

Culturally responsive curriculum, inclusive instructional strategies and collaborative partnerships for student success in STEM fields

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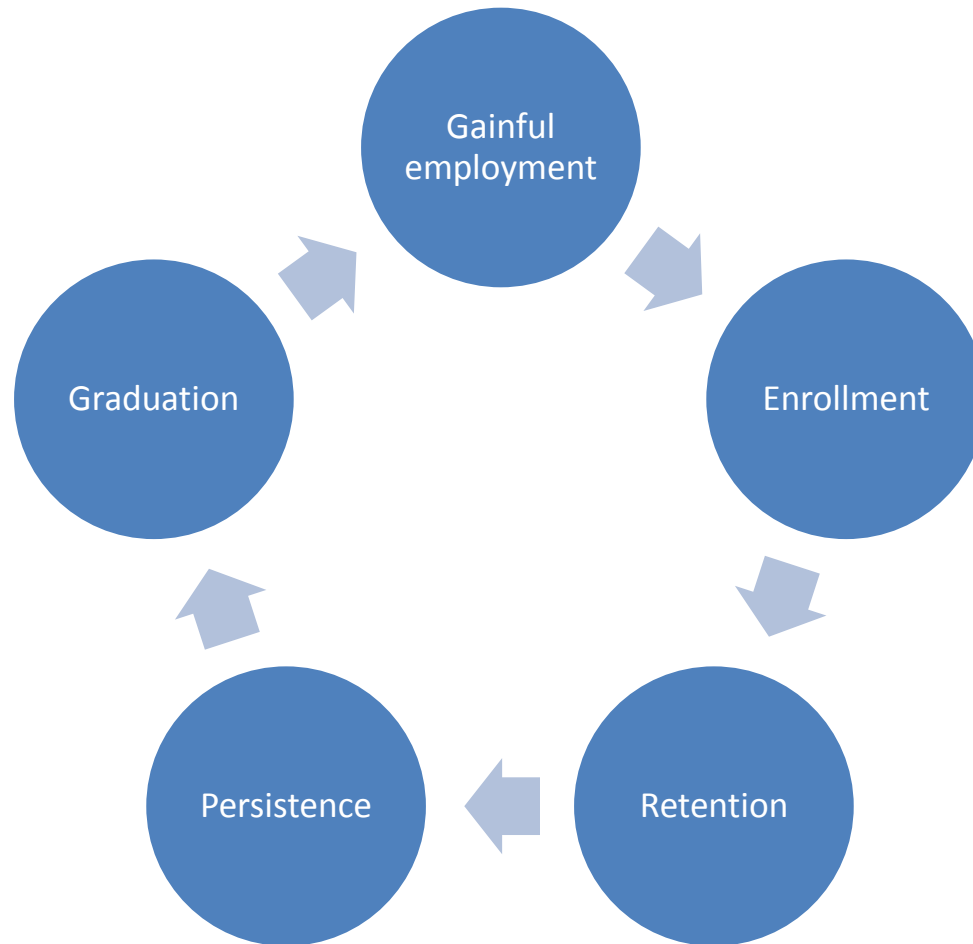
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Background and Rationale

- First generation college students, students from under-represented communities, and students from rural communities face challenges in obtaining meaningful employment after graduation.
- This presentation aims to address some of these challenges through (a) changes in curricular design and (b) development of structured collaborative partnerships.

Need



Key Elements

- Curriculum & Instruction
- Career Preparation
- Student Support Services
- Team Effort
 - Faculty from 2 year and 4 year colleges
 - Student Support Services

Framework

- Student Centered
 - Academic preparedness & content mastery
 - Develop skills for lifelong learning
- Student Engagement
 - Active learning strategies
 - Interactive exercises
- Student Ownership

Challenges in the classroom

Although students are able to read, many do not comprehend the content in the context of the discipline.



This translates to random memorization of information and regurgitating of facts without any contextual meaning



Leads to lack of understanding of scientific principles and applications, results in misconceptions



The net result is an inability to integrate & apply what is learnt in classroom to real world problems impacting the student's growth potential and success

Exercise

- What issues do you see in your classroom?

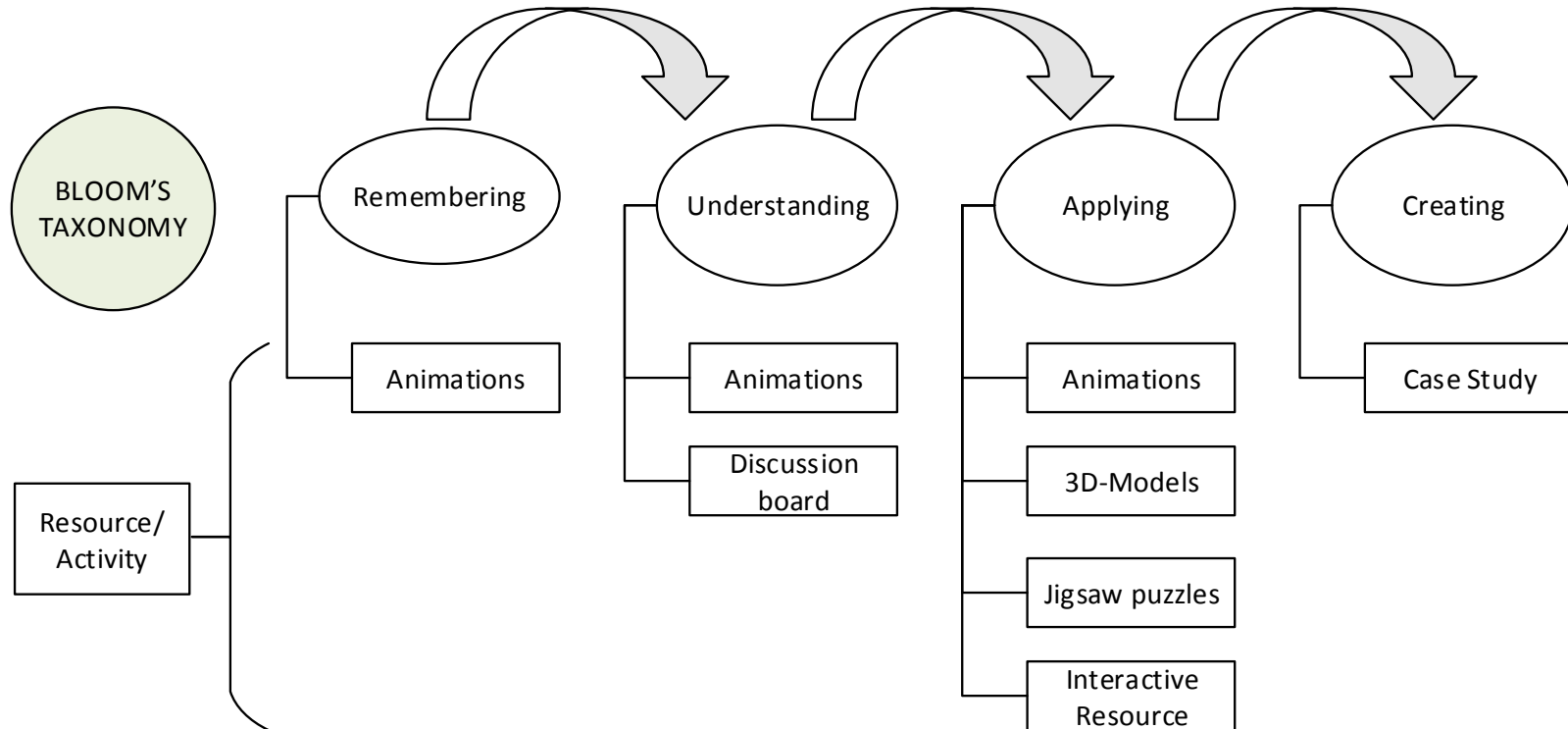
Exercise

- What interventions do you use to address these issues?

Interventions / Strategies

- Structured instructional strategies aimed at developing cognitive and metacognitive skills associated with reading comprehension, analysis of data and critical thinking.
- Provide opportunities throughout the course for students to practice and enhance their skills.
 - Annotated course readings
 - Literature review
 - Scientific literacy
 - Research paper

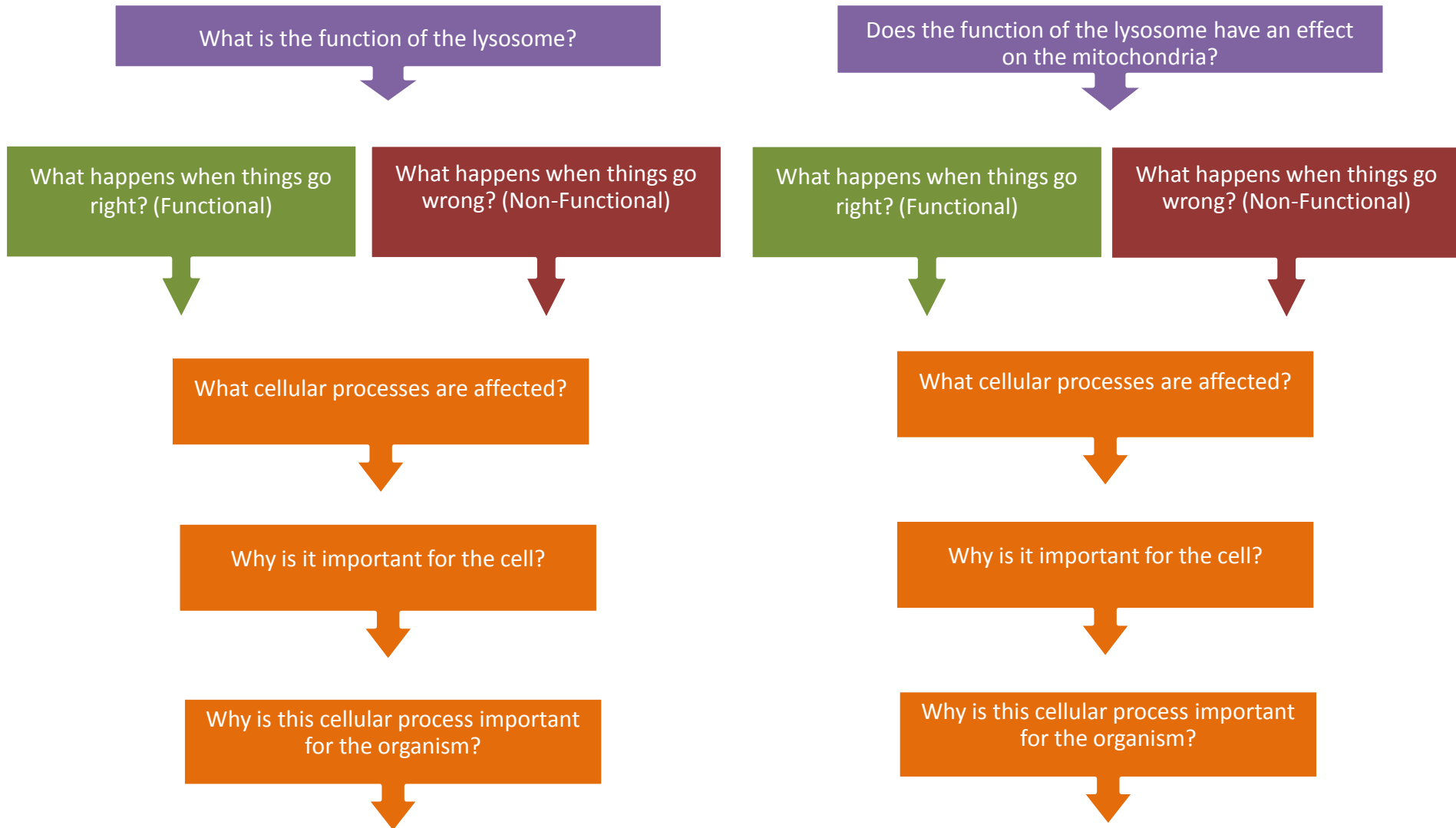
Aspects of student learning based on Bloom's Taxonomy



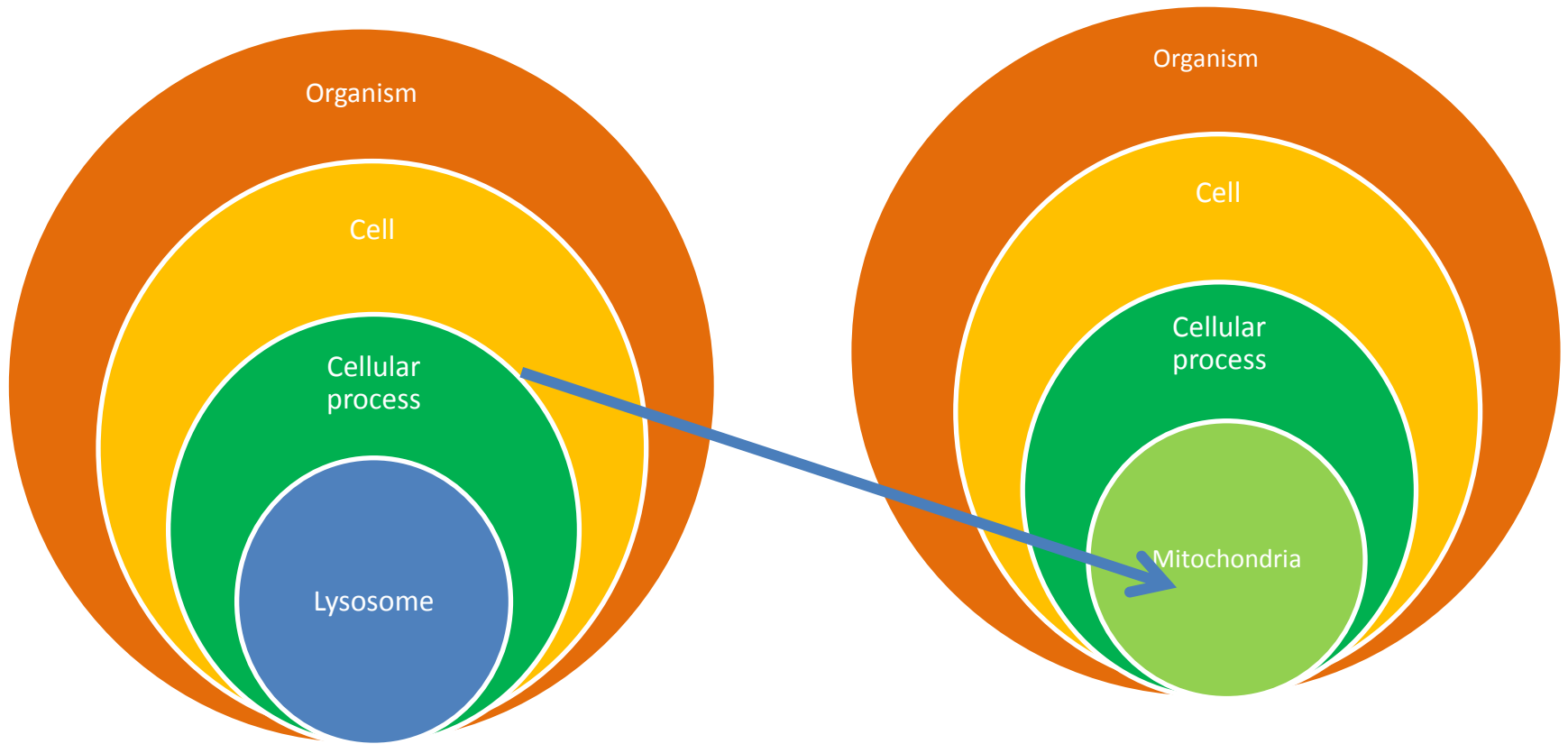
Alignment grid: Interrelationship between cellular organelles

Learning Objective	Taxonomy Level/Category	Learning Activities	Formative Assessments	Summative Assessment
Demonstrate a basic understanding of cell organelles.	Remembering	Create a table / diagram listing the organelles in a eukaryotic cell.		Question (multiple choice / matching) in the exam.
Demonstrate an understanding of the interrelationship between cell organelles	Understanding	Model a scenario where a specific cell organelle is not functional, what effect would it have on other organelles? Why?	Concept maps / schematics	
Apply the understanding of the interrelationship between cellular organelles to evaluate their role in disease.	Applying	Extension of previous activity. Using the literature provided understand how the loss of function of the organelle led to a specific disease.	Concept maps / schematics Initial draft of the literature search. Drafts of the report at various stages.	Final report.
Design a case study to demonstrate the understanding of the role of cell organelles in disease.	Creating	Students will design / develop a scenario where a specific cell organelle is not functional and discuss its impact.	Concept maps / schematics Initial draft of the literature search. Drafts of the report at various stages.	Final report

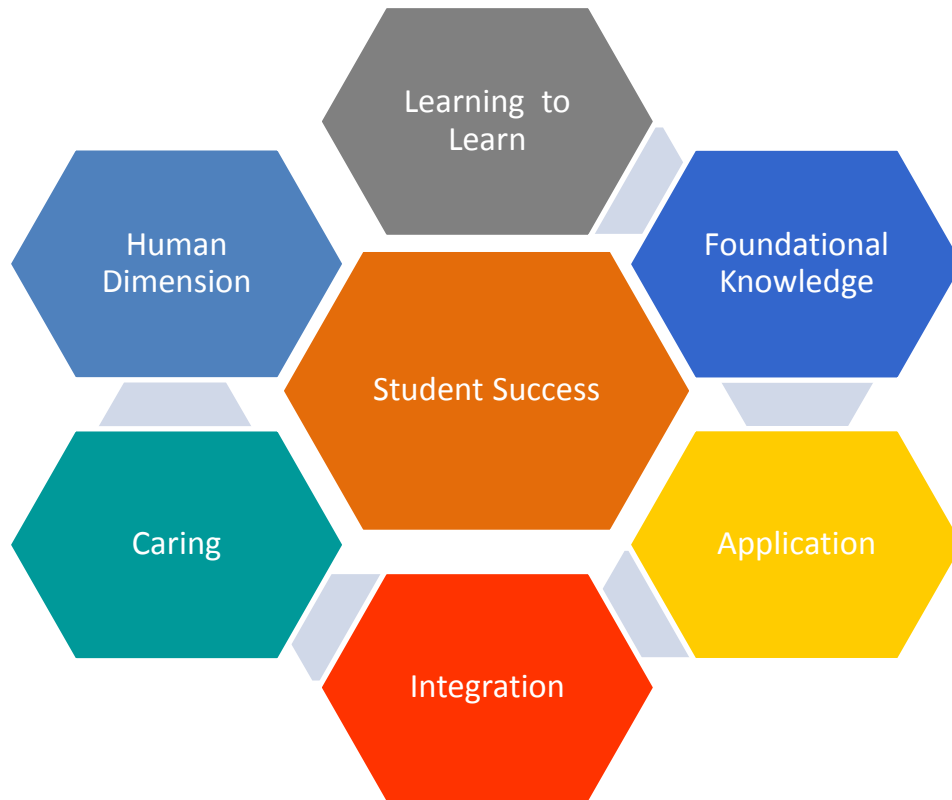
Activity 1; : This is a guided activity where the instructor offers guidance throughout the course of the assignment (brainstorm ideas, discussions-on the board, discuss as a class and in individual groups).



Interrelationship between cellular organelles



Fink's Taxonomy



Fink LD. A taxonomy of significant learning. In: *Creating Significant Learning Experiences: An Integrated Approach to Designing College Courses*. San Francisco, CA: John Wiley and Sons, Inc; 2003.

Significant Learning Experiences :

- Interactive
- Learner Centered
- Designed intentionally
- More than “understand & remember”
- Includes critical thinking, creative use of knowledge to address real world problems
- Developing learning about self and other
- Building skills for lifelong learning

Student Support Services

- Academic support
- Financial literacy
- Preparation for graduate school / career preparation

Career Preparation

- Biotechnology Curriculum at Madison Area Technical College
 - Dynamic & Current
 - Transferable skills
 - Cutting edge technologies
 - Associate degree / post-baccalaureate certificates



Biotechnology

Career Pathway at Madison College

School of Applied Science, Engineering, & Technology—Biotechnology Cluster

Bachelor's Degree

Various Options—120+ credits
See: <http://madisoncollege.edu/transfer-opportunities>

Biotechnology Post-Baccalaureate Certificate—15 credits

Contains some advanced credits not included in the Associate Degree.

[Program Information](#)
[Transfer Credit or Credit for Prior Learning](#)

Biotechnology Post-Baccalaureate Intensive Certificate—15 credits

All credits are part of the Associate Degree.

[Program Information](#)
[Transfer Credit or Credit for Prior Learning](#)

Biotechnology Laboratory Technician

Associate Degree—68 credits

Students who have completed the Biotechnology Laboratory Support Technical Diploma will have completed 9 credits toward this Associate Degree.

[Program Information: http://madisoncollege.edu/program-info/biotechnology-laboratory-technician](http://madisoncollege.edu/program-info/biotechnology-laboratory-technician)

[High School Dual Credit opportunities available: http://madisoncollege.edu/dual-credit](http://madisoncollege.edu/dual-credit)

[Transfer Credit or Credit for Prior Learning: https://madisoncollege.edu/prior-learning-credit](https://madisoncollege.edu/prior-learning-credit)

Biotechnology Bridge

Skill building and support for students who need it.

<https://madisoncollege.edu/bridge-programs>

Biotechnology Lab Support Assistant

Technical Diploma—9 credits

[Program Information](#)

[High School Dual Credit](#)
[Transfer Credit or Credit for Prior Learning](#)

Upper Level Employment

Example Job Titles:

- ◊ Biotechnology Research & Development
- ◊ Lab Manager

Average Industry Wages:
\$25.94-\$36.30 per hour

Mid-Level Employment

Example Job Titles:
Biological Technician

Average Industry Wages:
\$16.55-\$20.60 per hour

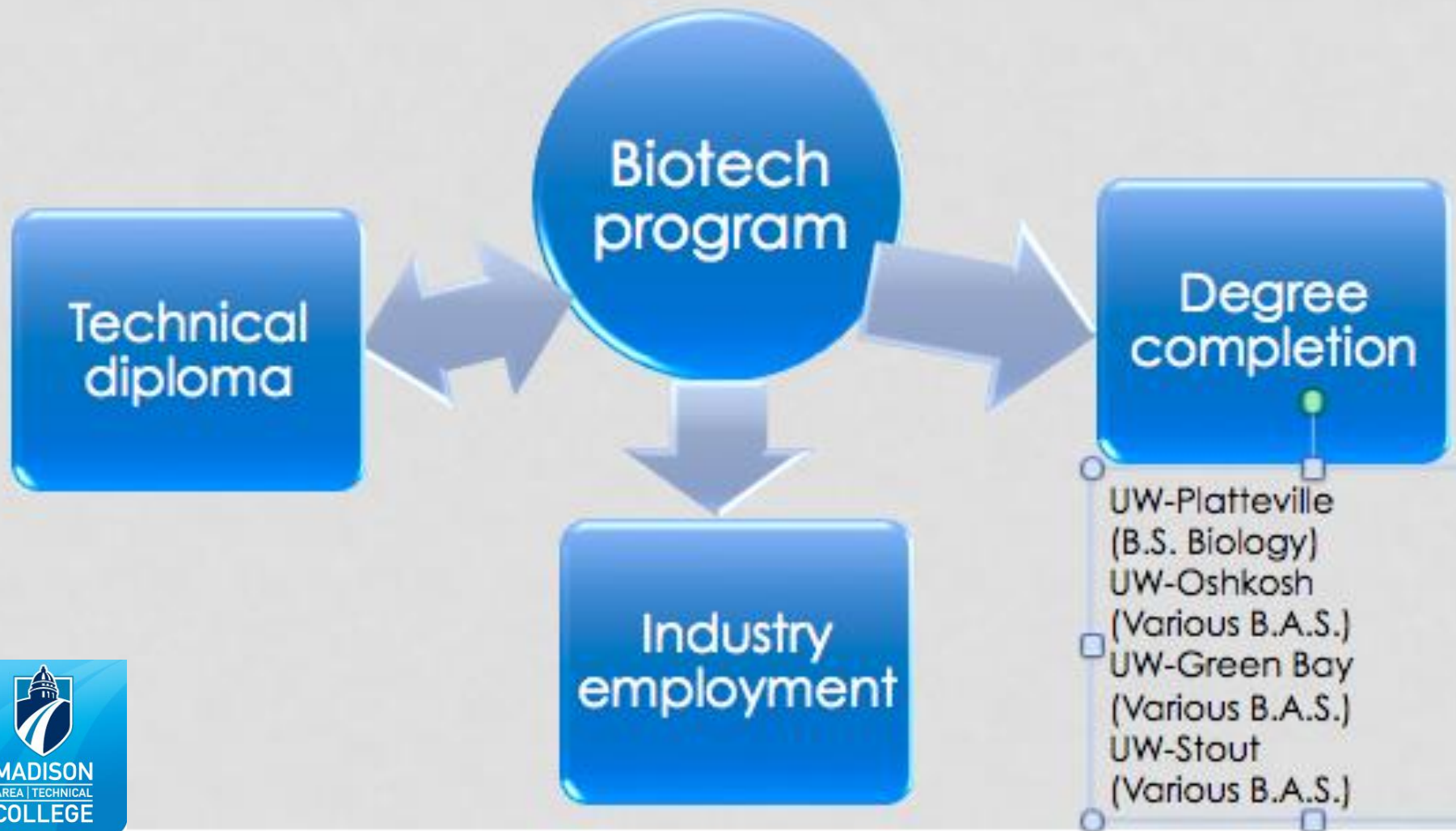
Entry-Level Employment

Example Job Title:
Laboratory Assistant

Average Industry Wages:
\$14.69-\$15.52 per hour

Education 0 Credits 15 Credits 30 Credits 45 Credits 60 Credits

CAREER PATHWAYS FOLLOWING PROGRAM COMPLETION



Making Products for the Biotechnology Industry

Madison College Truax Campus

March 12th or April 11th, 2019

8:30 AM – 12:30 PM

Come take part in a four-hour laboratory opportunity exploring techniques used to make biotechnology products in industry! During this experience, you will use technologies in molecular biology, fermentation and chromatography. Learn how the biotechnology industry in the Dane County area uses these techniques to make products to improve human lives. Whether you want to learn more about working in a laboratory or are looking for a learning experience in biological and health science, this workshop has something for you! This event is open to students in 10th -12th grade who have completed a year of high school biology.

Join us and ...

- Work in state of the art laboratories
- Use advanced instrumentation
- Learn about careers in biotechnology



MAKING PRODUCTS FOR BIOTECHNOLOGY: an introduction to laboratory techniques and instrumentation

Agenda:

April 11th, 2019

8:30 AM – 12:30 PM

- 8:30 – 9:00: Welcome and introduction / Overview of bioprocessing
- 9:00 – 9:30: Prepare DNA from colonies on Blue/White selection plates
Set up PCR reactions and place in thermocycler
- 9:30 – 11:00: Practice agarose gel sample loading
Observe cell growth in fermenters and take absorbance readings using DU800 spectrophotometers
Discuss gel filtration chromatography
- 11:00 – 11:45: Load PCR samples on agarose gels and electrophorese
Run gel filtration columns
- 11:45 – 12:30: Complete chromatography
Analyze agarose gel results
Question/answer session and lab tour



Using Biotechnology to Study Gene Expression

Madison College *Truax* Campus

November 2nd and 9th, 2019

9:00 AM – 3:30 PM

Come take part in a unique partnership between Catalent Biologics and the Madison Area Technical College Biotechnology Program! During two days in the Biotechnology Program's state-of-the-art laboratory suite, you will experience technologies used to study changes in gene expression. You will isolate RNA, perform gel electrophoresis, use UV spectrophotometry, perform quantitative PCR and more! Scientists from Catalent will provide perspective and guidance throughout the workshop to form an industry focus. Whether you want to learn more about working in a laboratory, are looking for a learning experience in biological and health sciences, or just want to become a more informed adult consumer in the health care arena, this workshop has something for you!



Join us and ...

- Work in state of the art laboratories
- Use advanced instrumentation
- Interact with industry professionals
- Learn about careers in biotechnology



BOYS & GIRLS CLUB
OF DANE COUNTY



Catalent
BIOLOGICS

MAKING PRODUCTS FOR BIOTECHNOLOGY: an introduction to bioprocessing



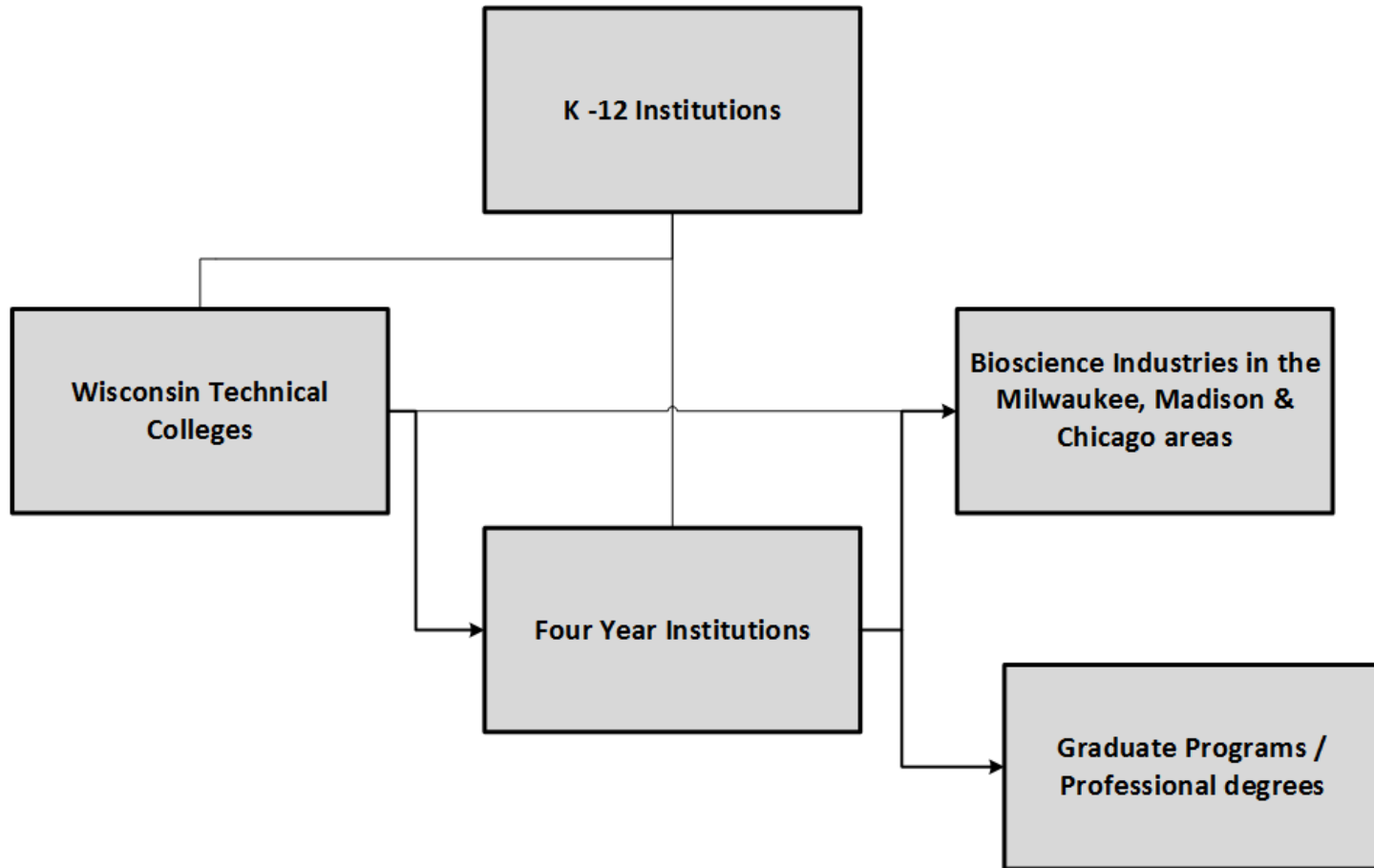
La Follette High School Visit Agenda:

January 16th, 2019

12:26 PM – 1:59 PM

12:26 – 12:30:	Students arrive
12:30 – 12:35:	Introduce bioprocessing
12:35 – 12:55:	Using bacteria to make a product: enzyme analysis
12:55 – 1:00:	Introduce chromatography
1:00 – 1:25:	Gel filtration chromatography exercise
1:25 – 1:30:	Introduce gas chromatography
1:30 – 1:55:	Gas chromatography exercise
1:55 – 1:59:	Students dismissed

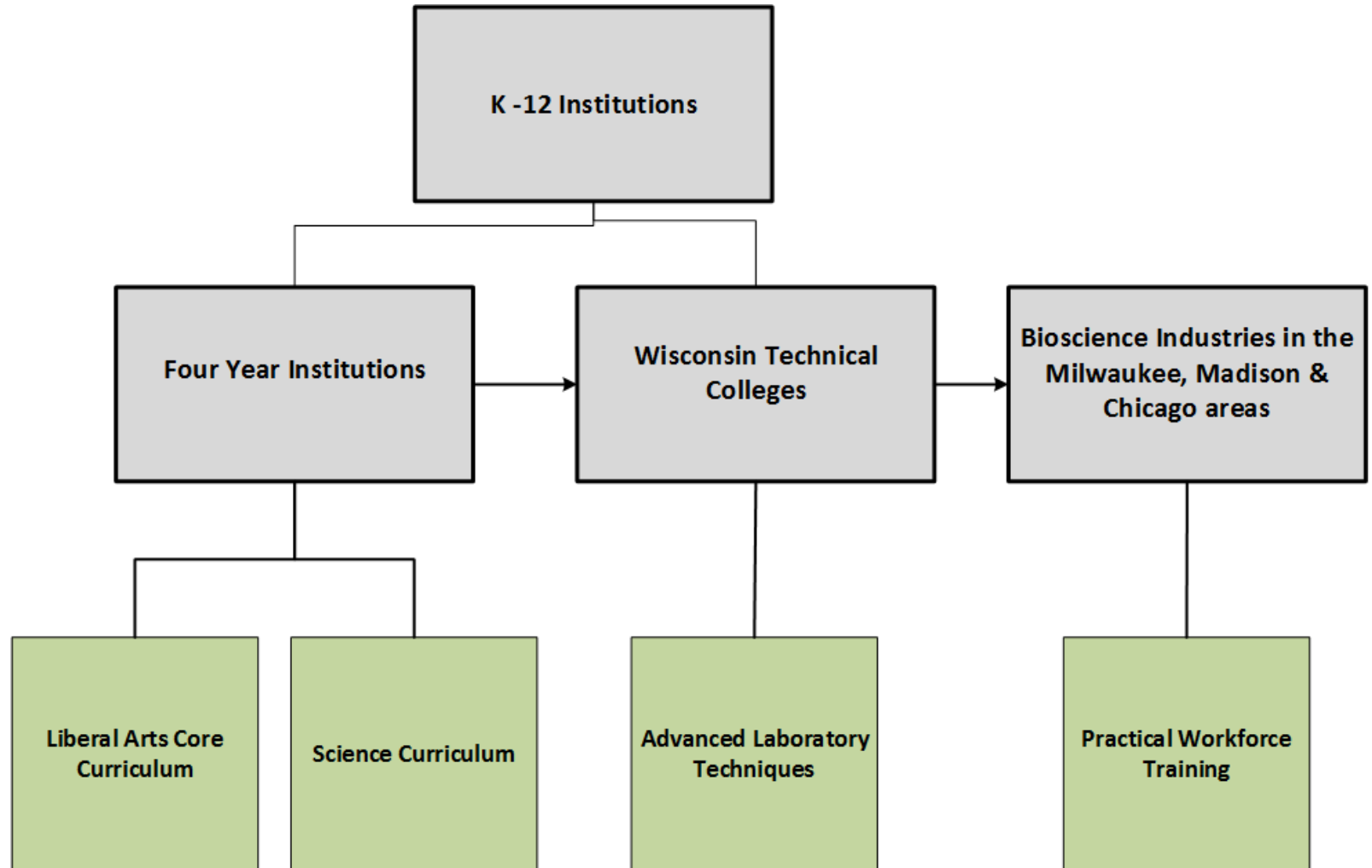
Career Paths



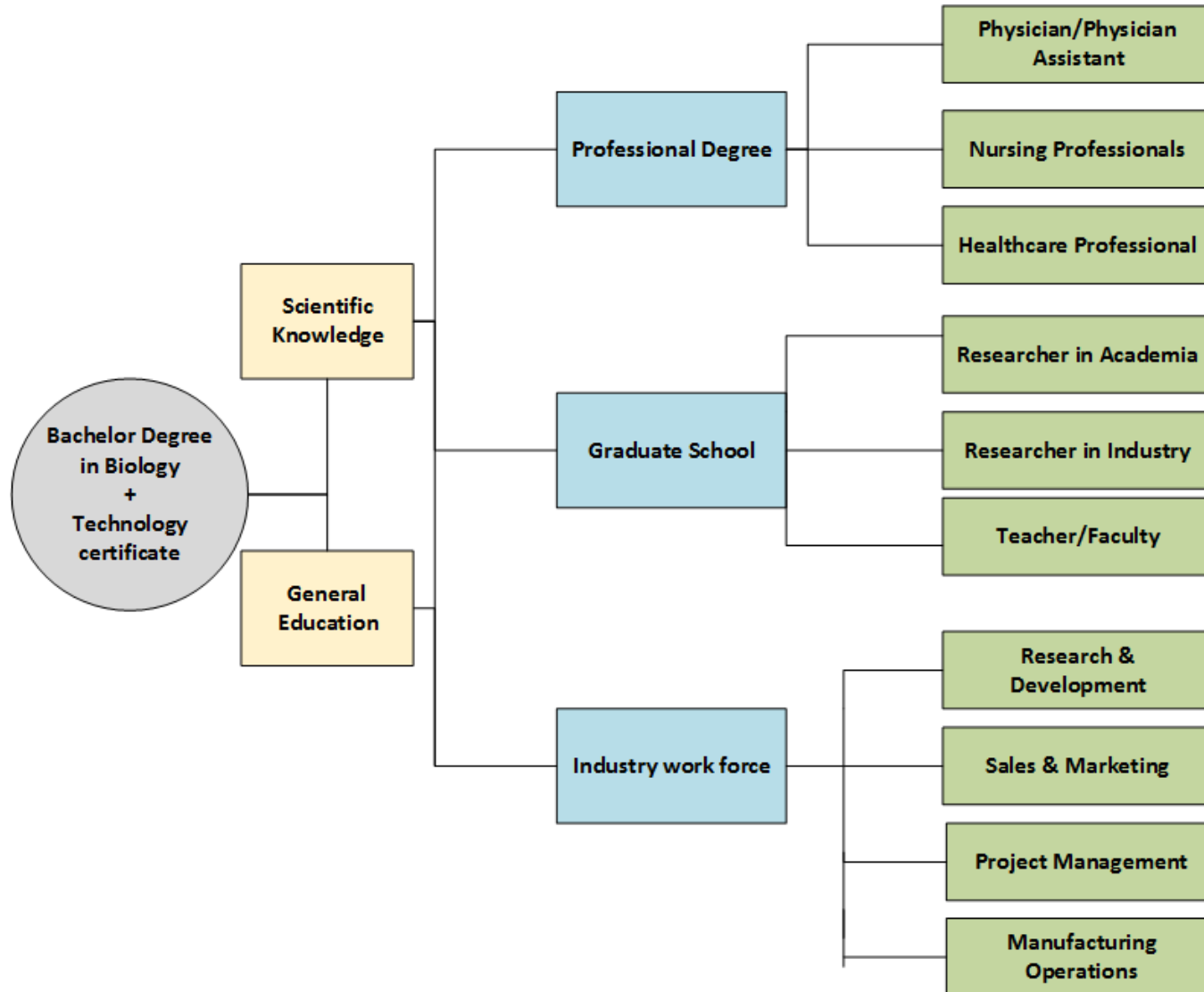
Collaborative Partnerships

- Dual credit
- Professional Development
- Shared resources
- Articulation agreements

Structural Framework



Career Paths



Discussion