Biomedical Science I Career & Technical Education Curriculum

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2022

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Office of Teaching and Learning Philosophy

The Office of Teaching and Learning believes that educating our students requires children to pursue learning in ways that are culturally engaging and academically rigorous. In order to accomplish this goal, we understand curriculum as dynamic rather than static. This means the teacher is always in conversation with the curriculum as informed by student voice, needs, strengths, culture, interests, and the world. Curriculum documents are not meant as scripts to dictate what happens each moment in the classroom, but instead serve as guides to create lived moments that are full of invention, inquiry, joy, creativity, and academic rigor. We believe that curriculum should be culturally responsive and sustaining, putting the student at the center of the learning process.

The success of curricular implementation calls for teachers to make informed choices as they use the materials in meaningful and purposeful ways. These choices include, but are not limited to making learning student-centered, differentiating learning, and infusing past and current events to critique the world. Both teachers and students bring with them a wealth of knowledge and experience to the classroom. These experiences are a resource that should be leveraged to make choices that continually invent and reinvent the curriculum.

The Office of Teaching & Learning values:

- Teachers as Intellectuals,
- Culturally Responsive and Sustaining Teaching,
- Equity, and
- Academic Rigor.

The Office of Teaching & Learning affirms the following beliefs:

- We believe in the power and freedom of inquiry, imagination, and joy.
- We believe that all students bring with them valuable knowledge.
- We believe that the knowledge and expertise of teachers is critical to the development, implementation, and success of the curriculum process.
- We believe that teachers should co-construct curriculum with students.
- We believe that teachers are advocates of students.
- We believe in teaching and learning that is culturally responsive and sustaining.
- We believe that teaching, learning, and curriculum, as Bettina Love reminds us, should help students thrive instead of merely survive.
- We believe that teaching, learning, and curriculum should move us toward social justice and a more equitable society.
- We believe teaching, learning, and curriculum should develop the critical consciousness of learners and asks them to identify, analyze, and deconstruct various forms of oppression that affect their lived realities.
- We believe teaching, learning, and curriculum should be trauma-informed and consider the ways young people are affected by their environments.
- We believe, as bell hooks reminds us, that teachers, like any helping professional, are healers and that curriculum should be a reflection of a healing environment.
- We believe that teaching, learning, and curriculum should be anti-racist and help students identify bias, reduce stereotypes, and develop a sense of social justice.
- We believe that curriculum and instruction should be inclusive, valuing all students as an asset to the learning environment.
- We believe in the importance of continuous professional growth for all educators in order to develop a growth mindset and remain intellectually stimulated.
- We believe in the importance of preparing students for college and careers in the twenty-first century.

Course Description

The Biomedical Science Program provides students with the academic and technical preparation necessary to pursue high-skill, high-demand careers in the health field. It encompasses three primary areas of technical focus: Principles of Biomedical Science (PBS), Human Body Systems (HBS) and Medical Interventions (MI), all which connect to one another in academic knowledge and health careers. The curriculum is designed to integrate academic, technical, and professional skill concepts. The Biomedical Science Program includes comprehensive technical knowledge and skills that will prepare students for learning within a sequential, standards-based pathway program that integrates hands-on projects and labs, career-based skills, and leadership development.

In this introductory course of the Biomedical Science program, students explore concepts of biology and medicine to determine factors that led to the death of a fictional person. From design and data analysis to outbreaks, clinical empathy, health promotion, and more, students explore the vast range of careers in biomedical sciences. They develop not just technical skills, but also in-demand, transportable skills that they need to thrive in life and career. Sample occupations associated with this particular course are:

- Blood Spatter Analyst
- Digital Forensics Investigator
- Dermatologist
- Fields of Nursing (LPN, RN, NP)
- Hematologist
- Epidemiologist
- Flight Paramedic
- Pharmaceutical Scientist
- Biomedical Engineer

Statement on Culturally Responsive-Sustaining Education

Through a Culturally Responsive and Sustaining Education (CR-SE) framework for curriculum and instruction, each content area includes inquiry-based, culturally responsive, and student-centered prekindergarten to grade twelve curricula that is designed to meet the needs of all students. In a districtwide effort to establish a culture of equity, our Clarity 2020 calls for a "A Rigorous and Relevant Framework for Curriculum & Instruction" (Priority 2). This means reimagining the landscape of teaching and learning to see diversity and difference as indispensable assets that should be leveraged for student engagement in classrooms with high expectations.

Our curriculum draws on the backgrounds, identities, and experiences of our students to make their connections to learning relevant and meaningful. Understanding the role of culture in the process of education means thinking about the ways identity (race, ethnicity, gender, sexual orientation, language, social class, nationality, ability, and religion) influences teaching and learning, gets reflected in the curriculum, and affects each individual student's educational experience.
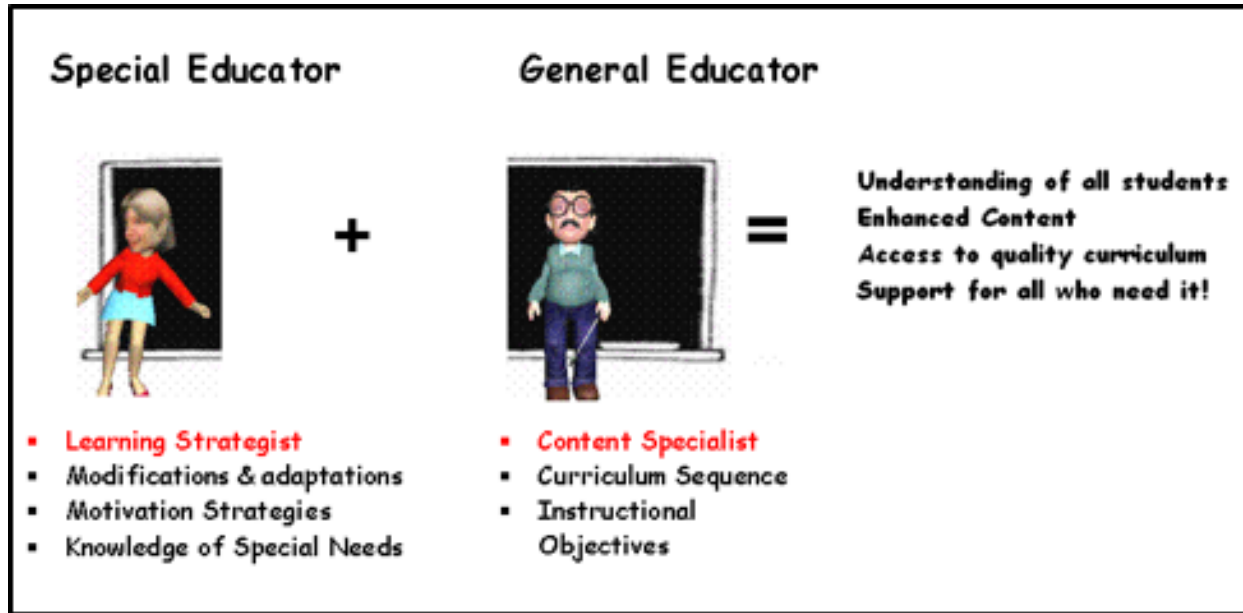
Developing the media literacy, critical consciousness, and civic engagement of students in the twenty-first century is a priority that must happen alongside the growth of academic skills. This is an interdisciplinary, democratic, and socially just approach to culturally responsive teaching that highlights the injustices that have characterized vast inequalities in the education system. A culturally responsive and sustaining approach to teaching necessitates that teachers and students work alongside one another to confront bias and disrupt educational inequities.

Studies across the country have shown that Culturally Responsive and Sustaining Education (CR-SE), "increases student participation, attendance, grade point averages, graduation rates, civic engagement, self-image, and critical thinking skills" (NYC DOE). This approach to teaching and learning requires an inclusive curriculum that integrates support for English Language Learners, students with disabilities, students at risk of school failure, gifted and talented students, and students with 504 plans. It is a framework for teaching that means advocating for students who have been historically marginalized and denied access to an equal education by creating opportunities for these students to be educated alongside their general education peers. It also involves the identification of successful practices that reduce referrals and placements in more restrictive environments.

Through the implementation of a plan to integrate civics, the Amistad Curriculum, and Holocaust/Genocide studies at all grade levels across the district, students will learn about the history of Newark, the contributions of African Americans and other ethnic groups to the city, and

how to become civically engaged, democratic citizens in the twenty first century. Further, students will learn about the evils of bias, prejudice and bigotry and how these may lead to genocide and that the evil period of slavery in the United States exhibited a number of components seen in genocides throughout the centuries. This curricula, project-based and interdisciplinary in nature, spans the content areas and grade levels.

Integrated Accommodations and Modifications for Special Education Students, English Language Learners, Students At Risk of School Failure, Gifted and Talented Students, and Students with 504 Plans

Special Educator + General Educator = Understanding of all students / Enhanced Content / Access to quality curriculum / Support for all who need it!

- **Learning Strategist**
- Modifications & adaptations
- Motivation Strategies
- Knowledge of Special Needs

- **Content Specialist**
- Curriculum Sequence
- Instructional Objectives

Co-Teaching Models

One Teach, One Observe: One of the advantages in co-teaching is that more detailed observation of students engaged in the learning process can occur. With this approach, for example, co-teachers can decide in advance what types of specific observational information to gather during instruction and can agree on a system for gathering the data. Afterward, the teachers should analyze the information together. The teachers should take turns teaching and gathering data, rather than assuming that the special educator is the only person who should observe.

Station Teaching: In this co-teaching approach, teachers divide content and students. Each teacher then teaches the content to one group and subsequently repeats the instruction for the other group. If appropriate, a third "station" could give students an opportunity to work independently. As co-teachers become comfortable with their partnership, they may add groups or otherwise create variations of this model.

Parallel Teaching: On occasion, students' learning would be greatly facilitated if they just had more supervision by the teacher or more opportunity to respond. In parallel teaching, the teachers are both teaching the same information, but they do so to a divided class group within the same room. Parallel also may be used to vary learning experiences, for example, by providing manipulatives to one group but not the other or by having the groups read about the same topic but at different levels of difficulty.

Alternative Teaching: In most class groups, occasions arise in which several students need specialized attention. In alternative teaching, one teacher takes responsibility for the large group while the other works with a smaller group. These smaller groups could be used for conferences, remediation, pre-teaching, to help students who have been absent catch up on key instruction, assessment, and so on.

How can the various models and co-partner roles help?

- It increases the Instructional Intensity for students. Instruction is least effective if one teacher is "off" while the other teacher is "on". For example, the most common ICS model, "One Teach One Assist" is the least effective if implemented every day. For improved results, both teachers should be engaged with students at the same time.

- The use of various ICS Models promotes and embeds differentiation of instruction, flexible grouping, unique discussion and questioning techniques.

- Be sure to explain to students and parents the benefits of two teachers. Avoid using the term "special education or special education teacher" to describe the environment. Instead, use terms such as Content Specialist and Learning Strategist to define your roles.

- When providing feedback, consider using different pen/ink colors (stay away from red). This reduces confusion when students have a question to ask.

- It helps to establish a more balanced role of authority between co-partners. Students need to experience instruction and directives from both co-partners.

Adaptations

Instructional adaptations for students with disabilities, English Language Learners, students At Risk of School Failure, Gifted and Talented students, and students with 504 plans include, but are not limited to, the below approaches. For students with disabilities, self-determination and interdependence are two core principles of citizenship education that applies directly to their educational needs and interests.

Student Motivation: Expanding student motivation to learn content and acquire skills in Career & Technical Education can occur through: activity choice, appeal to diverse learning styles, choice to work with others or alone, hands-on activities, and multimodal activities.

Instructional Presentations: The primary purpose of these adaptations is to provide special education students with teacher-initiated and teacher-directed interventions that prepare students for learning and engage students in the learning process (Instructional Preparation); structure and organize information to aid comprehension and recall (Instructional Prompts); and foster understanding of new concepts and processes (Instructional Application) e.g. relating to personal experiences, advance organizers, pre-teaching vocabulary and/or strategies; visual demonstrations, illustrations, mode**ls.**

 Instructional Monitoring: Career & Technical Education instruction should include opportunities for students to engage in goal setting, use of anchor papers, work with rubrics and checklists, reward systems, conferences.

Classroom Organization: The primary purpose of classroom organization adaptations is to maximize student attention, participation, independence, mobility, and comfort; to promote peer and adult communication and interaction; and to provide accessibility to information, materials, and equipment.

Student Response: The primary purpose of student performance responses is to provide students with disabilities a means of demonstrating progress toward the lesson objectives related to reading and writing activities.

Sample Differentiation Strategies and Activities to Enrich Learning for Advanced Students

Anchor Activities: Self-directed specified ongoing activities in which students work independently.

Curriculum Compacting: Curriculum Compacting is an instructional technique that is specifically designed to make appropriate curricular adjustments for students in any curricular area and at any grade level. Essentially, the procedure involves (1) defining the goals and outcomes of a particular unit or segment of instruction, (2) determining and documenting which students have already mastered most or all of a specified set of learning outcomes, and (3) providing replacement strategies for material already mastered through the use of instructional options that enable a more challenging and productive use of the student's time.

Flexible Grouping: Flexible grouping is a range of grouping students together for delivering instruction. This can be as a whole class, a small group, or with a partner. Flexible grouping creates temporary groups that can last an hour, a week, or even a month.

Jigsaw Activities: Jigsaw is a strategy that emphasizes cooperative learning by providing students an opportunity to actively help each other build comprehension. Use this technique to assign students to reading groups composed of varying skill levels. Each group member is responsible for becoming an "expert" on one section of the assigned material and then "teaching" it to the other members of the team.

Differentiated Instruction - English Language Learners
English Language Development Standards

ENGLISH LANGUAGE LEARNERS

Instructional Supports:

- hands-on materials

- bilingual dictionaries

- visual aids

- teacher made adaptations, outlines, study guides

- varied leveled texts of the same content

Preparing students for the lesson:

1. Building Background Information through brainstorming, semantic webbing, use of visual aids and other comprehension strategies.

2. Simplifying Language for Presentation by using speech that is appropriate to students' language proficiency level. Avoid jargon and idiomatic speech.

3. Developing Content Area Vocabulary through the use of word walls and labeling classroom objects. Students encounter new academic vocabulary in literature, editing conventions, and the study of language arts.

4. Giving Directions - Stated clearly and distinctly and delivered in both written and oral forms to ensure that LEP students understand the task. In addition, students should be provided with/or have access to directional words such as: circle, write, draw, cut, underline, etc.

5. Leveraging assisted technologies.

WIDA Language Proficiency Levels

The five language proficiency levels outline the progression of language development implied in the acquisition of English as an additional language, from 1, Entering the process, to 6, Reaching the attainment of English language proficiency. The language proficiency levels delineate expected performance and describe what ELLs can do within each domain of the standards.   The Performance Definitions define the expectations of students at each proficiency level. The definitions encompass three criteria: linguistic complexity—the amount and quality of speech or writing for a given situation; vocabulary usage—the specificity of words or phrases for a given context; and language control—the comprehensibility of the communication based on the amount and types of errors.

WIDA Performance Definitions

At the given level of English language proficiency, English language learners will process, understand, produce or use:

Level	Description
6- Reaching	• specialized or technical language reflective of the content areas at grade level • a variety of sentence lengths of varying linguistic complexity in extended oral or written discourse as required by the specified grade level • oral or written communication in English comparable to English-proficient peers
5- Bridging	• specialized or technical language of the content areas • a variety of sentence lengths of varying linguistic complexity in extended oral or written discourse, including stories, essays or reports • oral or written language approaching comparability to that of English-proficient peers when presented with grade level material
4- Expanding	• specific and some technical language of the content areas • a variety of sentence lengths of varying linguistic complexity in oral discourse or multiple, related sentences or paragraphs • oral or written language with minimal phonological, syntactic or semantic errors that do not impede the overall meaning of the communication when presented with oral or written connected discourse with sensory, graphic or interactive support
3- Developing	• general and some specific language of the content areas • expanded sentences in oral interaction or written paragraphs • oral or written language with phonological, syntactic or semantic errors that may impede the communication, but retain much of its meaning, when presented with oral or written, narrative or expository descriptions with sensory, graphic or interactive support
2- Beginning	• general language related to the content areas • phrases or short sentences • oral or written language with phonological, syntactic, or semantic errors that often impede the meaning of the communication when presented with one- to multiple-step commands, directions, questions, or a series of statements with sensory, graphic or interactive support
1- Entering	• pictorial or graphic representation of the language of the content areas • words, phrases or chunks of language when presented with one-step commands, directions, WH-, choice or yes/no questions, or statements with sensory, graphic or interactive support • oral language with phonological, syntactic, or semantic errors that often impede meaning when presented with basic oral commands, direct questions, or simple statements with sensory, graphic or interactive support

Career & Technical Education Best Practices

1. Includes coherent and rigorous content aligned with challenging academic standards and relevant career and technical content in a coordinated, non-duplicative progression of courses that align secondary to post-secondary education.

2. Incorporates secondary education and post-secondary education elements.

3. Includes opportunity for secondary education students to gain post-secondary education credits through dual or concurrent enrollment programs or other means.

4. Leads to an industry-recognized credential or certificate at the post-secondary level or an associate or baccalaureate degree.

5. Prepares students to succeed in college.

6. Emphasizes real-world applications of academic learning.

7. Provides exposure to real-world workplaces through work-based learning.

8. Teaches professional skills needed to thrive in a career.

9. Provides comprehensive support services to address individual needs of all students, ensuring equity of access, opportunity, and success.

Occupational Safety and Health

The Newark Board of Education is committed to providing a safe and healthy environment for all employees and students on school property and at work based learning worksites. The District's goal is to eliminate, as much as possible, the risk of school-related injuries and illnesses. It is also committed to providing instruction to students on the proper skills, attitudes, and work habits necessary for them to work safely in their future occupations. School staff will ensure that CTE students understand the Occupational Safety and Health Program Plan for Career and Technical Education Academies. This safety and health plan covers all occupational safety and issues associated with staff, teachers, and students both on school district property and at work based learning worksites.

Link: https://drive.google.com/file/d/1OAdgAjU5uPArKe4fqCeMh1eSbmhjkhoY/view?usp=sharing

Essentials of Project Based Learning

The Buck Institute maintains that in order to be considered PBL, a curriculum must include eight essential elements.

1. **Focus on Significant Content**

   Projects target concepts and skills necessary for a student's future career in supply chain management.

2. **Develop 21st Century Skills**

   New Jersey's Career Ready Practices are laced throughout the curriculum to increase a student's future employability.

3. **Engage Students in In-Depth Inquiry**

   Projects require in-depth subject matter research to address the requirements of the driving question.

4. **Organize Tasks Around a Driving Question**

   The driving question is written in terms relatable to the students and is the focal point for all research.

5. **Establish a Need-to-Know**

   Engaging activities and relevant selected readings lead to critical and creative thinking about the driving question, but are not meant to provide the solution.

6. **Encourage Voice and Choice**

   Teachers do not lecture but guide students through the projects, allowing them to make choices about what to research and how to work toward a solution.

7. **Incorporate Revision and Reflection**

   Midway through the project, students will present an initial, proposed solution. Students must then incorporate audience feedback into their revisions until they settle on a final project product. At the end of each project, students will participate in a round table discussion about what they learned – process as well as content – and how they might apply those learnings in their own futures.

8. **Include a Public Audience**

   Teachers are encouraged to invite subject matter experts and other knowledgeable individuals to serve as an authentic audience for initial solution presentations.

Integration of 21st Century Life and Careers Skills

Career Ready Practices describe the career-ready skills that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

Career Ready Practices in Course I:

CRP4.   Communicate clearly and effectively and with reason.

CRP7.   Employ valid and reliable research strategies.

CRP8.   Utilize critical thinking to make sense of problems and persevere in solving them.

NJ Learning Standards 9.3

Career & Technical Education standards outline what students should know and be able to do upon completion of a CTE Program of Study.

Career & Technical Education Standards in Course I

9.3.HL.5   Analyze the legal and ethical responsibilities, limitations and implications of actions within the healthcare workplace.

9.3.HL-BRD.4   Demonstrate the principles of solution preparation, sterile techniques, contamination control, and measurement and calibration of instruments used in biotechnology research.

9.3.HL.4   Evaluate the roles and responsibilities of individual members as part of the healthcare team and explain their role in promoting the delivery of quality health care.

Core Instructional and Supplemental Materials

- Project Lead the Way Biomedical Science Online Curriculum and resources
- HOSA: http://www.hosaofnj.org/
- Career Essentials Curriculum

Curriculum Map

Assessed Focused Standards	Unit 1	Unit 2	Unit 3	Unit 4
9.3.HL-BRD.4 Demonstrate the principles of solution preparation, sterile techniques, contamination control, and measurement and calibration of instruments used in biotechnology research.	x	x	x	x
9.3.HL.4 Evaluate the roles and responsibilities of individual members as part of the healthcare team and explain their role in promoting the delivery of quality health care.	x	x	x	x
9.3.HL.5 Analyze the legal and ethical responsibilities, limitations and implications of actions within the healthcare workplace.	x	x	x	x
Supporting Standards:	Unit 1	Unit 2	Unit 3	Unit 4
9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas.	x	x	x	x
9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice.	x	x	x	x
ELA Standards:	Unit 1	Unit 2	Unit 3	Unit 4
RST.9-10.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.	x	x	x	x
RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.	x	x	x	x

Career Ready Practices:	Unit 1	Unit 2	Unit 3	Unit 4
CRP4. Communicate clearly and effectively and with reason.	x	x	x	x
CRP7. Employ valid and reliable research strategies.	x	x	x	x
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.	x	x	x	x
Career Education:	Unit 1	Unit 2	Unit 3	Unit 4
9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest.	x	x	x	x
Math Practices	Unit 1	Unit 2	Unit 3	Unit 4
1. Make sense of problems and persevere in solving them.	x	x	x	x
2. Reason abstractly and quantitatively.	x	x	x	x
3. Construct viable arguments and critique the reasoning of others.	x	x	x	x
4. Model with mathematics.	x	x	x	x
5. Use appropriate tools strategically.	x	x	x	x
6. Attend to precision.	x	x	x	x
7. Look for and make use of structure.	x	x	x	x
8. Look for and express regularity in repeated reasoning.	x	x	x	x
Math Practices	Unit 1	Unit 2	Unit 3	Unit 4
Asking Questions and Defining Problems	x	x	x	x

Planning and Carrying Out Investigations	x	x	x	x
Analyzing and Interpreting Data	x	x	x	x
Developing and Using Models	x	x	x	x
Constructing Explanations and Designing Solutions	x	x	x	x
Engaging in Argument from Evidence	x	x	x	x
Using Mathematics and Computational Thinking	x	x	x	x
Obtaining, Evaluating, and Communicating Information	x	x	x	x

Pacing Guide

UNIT	Unit 1	Unit 2	Unit 3	Unit 4
Unit Focus	Medical Investigation: Investigating the Scene Master the Morgue Open Investigation CTSO: Communication	Clinical Care: Talk to Your Doc Decoding a Diagnosis New to the Practice CTSO: Communication within a professional setting	Outbreaks & Emergencies: Emergency Response Information sharing CTSO: Emergency Preparedness Industry-valued certification: Stop the Bleed	Innovation, Inc.: Designing the Future New Frontiers Pioneering the Future CTSO: Creativity
Duration	3 lessons	3 lessons	3 lessons	3 lessons

	Units	Project Lead the Way Program	Standards Areas	Pacing
1	**Medical Investigation**	1.1 - 1.3	9.3.HL.4, 9.3.HL.5, 9.3 HL-BRD.4, 9.4.12.CI.1, 9.4.12.CT.1, RST.9-10.4., RST.9-10.7, CRP 4, CRP 7, CRP8, 9.2.12.CAP.7	41 days
2	**Clinical Care**	2.1 - 2.3	9.3.HL.4, 9.3.HL.5, 9.3 HL-BRD.4, 9.4.12.CI.1, 9.4.12.CT.1, RST.9-10.4., RST.9-10.7, CRP 4, CRP 7, CRP8, 9.2.12.CAP.7	44 days
3	**Outbreaks & Emergencies**	3.1 - 3.3	9.3.HL.4, 9.3.HL.5, 9.3 HL-BRD.4, 9.4.12.CI.1, 9.4.12.CT.1, RST.9-10.4., RST.9-10.7, CRP 4, CRP 7, CRP8, 9.2.12.CAP.7	44 days
4	**Innovation, Inc.**	4.1 - 4.3	9.3.HL.4, 9.3.HL.5, 9.3 HL-BRD.4, 9.4.12.CI.1, 9.4.12.CT.1, RST.9-10.4., RST.9-10.7, CRP 4, CRP 7, CRP8, 9.2.12.CAP.7	35 days

Course Proficiencies

Unit 1: Medical Investigation
1. Demonstrate how to document a potential crime scene using sketches, measurements, and photography
2. Analyze and record evidence to evaluate a potential crime scene.
3. Analyze statements and simulated polygraph data from persons of interest to evaluate the credibility of their statements.
4. Discuss physiological changes that can occur as a result of providing false information.
5. Analyze forensic evidence to draw conclusions.
6. Describe the composition of blood and the ABO system.
7. Explain the structure and properties of DNA to examine how and why DNA is used in forensic science.
8. Perform gel electrophoresis and interpret results
9. Explain how an autopsy assists with a determination of the cause, mechanism, and manner of death.
10. Evaluate evidence to determine time of death.
11. Interpret a toxicology report to determine whether a substance in the body played a role in a death.
12. Describe the relationship between cells, tissues, organs, and systems in the human body.
13. Analyze models and perform a dissection of the heart to explain proper and improper functioning.
14. Synthesize information to determine cause of death.
15. **CTSO:** Identify strategies to improve communication skills.

Unit 2: Clinical Care
16. Record a comprehensive medical history for a fictional patient
17. Apply listening skills and interpret verbal an nonverbal behaviors to enhance communication with patients..
18. Collect, assess, and interpret patient vital signs.
19. Describe and practice the main assessments in a routine physical exam.
20. Interpret blood testing and physical exam results.
21. Describe the impact of telemedicine on the health care field.
22. Evaluate scenarios for HIPAA compliance or violation.
23. Explain the process of mitosis and the impact of this process on health.
24. Explain how genetic disorders originate and are diagnosed.
25. Create and interpret pedigrees to assess the probability of inheriting specific traits.
26. Demonstrate how a karyotype can be used to evaluate the genetic health of an individual.
27. Synthesize complex medical information to diagnose disease.
28. **CTSO:** Define and explain the importance of creativity.

Unit 3: Outbreaks & Emergencies

29. Describe the role of epidemiology and epidemiology in investigating and resolving health events.
30. Explain how infectious diseases can be spread, treated and prevented.
31. Summarize how our bodies can fight infection.
32. Communicate recommendations to a hospital or other medical facility about how to stop the spread of infection.
33. Examine and characterize bacteria based on colony characteristics and gram stain results.
34. Examine how medical professionals share information with each other and with the public.
35. Describe the education requirements, professional licensure, skills, and responsibilities of professionals involved in emergency response.
36. Determine the most appropriate route of delivery and dosage of a medication for a patient.
37. Evaluate the severity of bleeding in a patient and describe an appropriate response.
38. Evaluate triage categories to a set of patients awaiting emergency care.
39. Propose strategies for responding to disasters and large-scale health crises.
40. Collaborate to design a mobile medical facility
41. Analyze user needs and design and sketch a basic app design.
42. **Industry-valued certification**: Stop the Bleed

Unit 4: Innovation, Inc.

43. Categorize innovations that impact human health and wellness.
44. Create a solid model of an anatomical structure using CAD software.
45. Discuss the ethical issues related to biomedical science research and product development.
46. Develop a preventive medicine program for a specific client's needs through team collaboration.
47. Investigate how varying formalations of enteric coatings react in different sections of the digestive system.
48. Investigate how maps and information gained using mapping and analytics programs such as ArcGIS contribute to scientific discovery.
49. Describe the impact that biomedical science research and interventions have on society.
50. **CTSO:** Determine when it is appropriate to use e-mails, phone calls, face to face conversations, text messages and social networking personal messages to communicate within the workplace.

Unit 1 Plan - Medical Investigation

Stage 1 – Desired Results	
ASSESSED FOCUS STANDARDS: ❏ 9.3.HL.4 Evaluate the roles and responsibilities of individual members as part of the healthcare team and explain their role in promoting the delivery of quality health care. ❏ 9.3.HL-BRD.4 Demonstrate the principles of solution preparation, sterile techniques, contamination control, and measurement and calibration of instruments used in biotechnology research. ❏ 9.3.HL.5 Analyze the legal and ethical responsibilities, limitations and implications of actions within the healthcare workplace. **SUPPORTING STANDARDS:** **9.4 Life Literacies and Key Skills** **Creativity and Innovation** ❏ 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas. **Critical Thinking and Problem-solving** ❏ 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice.	*Unit Description*
	In Unit 1 students engage in forensic science and medical examination investigations in order to: a.) explore biological and forensic science careers; b.) gain experience in experimental design and data analysis; c.) learn about biomolecules and their role in determining identity; d.) learn about human anatomy and physiology and causes of death; e.) practice synthesizing multiple forms of data to draw conclusions; and f.) work to develop professional communication skills.

Meaning	
ENDURING UNDERSTANDINGS 1. Principles of Biomedical Science can be used to investigate the circumstances surrounding a mysterious death. 2. Experiments are designed to find answers to testable questions. 3. DNA from all living organisms has the same basic structure – the differences are in the sequences of the nucleotides. 4. Clear communication is necessary as a medical professional.	**ESSENTIAL QUESTIONS** 1. What are different forms of evidence, how infallible are they, and how are they useful in resolving potential criminal cases? 2. How can information collected during an autopsy lead to an understanding of disease and/or cause of death? 3. In what ways are the careful evaluation of evidence and accurate recording of data critical to establishing legitimate testimony?

What students will know and be able to do	
KNOWLEDGE 1. Demonstrate how to document a potential crime scene using sketches, measurements, and photography.	**SKILLS** 9. Explain how an autopsy assists with a determination of the cause, mechanism, and manner of death.

CONTENT CONNECTIONS:

ELA

❏ RST.9-10.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

❏ RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

Math Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

SCIENCE and Engineering Practices

❏ Asking Questions and Defining Problems

2. Analyze and record evidence to evaluate a potential crime scene.
3. Analyze statements and simulated polygraph data from persons of interest to evaluate the credibility of their statements.
4. Discuss physiological changes that can occur as a result of providing false information.
5. Analyze forensic evidence to draw conclusions.
6. Describe the composition of blood and the ABO system.
7. Explain the structure and properties of DNA to examine how and why DNA is used in forensic science.
8. Perform gel electrophoresis and interpret results

10. Evaluate evidence to determine time of death.
11. Interpret a toxicology report to determine whether a substance in the body played a role in a death.
12. Describe the relationship between cells, tissues, organs, and systems in the human body.
13. Analyze models and perform a dissection of the heart to explain proper and improper functioning.
14. Synthesize information to determine cause of death.
15. **CTSO:** Identify strategies to improve communication skills.

❏ Planning and Carrying Out Investigations ❏ Analyzing and Interpreting Data ❏ Developing and Using Models ❏ Constructing Explanations and Designing Solutions ❏ Engaging in Argument from Evidence ❏ Using Mathematics and Computational Thinking ❏ Obtaining, Evaluating, and Communicating Information		

Stage 2 – Evidence

SUMMATIVE ASSESSMENT(S)

Students will demonstrate skill mastery through the following tasks:
- Individually, students will complete teacher-generated exams.
- In small groups, students will complete teacher-generated projects and labs.

PRE-ASSESSMENT

As a class (or through Google Forms or relevant online tool) have the students answer and discuss the following questions/prompts:
- "What evidence can be used to solve a medical mystery?"
- "How does the body stay in homeostasis?"
- "How do heart problems occur?"
- "How can communication improve relationships?"

Integration of 21st Century Skills	Integration of Technology	Career Education
Career Ready Practices ❏ CRP4. Communicate clearly and effectively and with reason. ❏ CRP7. Employ valid and reliable research strategies. ❏ CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.	**Digital Citizenship** ❏ 9.4.12.DC.6: Select information to post online that positively impacts personal image and future college and career opportunities. **Information and Media Literacy**	**9.2 Career Awareness, Exploration, Preparation, and Training** **Career Awareness and Planning** ❏ 9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry

	❏ 9.4.12.IML.1: Compare search browsers and recognize features that allow for filtering of information. **Technology Literacy** ❏ 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem	requirements in areas of career interest.

Stage 3 – Learning Plan		
UNIT VOCABULARY		
Decedent	Telogen	Prokaryotic
Person of interest	Pili torti	Eukaryotic
Physiologic response	Ridges	Nucleus
Polygraph test	Arch pattern	Chromosomes
Heart rate	Tented arch	Histones
Blood pressure	Loop	Gel electrophoresis
Respiration Rate	Whorl	Gel polarity
Skin conductivity	Minutiae	DNA ladder
Vital signs	12-point match	Base pairs as unit
Pulse	Latent fingerprint	RFLP
Baseline	Forensic Science	DNA
Control	Digital evidence	Protein
Hypothesis	Erythrocyte	Nucleotides
Experimental design	Leukocytes	Double helix
Iterative process	Thrombocytes	Adenine
Independent variable	Plasma	Thymine
Dependent variable	Presumptive test	Guanine
Trace evidence	Confirmatory test	Cytosine
Locard's exchange principle	Hemoglobin	Base pairs
Keratin	Luminol	Deoxyribose
Cuticle	Kastle-meyer test	Phosphate

Cortex Medulla Anagen Catagen	Antigen Cells Organelles	Nitrogenous base Purine Pyrimidine

SUMMARY OF KEY LEARNING

Lesson 1: Days 1 - 20 → Investigating the scene
- **Learning Intention:** I am learning how to analyze a medical and forensic science investigation.
- **Success Criteria:** I can synthesize multiple forms of data to draw conclusions.
- **Brief Overview of Lesson:** In lesson 1.1, students begin their training as medical investigators. Shadowing members of the forensic investigation team, they will document and analyze the clues left at the scene of a woman's death. A video from the police commissioner emphasizes the severity of the situation, the need for more qualified professionals to help solve these types of cases, and the need for them to get to the bottom of the case ASAP. Students will sketch the crime scene and document evidence, analyze trace evidence in the lab, analyze biometric data of interviewed suspects, as well as record a video check-in for the police commissioner – chronicling what they have learned about the case in this lesson. Students will also be introduced to experimental design as well as proper scientific documentation.

Lesson 2: Days 21 - 35 → Master the Morgue
- **Learning Intention:** I am learning about the human body system structure and function to maintain homeostasis.
- **Success Criteria:** I can identify how anatomy and physiology function to help determine a cause of death.
- **Brief Overview of Lesson:** In lesson 1.2, students shadow the medical examiner to investigate what clues the body provides about the cause and manner of death. Students explore human body system structure and function as they investigate the composition of an autopsy. They will explore the many pieces of evidence that go into determining time of death and complete toxicology testing to determine the presence of drugs or chemicals in the body of the decedent. Examining basic tissue types in the body, students will zoom in to the microscopic level for clues that can't be seen with the naked eye. Students will then explore gross anatomy as they complete an "autopsy" dissection of a preserved heart. Using what they have learned in this lesson and from the examination of evidence from the scene, students will determine the cause, mechanism, and manner of death of the decedent.

Lesson 3: Days 36 - 41→ Open Investigation & Career Essentials- Putting Your Best Communication Forward
- **Learning Intention:** I am learning how to communicate effectively.
- **Success Criteria:** I can communicate professionally with teammates, supervisors and customers.

- **Brief Overview of Lesson:** Now that students have "graduated" from their training, they will be tasked to solve a new case. They will explore a virtual crime scene, gather evidence from the scene and persons of interest, complete laboratory testing, analyze evidence to deduce what happened, and complete an autopsy report using test and examination results. In preparation for court testimony, they must create an evidence board that illustrates the case to a judge or jury. This lesson will include activities that help students develop a variety of written, verbal, and non-verbal communication skills. By considering a variety of scenarios and participating in role play scenarios, students will practice effective communication skills. Students will also have real world learning opportunities to interact with professionals and volunteers that will provide feedback on the students' communication techniques.

CULTURALLY RESPONSIVE TEACHING in PRACTICE	SOCIAL EMOTIONAL LEARNING in PRACTICE
Acknowledge Students Ideas During think-pair-share, discussions, eliciting ideas probes or any other time that you have students sharing ideas out loud you can write down key points from their ideas on the board. This shows that you are acknowledging their words and listening to what they are saying. From these key points you can use them to facilitate discussion, which makes for a much richer and authentic classroom discussion as you are pulling from what students have said directly. **Set classroom norms for discussions** When having discussions in the classroom we open the floor to all students' perspectives. We want to make sure all of our students feel heard, and we also want to make sure all of our students feel safe enough to express their ideas within the space as well. By setting discussion norms for students that they can all contribute to, sets the tone that the classroom is a safe space and that all student ideas, perspective, opinions etc. are welcome while also setting guidelines for how the class will go about discussing counterpoints in a constructive manner.	**Assign Group Roles** Whenever group work is being done all members of the group should have an assigned role. You can assign this role randomly to members in the group or let them pick their role. If groups/tables are the same every time roles can shift each time there is group work or remain the same for consistency depending on your classroom climate and preference. Having a role not only gives every student a designated task to do during that assignment/activity, it enforces a sense of self-worth to make them feel part of a larger community in that the role they are playing is essential to completion of the task as a whole group. **Promoting Growth Mindset** Many times students will become confused or not fully understand the material right away. Often, students shut down, think that they have failed and automatically have a "fixed mindset" view. By promoting growth mindset and teaching students how to shift their thinking promotes not only students' social-emotional learning, but highlights the classroom community as a positive and safe place to cultivate learning. Reinforcing a growth mindset through consistent reflective practice (either as a group or individually) is essential for maintaining it through the year.

Unit 2 Plan - Clinical Care

Stage 1 – Desired Results	

ASSESSED FOCUS STANDARDS:

- ❏ 9.3.HL.4 Evaluate the roles and responsibilities of individual members as part of the healthcare team and explain their role in promoting the delivery of quality health care.
- ❏ 9.3.HL-BRD.4 Demonstrate the principles of solution preparation, sterile techniques, contamination control, and measurement and calibration of instruments used in biotechnology research.
- ❏ 9.3.HL.5 Analyze the legal and ethical responsibilities, limitations and implications of actions within the healthcare workplace.

SUPPORTING STANDARDS:

9.4 Life Literacies and Key Skills

Creativity and Innovation

- ❏ 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas.

Critical Thinking and Problem-solving

- ❏ 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice.

Unit Description

Students assume the role of different medical professionals working through the schedule of patients in a family care clinic in order to: a.) explore medical careers; b.) practice professional communication; c.) gain experience collecting, recording, and interpreting physiological data; d.) learn how to perform routine medical tests and evaluate results; e.) learn about cutting edge technologies revolutionizing healthcare; f.) understand the interconnectedness between body systems; and g.) explore the various causations and inheritance of disease.

Meaning

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
1. Genetics is the study of variation among offspring as a result of sexual reproduction. Changes in normal inheritance can result in genetic disorders. 2. Genetic testing is used to read a person's genetic code.	1. How can an individual's health status be assessed and evaluated? 2. What qualities make for an effective medical professional? 3. How can changes in a genome lead to disease? 4. How can the genetic health of an individual be evaluated?

What students will know and be able to do

KNOWLEDGE	SKILLS
16. Record a comprehensive medical history for a fictional patient. 17. Apply listening skills and interpret verbal an nonverbal behaviors to enhance communication with patients.	23. Explain the process of mitosis and the impact of this process on health. 24. Explain how genetic disorders originate and are diagnosed.

CONTENT CONNECTIONS:

ELA

❏ RST.9-10.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

❏ RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

Math Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

SCIENCE and Engineering Practices

❏ Asking Questions and Defining Problems

18. Collect, assess, and interpret patient vital signs.
19. Describe and practice the main assessments in a routine physical exam.
20. Interpret blood testing and physical exam results.
21. Describe the impact of telemedicine on the health care field.
22. Evaluate scenarios for HIPAA compliance or violation.

25. Create and interpret pedigrees to assess the probability of inheriting specific traits.
26. Demonstrate how a karyotype can be used to evaluate the genetic health of an individual.
27. Synthesize complex medical information to diagnose disease.
28. **CTSO:** Define and explain the importance of creativity.

❏ Planning and Carrying Out Investigations		
❏ Analyzing and Interpreting Data		
❏ Developing and Using Models		
❏ Constructing Explanations and Designing Solutions		
❏ Engaging in Argument from Evidence		
❏ Using Mathematics and Computational Thinking		
❏ Obtaining, Evaluating, and Communicating Information		

Stage 2 – Evidence

SUMMATIVE ASSESSMENT(S)

Students will demonstrate skill mastery through the following tasks:
- Individually, students will complete teacher-generated exams.
- In small groups, students will complete teacher-generated projects and labs.

PRE-ASSESSMENT

As a class (or through Google Forms or relevant online tool) have the students answer and discuss the following questions/prompts:
- "What is DNA?"
- "How are traits inherited through families?"
- "Why is it important to be enthusiastic about your job?"

Integration of 21st Century Skills	Integration of Technology	Career Education
Career Ready Practices ❏ CRP4. Communicate clearly and effectively and with reason. ❏ CRP7. Employ valid and reliable research strategies. ❏ CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.	**Digital Citizenship** ❏ 9.4.12.DC.6: Select information to post online that positively impacts personal image and future college and career opportunities. **Information and Media Literacy** ❏ 9.4.12.IML.1: Compare search browsers and recognize features that allow for filtering of information. **Technology Literacy**	**9.2 Career Awareness, Exploration, Preparation, and Training** **Career Awareness and Planning** ❏ 9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest.

	❏ 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem	

Stage 3 – Learning Plan		

UNIT VOCABULARY

Phlebotomy	Negative Feedback Loop	Protein Synthesis
Blood-borne pathogen	Positive Feedback Loop	RNA
Hemoglobin	Glucagon	Transcription
Hematocrit	Biosensors	Translation
Thrombocytes	HIPAA	Prognosis
Erythrocytes	Chronic Conditions	Alleles
Leukocytes	Acute Conditions	Homozygous
Plasma	Differential Diagnosis	Heterozygous
Cholesterol	Somatic Cells	Gamete
Risk Factors	Mitosis	Autosomes
LDL	Homologous Chromosomes	Dominant
HDL	Chromatids	Recessive
Hormes	Centromere	Punnett Square
Referrals	Tumor	Karyotype
Telemedicine	Benign	Nondisjunction
Diabetes	Malignant	Monosomy
Biomolecules	Cancer	Trisomy
Carbohydrates	Metastasis	Familial Hypercholesterolemia
Metabolized	Genes	Care Plan
Insulin	Mutation	

SUMMARY OF KEY LEARNING

Lesson 1: Days 42 - 59 → Talk to Your Doc
- **Learning Intention:** I am learning how to complete a medical assessment .
- **Success Criteria:** I can collect and analyze data to diagnose and make recommendations to a patient

- **Brief Overview of Lesson:** Students begin their day at the PLTW Total Care Clinic. Each patient they see will highlight key clinical skills as well as allow students to explore biological and physiological content. Students will explore effective questioning techniques, learn about documentation of patient data and medical history in electronic medical records, and investigate issues related to patient privacy. They will collect and analyze vital signs from a patient, investigating how each vital sign relates to the overall health and homeostasis of the body as well as how these vital signs can be used as part of clinical care and disease diagnosis. Students will interpret the results of routine bloodwork and make recommendations on ways to improve overall health and limit disease risk. Students are also introduced to telehealth, wearable devices, and remote monitoring as they simulate a virtual visit with a diabetic patient. At the end of the lesson, students will apply what they have learned to design a plan for a routine visit of a patient with a chronic health condition.

Lesson 2: Days 60 - 81 → Decoding a Diagnosis
- **Learning Intention:** I am learning how DNA functions in the process of protein synthesis.
- **Success Criteria:** I can explain how gene abnormalities with chromosomes can contribute to disease and overall health.
- **Brief Overview of Lesson**: In this lesson students explore the relationship between DNA, chromosomes, genes and proteins as they work through the diagnosis of various patients in the practice. Students investigate the process of protein synthesis as they piece together how mutations are related to various health conditions. Students will also explore how abnormalities with chromosomes can contribute to disease and overall health. At the end of the lesson, students will use what they have learned to help a family interested in learning more about their genetic risk.

Lesson 3: Days 82 - 86 →New to the Practice- Career Essentials: Get Out of the Box
- **Learning Intention:** I am learning that there is value to thinking outside of the box.
- **Success Criteria:** I can share my creativity and new ideas with others in order to positively contribute to the world and the workplace.
- **Brief Overview of Lesson:** In the problem students are tasked with helping a new patient at the PLTW Total Care Clinic. They will need to evaluate all medical evidence, question the family, record vital signs, order and evaluate bloodwork and synthesize data to make a diagnosis.

CULTURALLY RESPONSIVE TEACHING in PRACTICE	SOCIAL EMOTIONAL LEARNING in PRACTICE
Acknowledge Students Ideas During think-pair-share, discussions, eliciting ideas probes or any other time that you have students sharing ideas out loud you can write down key points from their ideas on the board. This shows that you are acknowledging their words and listening	**Assign Group Roles** Whenever group work is being done all members of the group should have an assigned role. You can assign this role randomly to members in the group or let them pick their role. If groups/tables are the same every time roles can shift each time

to what they are saying. From these key points you can use them to facilitate discussion, which makes for a much richer and authentic classroom discussion as you are pulling from what students have said directly.

Set classroom norms for discussions
When having discussions in the classroom we open the floor to all students' perspectives. We want to make sure all of our students feel heard, and we also want to make sure all of our students feel safe enough to express their ideas within the space as well. By setting discussion norms for students that they can all contribute to, sets the tone that the classroom is a safe space and that all student ideas, perspective, opinions etc. are welcome while also setting guidelines for how the class will go about discussing counterpoints in a constructive manner.

there is group work or remain the same for consistency depending on your classroom climate and preference. Having a role not only gives every student a designated task to do during that assignment/activity, it enforces a sense of self-worth to make them feel part of a larger community in that the role they are playing is essential to completion of the task as a whole group.

Promoting Growth Mindset
Many times students will become confused or not fully understand the material right away. Often, students shut down, think that they have failed and automatically have a "fixed mindset" view. By promoting growth mindset and teaching students how to shift their thinking promotes not only students' social-emotional learning, but highlights the classroom community as a positive and safe place to cultivate learning. Reinforcing a growth mindset through consistent reflective practice (either as a group or individually) is essential for maintaining it through the year.

Unit 3 Plan - Outbreaks & Emergencies

Stage 1 – Desired Results	
ASSESSED FOCUS STANDARDS:	*Unit Description*
❏ 9.3.HL.4 Evaluate the roles and responsibilities of individual members as part of the healthcare team and explain their role in promoting the delivery of quality health care. ❏ 9.3.HL-BRD.4 Demonstrate the principles of solution preparation, sterile techniques, contamination control, and measurement and calibration of instruments used in biotechnology research. ❏ 9.3.HL.5 Analyze the legal and ethical responsibilities, limitations and implications of actions within the healthcare workplace. **SUPPORTING STANDARDS:** **9.4 Life Literacies and Key Skills** **Creativity and Innovation** ❏ 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas. **Critical Thinking and Problem-solving** ❏ 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice.	Working as public health officials and then as emergency responders, students are presented with a series of events they must address while exploring: a.) careers in public health, epidemiology, microbiology and emergency medicine; b.) professional communication and presentation; c.) data analysis; d.) processes by which critical medical decisions are made and acted upon; e.) processes by which patients are diagnosed with a contagious disease and by which a causative agent is identified.

Meaning	
ENDURING UNDERSTANDINGS 1. How are infectious diseases spread through a population? 2. How can an unknown sample of bacteria be identified? 3. How does the immune system function to protect the human body from foreign invaders?	**ESSENTIAL QUESTIONS** 1. What are effective strategies for preventing and treating disease? 2. How does an immune system identify and eradicate infection? 3. How do patient vitals and presumptive diagnoses inform the prioritization for treatment options in emergency medical situations? 4. To respond to emergency situations, what common medical resources and facilities need to be available? 5. In what ways can technology enable a faster response and quicker resolution during medical emergencies?

What students will know and be able to do	
KNOWLEDGE	**SKILLS**

CONTENT CONNECTIONS:

ELA

❏ RST.9-10.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

❏ RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

Math Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

SCIENCE and Engineering Practices

❏ Asking Questions and Defining Problems

29. Describe the role of epidemiology and epidemiology in investigating and resolving health events.
30. Explain how infectious diseases can be spread, treated and prevented.
31. Summarize how our bodies can fight infection.
32. Communicate recommendations to a hospital or other medical facility about how to stop the spread of infection.
33. Examine and characterize bacteria based on colony characteristics and gram stain results.
34. Examine how medical professionals share information with each other and with the public.
35. Describe the education requirements, professional licensure, skills, and responsibilities of professionals involved in emergency response.

36. Determine the most appropriate route of delivery and dosage of a medication for a patient.
37. Evaluate the severity of bleeding in a patient and describe an appropriate response.
38. Evaluate triage categories to a set of patients awaiting emergency care.
39. Propose strategies for responding to disasters and large-scale health crises.
40. Collaborate to design a mobile medical facility .
41. Analyze user needs and design and sketch a basic app design.
42. **Industry-valued certification**: Stop the Bleed

❏ Planning and Carrying Out Investigations ❏ Analyzing and Interpreting Data ❏ Developing and Using Models ❏ Constructing Explanations and Designing Solutions ❏ Engaging in Argument from Evidence ❏ Using Mathematics and Computational Thinking ❏ Obtaining, Evaluating, and Communicating Information		

Stage 2 – Evidence

SUMMATIVE ASSESSMENT(S)

Students will demonstrate skill mastery through the following tasks:
- Individually, students will complete teacher-generated exams.
- In small groups, students will complete teacher-generated projects.

PRE-ASSESSMENT

As a class (or through Google Forms or relevant online tool) have the students answer and discuss the following questions/prompts:
- "How does a doctor decide which patient to see first in an emergency?"
- "How does your body respond when you get sick?"
- "Why would a doctor recommend multiple different types of treatment plans?"

Integration of 21st Century Skills	Integration of Technology	Career Education
Career Ready Practices ❏ CRP2. Apply appropriate academic and technical skills. ❏ CRP4. Communicate clearly and effectively and with reason. ❏ CRP7. Employ valid and reliable research strategies.	**Digital Citizenship** ❏ 9.4.12.DC.6: Select information to post online that positively impacts personal image and future college and career opportunities.	**9.2 Career Awareness, Exploration, Preparation, and Training** **Career Awareness and Planning** ❏ 9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry

❏ CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. ❏ CRP10. Plan education and career paths aligned to personal goals. ❏ CRP11. Use technology to enhance productivity.	**Information and Media Literacy** ❏ 9.4.12.IML.1: Compare search browsers and recognize features that allow for filtering of information. **Technology Literacy** ❏ 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem	requirements in areas of career interest.

Stage 3 – Learning Plan		
UNIT VOCABULARY		
Epidemiologists Sporadic Disease Epidemic Pandemic Outbreak Nosocomial Infection Host Disease Pathogens Prions Viruses Bacteria Protists Fungi Helminths Direct Contact Indirect Contact Acquired Immunity Innate Immunity	T-cells B-cells Antibodies Immunity Vaccine Etiology Petri Dish Isolating Streak Aseptic Technique Coccus Bacillus Spirillum Morbidity Mortality Pathogenic Podcast Stridor Ventilation Intubate Endotracheal Tube Skin Turgor	Parenteral Drugs Intravenous Intramuscular Subcutaneous Catheter Solutions Solute Solvent Osmosis Isotonic Hypotonic Hypertonic Tourniquet Ligate Hemostat Emergent Urgent Semi-urgent Non-urgent Medical Surge

Antigen	Enteral Drugs	Surge Capacity User Interface

SUMMARY OF KEY LEARNING

Lesson 1: Days 87 - 102 → Nosocomial Nightmare
- **Learning Intention:** I am learning about how the immune system works and agents of disease are spread.
- **Success Criteria:** I can identify risk factors for spread of diseases to design a strategy for resolving outbreaks.
- **Brief Overview of Lesson**: In this lesson students are part of the PLTW Disease Defense Team and they have been called to the local hospital. There have been a number of hospital acquired infections and the patients are not related or in the same ward. Students are challenged to investigate the case, determine why and how patients are getting sick and design a strategy for resolving the outbreak (and preventing another one). Through their investigation, students will investigate the chain of infection, agents of disease, as well as basic structure and function of the human immune system. In the lab, students will work to identify the infectious agent that plagues the fictional hospital.

Lesson 2: Days 103 - 120 → Emergency Response
- **Learning Intention:** I am learning about emergency medical response.
- **Success Criteria:** I can assess a medical emergency to communicate how a patient needs to be stabilized.
- **Brief Overview of Lesson:** Students will now serve as part of an emergency medical response team, trained to respond when access to care is limited during accidents, natural disasters, and other mass casualty events. As they respond to an emergency in the field, students will investigate assessment and stabilization of a patient, drug delivery and metabolism, techniques to stop bleeding, and communication between medical care providers. Students will evaluate hospital protocol for medical surge during an event as well as design a mobile response facility to assist with patient triage and care.

Lesson 3: Days 121 - 126 → Information Sharing
- **Learning Intention:** I am learning how to design an app for emergency medical needs.
- **Success Criteria:** I can create a mock app that can be used to respond to emergencies by medical professions or civilians.
- **Brief Overview of Lesson:** Students will apply what they have learned in the unit as they plan the design of an app to be used to trace outbreaks, respond to emergencies (local or global), increase response efficiency in emergencies, or provide another public health function. This app can be used by medical professionals or can be designed to be used by civilians in an emergency. Students will create mock-ups of their app, modeling the interactivity and peer review each other's designs.

Lesson 4: Days 127 - 130 → Industry-valued certification: Stop the Bleed
- **Learning Intention:** I am learning Stop the Bleed techniques.

- **Success Criteria:** I can pass the Stop the Bleed certification exam.
- **Brief Overview of Lesson:** Lesson will include activities that help students develop a variety of Stop the Bleed skills. Students will take the assessments in order to obtain the industry-valued certification.

CULTURALLY RESPONSIVE TEACHING in PRACTICE	SOCIAL EMOTIONAL LEARNING in PRACTICE
Acknowledge Students Ideas During think-pair-share, discussions, eliciting ideas probes or any other time that you have students sharing ideas out loud you can write down key points from their ideas on the board. This shows that you are acknowledging their words and listening to what they are saying. From these key points you can use them to facilitate discussion, which makes for a much richer and authentic classroom discussion as you are pulling from what students have said directly. **Set classroom norms for discussions** When having discussions in the classroom we open the floor to all students' perspectives. We want to make sure all of our students feel heard, and we also want to make sure all of our students feel safe enough to express their ideas within the space as well. By setting discussion norms for students that they can all contribute to, sets the tone that the classroom is a safe space and that all student ideas, perspective, opinions etc. are welcome while also setting guidelines for how the class will go about discussing counterpoints in a constructive manner.	**Assign Group Roles** Whenever group work is being done all members of the group should have an assigned role. You can assign this role randomly to members in the group or let them pick their role. If groups/tables are the same every time roles can shift each time there is group work or remain the same for consistency depending on your classroom climate and preference. Having a role not only gives every student a designated task to do during that assignment/activity, it enforces a sense of self-worth to make them feel part of a larger community in that the role they are playing is essential to completion of the task as a whole group. **Promoting Growth Mindset** Many times students will become confused or not fully understand the material right away. Often, students shut down, think that they have failed and automatically have a "fixed mindset" view. By promoting growth mindset and teaching students how to shift their thinking promotes not only students' social-emotional learning, but highlights the classroom community as a positive and safe place to cultivate learning. Reinforcing a growth mindset through consistent reflective practice (either as a group or individually) is essential for maintaining it through the year.

Unit 4 Plan - Innovation, Inc.

Stage 1 – Desired Results	
ASSESSED FOCUS STANDARDS:	*Unit Description*

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ASSESSED FOCUS STANDARDS:

❏ 9.3.HL.4 Evaluate the roles and responsibilities of individual members as part of the healthcare team and explain their role in promoting the delivery of quality health care.

❏ 9.3.HL-BRD.4 Demonstrate the principles of solution preparation, sterile techniques, contamination control, and measurement and calibration of instruments used in biotechnology research.

❏ 9.3.HL.5 Analyze the legal and ethical responsibilities, limitations and implications of actions within the healthcare workplace.

SUPPORTING STANDARDS:
9.4 Life Literacies and Key Skills
 Creativity and Innovation
❏ 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas.

Critical Thinking and Problem-solving
❏ 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice.

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Unit Description

Welcome to PLTW Innovation, Inc. – an incubator for innovation where some of the best minds in science and engineering endeavor to solve some of the world's most pressing biomedical challenges. Students tour Innovation, Inc. labs and engage in experiences designed to: a.) build their engineering and experimental design process skills, b.) challenge them to design solutions to current and emerging issues both on and off this world, c.) tangibly highlight that solutions to biomedical science problems rely on collaboration between professions, d.) build their computer science skills by using computer aided design (CAD) and geographic information system (GIS) to innovate the future of medicine, and e.) explore career fields on the forefront of medicine.

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<td colspan="2">*Meaning*</td>
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ENDURING UNDERSTANDINGS
1. Medical innovations have changed as new treatment options have been discovered.
2. Innovation and invention are the backbone of America's history, development, and growth.
3. Innovation and invention are creative ways of turning ideas into real things.

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ESSENTIAL QUESTIONS
1. Who innovates, and why?
2. How do innovations impact and advance human health?
3. In what ways do different types of scientists and engineers collaborate in the biomedical sciences field?
4. What are potential untapped resources that could work to advance the field of biomedical sciences?

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<tr>
<td colspan="2">*What students will know and be able to do*</td>
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KNOWLEDGE
43. Categorize innovations that impact human health and wellness.

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SKILLS
47. Investigate how varying formalations of enteric coatings react in different sections of the digestive system.

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CONTENT CONNECTIONS:

ELA

- ❏ RST.9-10.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
- ❏ RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

Math Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

SCIENCE and Engineering Practices

- ❏ Asking Questions and Defining Problems

44. Create a solid model of an anatomical structure using CAD software.
45. Discuss the ethical issues related to biomedical science research and product development.
46. Develop a preventive medicine program for a specific client's needs through team collaboration.

48. Investigate how maps and information gained using mapping and analytics programs such as ArcGIS contribute to scientific discovery.
49. Describe the impact that biomedical science research and interventions have on society.
50. **CTSO:** Determine when it is appropriate to use e-mails, phone calls, face to face conversations, text messages and social networking personal messages to communicate within the workplace.

❏ Planning and Carrying Out Investigations ❏ Analyzing and Interpreting Data ❏ Developing and Using Models ❏ Constructing Explanations and Designing Solutions ❏ Engaging in Argument from Evidence ❏ Using Mathematics and Computational Thinking ❏ Obtaining, Evaluating, and Communicating Information		

Stage 2 – Evidence

SUMMATIVE ASSESSMENT(S)

Students will demonstrate skill mastery through the following tasks:
- Individually, students will complete teacher-generated exams.
- In small groups, students will complete teacher-generated projects.

PRE-ASSESSMENT

As a class (or through Google Forms or relevant online tool) have the students answer and discuss the following questions/prompts:
- "What is an Innovation?"
- "What Innovations have affected your daily life?"

Integration of 21ˢᵗ Century Skills	Integration of Technology	Career Education
Career Ready Practices ❏ CRP2. Apply appropriate academic and technical skills. ❏ CRP4. Communicate clearly and effectively and with reason. ❏ CRP7. Employ valid and reliable research strategies. ❏ CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.	**Digital Citizenship** ❏ 9.4.12.DC.6: Select information to post online that positively impacts personal image and future college and career opportunities. **Information and Media Literacy** ❏ 9.4.12.IML.1: Compare search browsers and recognize features that allow for filtering of information. **Technology Literacy**	**9.2 Career Awareness, Exploration, Preparation, and Training** **Career Awareness and Planning** ❏ 9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest.

CRP10. Plan education and career paths aligned to personal goals. CRP11. Use technology to enhance productivity.	9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem	

Stage 3 – Learning Plan		

UNIT VOCABULARY

Innovation	Biohacking	Vaccine
Design Process	Regenerative Medicine	Immunity
Coronary Artery Disease	Antigens	Primary Prevention
Stent	Tissue Typing	Secondary Prevention
Drug-eluting	Xenotransplantation	Tertiary Prevention
Computer Aided Design (CAD)	Stem Cells	Epidemiology
Additive Method	Decellularization	Risk Factors
Subtractive Method	Preventative Medicine	

SUMMARY OF KEY LEARNING

Lesson 1: Days 131 - 148→ Designing the Future
- **Learning Intention:** I am learning how innovation leads to design
- **Success Criteria:** I can explore innovation in drug delivery to design an initiative to be implemented in a community
- **Brief Overview of Lesson:** In lesson 4.1 students will tour labs in the company, each dedicated to a different area of research, innovation, and design. They will investigate innovation in medical device development as they design model vessels for testing of cardiac stents. They will explore how computer-aided design (CAD) can be used for modeling and prototyping in innovation. Students will explore innovation in drug delivery as they design and test the formulation for a new drug. Focusing on large scale efforts in disease prevention and health promotions, they will then design a comprehensive initiative that could be implemented in communities around the country.

Lesson 2: Days 149 - 161→ New Frontier
- **Learning Intention:** I am learning about innovation to new frontiers.
- **Success Criteria:** I can explore how to design innovative improvements in space and in the ocean.
- **Brief Overview of Lesson:** In this lesson students expand their exploration of innovation to new frontiers. They will explore how the body reacts to travel to and life in space and design innovative improvements. They will then dive under the sea as they locate and test marine organisms for bioactive compounds useful as therapeutics. In the project students will be tasked with identifying the

next frontier for scientific exploration using GIS and designing an innovation for use in exploring, existing in, or adapting materials from, this new frontier. Students will summarize their research and present their proposal in an interactive story map.

Lesson 3: Days 162 - 167→ Invitation to Innovation
- **Learning Intention:** I am learning how to communicate effectively.
- **Success Criteria:** I can communicate professionally with teammates, supervisors and customers.
- **Brief Overview of Lesson:** Lesson will include activities that help students develop a variety of written, verbal, and non-verbal communication skills. By considering a variety of scenarios and participating in role play scenarios, students will practice effective communication skills. Students are tasked with competing for open lab space at PLTW Innovation, Inc. To make their case, students apply all they have learned in this unit (and course) to design a medical innovation.

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