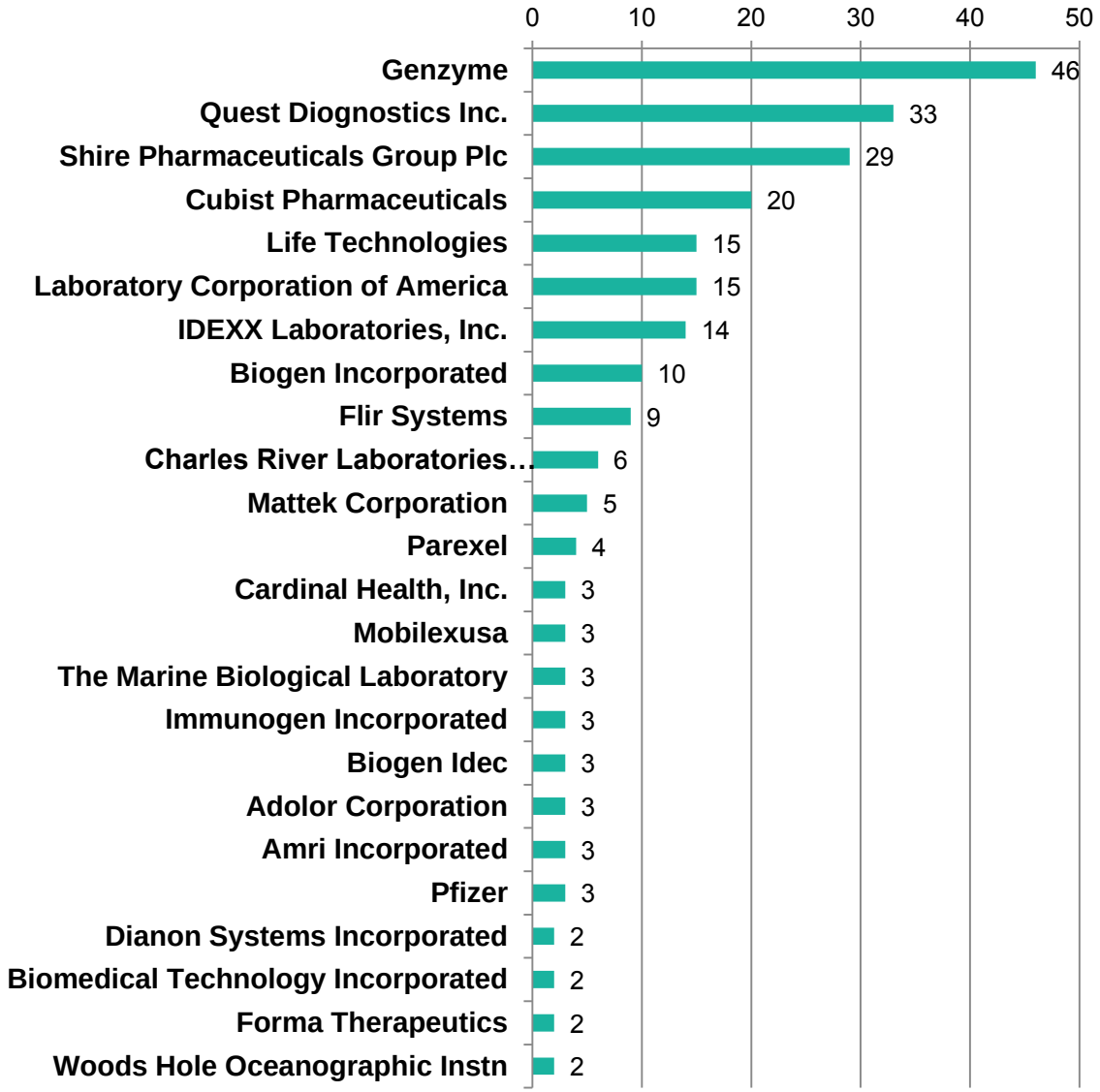
- The search identified 604 jobs that require high school or associate level education posted from Aug. 2012 – Aug. 2013.
- The next slides summarize this data.

Data Collected for the One Year Period Aug 2012 – Aug 2013



Source: Labor Insight, A Burning Glass Solution

MA Companies with Postings of Top Seven Job Titles



Sample Job Posting

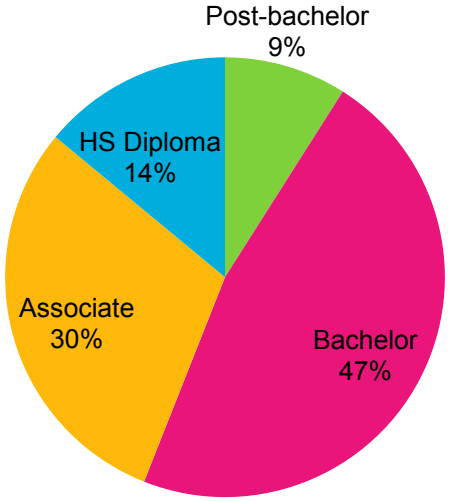
- Search Location: Lexington, MA
- Job Category: Manufacturing
- Job Description Primary Duties:

  With general supervision the individual will perform routine and critical manufacturing operations, including but not limited to work functions in Cell Culture, Purification, Solution & Equipment Prep areas. Operates production equipment according to SOPs for the production of clinical and/or commercial products.

- Education and Experience Requirements:

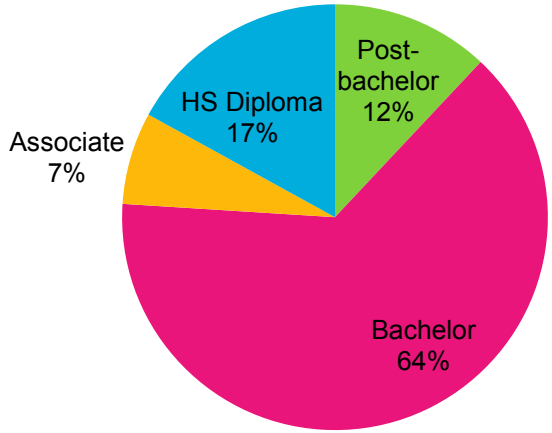
  Normally requires a high school diploma and 2-4 years related industry experience or an Associates Degree in Life Sciences/Engineering field with 1 year of GMP Manufacturing experience. Biotech Certificate preferred.

Preferred education level for entry level positions



A survey of local biotech and allied companies (49 respondents) shows a willingness to hire associate level individuals.

Actual education level listed in job postings



However, data from actual job postings shows a heavy bias toward the bachelor's degree.

How can we change this *willingness* into a *reality*?

Source: Massachusetts Life Sciences Industry Entry Level Employment Demand Report 2013

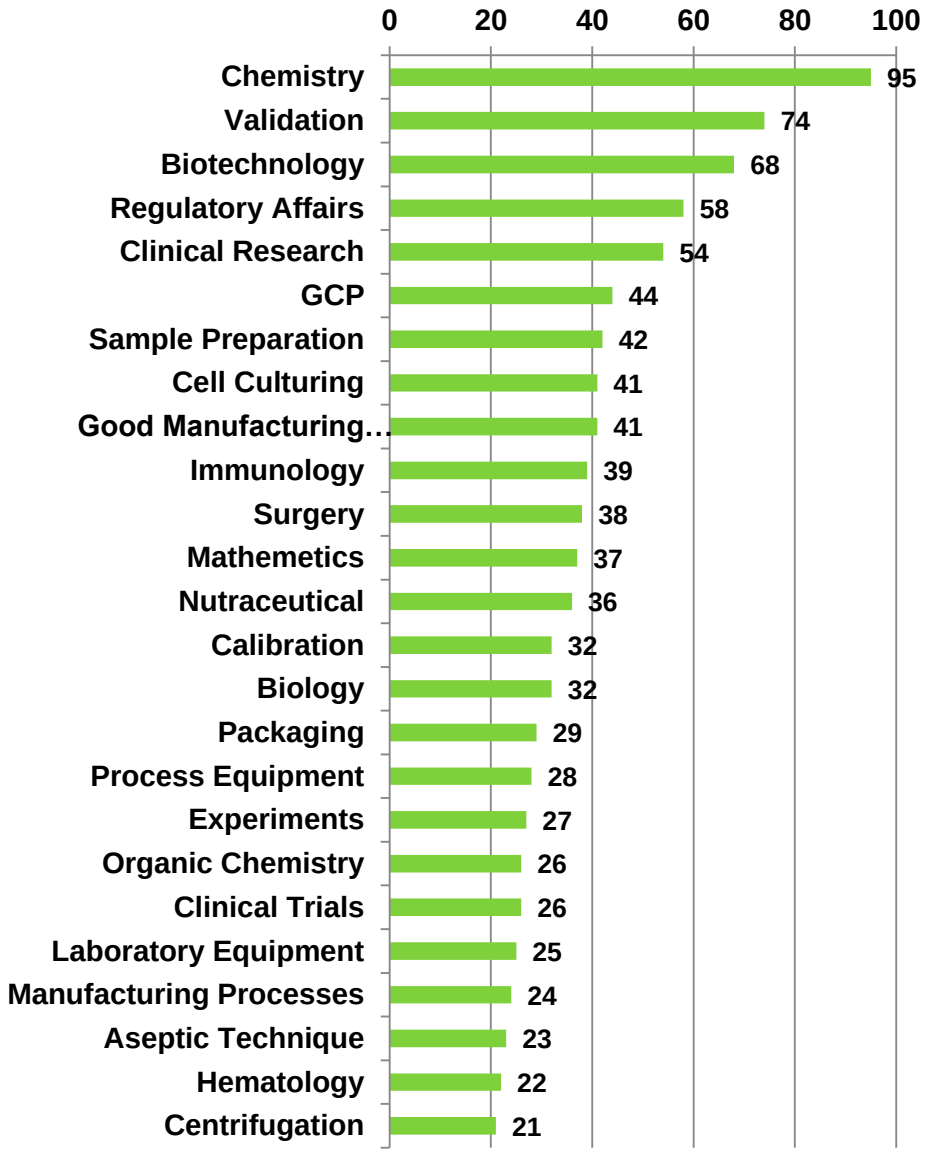
How can we change this willingness into a reality?

1. Understand industry requirements.
2. Make sure our students meet these requirements.
3. Make sure industry is aware that our students meet their requirements.

Core Competencies

- Skill and knowledge set established by MLSEC Community College Consortium in collaboration with industry.
- Ensure consistency between programs.
- Engender confidence in qualifications of CC Biotech graduates in the workplace.
- Approved in 2012.

Skills identified for top seven job postings



Job Titles

- Medical and Clinical laboratory technician
- Manufacturing production technician
- Medical and clinical laboratory technologist
- Biological technician
- Quality control analyst
- Regulatory affairs manager
- Chemical technician

Skills listed for top seven job titles	Skills included in our core competencies.
Chemistry	√
Validation	√
Biotechnology	√
Regulatory Affairs	√
Clinical Research	√
GCP	√
Sample Preparation	(√)
Cell Culturing	√
Good Manufacturing Practices (GMP)	√
Immunology	(√)
Surgery	-
Mathematics	√
Nutraceutical	-
Calibration	√
Biology	√
Packaging	(√)
Process Equipment	(√)
Experiments	√
Organic Chemistry	(√)
Clinical Trials	(√)
Laboratory Equipment	√
Manufacturing Processes	√
Aseptic Technique	√
Hematology	(√)
Centrifugation	√

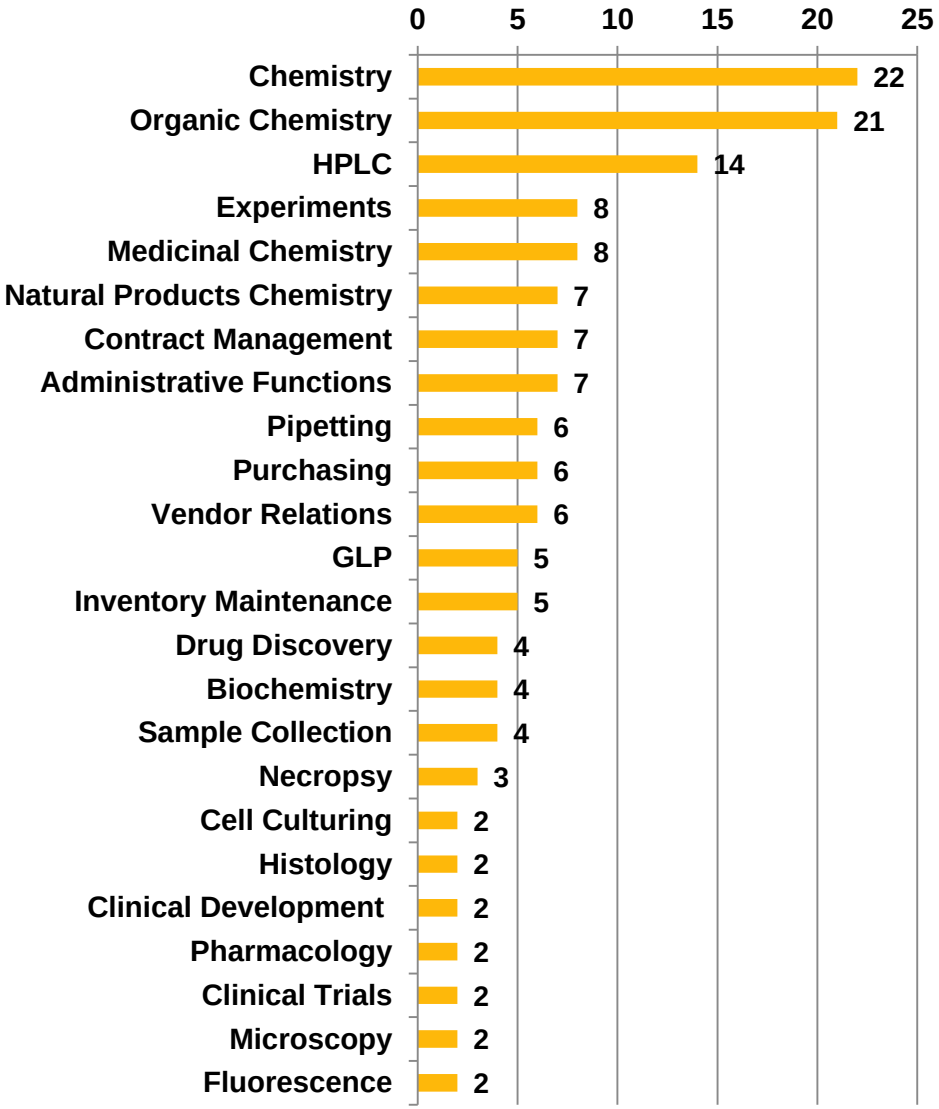
Skill covered in our core competencies.		
√	Yes	16
(√)	Probably	7
-	No/probably not	2

The *"right stuff"*?

YES!

Community College students are well prepared and qualified for these entry level positions.

Skill requirements for jobs titled Biological Technician (50 positions)

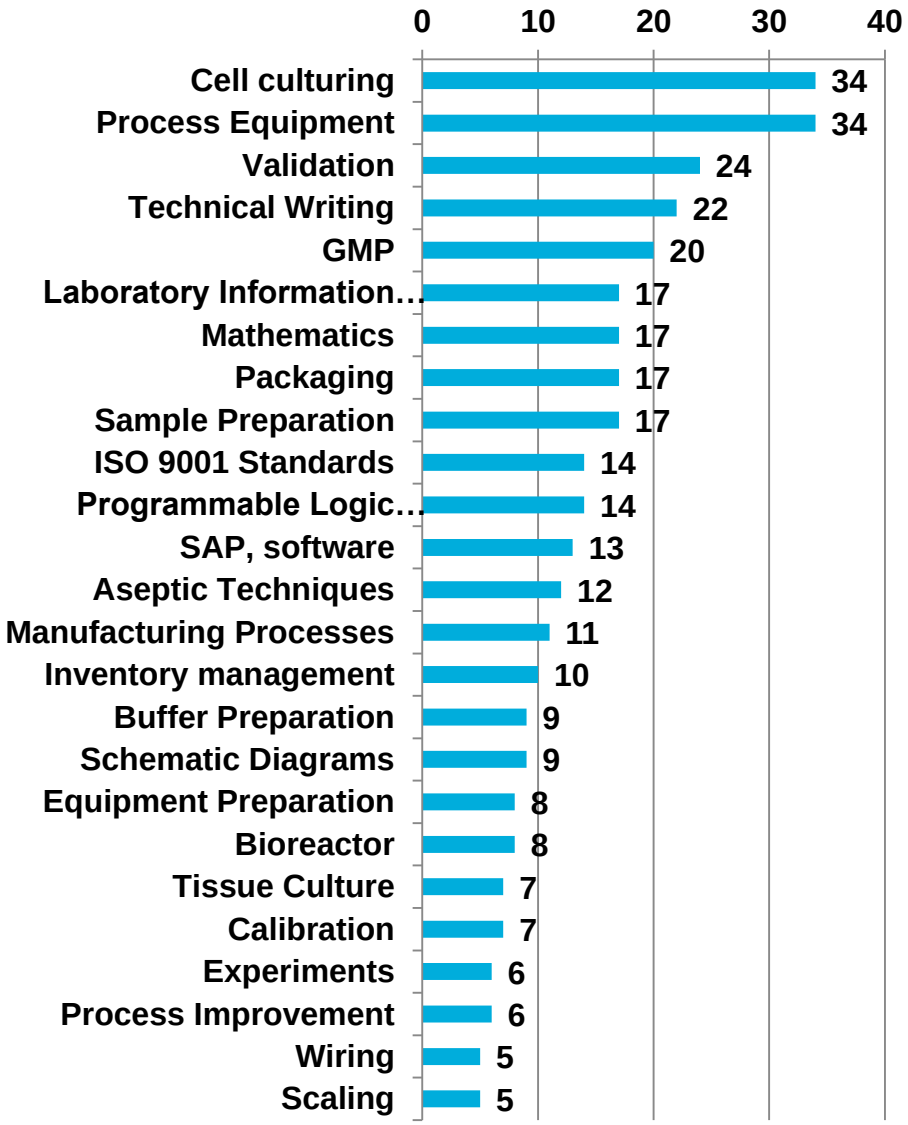


- Strong emphasis on chemistry.
- Secondary emphasis on organization and communication.
- It is difficult to assess the depth required for some of these categories given these are posted as entry level positions.

Skills required for Biological Technician	Skills included in our core competencies.
Chemistry	√
Organic Chemistry	√
HPLC	(√)
Experiments	√
Medicinal Chemistry	(√)
Natural Products Chemistry	(√)
Contract Management	(√)
Administrative Functions	(√)
Pipetting	√
Vendor Relations	(√)
GLP	√
Inventory Management	(√)
Drug Discovery	(√)
Biochemistry	√
Sample Collection	√
Necropsy	-
Cell Culturing	√
Histology	(√)
Clinical Development Plans	(√)
Pharmacology	(√)
Clinical Trials	(√)
Microscopy	√
Fluorescence	(√)

Skill covered in our core competencies.		
√	Yes	9
(√)	Probably	13
-	No/probably not	1

Skills requirements for jobs titled Manufacturing Technicians (95 positions)



Skills required for Manufacturing Technician	Skills included in our Core Competencies
Cell culturing	√
Process Equipment	√
Validation	√
Technical Writing	(√)
GMP	√
Laboratory Information Management System (LIMS)	—
Mathematics	√
Packaging	√
Sample Preparation	√
ISO 9001 Standards	√
Programmable Logic Controller	—
SAP, software	—
Aseptic Techniques	√
Manufacturing Processes	√
Inventory management	(√)
Buffer Preparation	√
Schematic Diagrams	—
Equipment Preparation	(√)
Bioreactor	√
Tissue Culture	√
Calibration	√
Experiments	√
Process Improvement	(√)
Wiring	—
Scaling	(√)

Skill covered in our core competencies.		
√	Yes	15
(√)	Probably	5
-	No/probably not	5

Core competencies

- GMP
- Solution making
- Basic math skills
- Working with lab equipment
- Microbiology techniques
- Quality and compliance
- Protein purification
- Recombinant DNA
- Basic chemistry
- SOP/documentation
- Teamwork
- Biotechnology basics (science and industry concepts)
- Workplace-ready soft skills

(Approximately 30 credits)

Continued Education:

- General electives
- Biology
- Chemistry
- Theoretical knowledge
- Critical thinking
- Writing

(Additional 30 credits, 60 total)

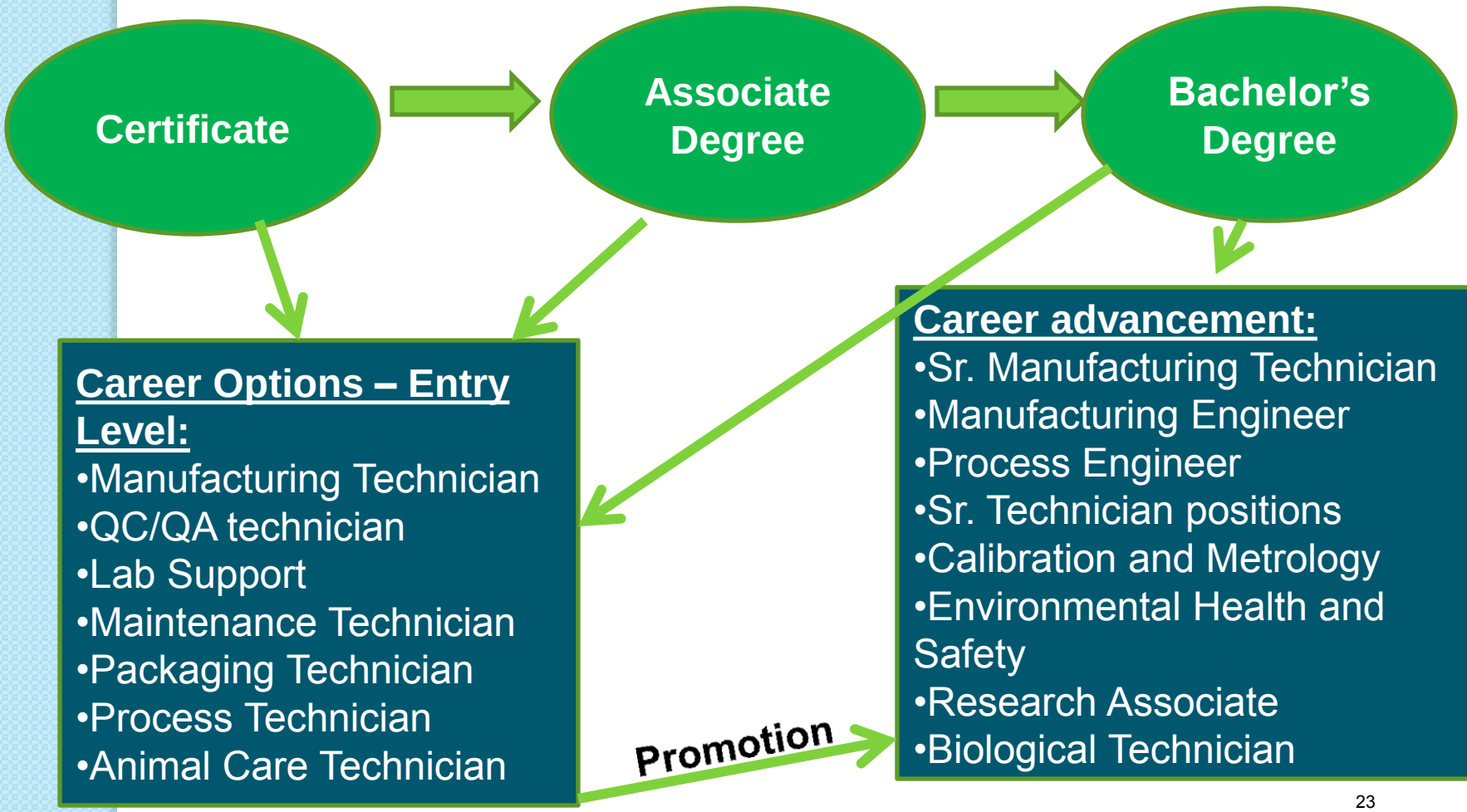
Continued Education:

- Theoretical knowledge
- Critical thinking
- Writing
- Problem solving
- Specialized advanced training and skills

(Additional 60 credits, 120 total)

BIOTECHNOLOGY/ BIOMANUFACTURING ACADEMIC PATHWAY

BIOTECHNOLOGY/BIOMANUFACTURING CAREER PATHWAY



Value of CC Graduate

- CC students are GMP ready.
  - Typical bachelor's program has a theoretical/research bias vs. understanding industry.
- CC students tend to have more hands-on lab experience than Bachelor's graduates.
  - CC labs run to mimic industry needs and regulations (SOP, GMP). Bachelor's more research oriented (lab notebooks).
- More likely to have job satisfaction and employee retention over time than an over qualified hire.
- CC graduates frequently have workplace experience.

Value of CC Graduate

- Importance of being a team player.
- General comfort level working in a laboratory environment.
- Enough knowledge to ask intelligent questions about processes and procedures.
- Understanding of the importance of safety, documentation and integrity in biomanufacturing.

Group Work

1. Is our stated value proposition of community college graduates correct? Are there other education or skill requirements that we are not considering?

2. Are there other actions (beyond education items above) you could recommend to build the credibility of CC graduates and facilitate the pathway to industry employment?

Attachment #2:

Career Mapping

Career Mapping

A general guide to how community college certificates and associate degrees fit into the workforce and continuing education.

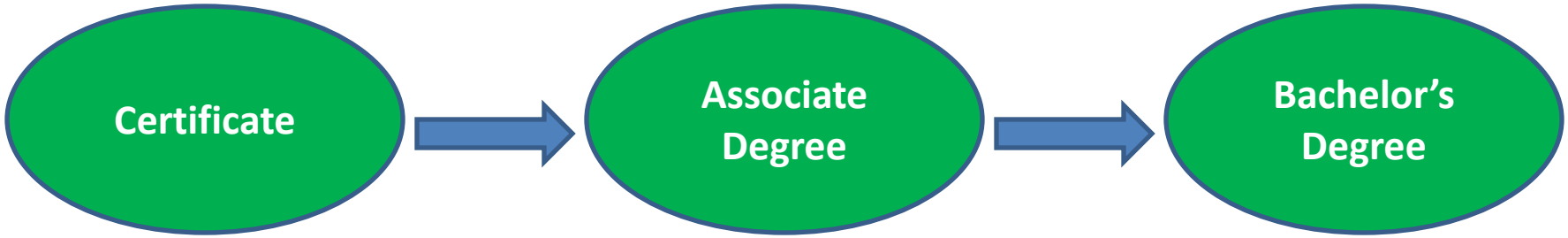
Career and Academic Mapping

- A series of figures are presented here to help prospective students and industry employers understand the content of current biotechnology/biomanufacturing certificate and associate degree programs.

- These diagrams also help define:
  - The types of employment opportunities these programs best prepare students to enter .
  - How these qualifications fit into the bachelor's degree track for academic advancement.

Career and Academic Mapping

- The curriculum content is based on an agreed upon set of Core Competencies that were established as part of the MLSEC/MassBioEd/MassBio community college program Endorsement process in 2012.



Core competencies

- GMP
- Solution making
- Basic math skills
- Working with lab equipment
- Microbiology techniques
- Quality and compliance
- Protein purification
- Recombinant DNA
- Basic chemistry
- SOP/documentation
- Teamwork
- Biotechnology basics (science and industry concepts)
- Workplace-ready soft skills

(Approximately 30 credits)

Continued Education:

- General electives
- Biology
- Chemistry
- Theoretical knowledge
- Critical thinking
- Writing

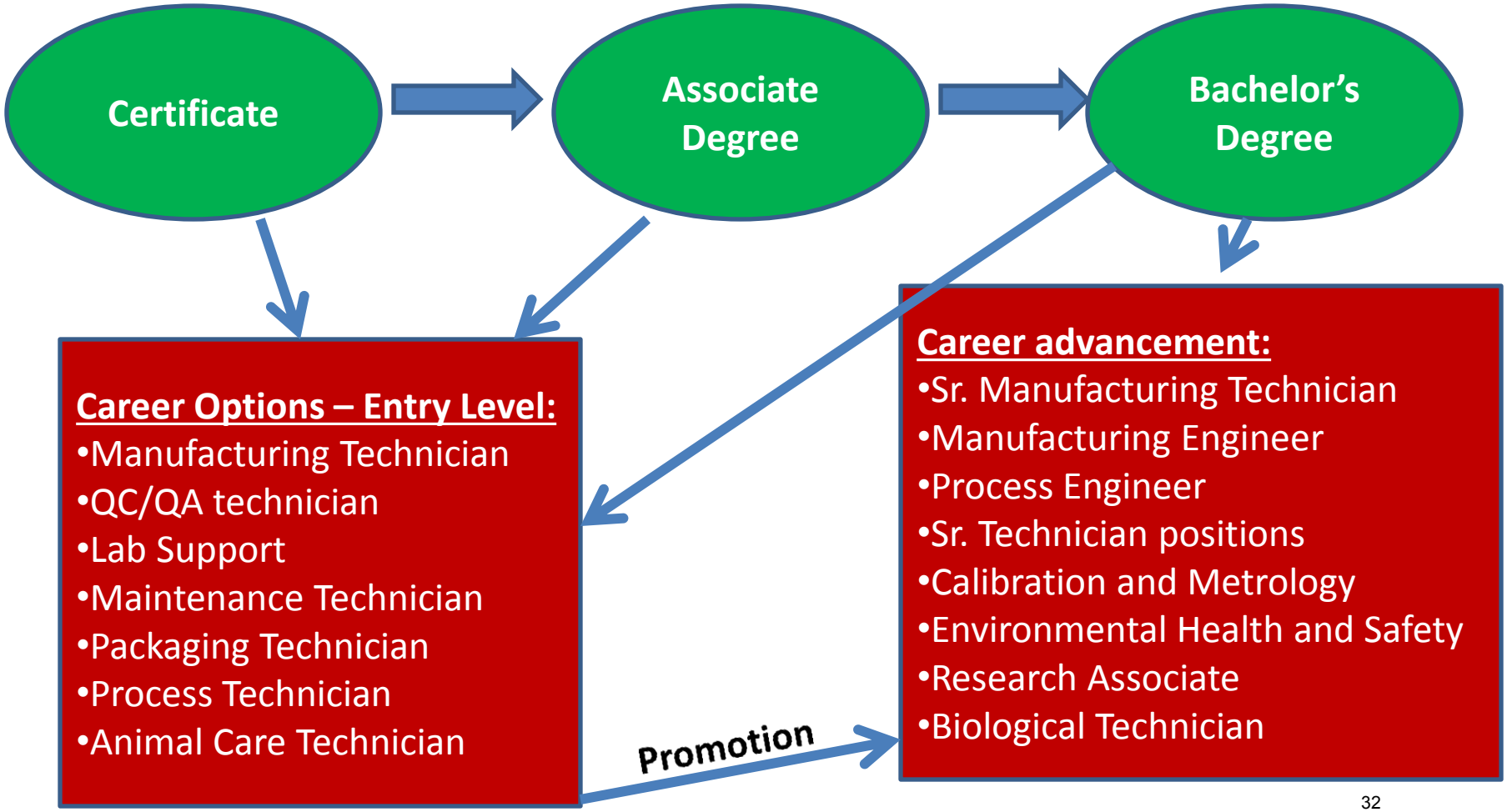
(Additional 30 credits, 60 total)

- **Continued Education:**
- Theoretical knowledge
- Critical thinking
- Writing
- Problem solving
- Specialized advanced training and skills

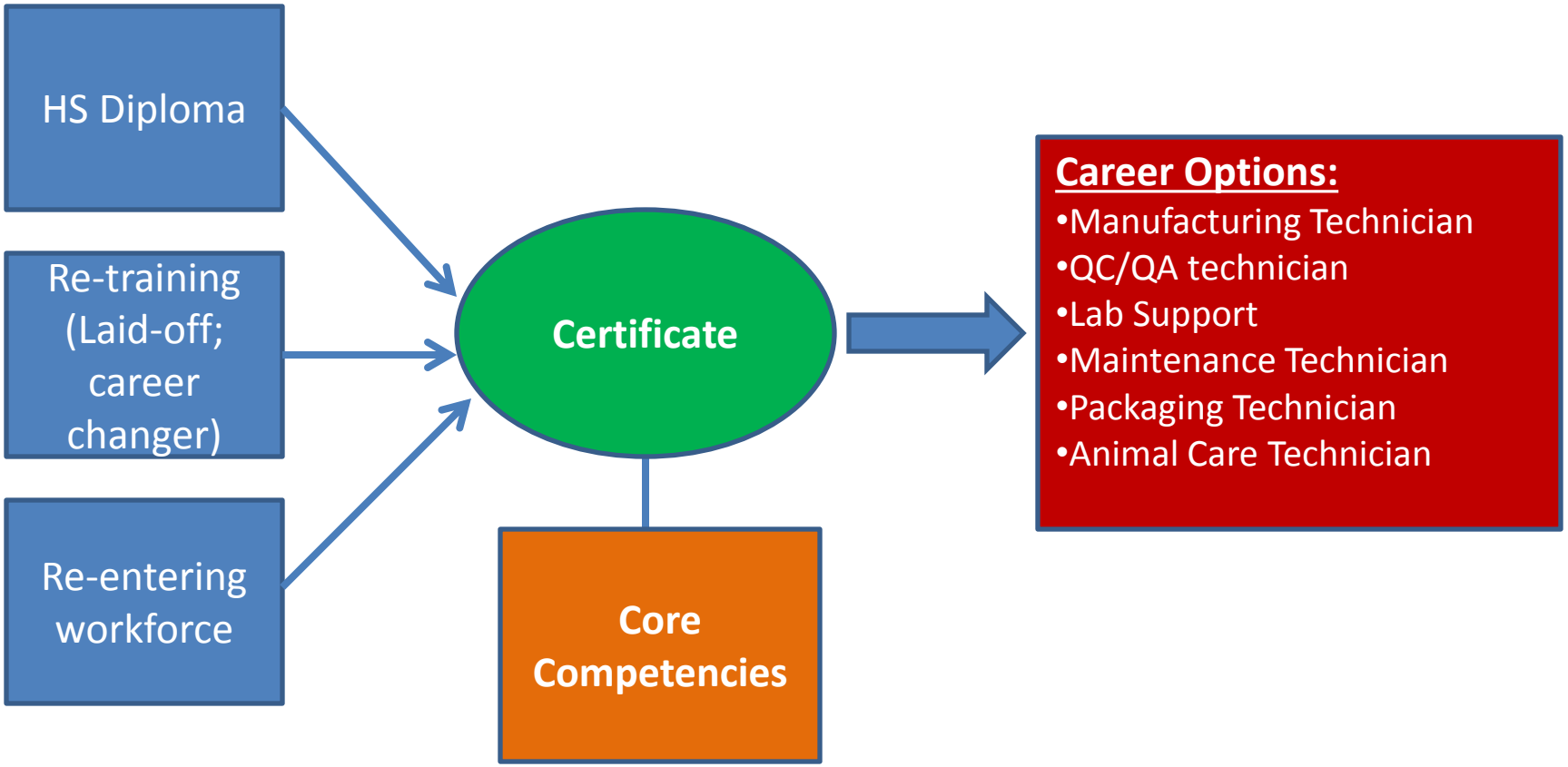
(Additional 60 credits, 120 total)

BIOTECHNOLOGY/ BIOMANUFACTURING ACADEMIC PATHWAY

BIOTECHNOLOGY/BIOMANUFACTURING CAREER PATHWAY

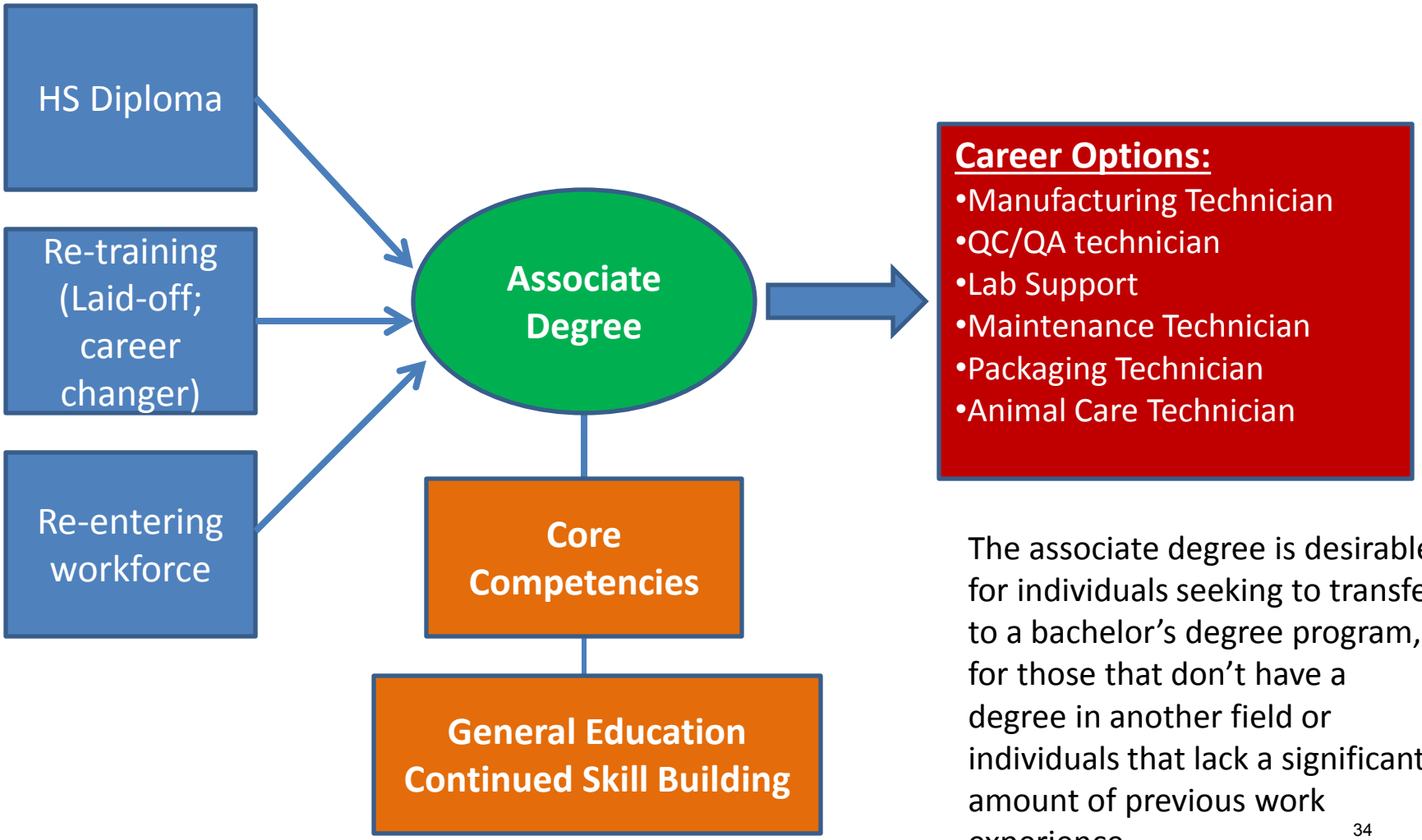


BIOTECHNOLOGY/BIOMANUFACTURING CERTIFICATE CAREER PATH

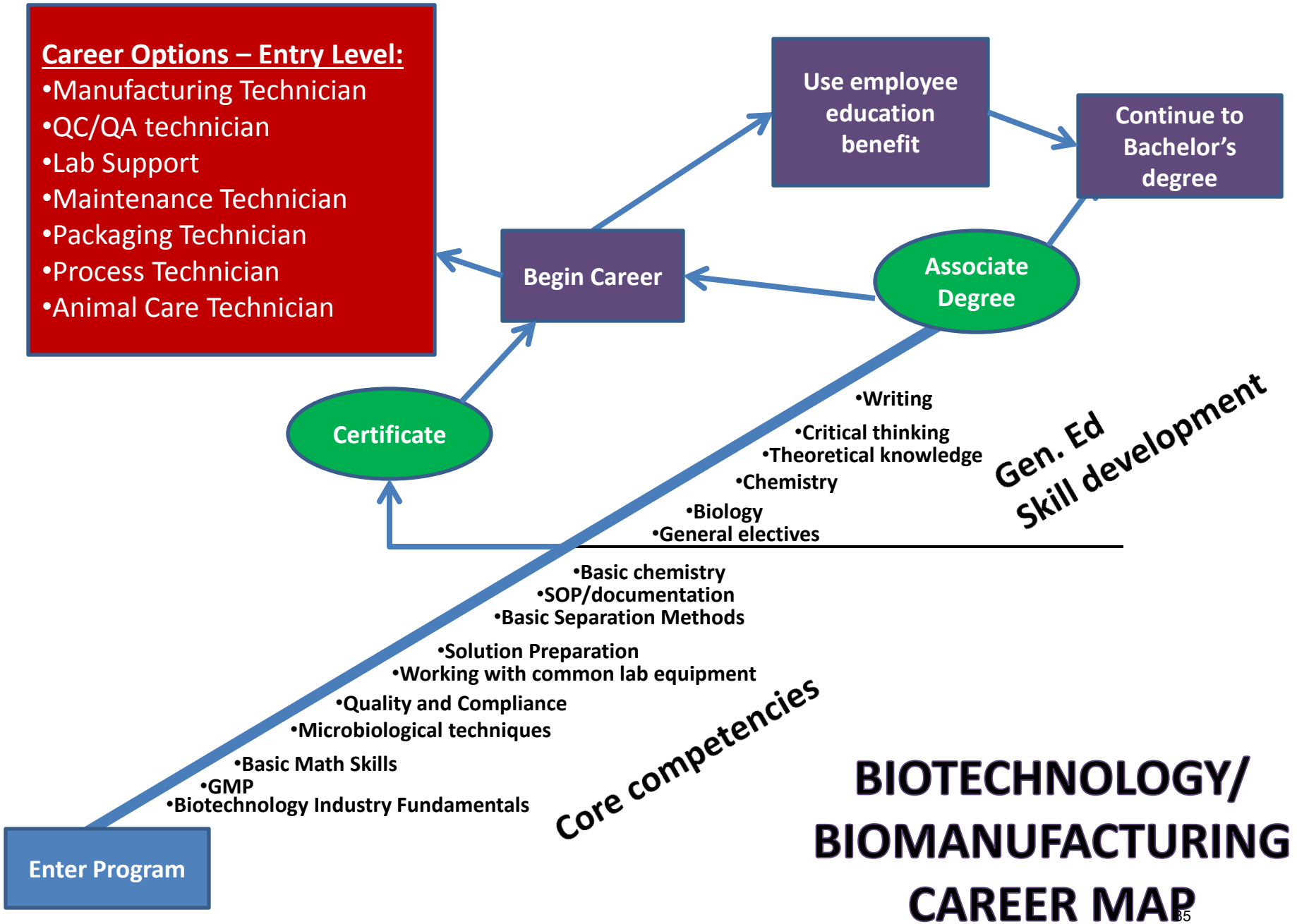


This figure highlights the varied nature of individuals entering biotech programs. Some certificate seekers already have bachelor's degrees in a different subject matter.

BIOTECHNOLOGY/BIOMANUFACTURING ASSOCIATE DEGREE CAREER PATH



The associate degree is desirable for individuals seeking to transfer to a bachelor's degree program, for those that don't have a degree in another field or individuals that lack a significant amount of previous work experience.


Career Options – Entry Level:
•Manufacturing Technician
•QC/QA technician
•Lab Support
•Maintenance Technician
•Packaging Technician
•Process Technician
•Animal Care Technician
Use employee education benefit
Continue to Bachelor's degree
Begin Career
Associate Degree
Certificate
Enter Program
•Writing
•Critical thinking
•Theoretical knowledge
•Chemistry
•Biology
•General electives
Gen. Ed
Skill development
•Basic chemistry
•SOP/documentation
•Basic Separation Methods
•Solution Preparation
•Working with common lab equipment
•Quality and Compliance
•Microbiological techniques
•Basic Math Skills
•GMP
•Biotechnology Industry Fundamentals
Core competencies
BIOTECHNOLOGY/
BIOMANUFACTURING
CAREER MAP

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