Principles of Biomedical Science
Course Framework

PLTW

PLTW Framework - Overview

PLTW Frameworks are representations of the knowledge, skills, and understandings that empower students to thrive in an evolving world. The PLTW Frameworks define the scope of learning and instruction within the PLTW curricula. The framework structure is organized by four levels of understanding that build upon each other: Knowledge and Skills, Objectives, Domains, and Competencies.

The most fundamental level of learning is defined by course Knowledge and Skills statements. Each Knowledge and Skills statement reflects specifically what students will know and be able to do after they've had the opportunity to learn the course content. Students apply Knowledge and Skills to achieve learning Objectives, which are skills that directly relate to the workplace or applied academic settings. Objectives are organized by higher-level Domains.

Domains are areas of in-demand expertise that an employer in a specific field may seek; they are key understandings and long-term takeaways that go beyond factual knowledge into broader, conceptual comprehension.

At the highest level, Competencies are general characterizations of the transportable skills that benefit students in various professional and academic pursuits. As a whole, the PLTW Frameworks illustrate the deep and relevant learning opportunities students experience from PLTW courses and demonstrate how the courses prepare students for life, not just the next grade level.

To thrive in an evolving world, students need skills that will benefit them regardless of the career path they choose. PLTW Frameworks are organized to showcase alignment to in-demand, transportable skills. This alignment ensures that students learn skills that are increasingly important in the rapidly advancing, innovative workplace.

Essential Questions

1.1 - 1 What are different forms of evidence, how infallible are they, and how are they useful in resolving potential criminal cases?

1.1 - 2 How can varying forms of evidence be evaluated for meaning?

1.1 - 3 How does technology help bring resolution to forensic cases? Or how does technology advance the understandings in forensic science?

1.2 - 1 How can the cause, mechanism, and manner of death be established?

1.2 - 2 What information can be collected from an autopsy?

1.2 - 3 How can information collected during an autopsy lead to an understanding of disease and/or cause of death?

1.2 - 4 In what ways are the careful evaluation of evidence and accurate recording of data critical to establishing legitimate testimony?

1.3 - 1 How can individual pieces of evidence, evaluated against the whole, be used to resolve questions?

1.3 - 2 In what ways can scientific writings and presentations be utilized to present evidence and justify conclusions?

1.3 - 3 To what extent can current understandings be reinforced through practice?

2.1 - 1   How can an individual's health status be assessed and evaluated?

2.1 - 2   What factors make an individual more susceptible to disease?

2.1 - 3   What are strategies for maintaining health?

2.1 - 4   What are effective means of communicating with others in order to reach common goals?

2.1 - 5   What qualities make for an effective medical professional?

2.1 - 6   In what ways, and for what purpose, can patient confidentiality be maintained?

2.2 - 1   How can changes in a genome lead to disease?

2.2 - 2   Why is an understanding of heredity an important factor in human health?

2.2 - 3   In what ways are genetic changes acquired?

2.2 - 4   In what ways can altered biological processes lead to disease?

2.2 - 5   How can the genetic health of an individual be evaluated?

3.1 - 1   In what ways, and for what purpose, can microorganisms be characterized?

3.1 - 2   What factors affect the growth and death of microorganisms?

3.1 - 3   What are effective strategies for preventing and treating disease?

3.1 - 4   How does an immune system identify and eradicate infection?

3.1 - 5   How can pieces of evidence be evaluated to form conclusions and inform decisions?

3.2 - 1   How can an individual's health status be assessed and evaluated?

3.2 - 2   How is patient case information summarized and communicated efficiently?

3.2 - 3   What professions respond in emergency situations, what are their roles, and how do they work together?

3.2 - 4   What are several career paths in the field of emergency medicine?

3.2 - 5   How do patient vitals and presumptive diagnoses inform the prioritization for treatment options in emergency medical situations?

3.2 - 6   What make for effective emergency and disaster response protocols?

3.2 - 7   How do medical professionals manage emergencies that involve multiple patients?

3.2 - 8   To respond to emergency situations, what common medical resources and facilities need to be available?

3.3 - 1   What are features of a user-friendly app?

3.3 - 2   In what ways can technology enable a faster response and quicker resolution during medical emergencies?

4.1 - 1   How do the engineering and experimental design processes enable innovation?

4.1 - 2   Who innovates, and why?

4.1 - 3   What is the process for innovation and what personal characteristics are required for success?

4.1 - 4   How do innovations impact and advance human health?

4.2 - 1   How does technology function as a vehicle for innovation?

4.2 - 2   In what ways do different types of scientists and engineers collaborate in the biomedical sciences field?

4.2 - 3   What are potential untapped resources that could work to advance the field of biomedical sciences?

Competencies, Domains, Objectives, Knowledge and Skills

Transportable Knowledge and Skills

Core workplace skills that students and workers need to acquire, that can be used across all stages of a career, and that, because of their universal utility, are transportable from job to job, from employer to employer, across the economy.

Career Readiness (CAR):

Biomedical science solutions have global impacts in economic, environmental, and societal contexts.

CAR-A. Explain the education and skills required for biomedical science professionals.

CAR-A.1 Identify and describe the different careers of professionals who research, diagnose, and treat medical conditions.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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CAR-A.2 Describe the education requirements, salary ranges, professional licensure, skills, and/or responsibilities of biomedical science professionals.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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CAR-B. Describe the societal impact of biomedical science professionals.

CAR-B.1 Describe the impact that biomedical science research and interventions have on society.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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Communication (COM):

Biomedical Science requires effective communication with a variety of audiences using multiple modalities.

COM-A. Communicate effectively with a specific audience.

COM-A.1 Follow acceptable formats for writing assignments and professional presentations.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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COM-A.2 Modify communications to meet the needs of the audience or patient.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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COM-A.3 Properly cite references for all reports in an accepted format.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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COM-A.4 Use proper elements of written and electronic communication (spelling, grammar, and formatting).

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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Competencies, Domains, Objectives, Knowledge and Skills

COM-A.5 Apply listening skills and interpret verbal and nonverbal behaviors to enhance communication with coworkers and patients.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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COM-A.6 Demonstrate technical reading and writing by reading scientific journal articles and demonstrating knowledge of databases (PubMed, NCBI), and writing scientific lab reports.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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COM-A.7 Use appropriate scientific terminology and abbreviations.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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Collaboration (COL):

Being able to effectively and efficiently function on multidisciplinary teams is critical to success in the biomedical sciences.

COL-A. Create an effective team environment to promote successful goal attainment.

COL-A.1 Respect others' viewpoints.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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COL-A.2 Demonstrate teamwork and describe the importance of each team member's contribution to the project.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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COL-A.3 Identify basic conflict resolution strategies and employ those strategies as necessary and appropriate.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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COL-A.4 Employ a peer review process to give effective and constructive feedbackto meet given outcomes.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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COL-A.5 Develop a project schedule allocating tasks among team members, and track progress for successful completion of the project.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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COL-A.6 Select and use collaborative tools, such as cloud-based tools, document sharing, and video and text functions, to successfully complete a project.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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Competencies, Domains, Objectives, Knowledge and Skills

Ethical Reasoning and Mindset (ERM):

Successful biomedical scientists typically exhibit specific personal and professional characteristics that lend themselves to the creative, collaborative, and solution-driven nature of the profession.

ERM-A. Apply professional standards, as they relate to the personal traits of a biomedical science professional.

ERM-A.1 Demonstrate professional standards, such as creativity, perseverance, honesty, integrity, and accountability, which should be exhibited by biomedical professionals.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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ERM-A.3 Create and support an environment that fosters teamwork, emphasizes quality, and promotes learning.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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ERM-A.7 Weigh the ethical implications of biomedical science decisions.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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ERM-A.8 Summarize and explain the larger ethical, moral, and legal issues related to scientific research, product development, and use in society (animal use/human research).

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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Critical and Creative Problem-Solving (CCP):

Biomedical science professionals approach complex problems systematically and logically by breaking them into manageable components. They work collaboratively and apply their knowledge and skills to draw well-reasoned conclusions and solutions.

CCP-A. Devise and execute a plan to solve a problem.

CCP-A.1 Synthesize information from multiple credible sources, such as literature, databases, policy documents, and diverse perspectives from multiple disciplines, to explore causes and solutions to problems.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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CCP-A.2 Devise and execute a plan to solve a problem while considering the impacts of the possible solutions.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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CCP-B. Use data and evidence to evaluate and justify decisions.

CCP-B.1 Use mathematical computations to interpret data.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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Competencies, Domains, Objectives, Knowledge and Skills

CCP-B.2 Conduct research using credible resources to craft explanations and draw conclusions while acknowledging the limitations, opposing views, and biases.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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CCP-C. Apply an iterative design process to creatively address a need or solve a problem.

CCP-C.1 Assess how design and innovation can help solve a problem in biomedical science.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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CCP-C.2 Identify and define visual, functional, and structural design requirements (criteria) and realistic constraints, against which solution alternatives can be evaluated and optimized.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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CCP-C.3 Describe how failure, or unexpected results, can produce positive outcomes by improving understanding.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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CCP-C.4 Compare competing solution ideas and justify the selection of a solution path with respect to design requirements and constraints.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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CCP-C.5 Develop a solution and implement a plan to test and evaluate a potential solution to verify that it meets all constraints and complies with all design criteria.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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Experimental Design (EXD):

An experimental design process is a systematic approach to investigate and gain knowledge.

EXD-A. Design and carry out an experiment that investigates a research question.

EXD-A.1 Develop a testable hypothesis and design an experimental protocol that evaluates its validity.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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EXD-A.2 Distinguish between independent and dependent variables.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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EXD-A.3 Identify and explain the purpose and importance of experimental controls.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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Competencies, Domains, Objectives, Knowledge and Skills

EXD-A.4 Maintain a detailed repeatable account of an experiment in a physical or digital laboratory notebook.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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EXD-A.5 Conduct background research using credible sources to identify and investigate a relevant research question.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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EXD-A.6 Select and use equipment appropriately to conduct experiments.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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EXD-A.7 Identify possible sources of errors, then redesign and repeat the experiment when appropriate.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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EXD-A.8 Communicate experimental findings with appropriate audiences both orally and in writing.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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EXD-B. Collect and analyze experimental data to draw conclusions.

EXD-B.1 Demonstrates an ability to accurately follow a lab protocol.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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EXD-B.2 Display data appropriately and accurately in digital or written form (graphs, tables, diagrams).

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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EXD-B.3 Perform necessary calculations to analyze experimental data.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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EXD-B.4 Draw logical conclusions from experimental data.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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Competencies, Domains, Objectives, Knowledge and Skills

Technical Knowledge and Skills

Every career field requires technical literacy and career-specific knowledge and skills to support professional practice.

General Laboratory Practices (GLP):

The practice of biomedical sciences requires the application of common tools, techniques, and technologies to solve problems.

GLP-B. Demonstrate mastery of general laboratory practice common to many biomedical science fields.

GLP-B.1 Use and apply principles of measurement.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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GLP-B.2 Calculate concentrations and/or prepare solutions.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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GLP-B.3 Develop and utilize a standard curve.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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GLP-B.4 Practice precise and accurate micropipetting.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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GLP-B.5 Demonstrate proper use of a microscope to view biological samples.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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GLP-B.6 Demonstrate aseptic technique.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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GLP-B.7 Practice culturing techniques.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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Anatomy and Physiology (ANP):

Biomedical scientists need to understand how the body functions in order to support patient health.

ANP-A. Explain the connection between structure and function in biology.

ANP-A.1 Describe the anatomy and physiology of key human body systems as well as the organization and interaction of these systems.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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ANP-A.2 Understand that interactions between internal and external sources can affect body systems and cell functions.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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ANP-A.3 Explain how organ anatomy (such as that of the heart or brain) is related to function.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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ANP-A.4 Demonstrate how a change in structure in the body impacts function.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
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ANP-B. Describe how the systems of the body work together to maintain homeostasis.

ANP-B.1 Cite examples of how body systems collaboratively function to maintain homeostasis and health.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☐	✔	✔	✔	✔	☐	☐	✔	☐	☐	✔	☐

ANP-B.2 Demonstrate how feedback loops help maintain homeostasis in the body.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☐	☐	☐	✔	✔	☐	☐	✔	☐	☐	☐	☐

ANP-B.3 Create, describe, and analyze models of biological processes to explain proper and improper functioning.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☐	✔	✔	✔	☐	☐	☐	✔	☐	✔	☐	☐

Clinical Medicine (CME):

Patient records and other pieces of medical evidence can be used to assess a person's health and identify disease.

CME-A. Document patient information.

CME-A.1 Use medical terminology to transcribe and communicate information, data, and observations.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	☐

CME-A.2 Maintain accurate patient records and demonstrate why this is important.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☐	✔	✔	✔	✔	✔	☐	✔	☐	☐	☐	☐

CME-A.3 Demonstrate adherence to HIPAA guidelines to maintain patient privacy.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☐	☐	☐	✔	☐	☐	☐	☐	✔	☐	☐	☐

CME-B. Synthesize complex medical information to diagnose a disease, disorder, or injury or to determine cause of death.

CME-B.1 Collect, assess and interpret patient vital signs.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	✔	☐	☐	✔	✔	✔	✔	✔	☐	☐	✔	☐

CME-B.2 Select and use appropriate diagnostic tools and tests to evaluate a patient's condition.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☐	✔	✔	✔	✔	✔	☐	✔	✔	☐	☐	☐

CME-B.3 Interpret medical information and/or laboratory test results to draw conclusions.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	✔	✔	✔	✔	✔	✔	✔	✔	☐	☐	✔	☐

CME-B.4 Identify causes (environmental, genetic, lifestyle, and the like) of health conditions.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☐	✔	✔	✔	✔	✔	✔	☐	☐	✔	✔	☐

CME-B.5 Describe how a condition or disorder impacts body systems.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☐	✔	✔	✔	✔	✔	☐	✔	☐	✔	☐	☐

CME-C. Respond to patient and/or community needs and propose treatment strategies for disease, disorder, injury, or the prevention thereof.

CME-C.1 Prescribe a viable course of action to treat or manage a condition.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☐	✔	☐	✔	✔	✔	✔	✔	☐	✔	☐	☐

CME-C.2 Demonstrate appropriate public health measures by proposing strategies for responding to health crises and/or disasters.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☐	☐	☐	☐	☐	☐	✔	✔	✔	☐	☐	☐

CME-C.3 Describe the impact of lifestyle habits on human health and disease risk.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☐	✔	✔	✔	☐	✔	☐	☐	☐	✔	☐	☐

CME-C.4 Describe measures to prevent disease, disorder, or injury, such as regular doctor's visits and screening tests.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☐	☐	☐	✔	☐	☐	✔	☐	☐	✔	✔	☐

Molecular Biology and Genetics (MBG):

DNA analysis allows scientists to understand the causes and treatment of genetic disease, identifydisease pathogens, as well as biomanufacture protein products.

MBG-A. Explain the role of DNA, RNA, and proteins in the inheritance of traits and the development of diseases or disorders.

MBG-A.1 Describe the structure and function of nucleic acids and the relationship among genes, alleles, chromosomes, proteins, and traits.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	✔	☐	☐	☐	✔	☐	☐	☐	☐	☐	☐	☐

MBG-A.2 Explain how the order and chemical properties of amino acids influence a protein's structure and function.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐

MBG-A.3 Describe the processes of DNA replication and protein synthesis.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐

MBG-A.4 Explain how mutations in nucleic acids can lead to diseases or disorders or promote evolutionary change.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐

MBG-A.5 Demonstrate how environmental factors can lead to genetic mutations.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐

MBG-B. Describe cell division and the process by which chromosomes replicate leading to genetic diversity.

MBG-B.1 Differentiate between mitosis and meiosis and model how these processes lead to genetic diversity.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐

MBG-B.2 Analyze karyotypes to diagnose chromosomal abnormalities.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐

MBG-C. Analyze genetic information to predict patterns of inheritance

MBG-C.1 Predict the pattern of gene inheritance using Punnett squares.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐

MBG-C.2 Predict the pattern of gene inheritance using pedigree analysis.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐

MBG-D. Select and use appropriate tools, techniques, and/or technologies to analyze genetic information and diagnose disease.

MBG-D.1 Explain and demonstrate techniques in molecular biology (DNA extraction, restriction digestion, gel electrophoresis) and interpret results.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☑	☑	☑	☐	☑	☑	☐	☐	☐	☐	☐	☐

MBG-D.2 Utilize bioinformatics to analyze and compare genetic information.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐

Competencies, Domains, Objectives, Knowledge and Skills

Microbiology (MIB):

Biomedical scientists study and manipulate microorganisms to understand their properties (i.e., growth and behavior) and their role in infectious disease.

MIB-A. Explain how the composition, structure, and activities of cells build functional systems in the human body.

MIB-A.1 Differentiate between prokaryotic and eukaryotic cells.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☑	☐	☐	☐	☑	☐	☑	☐	☐	☐	☐	☐

MIB-A.2 Describe the relationship of cells, tissues, organs, and systems in the human body.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☐	☑	☑	☑	☑	☐	☐	☑	☐	☐	☐	☐

MIB-A.3 Identify the structure and function of macromolecules that are used in the body.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☑	☐	☐	☑	☑	☐	☐	☐	☐	☐	☐	☐

MIB-A.4 Demonstrate how the structure of the cell membrane impacts homeostasis.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐

MIB-A.5 Interpret the interaction between cells, and between cells and their environment.

Lessons:	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3
	☑	☐	☐	☑	☑	☐	☑	☑	☐	☐	☐	☐